The "TECHNICIAN"

Bulletin and House Organ of

The Certified Radio Technicians' Association

An Organization of Competent, Qualified and Trustworthy Radio Technicians for the Purpose of Advancing the Radio Art and for the Protection of the Public.

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One Dollar Per Year

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Ten Cents Per Copy

VOL. 1 NOVEMBER, 1933 NO. 3

EDITORIAL

By The Editor

Unfortunately, for honest and competent participants in all lines of endeavor, there are certain people who attempt to capitalize on the good-will and reputation of others. It is necessary for the public to choose between the former and the latter when contemplating the purchase of commodities or labor. When this choice concerns the performance of some technical or personal service the matter of a correct decision is very important. Many methods of classifying services and assuring competence are in use in various fields. The state licenses doctors, pharmacists, lawyers and others whose business is necessarily the performance of satisfactory service to the public at large. What are we, as technicians, to do in order to protect ourselves from unworthy- competition and the public from incompetent service?

The radio service field is an entirely individual one. Its problems and details of operation are different in nature than any other service field. A new set of conditions must be met and we, as men familiar with these conditions, must devise means of clearly designating and protecting competent service technicians. The answer is found in a consideration of the systems used in other professional fields--a system of state licensing by examination. The problems are too universal and general to be confined by city or county license. Voluntary membership and consequent certification by local or more extensive associations does not eliminate the novice and the untrained as our competition and as poachers upon the public pocketbook.

By state licensing every man engaging in radio service would be required to obtain a license by proving his ability to operate as a service technician. This matter is one of utmost importance. During this period of readjustment we must attend to the needs of our profession. We must all bend our efforts toward obtaining such a system of licensing. It means protection for everyone--the public, the dealer, the manufacturer, and the service technician and engineer.

Each of us should make the realization of state licensing a goal for which to strive. We can, if we honestly try, attain this goal. We must publicise the ideal Convince our fellow technicians, convince the jobbers and wholesalers, convince the manufacturers, the broadcasters and the public that therein lies the means of establishing the radio service field on the plane it deserves and must have! The responsibility is with us--we have the ability and the means to accomplish that for which we are responsible if we will all combine our efforts in this direction. Again, let us not be found lacking in the ability and perseverance to attain our goal.

NOV

To facilitate ready contact with any member of the officers and directors of the Association, the following directory is published for your convenience:

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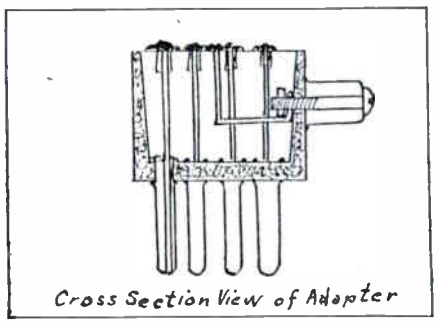
An Easy Method of Checking Circuit Continuity And Resistance

By CASH L. SWINNEY

In factories radio testing and repairing is usually done on the piece work basis and the prices paid for this work are usually such that the necessary speed can not be attained with the methods usually employed by the average service man for finding the trouble. Of course the factory man has several advantages over the service man, one of them being that of having the chasis removed from the cabinet. This makes continuity and resistance measurements easy. The purpose of this article is to bring to you a method of making many of these measurements with the chasis right in the cabinet.

It is assumed that your analizer will take the seven prong tubes, however, if it will not, use a six or five prong tube base instead of a seven prong as described in this article.



Cross Section View of Adapter

Secure a seven prong tube base, preferably a large one, and a grid cap from the top of any old tube. Drill a hole to take a 6-32 screw through the side of the tube base midway between the filament prongs and the same size hole through the top of the grid cap. Insert a 6|32 x 3|4 inch screw through the grid cap and then through the tube base. Bend a piece of buss wire to go on the screw and so that the end will come up wires extending through the holes. Put an on a small nut and tighten the screw. Solder a piece of buss wire in each prong long enough to extend a little above the top of the base.

Cut holes in a piece of heavy paper to correspond with the prongs and another one in the center. Place this piece of paper on top of the base shank with wires extending through the holes. Put an eyelet on each wire with the shank extending through the paper. This holds them even with the top of the base. Now clip the ends of the wires even with the tops of the eyelets and put a drop of solder on top of each one. Remove the paper and fill the base with sealing wax.

With your analizer plugged into the set and this adapter in the analizer socket you are ready to make the tests. With the radio turned on it is now possible with the voltmeter test leads to check the voltage between any two points. With the radio turned off you may check continuity or resistance between any two points or between any point and ground by touching one prod to the chasis and the other to the desired point on the adapter.

Faulty resistors, condensers or coils can often be positively determined in this way without removing the set from the cabinet thus saving all the work of taking the set out and replacing it again when the customer decides they just "can't afford it now."

NOV

MAJESTIC MODEL 66 VIBRATOR

By C. M. SHOOK
Service Manager, California Majestic Co.

After long continued operation the vibrator contacts may become sufficiently worn as to require readjustment. Adjustment is a very delicate procedure and under no circumstances should it be attempted without meters in the circuit. "Blind" adjustment of the contacts according to mechanical "feel," etc., invariably ends in improper adjustment resulting in excessive battery drain, overheating, accelerated wear and burning of contacts, improper plate voltage and noise interference with received programs. A primary d. c. ammeter (0 to 5 or 0 to 10 amps) is the most important indicator used during adjustments, and should be connected in series between positive lead and the vibrator terminal to which the Lead was connected. A 0-300 d. c. voltmeter, 1000 ohms per volt, should be connected between ground and the B side of the audio output transformer. A 0-100 d. c. milliammeter should be connected between ground and the ground end of the "B" filter choke (which is first removed from the ground). With a good "A" battery at 6.0 volts, there should be 5.7 volts at the vibrator terminals. With normal tubes which have been heating at least one minute, the following values should be read when the vibrator is properly adjusted:

Input
5.7 volts, 3.8 to 4.1 amperes

Output
200 volts, 53 milliamps

If the voltage measured at the vibrator is higher or lower than 5.7 then the other readings will be correspondingly more or less. Readjustment of the vibrator will be necessary if, for the above input voltage, the output current and voltage are down, or if the input current is much over 4.1 amperes. The latter conditions will be extremely rare unless the vibrator has been tampered with since leaving the factory.

The simplest and most usual adjustment required is a slight increase of spring tension by turning down the spring tension adjusting screw one or two turns. This adjustment is not critical, but if one or two turns do not improve the operation, this adjustment should be locked, and attention turned to the contact adjusting screws. Do not attempt to turn any adjusting screws without first loosening the lock nuts, and do not try any one adjustment as final without tightening the lock nut, as tightening the nut is apt to change things.

