The "TECHNICIAN"

Official Publication of the Certified Radio Technicians' Association, A Corporation
An Organization of Competent, Qualified and Trustworthy Radio Technicians for the Purpose of Advancing the Radio Art and for the Protection of the Public.

A. PAUL, Jr., President JOHN L. VINCENT, Vice-President
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HOT CHA

EDITORIAL

By The Editor

"This Year and Next Year"

At this time of the year we are all prone to review our progress during the past year and consider activities for the coming twelve months. In view of this universal practice it is undoubtedly appropriate at this time to discuss the progress of the Radio Industry of Southern California during 1934.

In the matter of organization, many significant groups have been organized and as a result a great many worthwhile things have been accomplished, many hatchets buried and there is, generally speaking, much greater cooperation and friendly spirit among the various members of the entire trade than has been the case for a number of years.

The brilliant climax of all these activities and this spirit of cooperation was the Annual Radio Banquet, held December 6. This Banquet, planned and arranged by the Certified Radio Technicians' Association, was in the general opinion of the trade at large, a great success. The attendance was so unexpectedly large as to cause some momentary confusion, but as the main purpose of the affair was to bring all the members of the trades together, it is sincerely felt by those who were in charge that the large attendance was most desirable and really accomplished a great deal in promoting a friendly spirit, mutual acquaintance and a feeling of cooperation within the industry.

The officers and members of the CRTA, although admittedly not familiar with the details of promoting and arranging affairs of this kind, are certainly due a great vote of thanks and congratulation for their part in this event.

This great get-together really impressed the industry with the fact that it was not only desirable but possible and reasonably easy to consolidate individual efforts and take unified action toward a common goal. Many comprehensive plans for the industry have been and are being made for 1935 and an affiliation of radio associations, as previously suggested in these columns, is now practically established and will be definitely in action shortly after the first of the year.

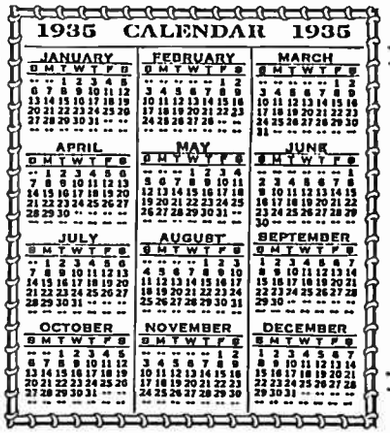
Mr. A. Paul, Jr., President of the CRTA and most active in the promotion of greater cooperation and resultant welfare in the industry, has just made a confidential suggestion for a grand coup on behalf of the industry at large which is astounding in nature and is sure to be of vast benefit to the industry throughout Southern California. It will stimulate trade, make possible the improvement of receiving conditions and generally aid the industry in raising its standards and improving its morale. This plan will be announced in detail in the near future according to Mr. Paul. In addition to this, there are many planned activities which, if loyally supported by the leading and conscientious members of the industry, will enable us one year from today to look back upon a year of even greater progress than we are now doing.

With the sincere hope that all readers of the "Technician" will realize that their support and intelligent cooperation with others will mean great advancement and progress for all of us, both individually and collectively in the radio industry, we bid you a very merry Christmas and a most happy, successful and profitable New Year.

« The » "TECHNICIAN"

December, 1934

A Merry Christmas



A Happy New Year

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ELECTRICAL MEASURING INSTRUMENTS

By C. CLIFFORD ADAMS, Laboratory Superintendent
Quality Electric Company

In the year 1819, Oersted discovered that current flowing through a conductor produced an effect on a magnet. The principle of this electro and magnetic effect is used in most electrical measuring instruments.

There were many types of measuring devices built by early experimenters but only the D'Arsonval type is of interest to us at this time. If a coil of wire is suspended or pivoted so that it is free to turn between the poles of a permanent magnet and a current is passed through the coil, it will turn; this is the principle of the D'Arsonval movement.

Until about 1888, there were no reliable measuring instruments available for the electrical field. All measurements were made with cumbersome laboratory instruments with which a great deal of calculating was necessary. Dr. Weston of the Weston Electrical Instrument Corp. was the first to realize this, and devoted a great deal of time to the development of reliable direct reading instruments and the introduction of the Weston Pivoted movable coil permanent magnet direct current instrument, revolutionized the art of Electrical Measurement.

Design

An electrical measuring instrument is in the strictest sense an electro-mechanical device. That is, it must possess clearly defined electrical characteristics and also perform certain mechanical functions.

In speaking of design, we include principle of operation, selection of materials, proportioning of parts, the development of tools, so that the composite result—the instrument—shall be the best adapted to all requirements met with in ordinary practical use. From this it can be seen that a high grade instrument is not the simple device it seems to be, but is an intricate electro-mechanical device that has been developed after exhaustive and painstaking research, and ranks high in the field of scientific achievement.

Practically all Weston Instruments employ springs for the purpose of opposing the forces acting to deflect the movable system. These springs must always function as a mechanical device, but in certain types of instruments the springs must also perform the additional service of conducting current into and away from the movable coil and thus function as an electro-mechanical device. The qualities essential to a spring performing a mechanical service are—strength and elasticity—and we super-impose suitable electrical qualities, such as proper conductivity, low temperature co-efficient and negligible Thermo-electromotive force to other conductors used in instrument construction; it will be appreciated that the problem is of exceptional difficulty. Thousands of different alloys have been compounded, analyzed and experimented with in the Weston Laboratories. An Ammeter spring must be of low resistance or high conductivity material because of the low resistance of the ammeter. The best metallic conductors, such as copper, aluminum and silver, while possessing proper characteristics of conductivity, are soft and ductile and entirely unsuited for making good springs—springs made from these materials would be permanently distorted through being put under tension, causing a set or fatigue to occur which would prevent the movable system from returning to its original zero position, thus destroying the accuracy of the instrument. Also the change of resistance of the materials is relatively large with changes of temperature. Consequently it became necessary to use some form of alloy to get a proper spring material. It was only after years of research and experimenting that an alloy was obtained that satisfactorily answered all the requirements for springs.