The second adjustment, and the one likely to do the most good, is to turn the No. 1 contact adjusting screw down very carefully, at the same time watching the ammeter. Usually not more than 1/8 to 3/8 turn will be necessary, but when the right adjustment is reached the ammeter will show 3.8 to 4.1 amperes. If the armature suddenly begins to clatter against the core the No. 1 contact is down too far and should be backed off. If proper operation is not obtained by adjusting the No. 1 contact it should be set at about 3.5 amperes and attention turned to the No. 2 contact. Turn the No. 2 adjusting screw down carefully until the ammeter shows 3.8 to 4.1 amperes at standard output. The vibrator should then be operating steadily and smoothly, and the input fluctuation should not exceed 0.2 amperes. If after a few trial adjustments the vibrator is obviously completely out of adjustment it is wise to proceed as follows:

Turn the No. 2 contact all the way out so that it does not make contact with the armature. Turn the No. 1 contact down until the armature clatters against the core, then back it off about one-half turn so that the clatter stops. Then turn down the No. 2 contact until the ammeter reading starts to rise and adjust to 3.8 to 4.1 amperes. Note that a point will be reached in this adjustment at which the output current and voltage do not decrease even though the input current is increased. This point will be between 3.8 and 4.1 amperes input, and is the point of correct adjustment.

If the reflection of a green arc is seen from the No. 1 contact, it is necessary to check the vibrator adjustment again. A vibrator operating with a green arc is apt to be a source of r. f. interference in the receiver. Incidentally, have no alarm if r. f. interference, or "buzzer noise," is observed while both lids are off the vibrator container. Usually, a green arc at the No. 1 contact is an indication of too much tension on the adjusting spring, or of a no-load condition in the output circuit--the latter being no fault of vibrator adjustment.

Before again closing the vibrator container after adjustments have been made, make sure that all connections and lock nuts are tight.

ELEMENTARY OHM'S LAW AND REVIEW

Part Three

By NORMAN B. NEELY

It has become standard practice to use the "self-bias" method of obtaining grid bias on vacuum tubes used in radio equipment. It is assumed that everyone is familiar with the theory of this method of biasing so this discussion shall deal only with the details of the calculation of resistor values for this purpose.

In circuits using cathode type tubes the bias resistor is placed in series with the cathode circuit. In tubes which do not have a separate cathode the resistor is placed in series with the center-tap of the filament winding on the power transformer or to the center-tap of a resistor placed across the filament circuit.

To determine the ohmic value of a bias resistor, a simple Ohm's Law formula is used. The value of the resistor is found by dividing the plate current of the tube into the grid voltage. (These values are taken from any reliable tube characteristics chart). For example, let us compute the value of a resistor for a 245 tube. By consulting the tube chart we find that a 245 tube draws .034 amperes with 250 volts on the plate and with a bias of minus 50 volts. From these figures we may set up our formula as follows:

$$R=\frac{E}{I} \qquad R=\frac{50}{.034} \qquad R=1470.58 \text{ ohms}$$

Inasmuch as it is not convenient to obtain a resistor of this exact value we would use a 1500 ohm resistor. Also, owing to the fact that the type of carbon resistors usually used are rarely more accurate than ten per cent of the rated value, such a small difference is not important.

A type 227 tube draws .005 amperes with a plate voltage of 180 volts and a grid bias of minus 13.5 volts.

$$R=\frac{E}{I} \qquad R=\frac{13.5}{.005} \qquad R=2700 \text{ ohms}$$

If two or more tubes are biased with the same resistor we must determine the total current flowing through the resistor and use that sum as the numerical value of E. In the cases of two 245 tubes in the pushpull output stage of an amplifier we find that the plate current of both tubes flows through the bias resistor in the grid return.

$$R=\frac{E}{I} \qquad R=\frac{50}{.068} \qquad R=735.29 \text{ ohms}$$

Twice the plate voltage of one 245 tube is .068 amperes so we divide the bias voltage, 50 volts, by this value and find that a resistor of 735.29 ohms is needed. The actual values in use are 750 or 800 ohms. The same rule applies to a number of 227 tubes (or any other type) with the cathodes (or center taps) all returned to ground through a single resistor. Of course, there are circuits to be found in everyday service work which do not conform exactly to the values found in this way but that is the exception rather than the rule. Also, there are some circuits using other methods of obtaining bias voltage. Class "B" amplifier circuits, of course, cannot use any method of obtaining bias voltage which is dependent upon plate current.

(This article will conclude this series for the present. If it is found that there is sufficient interest in this subject it will be continued either with a further study of Ohm's Law or subjects of a more advanced nature.—Editor).

Nov

NEW TELEVISION EQUIPMENT

The Radio Institute of California is installing some new and extensive television equipment which will be in operation very soon. Mr. Wm. G. Buffinger, owner and director of the school, extends a cordial invitation to all technicians to pay the new equipment a visit of inspection.

RECREATION

A Sunday afternoon spent at the Gardena American Legion Motor Bowl, located just south of Gardena, on Vermont Avenue, will prove exceedingly interesting. Some of the best riders and fastest machines in the country race there every Sunday. There are nineteen events and one may drive right in, park just above the track and enjoy the entire performance for a trifling admission fee.

SERVICE KINKS AND PET EQUIPMENT

Majestics

Majestic engineers have undoubtedly produced a great many receivers of outstanding performance. At the same time, however, it is unfortunately true that the mechanical design of certain models is such that they are extremely difficult to service.

In the model 50 the weakest point seems to be a group of six .15 by-pass condensers in two cans located underneath the section of the chassis which contains the 24 and 27 type tubes. The leads from these cans come out up in a corner between the can on an angle of the chassis. The leads however, can be traced to the voltage divider and different tube socket connections. By inspection it is a bit difficult to understand the significance of these wires. For instance, we might find a short from a screen grid to ground. By tracing, we would find a wire from the voltage divider to the condenser can and one from the screen grid to the can. The hot wire from the divider goes into the can and after making contact with the condenser continues on to the screen grid. Consequently, to replace a condenser in these cans it is necessary to cut both wires, connect a new condenser (preferably a 400 volt, .25 mfd.) from the screen grid circuit to ground, and connect a wire from the divider to the screen grid to supply the voltage.

Persistent and annoying cases of intermittent operation in this model may be caused by intermittent breakdown of the 500 ohm resistor connected from the i. f. screen grid to the first detector screen grid. This is a very small carbon resistor enclosed in a length of spaghetti and hung from the screen grid socket connections of the two tubes.

A considerable amount of the hum in model 70 sets may usually be eliminated by replacing the 27 detector tube with a type 56.

Very gradual fading in nearly all model Majestic Superheterodynes may sometimes be cured by reducing the oscillator heater voltage to somewhat less than 2.5 volts.