Simultaneously with the investigations in spring alloys, other alloys were investigated for many uses such as shunt material, resistance wire, material for pointers, damping vanes, field supports and other parts of the instruments. In certain types of instruments, such as the electrodynamometer wattmeter, it is very essential that the phase angle of the instrument is made as small as possible. This requires special design of the disposition and character of metallic parts adjacent to the movable system, so that they offer the greatest resistance possible to the generation of foucalt or eddy currents. Special alloys and position of coil supports have allowed the phase angle to be reduced to a minimum.

In the early years of electrical instrument construction, the idea that a magnet could be made permanent was derided and scoffed at. Dr. Weston has proven that it is possible to do so, provided a steel of proper characteristics is given correct heat treatment in hardening and then used to form a part of a properly designed magnetic circuit of very small air gap or reluctance.

Pointers present a very nice problem, they are usually composed of aluminum

(Continued on page 21)

TINY RESISTORS FOR HEAVY WORK

Although hardly larger than carbon resistors of low wattages, the tiny Pyrohm Junior wire-wound vitreous enamel resistors developed by Aerovox engineers are now available in 10, 15 and 20 watt ratings, and 100-30,000; 250-70,000, and 1000-100,000 ohms. The units are wound on a porcelain tube with a special high grade resistance wire, the ends of which are brazed to copper bands, while the pigtail leads are soldered to the terminal bands. The entire unit is completely coated with a vitreous porcelain enamel, thoroughly protecting the winding against moisture and mechanical injury. Proper design and conservative ratings insure adequate dissipation of heat. The units are being produced by the Aerovox Corporation, Brooklyn, N. Y.

SYLVANIA 6A6 AND 83V ANNOUNCED

Sylvania 6A6 is a complete Class B output tube of the heater cathode type comprised of two triode units in a single bulb. Except for the heater rating, which is 0.8 ampere at 6.3 volts, the characteristics are the same as those for Type 53. The 6A6 may be used primarily as a Class B output tube for A-C operated receivers. Power output up to 10 watts may be obtained when the plate voltage available is 300 volts. No grid bias is required.

Sylvania 83V is a heater cathode type high vacuum rectifier designed for full-wave circuit applications. The heater requires 1.75 amperes at 5 volts. This differs from the rating for Type 83, which takes 3 amperes at 5 volts. The d-c output current (175 milliamperes) is intermediate between the ratings for Type 80 and 5Z3.

BOOK REVIEW

A regular feature which will review outstanding technical publications which the editor, the technical committee of the CRTA and the educational director of the CRTA, Mr. Edw. H. Guilford, feel justified in recommending to readers of the "Technician." Only books which have actually been examined by the editorial staff will be reviewed. A short outline of the material covered, the class of men who might be most interested in each particular publication, the publishers and price of each book will be given.

Your inquiries are invited on works not appearing in this column and a special investigation will be made.

CASE RECORDS OF BROADCAST RECEIVER REPAIRS—Captial Radio Research Laboratories, Inc., 1503 21st St., N. W., Washington, D. C.—4.75. This 9x12 flexible, leatherette binder contains 1500 alphabetically and numerically arranged records of successfully completed service jobs. Each record describes symptoms, parts responsible, electrical values, location and best replacement or repair. A very valuable book for the service technician. Pages are loose leaf, and supplements will be added from time to time.

RADIO PHYSICS COURSE A. A.—Ghirardi—Radio & Technical Publishing Company—$4.00—45 Astor Place, New York City. (Second edition revised and enlarged). This second revised and enlarged edition represents the result of an effort to include in a single book all of the material required for a complete up-to-date course in radio. It is especially recommended as a text book for service technicians and will be found to be written in an easily understandable way. It should be included in every service technician's library.

PRINCIPLES OF PUBLIC ADDRESS SYSTEMS—M. N. Beitman—Supreme Publications, 3719 West 13th Street, Chicago—50 cents. This is an up-to-date outline of the principles of public address systems and is written in an easily read manner. It includes many diagrams and tables and is recommended to the radio technician who is working with public address systems.

BROADCAST RECEIVER DESIGN—G. S. Granger—Manson Publishing Company, 521 Fifth Avenue, New York City—50 cents. This is one of three booklets covering the developemnt of the modern receiving set from its earliest stages

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HIGH-LIGHTS OF AUTOMATIC VOLUME CONTROL

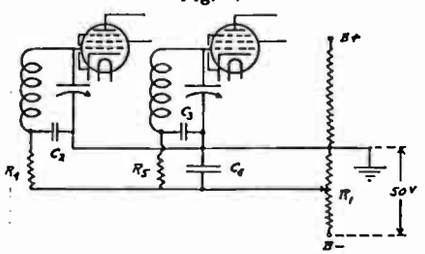
By H. K. BRADFORD
Formerly of the N.R.I. Staff. Now Technical Director Capitol Radio Research Laboratories, Inc., 1503 21st St., N. W. Washington, D. C.

Of the many methods of manual volume control developed with the progress of radio design, the variable grid bias scheme lends itself most suitable for automatic adaption. Undoubtedly the widespread use of manual bias control suggested automatic applications.

The reason why this type of volume control circuit can so easily be adapted for automatic operation is that very little electrical power is required for its actuation.