—NORMAN B. NEELY.

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Super-Powered Sound Reinforcing Systems

By L. C. LANGE
Leo J. Meyberg Co., Incorporated

During the last few years tremendous strides have been made in the development of sound reinforcing apparatus. At first these developments were confined to amplification of speech for telephone communication, then, with the advent of radio, engineers applied their energies toward building amplifying equipment that would have sufficient power to eliminate the necessity of earphones.

To do this it was necessary to construct a suitable sound projector, or loud speaker, because the speaker diaphram had to work much harder in order to produce sound of pleasing volume in a room than did the earphone diaphram to produce equal volume in the sealed area between the ear and the earphone diapharm. The amplifier driving the speaker had to be approximately 100 times as powerful as that driving the earphone.

With the advent of talking motion pictures it again became necessary to increase the power of amplifying equipment, whereas, before, a system having an output of one or two audio watts was entirely satisfactory, it now was necessary to have a system capable of producing forty watts of acoustic energy in order to satisfactorily cover the large theatres. In addition to increasing the power of the amplifier, it was necessary to design special sound projectors or speakers capable of converting this electrical power to audio power.

All of us are familiar with the amplifying equipment for home use. Some of us are familiar with the higher powered equipment used in theatres, and public address equipment. Few of us are familiar with the equipment capable of producing more than forty watts of audio energy.

Recently the R. C. A. Victor engineers were given the problem of constructing sound reinforcing apparatus for an electric carillion. As you know, the carillion is considered to be the world's most majestic musical instrument. Its melodious music is played on a series of bells hung in a tower. These bells, tuned to the diatonic scale, range in size from the small treble bell which is about eight inches in diameter and weighs about eight pounds, to the large bass bell, eight feet in diameter, weighing 20,000 pounds. This electric carillion was to produce music exactly the same as the standard carillion and of equal volume.

The tonal qualities of the bells were exactly reproduced by means of specially made metal reeds vibrating in a magnectic field. The voltage thus generated was then to be amplfied and the sound projected from a tower.

After some discussion the work was divided. One group of engineers was to build an amplifier capable of developing the tremendous electrical power necessary, while the other group was to construct a sound projector capable of converting this electrical power into audio energy.

The amplifier developed by the first group of engineers had an output of 1000 watts, consisting of five individual stages of amplification, the last stage being operated as a Class B. power amplifier.

The sound projector developed was of the dynamic type and utilized a micarta diaphram. It was 27 inches in diameter and weighed 250 pounds.

The amplifier and the operating console of the electric carillion were installed. Eight sound projectors were installed in the tower so that the sound could be projected in all directions, and then the instrument was played by an expert Carillionneur. The results obtained surprised even the engineers who had built the carillion. The reproduction was identical to that of the standard carillion, and the musical selections were of even greater beauty because of the much greater ease of control by the Carillionneur. Such tremendous audio power was developed that on a quiet evening the bells could be heard for a distance of 15 miles. Beyond question, this is the highest powered sound reinforcing equipment commercially available today.

(Additional articles by Mr. Lange describing equipment engineered by the Special Products Division of the R. C. A. Victor Company will appear in future issues of The "Technician."—Editor).

Nov

LOOKING FORWARD

By W. F. GRIMES, Lieutenant-Commander, U. S. N.

In the October issue of the "Technician" there appeared a very interesting article by Mr. H. D. Hatfield, Ex (long time ago) U. S. Navy. His article entitled "Looking Backward" tells a very brief story of the introduction of Radio Communication into the Navy; it also gives a brief story of the way in which radio operators were procured.

All of us now engaged in radio work owe much to the U. S. Navy for the present state of development of the Radio Art. Prior to Commercial Radio Broadcasting the Army, Navy, Amateurs and a few commercial ships of the United States were about the only outlet for radio products. The Amateurs in their own ingenuous way were rather independent of manufacturers; the Army limited in its requirements was not considered a potential market for radio products; on the other hand the Navy was charged with the protection of not only the shore line of the United States but its possessions and Nationals wheresoever located. The immense problem and benefits to be derived from providing communication between ships of the Navy and between Washington and possessions and isolated ships was fully realized shortly after the time mentioned by Mr. Hatfield (1905).

In 1907 the Navy Department established a Radio Research Laboratory at the Bureau of Standards with the late Dr. L. W. Austin as its head. The researches of Dr. Austin dealing with transmission formulae, static, receiving systems, etc., won for him recognition of the scientific world.

In 1915 the Navy Department in cooperation with one of the manufacturers conducted Radio Telephone experiments between Arlington, Paris and Honolulu. This was the introduction of vacuum tube transmitting equipment into the Naval Service.

In 1917 when the United States entered the war, practically all transmitting was done by spark or arc sets. Receivers generally were of the regenerative detector, two or three stage audio type. During the war much progress was made in the development of vacuum tubes and circuits for transmitting and receiving. This development being at the expense of the government but placing many manufacturers in an advantageous position when the commercial possibilities of Radio Broadcast were realized.

Today, with the exception of a few arcs, all transmitting in the Navy is done with vacuum tube transmitters ranging in size from a few watts to several hundred kilowatts. By means of these transmitters and receivers which follow closely in design the present day commercial receiver, the Navy Department at Washington is in constant touch with Naval vessels throughout the world. Large volumes of traffic are handled over the circuits provided, the handling of which is a study well worth while.

The present day researches of the Naval Radio Research Laboratory at Bellevue, under Dr. A. Hoyt Taylor, and those in the various Navy yards are constantly resulting in discoveries of considerable value not only to the Navy but to the art in general.

Until 1917 Radio personnel of the Navy was developed by one or both of two methods. Training given aboard ship to members of the ships crew, usually electricians, or to students at the electrical school, Brooklyn Navy yard.

When the United States entered the war there was an acute shortage of operators due to the fact that there was not a sufficient number of regular operators available to man the regular vessels of the Navy. Many amateurs and commercial operators entered the service and while skilled in operating, lacked familiarity with Naval procedure and customs. Consequently, there was a serious delay in the schooling of these men in order that auxiliaries and new ships might operate in conjunction with the regular service.

In order to provide a more suitable supply of operators and others required for the handling of Naval Communications in time of a National Emergency, Congress in 1925 authorized the Naval Communication Reserve with an authorized strength of 6,000 officers and men. At the present time this Reserve has been developed and recruited to about seventy-five per cent full strength. It functions as an integral part of the regular Navy shore establishment. Units have been developed in many localities and are conducting regular drills both on the air and at authorized meeting places. Officers and men must meet physical and technical requirements of the regular service and must maintain a regulation standard of efficiency. At the present time this activity is on a voluntary basis with compensation only in occasional active duty with pay and the satisfaction of personal patriotism.

OPEN FORUM

Los Angeles, Calif.,
October 20, 1933

Editor:

Much has been written about the crooked racketeering radio service man but nothing about the radio customer. I am sorry to admit that the crooked radio service man does exist but in many cases a chiseling public determined to take advantage of the service man has decided the latter to fight fire with fire. And have I met up with chislers in the dreary past? I've been gyped by experts. I still meet these people who want to deny a living to the service men but I do not fall as often as I used to. Once in a while, however, I run across an artist and he puts one over.

Before I start this tirade against low-down, mean, cheating (I could think of some other names) gyps, I hasten to say that I have often been off my guard in the past by contact with upright, honest, fair radio owners, people whom it has been a pleasure to know, who remain today my very best friends. And I may also add that the cheat has been the exception and not the rule, praise be.

"What," shouts outraged innocence, "you want money just for giving an estimate- Why, it's highway robbery. I certainly shall not pay. Why, you haven't done anything to fix the set. I'm willing to pay you to FIX the set providing I do not think your price too high for that but I'm damned if I will pay you for just LOOKING at it." And what can the poor service man do? Some men may enjoy a brawl with this type of human scum but I do not. I try to explain politely that like a physician, diagnosis is a large part of the service. It has generally ended in the past by my leaving with nothing and the customer has a friend or relative who can install defective parts but has not the equipment or knowledge to find the trouble.

Then there is the !!!??? dash dash hyphen to hyphen and return trip who tries to have you make every part in his set good just because upon some date he actually parted with money for your work. Typical of this breed of vermin is his greeting, "The set never has worked the same since you fixed it!" Maybe you replaced a burned out audio transformer. He will swear that before you tinkered with the outfit, the selectivity was marvelous but now "they all run together."

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NOV

A REACTANCE TYPE CAPACITANCE METER

By C. E. MILLER

Modern test equipment usually includes a rectifier type AC-DC 1000 ohm per-volt meter. The following data assume a meter of this type having a 4 volt AC scale which when reduced to its components consists of a 0-1 m. a. meter in series with approximately a 4000 ohm multiplier. The meter may be in a set analyzer. If it is, connections may be made to the external binding posts without disturbing the analyzer in any manner.

The method employed is based upon Ohm's Law. However, since we are dealing with AC rather than DC, we must carry out all calculations using the impedance of the circuit rather than the simple ohmic resistance and at all times consider the quadrature relationship between the reactance and resistance components. Since a properly designed AC meter has practically no inductance we may assume the inductance reactance as zero. The current flowing through the meter when a given AC voltage is applied will be inversely proportional to the impedance of the circuit. This impedance, composed of the resistance of the meter and its multiplier and the capacitance reactance of the condenser under test, may be expressed by the equation

$$Z = \sqrt{R^2 + \left(\frac{1}{2\pi fC}\right)^2}$$

where

Z -- Impedance in ohms,

R -- Resistance of meter and multiplier in ohms,

F -- Frequency in cycles per second,

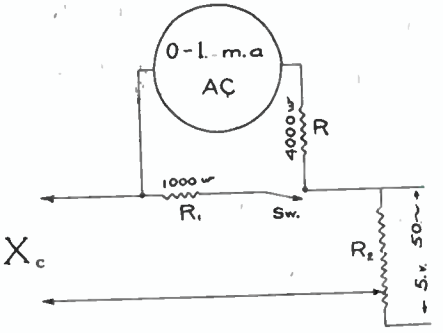
C -- Capicitance in farads.

Since the current through the meter I -- E -:- Z, when E is the applied voltage, we may substitute for Z in equation (1) and get the general equation for the circuit

$$I = \frac{E}{\sqrt{R^2 + \left(\frac{1}{2\pi fC}\right)^2}}$$

An analysis of equation (2) shows it to be a general equation that may be employed under any conditions of voltage, frequency, resistance, meter sensitivity, or capacitance. However there are certain limitations and requirements that must be met if the meter is to be of value as a tool in radio receiver servicing. Accuracy demands a source of power of known and stable frequency and voltage. This is best supplied by the commercial AC supply systems. Meter sensitivity and resistance are determined by the meter that is available. Since we have assumed a 1000 ohm per volt AC meter with a 4 volt scale the maximum meter current is limited to 1 m. a. and the resistance, R, is fixed at 4000 ohms.

All electrolytic condenser measurements are made with a 4 volt supply. The resistance of the meter protects it against dead shorts and the voltage is so low that no polarizing voltage is required since the inverse voltage is insufficient to break down the film. (The test does not necessarily mean that an electrolytic condenser is in good condition for high voltage DC. Leakage current at normal operating voltage should also be checked).



CAPACITANCE METER

Referring to the diagram, the meter and its multiplier R may be any 4 volt 1000 ohm per volt AC meter. R1 is a shunt for spreading the readings at high capacitances, and R2 is a low resistance potentiometer of the order of 10 or 15 ohms. A separate transformer may be used or a plug may be provided to obtain the 5 volts from the 80 socket of a receiver.

To operate, short the terminals at Xc and adjust R2 for full scale meter reading. Then connect the condenser at Xc and compare the meter reading with a calibration curve based upon the following data which are computed for a frequency of 50 cycles. (Note that from equation (2) the presence of R prevents the direct conversion from 50 to 60 cycles

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SHORT WAVE CONVERTERS

By CHARLES A. NICHOLS

Although the trend now seems to be toward combination all wave sets there are still a few persons who desire a converter that may be attached to their present radio so as to enable them to "listen-in" on the higher frequencies. The purpose of this article is to pass on a few facts in regards to the construction and servicing of such instruments.

Before going any further I wish to make it clear that any piece of equipment placed ahead of the first radio frequency tube in a broadcast receiver thus converting said receiver into a super-heterodyne, is to be spoken of as a converter. Other devices that use only the audio end of the broadcast receiver are to be known as adapters. This latter type have been in use much longer than the former although the principle of the converter has been known ever since the advent of the super-heterodyne circuit. The reason for the poor showing of the first converters and adapters was the very low gain obtained at high frequencies when using triodes. But with the advent of screen grid tubes much greater possibilities were presented. Many technicians may be heard to remark that even now they can not see that converters or adapters are a success. This may be true in some cases but usually there is a good reason for their failure and I will attempt to name some of them.