Ordinarily the grid bias type of volume control consists of a variable resistor connected from on, two or more cath-

Fig. 1



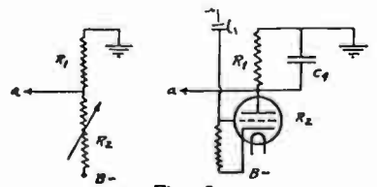


Fig. 2

odes to ground or chassis, where the grid returns and the B minus connections are made. The A.V.C. circuit is in shunt with this resistor or is across the apparatus separating the cathodes from the "absolute" negative of the power supply. Instead of being at this absolute negative terminal the grid returns are floated between the cathodes and chassis, their exact potential being determined by the factors in the A.V.C. circuit.

The amount of amplification which can be obtained from any tube is proportional to its mutual conductance (Gm). By varying the bias from rated minimum to values beyond plate current cut-off the mutual conductance is varied from rated value to zero. No signals remain in the circuit as far as the detector when cut-off has been reached.

The total amplification of the complete signal circuit is proportional to the product of the mutual conductance values of the tubes which contribute "gain" to the receiver. Thus by controlling two tubes instead of one, the effect of limiting the gain of the entire set is squared. This becomes an important factor when it is considered that input voltages to a receiver may vary through a ratio of 100,000 to 1 or more.

Let us now inspect some actual circuits. In Fig. 1, manual control is effected by the use of a potentiometer connected between ground and B minus, between which there exists a potential difference of 50 volts. The assumption, of course, is that 50 volts will be sufficient bias to bring about complete plate current cut-off of the tube or tubes in question.

In this arrangement the resistance R-1 is constant in value and the 50 volt potential will be divided in proportion to the resistance ratio of the slider to the ground portion and the balance of the resistor.

Replacing this potentiometer with one fixed resistor and one variable one with the grid return connection at their junction as in Fig. 2 we may procure the same general result. As before the voltages across each unit are proportional to their respective values, although the total circuit current varies with the adjustment of R-2.

To obtain zero to 50 volts between ground and the tap in this case R-2 must vary from infinity to zero. This should be clear as when R-2 is infinite, no current flows through R-1 and it is at ground potential at every point. On the other hand, when R-2 is zero a direct short is established between the tap and B minus.

Although the plate circuit of a vacuum tube cannot assume the two extremes outlined above, it is an excellent substitute for R-2. Now let us follow its operation from Fig. 4. Consider a signal of average intensity being fed into the R.F. amplifier. Originally the A.V.C. grid is biassed as indicated to cut-off, that is, so that no plate current can flow in the A.V.C. plate circuit. Any carrier coming to the detector grid circuit will be fed through C-1 to the grid of the A.V.C. tube. Plate current will flow and will be almost pro-

(Continued on Page 29)

NEW P. A. KIT

So much interest has been shown in the Radio Supply Company's new model RS-65 portable sound amplifier kit that we are printing a description of it here. The amplifier is not just a diagram, but a tried and tested kit with the original model on display at 912 South Broadway, Los Angeles.

The fact that this amplifier kit is available in kit form only is an obvious protection and advantage to you as a dealer, for "John Public" is not interested in parts, but in the completed instrument, which only you can give.

A word as to its application. The removal of all microphone hiss, by the use of the crystal microphone, coupled with the tremendous gain built into this little thirty-pound, 6½-watt, portable amplifier kit, makes it useful for many orchestra applications. It is also suitable for dictophone use (a select group around the speaker can hear clearly and distinctly soft voices twenty-five feet or so from the microphone), or for the pick-up of music or voice in out-of-the-way rooms such as are often found in churches, schools, halls, restaurants, beer gardens, etc.

All interested parties are invited to write or call at Radio Supply Company for the four page descriptive folder and picture of the completed instrument.

LOW PRICED SHOP EQUIPMENT

The American Tool and Machine Co. has recently announced a new line of low priced quality shop equipment especially designed for radio technicians, woodworkers, and others who desire light, efficient equipment at reasonable prices. The line includes metal and wood working lathes, saber saw, sander, buffer, circular saw, and drill press.

RCA VICTOR MEETING

The RCA Victor Service meeting held in the RCA Victor Recording Studios on North Sycamore Street, Friday night, December 14, attracted an unusually large crowd. The large attendance was due to the American Arts Foundation having been invited to hold its regular meeting in conjunction with the service meeting.

The subject of the meeting was the new RCA oscilloscope. After a few words had been offered by Mr. Paul Beuhler of the Meyberg Company and Mr. Jackson of RCA Victor Company, the elementary principles, theory and practical aspects of cathode ray devices were most ably discussed by Mr. Fredricks and Mr. Westphal of the RCA Victor Company.

THE PENTAGRID CONVERTER TUBES

By J. J. GLAUBER, Chief Engineer Arcturus Radio Tube Co.

(Continued from last month)

PART TWO

A tube was therefore designed as being the best compromise between simplicity, low cost and low cathode current and still perform satisfactorily. The result is a heptode, that is a tube possessing seven elements namely a cathode, five grids and an anode. As far as I am aware the heptode was developed by the RCA Radiotron Company. A similar tube known as a hexode because it contained one less shield grid was developed at the same time by the Hazeltine Corporation.

Proceeding outward from the cathode the structural arrangement is as follows:

(0) indirectly heated cathode
(1) grid No. 1, oscillator grid
(2) grid No. 2, anode grid
(3) grid No. 3, screen grid connected to grid No. 5
(4) grid No. 4, control or modulator grid for R.F. signal
(5) grid No. 5, screen grid connected to grid No. 3
(6) anode

The cathode and grids Nos. 1 and 2 form the oscillator section of the tube. They also constitute a virtual cathode for the modulator unit. The control-grid, grid No. 4, is electrostatically shielded from the other tube elements by the screen-grids located on both sides of it. The modulator section includes the virtual cathode, the modulator control-grid, the screen and the anode. Thus the oscillator portion functions as a triode while the modulator portion functions as a variable-mu tetrode.