Of course, a good location has much to do with the success of short wave reception, also the type of antenna and leadin used. A person may have a very nice antenna, high and well insulated, but if the leadin is brought under the house or through the wall via a wall-plug the efficiency of the antenna is very low. This same antenna may work very well on broadcast frequencies but on short waves it will be almost useless. One may get away from this difficulty to a considerable extent by employing a twisted leadin, either of the zepplin or doublet type. Perhaps the most common reason for the failure of converters is the broadcast set itself. If said broadcast receiver does not use screen grid tubes it is almost useless to attempt to receive short waves as there is not enough gain in the rf stages to properly amplify the very weak signal delivered from the converter. The exception to this rule is where the converter utilizes a stage of radio frequency ahead of the detector or a stage of intermediate frequency behind the detector or both. In the latter case very good results are quite often obtained if the broadcast receiver has even a fair amount of gain.

One great drawback to converters is the amount of noise heard while attempting to receive shortwave signals. Much of this is due to the rf stages picking up noise because of improper shielding and also from pickup in the connecting wires from the converter output to the antenna post of the broadcast receiver. Some of it may be due to improper mixing in the first-detector-oscillator circuit of the converter. The weaker the signal delivered to the broadcast set the higher the volume control has to be turned and vice-versa. By all means if you are contemplating construction of a converter plan on using a stage of rf ahead of the detector if you want at least fair results. Another good idea is to employ grid leak and condenser detection instead of power type for the first detector. The reason for this is the added sensitivity of the grid leak type. Needless to say, there is considerable loss in transfer from the converter to the broadcast receiver because of improper matching between the first detector of the converter and the first rf tube of the broadcast receiver. Quite often much higher gain may be had by tapping onto the grid of the first rf tube of the receiver instead of the antenna post. Caution must be exercised in doing this because of the danger of oscillation in the broadcast receiver as a result. If this happens there will be trouble unless the volume control is backed off until this condition ceases, which will cause a decided loss of signal.

Now for a few words in regard to adapters. Personally, I prefer adapters over converters but of course the general public experiences difficulties with them because of the regenerative detector feature and their inability to figure out how to hook them to the second detector of the broadcast receiver. The noise level of the adapter is much lower and the quality of the output considerably better than that of a converter, although the amount of gain is much lower. One other

(Continued on page 16)

Nov

A HANDY CAPACITY BRIDGE

By ROY McLAUGHLIN

Very often, in the average service shop, it becomes necessary to measure the capacity of condensers, especially small ones.

The usual methods of doing this require rather elaborate and expensive apparatus which most shops do not possess.

I have found that a very satisfactory bridge for this purpose can be constructed from a few simple parts. Of course the accuracy of this machine is not as good as a more elaborate affair but is near enough for most practical purposes.

Figure 1 is a circuit diagram of this bridge. R1 is a 50,000 ohm fixed resistor and should be reasonably accurate. R2 is a variable 50,000 ohm resistor and should be of the wire wound type. C1 is a fixed condenser of known value and as near accurate as it is possible to obtain. The value will depend on the size of the condenser under test. The headphones are any standard brand of about 2,000 ohms impedence.

The source of A. C. supply may be almost anything, even 110 volts direct from the line. However, a note of about 1,000 cycles will be more easily balanced and make more accurate readings possible.

The writer used a buzzer that could be adjusted from about 500 cycles to well over 3,000 cycles. This buzzer at one time did duty as a modulator on a 1,500 watt I. C. W. transmitter of G. E. manufacture and used in the Signal Corps so it was a good one.

An audio frequency oscillator of the vacuum tube type could also be used with good results. A circuit diagram and description of such an oscillator will be described in a future edition if our editor deems it of sufficient importance to take up the space—(This data will probably appear in the January issue.—Editor).

The only calibration necessary on this instrument is the variable resistor R2 which should be fitted with a dial, or other indicator, and calibrated so that the resistance can be determined at any setting of the indicator. The calibration can be done with an ohmmeter, Wheatstone bridge or other means available and should be pointed at least every 500 ohms and preferably 250 ohms or even less if possible.

In operation a known capacity is connected at C1, the unknown is connected at C2, the A. C. source is turned on and R2 is varied until no hum, or a minimum of hum, is heard in the phones. The unknown capacity can then be determined from the following equation:

$$C2 \text{ equals } \frac{R2}{R1} \times C1$$

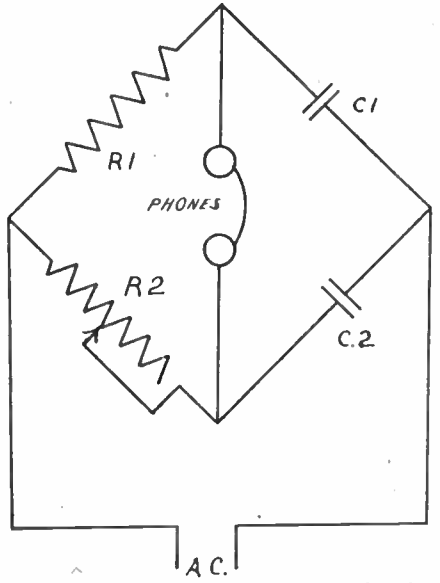
This is a very simple equation and no difficulty should be experienced in using it.

A leaky condenser will result only in a reduction of hum, noticeably different from that of a perfect condenser, but a balance cannot be had. Hence electrolytics cannot be measured. A shorted condenser will give an increased hum regardless of adjustments. An open condenser will also give an increased hum and cannot be balanced.

The range, with different values of C1, will be about as follows:

.0001 will give from .0001 to .02
.0005 will give from .0005 to .1
.005 will give from .005 to 1.
.05 will give from .05 to 10.

It will be seen that the lowest value that can be measured is about equal to C1. However by making R1 a lower value the ratio is changed and any desired value is obtained.



Constructional details will not be discussed at this time as each individual will probably want to use his own ideas along that line.

OPEN FORUM

(Continued from page 9)

They say they "expect you to make it good," and if you won't they will spread your reputation as a man who ruined their perfectly marvelous set and refused to make it good after he had collected his money.

I keep records of dates and it has served me well in cases where customers claim I just recently repaired their set and now the same trouble returns. I actually had a customer whom I couldn't recall tell me this: "You installed an audio transformer for us not long ago and another service man told me it is now burned out. Since I paid a very high price to you for this transformer I am giving you a chance to make it good." I told the customer that I would look up my records and that a 90 day guarantee was placed on that transformer by the manufacturer and that the price I sold it for was list and the transformer was high quality. My records showed it was TWO YEARS since I installed the transformer and the customer admitted it but refused to employ me to install a new transformer when pay was asked.

Often the undesirable customer will begin by knocking your competitor and saying that he doesn't know his business, is a highway robber, a racketeer and an outrageous profiteer. They attempt to trap you into agreeing with them. It's no trap for me because my competitor in this territory is a gentleman and friend and if they don't like his straightforward method of doing business they won't like me either. But I say, beware of the customer who is always knocking other service men! He is advertising that he will knock you just as enthusiastically if he fails to "work" you.

J. K.—A Service Man Victim.

(Alas and alack-a-day! Unfortunately we all know this to be only too true.—Editor).

Watson and Wilson are now distributing the new Grunow line of refrigeration and radio.

The distributorship of Zenith products has been taken over by the Ray Thomas Company.

The Crosley line, formerly handled by Kierulff and Ravenscroft is now being distributed by Chanslor Lyon and Co.

SHORT WAVE CONVERTER

(Continued from page 11)

advantage is the absence of bothersome images which can be very annoying when listening on short waves.

In regard to servicing there is very little to be said. High resistance contacts on switches and weak oscillator tubes are the two most frequent causes of poor reception or no reception at all. As for servicing all-wave receivers no difficulty should be experienced with regard to the short wave portion of the receiver, unless it has been "re-hashed" by some person that thought he could improve it and then found to his sorrow that he could not. In that case the entire receiver, in all probability, will have to be re-balanced.

Space does not permit going into the various methods of mixing the oscillator and first detector signals but most service men are familiar with the conventional circuits which will work out satisfactorily. Care should be exercised in selecting the intermediate frequency to be used so as not to beat against a local broadcast station, thereby causing distortion or modulated signals such as speech or music. If one cares to receive continuous waves (radio-telegraph) this is very good as the incoming signal will beat against the carrier of the broadcast station thereby creating a beat note that will be heard in the speaker. Another method is to construct a separate oscillator working at the intermediate frequency of the broadcast receiver being used. Of course this would have to be turned off or shifted slightly in frequency if one wishes to receive speech or music.

Regardless of my many years of experience with the higher frequencies I must admit that if I were called upon to repair some of these "custombuilt" 16 tube all-wave receivers I would advise the customer to throw it away and buy another one as that would probably be the least expensive. Some of them work quite nicely but if they ever stop they usually stay stopped.

PERSONAL MENTION

Mr. A. E. Ravenscroft, formerly of Kierulff & Ravenscroft, Inc., announces his new location of business, to be opened November 16, 1933, at 1818 S. Grand Avenue. The firm will be known as A. E. Ravenscroft. Mr .Ravenscroft will handle a full line of radio parts and accessories, also Mayflower refrigeration parts and service.

Mr. E. A. Freitas, formerly manager of the radio service department for Kierulff & Ravenscroft, will be in charge of the radio service, specializing on repairs of Crosley and Amrad receivers which he has done since 1928. The service department is one of the most complete in Southern California, equipped to perform all types of alignment and other repairs to all makes of radios as well as Crosley and Amrad.

Mr. W. J. Bryan, formerly instructor of radio servicing at Frank Wiggins Trade School, is now service manager for the Leo J. Meyberg Co. Mr. Bryan was previously connected with RCA Victor and is quite familiar with this line of equipment.

The new firm of Kierulff and Goddard, located at 1121 Venice Boulevard, are distributing National Union tubes. They have very kindly offered to relieve us of the financial burden of getting out the regular meeting notices. We owe a great debt of gratitude to these men for their continual and wholehearted support of our association both in spirit and act.

SERVICE KINKS AND PET EQUIPMENT

(Continued from page 6)

Power Pack Shorts: The use of a 0-5 amp. A. C. meter connected in series with the A. C. supply to the A. C. cord of the receiver being tested will enable one quickly to ascertain whether trouble is in the filter system or in the power transformer. The average eight tube receiver draws approximately 120 watts which will be indicated on the meter at slightly over one ampere. With the rectifier tube pulled out of its socket, the current drain will drop approximately fifty percent, depending on the receiver. If the a. c. current drain exceeds the normal drain by any great amount it can be assumed trouble is in the power transformer. If the A. C. current drain exceeds normal with the rectifier tube in place then the trouble is in the filter section and can usually be traced down to a defective filter condenser or grounded filter choke. This arrangement can be built permanently in the shop test panel with a test socket for the receiver under test. (An A. C. plug adapter arrangement is also very convenient and does not permanently "tie-up" the meter. —Editor).

E. A. FREITAS.

Crosley Model 127: When renewing tube equipment in this model it is advisable not to replace with any of the spray shield tubes on the present market, as the characteristics of this type tube vary somewhat from those for which the receiver was designed. The result is loss of sensitivity as well as poor action of the visual tuning meter. Motorboating will result if the tubes are not kept far enough apart from one another. The best bet when replacements are necessary is to use the regular type tubes. Ordinarily this model will swing the tuning meter needle three quarters of the dial range with the average station on an average size antenna.

Lack of sensitivity and proper operation of the tuning meter is lack of proper alignment. Trouble may also be found in the R. F. interstage coil.

E. A. FREITAS.

When testing a set or RPA using an 876 ballast tube substitute a 200 watt mogul base lamp for the 876. Lamps cannot burn out and also give the set better protection while you are working on it.

—C. E. MILLER.

Locating Cutoff Trouble in Philco Receivers

One of the common troubles that develop in Philco receivers is cutting on and off. The set will be playing and suddenly go off, only to come back on just as sudden. To find trouble of this sort, turn set on, tune to station and turn the volume up enough to come in good, then take a pointed piece of bakelite or other insulating material and insert it under the condenser leads that come out of the bakelite condenser cases, raise up and down gently and note if it effects the performance of the set, if not, proceed to the next fixed condenser and repeat procedure until the faulty one is located.

To locate noisy resistors, chokes and Audio Transformers take a continuity meter and place in series with a pair of head phones, with clips attached to one test prod and one phone tip, place these across the part suspected and note if the meter fluctuates, also note if it is audible in the prones if it is ,the part is defective and should be replaced.

J. ROBERT POOL.

SERVICE

By C. M. SHOOK

Have you ever stopped to analyze what you, I or anyone, millionaire or pauper, has to sell? Isn't it SERVICE in one form or another? The laborer the services of his strength, the banker, lawyer, broker, etc., the services of his brains, and you, your ability to correctly service this marvel of the age, "Radio."

Among your members undoubtedly are those who started in this thing, "Radio," as a pastime, others who definitely set out to make it a life work. Regardless of how you got into this fascinating work, we should seek to raise the status of the radio technician to that point whereby the public will insist on knowing they are getting the services of a man who is not only skillful but whose opinions if followed, will be proved to be correct and not experimental.

Selling of tubes is a source of revenue for you field men, but don't lose sight of the fact that you should leave with the customer the old tubes as evidence that they are really worn out or usable in an emergency; this also applies to replaced parts.

Past practices of hoodwinking the customer is partly responsible for the pessimistic and doubting attitude of customers. No one gets his fingers burned more than once if he can help it.