In operation, electrons emitted from the cathode 0 are accelerated through the oscillator grid 1 by the positive anode-grid 2 and inner screen grid 3. The anode-grid in reality consists of a pair of side-rods, no lateral wires being wound on them. Most of the electrons approaching the anode-grid possess high velocities so that they shoot past the anode-grid and for the most part through the inner screen-grid 3 and approach the modulator grid 4. This grid has a negative potential, which therefore retards the oncoming electron stream.

The cloud of retarded electrons between grids 3 and 4 therefore constitutes the virtual cathode for the modulator portion of the tube. Electrons may be drawn away from this source in a manner analogous to that by which they were originally accelerated away from the cathode element 0. Elements 4, 5 and 6 together modulator tube. The radio frequency signal is applied to grid 4 and the intermediate frequency output circuit is connected to the plate 6.

If the oscillator grid 1 is only slightly negative, or even somewhat positive, then the virtual cathode has an ample electron stream for the modulator unit. Whenever the oscillator grid swings to more negative values, the number of electrons arriving at the modulator is temporarily reduced or possibly even cut-off. Thus, the oscillator can modulate the signal in the modulator portion and produce the intermediate frequency beat-note in the anode circuit.

The current necessary to produce sustained oscillations is controlled by the oscillator grid and not by the modulator grid, the latter being incapable of producing cut-off in the oscillator portion. Thus, the gain of the modulator can be controlled to a nicety over a considerable range by a variable negative bias on the grid 4 without substantially affecting the oscillator unit. The modulator grid 4 shows a gradual and extended cut-off action, somewhat similar to the action of a variable-mu radio-frenquency pentode, but the conversion gain is considerably higher. The screen grids increase the output impedance of the tube, thereby improving the gain, and the inner one 3 serves to reduce the local frequency radiation.

This tube does not call for special follow-on design. Coils for the oscillator may be of absolutely conventional design, as employed in present-day advanced superheterodynes. Voltages less than 250 volts on the anode grid will prove adequate for the best conversion gain. For the 250 volt rating on this element a series resistance of approximately 20,000 ohms should be inserted in order to prevent excessive heating. If the resistor is omitted then rods will get red hot whenever the oscillations are feeble, due to the small bias voltage developed across the grid-leak and to the high anode-grid potential. The value of the oscillator grid resistor has not been found to be critical, but will be determined primarily by the voltage applied to the anode-grid and screen.

With some cricuit set-ups an audio-frequency oscillation was experienced. This seemed to be due to excessive feed-back for the value of grid-leak and condenser employed. In these cases it was necessary

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ELECTRICAL MEASURING INSTRUMENTS

(Continued from Page 7)

alloy tubing. Various size instruments require various sizes of pointers, which means a variety of tubing sizes. In some, the wall of the tubing is ¾ of a thousandth of an inch thick. Each pointer is balanced; this is accomplished by weights on nuts at the proper position.

In alternating current instruments, the pointers must be trussed to prevent vibration at critical frequences. The movable coils used on various instruments, differ according to the charactistics required for the instruments. It is always necessary to correctly design the coils with due regard to the current to be used; the allowable temperature error; in the case of A.C. instruments, the allowable frequency error due to self-inductance, the damping qualificatons, the weight of the coils as compared to the actuating forces, the stiffness or strength of the coil, and other things depending on the instrument.

Pivots must be of suitable size to accomodate the different size of coils. The pivots must be ground to the proper angle and with the correct roundness at the tip so that crushing will not occur and friction will be eliminated; nothing is left to chance. Pivots are individually ground, tested and inspected.

Jewels must be in proportion with the Pivot size, and shaped so as to eliminate friction and yet properly support the movable coil in any position.

In the design of cases for strength and shielding, the material used and its disposition must be carefully studied so that operating characteristics of the finished instrument shall be satisfactory.

These are just a few of the design problems. Each part of the whole presenting problems which must be considered individually. Special tools are necessary to allow manufacture on a commercial basis.

The value of any instrument depends entirely upon the manner in which each factor, electrical or mechanical, has been brought into permanent relation with the numerous other factors in order to secure the best combination or whole. Therefore, when investigating an instrument which may conform to certain superficial tests with reasonable accuracy, it is advisable to ascertain whether it is so designed and constructed that it wil meet the demands of ordinary practice as accurately under continual service as at the time of purchase.

(Continued in Next Issue)

RADIO INTERFERENCE BUREAU

MR. W. F. GRIMES, Chief Engineer Radio Interference Engineering Bureau

(This column is a regular feature and each month will consist of a report of interesting cases and activities of the RADIO INTERFERENCE ENGINEERING BUREAU. To report interference Phone Trinity 1244).

RECEIVER INSTALLATIONS

While it is not within the province of the Bureau to engage in commercial discussions, our records strongly indicate that Radio Dealers and Servicemen, in general, are overlooking splendid opportunities to not only provide the public with good reception but also to develope satisfied customers with consequent good will, increased business and profits.

During the month of November, out of a total of three hundred and twenty-nine cases of poor reception investigated, eighty-three were due directly to incorrect installations. Many of these affected late models and recently-purchased receivers which had apparntly been sold as just one more piece of furniture.

All engaged in the industry should constantly keep in mind that the public is not familiar with the technical features of the radio receiver and must depend upon the recommendations of the Dealer or Serviceman. If such recommendations are based on a correct understanding of the intentions of the design engineer as to how the receiver is to be installed, the purchaser will gladly pay a small additional charge to obtain complete satisfaction from the receiver.

The Bureau is often asked, "Why didn't they tell me that when I bought the receiver?" "They told me the receiver was so powerful I could hear stations on the East Coast without an antenna," or, "When I bought the receiver, they gave me this installation as called for by the purchase price as I bought it completely installed. I doubted if I was getting my money's worth as I wondered how the receiver could possibly operate when they wrapped that little piece of wire around the gas pipe and threw that other little piece of wire under the carpet."

An honest effort on the part of Dealers and Servicemen to obtain satisfied customers will prevent violent criticism, the necessity for repossession, the wasting of thousands of dollars in advertising true claims of receiver performance which cannot be met without a proper installation—and will prevent much wasted time and effort on the part of the Bureau.

Many, many cases of reported "man made static" will be entirely cleared by so much as a moderately good installation. A good antenna and ground are essential and not necessarily complicated or requiring more than ordinary good common sense in design.

A simple test of installation is to turn the residence lights on and off, if a "click" or change in signal volume is noted in the receiver, the installation is inadequate for good reception. Before making the test, remember that a ground connected to the antenna binding post of the receiver does not, never has and never will constitute a proper installation.

The Bureau will be pleased to cooperate with you in your installation problems. We should all endeavor to cooperate in this all important effort to give the public the best possible reception.

DR. HUND SPEAKS

At a joint meeting of the Los Angeles sections of the American Institute of Electrical Engineers and the Institute of Radio Engineers held in the Richfield Cafe November 27, Dr. August Hund, noted scientist, delivered an extremely interesting and informative paper on the subject of grid glow tubes. This paper, which lasted for about one and one-half hours, was delivered in Dr. Hund's inimitable style and everyone privileged to be present left the meeting much the wiser for the exprience. Dr. Hund has a most remarkable faculty for holding the intense interest of his audience and making his explanations so clear and full, yet without tiresome detail, that it is indeed a pleasure to be able to attend his lectures.

HAND-EE GRINDER

An amazing device has just been announced by the Chicago Wheel and Mfg. Co., manufacturers of high grade abrasive wheels and allied equipment for many years. This little grinder is a small motor which weighs only one pound and fits into the hand. Many different types, sizes, and kinds of grinding and polishing wheels, buffers, brushes and drills are available which attach to the armature by means of a small chuck. The motor attains a speed of thirteen thousand RPM making it very useful for countless purposes. It is indispensable to mechanics, technicians, and others who spend considerable time drilling, filing, sanding, cutting and routing—particularly in restrictive space. The price is surprisingly low.

tary-Treasurer.

The program presented four films of educational interest through the courtesy of the So. Calif. Telephone Co. and Electrical Research Products, Inc.

Mr. Dean T. Smith, public relations Dept. of the Telephone Co., operated the projection equipment and later demonstrated the artificial larynx.

PHILCO ALL-WAVE ANTENNA

Philco now comes into the field with an all-wave antenna system, possessing many outstanding features. According to Philco engineers, this new improved type all-wave antenna was designed and developed to meet the demands of purchasers of the Philco All-Wave Receivers, in order to assure them the utmost in all-wave reception. The antenna comes in kit form and includes coupling units making it adaptable to all receivers as well as Philcos.

UTC HIGH QUALITY

Connie Strasaner, United Transformer Corp. representative, reports ever-increasing use of UTC components in broadcast transmitters and studios, movie studios, recording studios and on board ship. This company produces several complete lines of transformers and chokes.

YULETIDE GREETINGS TO OUR ADVERTISERS

We wish to take this opportunity to express our best wishes for a Merry Christmas and a Very Happy and Prosperous New Year to all the advertisers of the "Technician." We sincerely appreciate your support in word and act in the past and we shall make every effort to deserve your continued patronage in the years to come and the attendant progress in the radio industry.

NEW FIRM

The newest transcription producing firm is the Earnshaw Radio Productions established early in December by Harry Earnshaw. G. O. Sebree heads the sales staff, R. E. Messer as auditor, with headquarters in Petroleum Securities Building.

BOOK REVIEW

(Continued from Page 15)

to present high fidelity design. The remaining two booklets will be reviewed in subsequent issues of the "Technician." The treatment of the title subject is ably handled in a very thorough and understandable manner. The practical development as well as the technical development of broadcast receivers is thoroughly covered and this series of booklets is recommended to all radio technicians as a part of their radio library.

SERVICING SUPERHETERODYNES — John F. Rider, Publisher, 1440 Broadway, New York City—$1.00. We all know Rider's Manuals and their great usefulnes to the radio technician. "Servicing Superheterodynes" (revised edition) is written by John F. Rider and is recommended to the radio technician. Written in a very understandable manner, it completely covers design, operation and servicing of the superheterodyn broadcast receiver. It covers all subjects pertaining to this type of receiver and should be in every radio service technician's library.

ENCE BUREAU

dio Interference Engineering Bureau

so powerful I could hear stations on the East Coast without an antenna." or, "When I bought the receiver, they gave me this installation as called for by the purchase price as I bought it completely installed. I doubted if I was getting my money's worth as I wondered how the receiver could possibly operate when they wrapped that little piece of wire around the gas pipe and threw that other little piece of wire under the carpet."

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The Bureau will be pleased to cooperate

APPLICATION OF ALL-WAVE TEST OSCILLATOR

(Continued from Page 9)

the procedure for determining the fundamental will be as follows:

TO DETERMINE THE FREQUENCY TO WHICH THE RECEIVER IS TUNED at a given dial setting, the oscillator dial is rotated until the signal is heard in the speaker. Continue rotating the dial until the second point is found. Of these two points the fundamental frequency is the lowest frequency heard.

TO TUNE THE RECEIVER TO A GIVEN OSCILLATOR DIAL SETTING, the same procedure is used except the fundamental frequency is the highest frequency on the receiver dial.