Strict adherence to the rule of honest dealing, fair prices and courtesy will go a longs ways towards raising the status of a radio service man to that of Radio Technician. The American public is radio educated now, and the service man who tries to fool his source of income is, after all, only fooling himself.

It might be well to make the Radio Technician's slogan, "Courtesy, Service, Honesty."

Classified Directory

JOHN A. ORME, Adv. Mgr.
Phone ATlantic 9501

For Sale—

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

Western Electric 240 AW Speaker, $3.50. C. A. Nichols, UNiversity 9422.

New Esco motor generator, 12 volts D. C. input--750 volts D. C. output at 165 MA. ???

Wanted—

Rider's Manual No. 2. Ray Rushoi, UNiversity 3093.

Weston Model 301 10 ampere meter. Norman B. Neely, ALbany 1628.

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

Land close to Los Angeles. H. A. Aanderson, FItzroy 2727.

Beat-Frequency oscillator and other precision measuring equipment. ALbany 1628.

ADVERTISERS

The absolute deadline for all advertising copy to appear in the Christmas issue will be December 2. If you wish proofs before the magazine goes to press your copy must be received by the advertising manager or the editor one week in advance of this date.

NOV. 33

TECHNICAL QUESTION AND ANSWER DEPARTMENT

Conducted by CHARLES MILLER
Chairman, Technical Board

Q. Just what is the actual difference between variable-mu tubes and ordinary screen-grid tubes such as the 224?—D. S.

A. Super-control amplifier tubes differ structurally from other scheen-grid tubes chiefly in the fact that the control grid is wound with course spacing in the middle and close spacing at the ends. As a result of this spacing it is possible to apply a high bias to control powerful signals and at the same time have the plate current high enough to permit relatively distortionless amplification.

Q. Would it improve the performance of an AF transformer to mount it in a heavy cast iron case?—M. W.

A. The electrical characteristics would remain substantially the same. However it would permit close mounting of the transformers without serious interstage coupling and would assist greatly in the reduction of inductive pick-up from the power transformer and filter choke.

Q. What is the function of the "suppressor grid" in power output pentodes—M. D.

A. Secondary emission of electrons from the plate due to its bombardment by electrons from the cathode lowers the plate current and limits the permissible plate swing which leads to a reduction in power output for a given plate voltage. The introduction of a "suppressor grid" between screen and plate diverts the secondary electrons back to the plate where they can cause no trouble.

Q. I have a five tube set that is very weak. The tubes are new, the circuit is correct, the coils and gang test perfect on a grid-di- oscillator, the electrolytics, resistors and condensers test OK and are of the correct values, the hum is normal, and all voltages check OK. In other words the set is apparently normal in every respect but has lost its kick. What might be the cause of the trouble.—H. H. H.

A. Your trouble is probably due to high RF resistance in the electrolytic between +B and ground. While it is very common to find an electrolytic condenser acting as the RF by-pass as well as filter condenser in cheap sets it is very poor practice to depend upon the electrolytic for other than filter purposes as its characteristics change greatly with age. Even though the age of the electrolyticcs may justify their replacement, you should also bypass the +B with a high voltage non-inductive condenser of .1 mfd. or larger.

SHOW YOUR APPRECIATION

Only by cooperation and united action may we, of the radio industry, establish prosperity for ourselves. The firms whose advertisements appear in this publication are proving their faith in us and our ability to progress.

Show your appreciation of their effort by trading with only those concerns who have indicated their determination that fair, honest and straight-forward business shall overcome any attempt at unfair tactics.

Mr. A. J. Moser, of the Technical Service Laboratories, has found it impossible to continue his services as draftsman, gratis. He has asked that anyone wishing drawings made, furnish the small sum of fifty cents for each ordinary diagram or design to defray the expenses of material. The exceptionally fine work performed by Mr. Moser necessarily takes considerable time and he is not asking remuneration for his labor but only for the actual expense involved. Examples of his work have appeared in each issue of The "TECHNICIAN."

PRIZE CONTEST

The prize contest with a $10.00 cash prize for the writer of the best 500 word technical article, offered by Mr. Hirsch, of Radio-Television Co., has aroused considerable interest amongst our members. The first two articles will appear in the December issue of The "TECHNICIAN" and two articles will be published each month until all the contributions have been printed. Mr. Hirsch has proved to be our friend in many past instances and he is to be commended for his kindness in offering this prize.

CAPACITANCE METER

(Continued from page 10)

by the simple 6-5 ratio). If R is increased to 400,000 ohms, R1 to 100,000 ohms and E is raised to 400 volts the capacitance column will be multiplied by .01 for the same meter readings.

C mfds.	Z ohms	I m. a.	Meter volts	Switch (sw)
10	863	.940	3.76	Closed
9	875	.915	3.66	"
8	890	.900	3.60	"
7	920	.870	3.48	"
6	960	.833	3.33	"
5	1025	.780	3.12	"
4	1150	.700	2.80	"
3	1330	.600	2.40	"
2	1790	.440	1.76	"
1	3200	.250	1.00	"
1	5120	.782	3.12	Open
.5	7520	.532	2.13	"
.25	13350	.300	1.20	"
.1	32400	.123	.50	"
.05	64000	.063	.25	"

THIS IS A STICK-UP!

There is little doubt that the radio field is afflicted with more than its share of unscrupulous business practices at the present time. The man who is endeavoring to give the public a fair deal finds he has an ever increasing field of high pressure methods and questionable schemes to compete with. The investigations the Association is making into the business practices which are very unfavorable to the men who have shown by their willingness to subject themselves to an examination and who have signed agreements to refrain from business practices of questionable character reveal the fact that this part of the radio field is overrun with individuals who are devoid of honor. This Association is working in every way possible to eliminate these practices and though it will undoubtedly require much time and legal action to clean up the field we are in this for a FIGHT TO THE FINISH. We will not lay down our arms until it is possible for the public to obtain competent, honest and dependable radio service and the qualified and ethical radio technician to make a living and equip himself with the necessary apparatus of the high quality required for modern radio receivers.

Recently several of our leading newspapers, who parade as great public benefactors, have carried advertisements which on the very face are less honorable than the methods used by the stick-up man and the purse snatcher. Indeed, a certain amount of admiration can be held for a man who risks his life and perhaps a good name to wrest from this world the goods necessary to feed his loved ones, at the point of a gun, over the man who poses as an honest business man and takes unfair advantage of the public by false advertising and subterfuge. I refer to this crop of advertisements which read or imply that any radio will be repaired for so much whether that amount be fifty cents or twenty dollars. I will welcome an explanation as to how this can be done in fairness to all of this man's victims.

JOHN A. ORME.

NEW MODEL TIFFANY-TONES

The Herbert H. Horn Company, manufacturers of Tiffany-Tone Radios, has recently introduced a new line of receivers of exceptional performance and appearance. The Horn Company designs and manufacturers its own cabinets and consequently the line is quite distinctive and individual in appearance.