In case the receiver oscillator operates at a lower frequency than the detector, this entire procedure is simply reversed, i.e., when rotating the oscillator dial to determine the receiver's frequency, the fundamental frequency is the highest.

CONVERTER TUBES

(Continued from Page 20)

to reduce the coupling between the oscillator-grid and anode-grid coils, or to low-with the virtual cathode provide a tetrode er the value of grid-leak resistance, this in some cases having been set at too high a value.

The average cathode current for proper operation is about 11 milliamperes. It is best not to exceed the 14 milliampere maximum rating.

The conversion gain is best controlled by a variable negative voltage on the modulator grid 4. This may be obtained either from a separate supply or from a variable resistance in the cathode circuit. If the latter method is used the oscillator-grid return must be made direct to the cathode. Otherwise the oscillator performance will be influenced by variations in the modulator-grid bias.

The range of control-grid bias voltage required to control the gain will be governed by the screen voltage. With 100 volts on the screen grids 3 and 5 and 3 volts on the signal grid, the range of bias voltage will be from -3 to a value near plate current cut-off. The cut-off will be less remote for lower screen voltages. In conjunction with automatic volume control, the pentagrid converter provides all of the advantages previously obtained with a separate oscillator and a variable-mu first detector. Because of this, its use permits a reduction in the number of tubes required.

(To be continued)

MATHEMATICS COURSE

Mr. Edw. H. Guilford, Educational Director of the CRTA, is planning a comprehensive course on mathematics, particularly as applied to radio.

Mr. Guilford, through his connection as Pacific Coast Representative of the Capitol Radio Engineering Institute, has obtained mathematics lessons of this school for the use of CRTA members attending these lectures, which will be given in conjunction with Mr. Leitner's talks at the regular Monday night meetings.

FOR SALE OR TRADE

Complete Public Address System Microphone, 12 inch A. C. Dynamic Speaker and Amplifier. Amplifier consists of 2—24's into 2—27's into 2—45's which drive a pair of 50's. See Mr. W. H. Nielson at Service Station on 4th and Vermont.

ARCTURUS PORTFOLIO

A new loose-leaf portfolio for distributors and their salesmen has just been issued by the Arcturus Radio Tube Company, Newark, N. J.

Pretentious in make-up, the portfolio contains actual samples of advertising materials such as consumers' price-lists and radio logs, characteristic charts, book matches, tube stickers, etc., that are available to dealers and service men. Samples of three post-cards for dealers' direct-mail campaigns, and a combination stationery unit comprising letterheads, envelopes and business cards are also included.

Another section of the book is devoted to combination deals on tube checkers, oscillators, set analyzers, and Rider's Manuals.

Still another section shows a comprehensive assortment of cuts or mats of various sizes that are available for newspaper, catalog or other uses. Window display units, a decalcomania and streamers are also shown.

INCREASED BUSINESS

The Pacific Radio Exchange informs us that their over-all volume of business has been very definitely increasing from month to month and that the month of December up to the time we go to press has been their most profitable in the existence of the company. This is indeed good news when we hear so much about depression.

THANKS TO NAT'L SCHOOL

In addition to offering our most sincere wishes for a Merry Christmas and a Happy, Prosperous New Year to all the members of the Nat'l School, we wish to offer the school earnest thanks for the extended use of the auditorium where we have been holding our meetings since the formation of the CRTA. Through the courtesy of Mr. Rosenkranz, we have been allowed full use of the auditorium and extra classrooms for the accommodation of the men taking examinations.

GUILFORD MOVES

Mr. Edw. H. Guilford, West Coast Representative of Capitol Radio Engineering Institute, has moved his office from Glendale and is now located at 1656 N. Serrano Street, Los Angeles, GRanite 0755, where he will be glad to meet all radio men interested in furthering their knowledge of radio engineering through the CREI course in practical radio engineering.

TRAVELING THE TERRITORY WITH MILTON

And here we are again, people; just like Santa Claus at Xmas time, still travelin'.

* * *

Bill Whisman, deep down from the vast depths of North Vine Street, comes forward to announce a new "put-put" transformer which he recently received from a local radio supply house. Bill says it sure is the bathtub's stopper for eliminating motorboating in amplifiers.

* * *

Julius Hartman, of the firm of Hartman, Hartman, Hartman, & Hartman (or just plain Hartman Radio Service to you), has just finished modernizing his tube checker. And can he pick our detectors and oscillators for short wave—just watch him!

* * *

We respectfully doff our hat in greeting to our good friend William Hansen, who recently announced the opening of his new store in Beverly Hills. It takes only a moment in the new establishment to be impressed with the good taste displayed in the furnishings and arrangement of the various apparatus, which is, without doubt, a reflection of the inherent good taste of the man himself. Congratulations and the best of good fortune!

* * *

Bill Hitt, in his eulogy and ode to the fair ladies present at the banquet, was carried away in his enthusiasm for the color and charm which they lent to the occasion. Did he also notice their vivacity? M-m-m-m.

* * *

They tell us that Al Henkin of Hollywood Radio Service recently deserted the ranks of the bachelor army for wedded bliss. May all your troubles be little ones, Al!

Boy, oh boy, oh boy! Every time the Traveler recalls the various events of the CRTA banquet, does he chuckle inwardly—huh! We wonder just how many stiff necks there were the following morning caused by inadvertent attempts to discover the presence of "Man-Mountain" Dean.

* * *

Just a word of praise for the acting of John Vincent, the screw-driver mechanic of the CRTA playlet. To say it was quite convincing would be entirely too conservative a statement—we might add that it was very con-vincent.

* * *

And speaking of additions to families, the Traveler has been informed that Roy Wallick (out Echo Park way) has been handing out the cigars so prevalent in his section. Yes, Meredith, it's a boy.

Is Sol Popelsky smiling; Yes indeedie, his trim little shop is now located on an honest-to-goodness full-fledged paved boulevard.

* * *

While snooping around the Wilshire district, the Traveler recently stumbled on Bill Hilchey of Wilshire Radio Service in the act of constructing a midget auto set. And when we say "midget" we don't mean maybe.

* * *

Yes sir, one of the most cheery telephone voices in the radio industry can be found emanating from Weir's Coast Radio Shop in El Monte. It sure warms the Traveler's heart to hear coming through the telephone receiver, "This is Old Man Weir talking. How are you, anyhow?"

* * *

And to all of those who, either out of politeness or courtesy, have followed this column through to the bitter end (or possibly its finish)—Merry Christmas, doggone yuh, a jolly Merry Christmas!

Classified Advertisements

For Sale or Trade—

FOR SALE—Double Commutator DAYFAN motor-generator, 110 volt driven to 450 volts, 60 M.A. D.C. and 7.5 volts 1.75 amp. D.C. Like new, $10. Phone PR. 3515.

Several new Universal and Inca mike and inter-stage transformers. Chas. Miller attenuator and several miscellaneous meters. Norman B. Neely, 1656 N. Serrano, GRanite 0755.

Laboratory Service—

All types of laboratory measurements and calibration of electronic devices and component parts. Dr. John F. Blackburn, Consulting Physicist. GRanite 8179.

MEN WANTED—Certified Radio Technicians interested in affiliating with a cooperative service organization write giving full details as to training experience and equipment. Mr. Barns, Box D-1, % Technician

HIGHLIGHTS OF AUTOMATIC VOLUME CONTROL

(Continued from Page 18)

portional to the carrier energy fed to the grid. Only positive grid swings allow plate current to flow and instead of rectified R.F. in the plate circuit we have C-4 to filter this into D.C.

This will make the potential at the A.V.C. plate actually drop toward B minus from ground. From this it is obvious that the A.V.C. tube supplies a 40 volt negative bias to the two 35 tubes. Their cathode resistors R-2 and R-3 of course furnish additional bias.

Resistors R-4 and R-5 are to filter the voltage fed from the plate of the A.V.C. tube. C-4 furnishes a major part of the filter system, but R-4 and R-5 also serve to prevent coupling between the two R.F. tubes. If they were ommitted it is obvious that the voltage across C-3 would be placed across C-2 thus effectively coupling the two stages. C-2 and C-3 are essential for A.V.C. to isolate the A.V.C. voltage from ground.

When the carrier decreases the excitation to the grid of the A.V.C. tube decreases and its plate current also decreases. This is true for any tube biassed at cut-off. Let us say that the tube resistance reaches 8 megohms, assuming a value of ½ meg. for R, the voltage from plate to ground (bias voltage for controlled tubes) becomes approximately 3 volts.

Thus if R-1 is chosen to be ½ meg. and the grid charge makes R-2 125,000 ohms V will be approxiately 40 volts. When R-2 is driven to 2 megs. V will be 10 volts. In this manner V can be made to assume values from a fraction of a volt to about 45 volts or more. This is a voltage which cannot be measured by any ordinary means, because of the high values of the resistors envolved in the circuit.

Condenser C-4 is 2 mfd. or sufficiently large to prevent rapid change of the A.V.C. voltage. If it changes too rapidly it will respond to carrier variations due to modulation thus destroying the signal.

THANKS TO SYLVANIA

Along with our wishes of a Merry Christmas and a Happy, Prosperous New Year to the Hygrade Sylvania Corporation, we must offer sincere thanks for their sponsorship of Mr. Leitner's lecture course. This course of lectures continued for a year and a half by various sponsors, the past several weeks having been sponsored by Sylvania, has been most beneficial to the members of the CRTA.

« The » "TECHNICIAN"

JANUARY, 1935

"ALOHA OE"

TO OUR FRIEND AND COUNSELOR

JAMES M. CHAPPLE

WHO LEAVES LOS ANGELES FEBRUARY 1st TO ESTABLISH AN OFFICE FOR THE FEDERAL COMMUNICATIONS COMMISSION IN HONOLULU.

BON VOYAGE AND BEST WISHES FOR CONTINUED SUCCESS.

—INDEX—

The "TECHNICIAN"

Official Publication of the Certified Radio Technicians' Association, A Corporation
An Organization of Competent, Qualified and Trustworthy Radio Technicians for the Purpose of Advancing the Radio Art and for the Protection of the Public.
A. PAUL, Jr., President JOHN L. VINCENT, Vice-President
V. KARL HATFIELD, Secretary-Treasurer

NORMAN B. NEELY
Editor - Manager

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Vol. II JANUARY, 1935 No. 5

EDITORIAL
By The Editor
"Tribute"

Our "superior civilization" has brought with it many evils. One of the most far-reaching in its detrimental effects upon the welfare of the average citizen is not readily apparent. It is the strangle hold which large, wealthy concerns have upon the inventive talents and God-given genius of our country. In a large majority of cases the worthwhile and valuable inventions and developments have been due to the efforts and sacrifices of some individual or small concern. But do these persons reap the harvest of returns which are the reward of genius? No! Some large "octupus" either cheats the original inventor out of the credit of originating the idea or by unscrupulous methods forces him to deal with the company on its own terms.

Sometimes these companies pretend to be big hearted and make a deal that is outright and supposedly above board. They may actually go to the inventor or small concern responsible for the organization and development of a worthwhile business based on an original idea or invention and offer to purchase the lion's share of control—at their own prices and under their own terms, of course. The activity behind the scenes is not always apparent to the casual observer, however. Along with such an offer of purchase or merger nearly always goes the threat that if the small concern or individual does not agree to the conditions laid down by the capitalist, he will be run out of business by fair means or foul—usually foul.