NOV. 33

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.

ADVANCE NOTICE

Don't miss the special Christmas issue of the "TECHNICIAN." Your editor has spared no effort in preparing copy which will prove exceedingly interesting and useful to everyone interested in any phase of radio and the electronic arts. The advertisers will announce many new articles and models of merchandise and new services to be extended to the radio technicians of Southern California.

An array of outstanding technical articles by well-known radio engineers and our own members which will prove to greatly exceed your expectations will be presented. The following is a partial list of contents for the special holiday edition which will be out about December 12th:

An Outline Comparison of Class "A" and "B" Amplifier Circuits.

Constructional Details of A High Quality Audio Oscillator for All Types of Work.

Circuit Details of a 45 Watt, 3 Channel P. A. System.

The Radio Situation in Mexico.

Frequency Problems in Television.

USEFUL INFORMATION

Automobile Battery Grounds

	1929	1930	1931	1932	1933
Auburn	P	P	P	P	P
Austin			P	P	P
Blackhawk	N	N			
Buick	N	N	N	N	N
Cadillac	P	P	P	P	P
Chandler	P				
Chevrolet	N	N	N	N	N
Chrysler	P	P	P	P	P
Continental					N
Cord		P	P	P	P
Cunningham	N	N	N	N	N
De Soto	N	P†	P	P	P
De Vaux				N	
Dodge	P	P	P	P	P
Dusenberg	N	N	N	N	N
Durant	N	N	N	N	
Elcar	N	N			
Erskine	P	P			
Essex	N	N	N	N	N
Ford	P	P	P	P	P
Franklin	P	P	P	P	P
Gardner	P	P	P		
Graham	P	P	P	P	P
Hudson	N	N	N	N	N
Hupmobile	P	P	P	P	P
Jordan	N	N	N		
Kissel	P	P			
La Salle	P	P	P	P	P
Lincoln	N	N	N	N	N
Marmon	P	P	P	P	P
Marquette		N			
Moon	N				
Nash	P*	P°	P‡	P§	P'
Oakland	N	N	N		
Oldsmobile	N	N	N	N	N
Packard	P	P	P	P	P
Peerless	P	P	P	P	
Pierce-Arrow	P	P	P	P	P
Plymouth	P	N	P	P	P
Pontiac	N	N	N	N	N
Reo	N	N	N	N	N
Rockne				P	P
Roosevelt		P			
Stearns Knight	N				
Studebaker	P	P	P	P	P
Stutz	N	N	N	N	N
Viking		N			
Whippet	P	N			
Willys	P	N	N	N	N

P—Positive battery terminal grounded to chassis.

N—Negative battery terminal grounded to chassis.

*Standard 6 has negative ground.

†6 has negative ground.

°Twin-ign. 6 has negative ground.

‡6-60 and 8-70 have negative ground.

§967 and 970 have negative ground.

'Big 6, Std. 8 and Spec. 8 have negative ground. —Radio Retailing.

OUR PRESIDENT SCORES AGAIN

Mr. Paul has succeeded in contracting for thirty days of radio publicity in behalf of the Certified Radio Technicians Association. Station KMTR has agreed to make daily announcements publicizing the Certified Radio Technician and what he stands for, in return for technical services which Mr. Paul has very kindly offered to take care of in his laboratory. Further radio publicity is well within reach and will probably be definitely arranged in the next few days according to Mr. Paul.

INTERESTING RCA VICTOR MEETING

A real vote of thanks is certainly due the Leo J. Meyberg Company, Mr. Bryan, and Mr. Harry Lange, for the wonderful meeting Monday evening, November 6, which was held in the recording studio of the RCA Victor Co. on Sycamore street. Through the cooperation of Mr. Lange, the meeting was held on Monday instead of Thursday as has been the custom, to coincide with our regular meeting night. The circuits and details of the latest RCA Victor sets were very ably and clearly explained by Mr. Lange. The Mickey Mouse reels at intervals made the meeting a very complete and interesting one. The personnel of Leo J. Meyberg has done many things in our behalf and the company has supported our efforts not only in word and act, but by consistent advertising in these pages. We mustn't forget their cooperation and kindness.

MISSING RADIO

Radio stolen. Philco Mod. 19B, No. J34175. Baby Grand Table model with Shadow Tuning.

Skipped. Philco Auto Radio Mod. 5, No. K14257. Was or still is, in the possession of Mr. Douglas Swanson. Installed in a Mood Sedan, 1925 model. License number 3N9469. If you repair either of these radios notify Mr. Ekleberry or Sullivan, at Hl. 2788.

EQUIPMENT CASES

Many technicians will be glad to know that Mr. H. D. Hatfield, of 1672 North Vermont Avenue, will make equipment boxes to order at a very reasonable cost. He has been designing and building artists supplies and paint boxes for some time and will be glad to accommodate those of us who desire special cases for custom-built equipment. Mr. Hatfield will be glad to discuss your needs and advise you by phoning OL. 5220.

—INDEX—

Mistress (discovering butler helping himself from cellarette): "Robert, I am surprised."

Butler: "So am I, ma'am. I thought you was out."

RADIO EXHIBIT

The RADIO TECHNOLOGY ASSOCIATION, a private school and club for Spanish speaking students with eighty-five members held a radio show in commemoration of its third anniversary. The exhibit was held in the quarters of the Association at 406 Sunset Boulevard, the first, second and third of November and featured new models of leading radio receivers and a television demonstration by the E. B. Dunn Co. Several shortwave transmitters built by the members and students were on display. The show closed with a DX party which consisted of considerable traffic with Mexican "hams."

This association, founded and directed by Senior Luis Lopez Romero, has done much to educate Spanish speaking people who are interested in technical radio.

A very interesting article by Senor Romero concerning the radio situation in Mexico will appear in the December issue of The "Technician."

"Give an example of period furniture."

"Well, I should say an electric chair; it ends a sentence."

Little Algernon (to old lady who has just arrived, and whom he has never seen before): "So you're my grandmother, are you?"

Old Lady: "Yes, on your father's side."

Algernon: "Well, you're on the wrong side, I'll tell you that right now."

She was only the opticians daughter—two glasses and she made a spectacle of herself.

"I turned the way I signaled," indignately said the lady, after the crash.

"I know it," sadly said the man, "that's what fooled me."

"Mary," inquired the mistress suspiciously, "did you wash this fish carefully efore you baked it?"

"Lor' ma'am," replied Mary, "wot's the use of washing a fish that lived all his life in the water?"

NOV. 23

The "Technician"

Christmas Issue

Best Wishes For A

Merry Christmas

and Prosperous

New Year