The public is forced to stand the financial burden and consequent hardships as a result of this legalized robbery. These large companies, after acquiring control of important patents, then raise the prices of commodities or devices controlled by such patents and charge small concerns who are composed of members of the great "white collar class" exhorbitant license fees for the right to manufacture items under their control. And we, the consumers, are forced to pay this tribute to the capitalists and brokers who in most cases never did a day's honest labor for the sake of humanity in their lives. They are parasites living on the productive energy of a progressive world, riding high on the waves of scientific development.

This practice would be outrageous enough if the money lords came by this control of technical patents by reason of their own efforts, but they don't. They are exploiting the honest labor and creative genius and many times the sacrifices of the true contributor to public welfare for their own selfish ends. They are taking from us who produce and create and selling the same thing back to us at exhorbitant profit which goes into their own pockets without having been earned by any deserving expenditure of energy or labor.

Countless thousands of cases are on record where individuals and small groups of individuals have struggled through financial stress and strain, worked night and day for many years employing God-given genius to the utmost to invent and develop every-day commodities and scientific apparatus which are truly boons to mankind. By divine right these men are entitled to the power of control of their inventions. In most cases these men

(Continued on Page 14)

LITTLE KNOWN FACTS ABOUT PATENTS

By BENJAMIN CHROMY, Attorney-at-Law

Radio service men are perhaps among the most prolific inventors. Many worthwhile improvements are invented and patented by service men. Yet, because of the mystery that generally surrounds inventions little appears to be know about the procedure of obtaining patents. This brief article was accordingly written with the idea in mind of presenting a summary of some of the little known facts concerning the procedure of obtaining patents for inventions, for the purpose of guiding and assisting the radio service man who may have made a worthwhile invention and desires to know how he may proceed to protect it and, furthermore, how much protection his patent may afford his invention.

Up to the present time there have been issued several thousand patents for radio apparatus and circuits. These patents are divided according to the type of invention and classified under numerous headings, such as, radio tubes, radio tuners, oscillation generator circuits, receiving circuits, fixed and variable condensers and so on. All patents granted are classified for purposes of future referenece and when an application for patent is filed in the Patent Office the examiner in charge of the application makes a search through these classified patents to find whether or not one or more prior patents have been issued for an invention like or similar to the invention claimed in the application.

A similar set of classified patents is available to patent attorneys and the general public in the Patent Office at Washington for the purpose of making searches. These are usually searched prior to filing an application for patent and in order to show more clearly what part they play a brief discussion of the procedure generally followed in obtaining a patent is given in the following paragraphs.

First, after an invention is made and before an application for patent is filed it is always best to search the files of prior patents relating to the same class of inventions, to determine whether or not the same invention has been patented by some prior inventor.

This search should always be made with care unless the inventor is actively engaged in making inventions in the same field and knows what has been patented. Inasmuch as the radio field is at the present time rather active and new patents for various improvements are being issued every week it is difficult to keep abreast of all of the new patents and for that reason it is always well to make a search before filing an application for patent.

After the search is made and it is found that the invention has not been patented by some prior inventor the next step is to prepare and file the application for patent.

The patent application consists mainly of the specification which includes the description of the invention in technical and scientific terms, the claims and the drawing. These are prepared in accordance with established rules of the Patent Office and unless an inventor is familiar with the practice he will save both time and money in having this part of the patent application prepared by a recognized patent attorney.

When the patent application is filed in the Patent Office it is placed on the desk of the examiner in charge of the class of applications to which the invention relates. All of the patent applications relating to inventions of the same class are thus examined under the supervision of one examiner. The applications are kept in chronological order and one by one they are examined. The examination by the patent examiner consists, among other things of studying the specification and making a search through the prior patents to determine whether or not he believes the claims of the application to be patentable. After considering a certain application the examiner writes a letter to the inventor's patent attorney (or to the inventor-applicant if there is no attorney in the case). In this letter the examiner cites such prior patents or publications as he may consider relevant to the claims of the application and he either rejects the claims on these prior patents or allows the claims. An answer to this letter must be filed in the Patent Office by the attorney or the applicant within six months. The answer may consist of a revision of the rejected claims, or the cancelation of all or some of the rejected claims, or these claims may be amended, or additional claims may be added or an argument urging the patentability of the rejected claims may be filed.

(Continued on Page 27)

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(Continued on Page 27)

THE PENTAGRID CONVERTER TUBES

By J. J. GLAUBER, Chief Engineer Arcturus Radio Tube Co.

(Continued from last month)

PART THREE

Conventional circuits for a triode oscillator are applicable for the oscillator sections of this tube, provided proper consideration is given to the constants involved. Likewise the detector section may, in general, be considered as functioning in a similar manner to a separate variable-mu detector. However, due to the series modulation which results from the oscillator control of the electron stream, it is not necessary to feed the oscillator voltage into the detector grid circuit; nor is there any cause for anxiety that the signal grid will be driven positive.

A straight series feed oscillator circuit for the oscillator section is practical, and may be employed to advantage where a formed anode oscillator tuning condenser is employed. Somewhat stronger oscillations will be obtained at the high frequency end. If sufficient coupling is used to give reasonably strong oscillations at the low frequency end, the conversion gain will not vary appreciably over the entire range.

Other circuits provide for compensation at the low freqency end, due to the added coupling from the oscillator tracking condenser. With the proper amount of inductive coupling it is easily possible to obtain practically constant oscillation strength over the entire frequency band covered.

The design of the pentagrid converter tube offers an oscillator modulator system that involves only one physical tube structure (single cathode structure) yet which possesses all of the advantages of the two tube system and provides, in addition, several most important improvements in performance. These improvements include:

(1) A considerably higher conversion gain.

(2) An oscillator system which is entirely independent of the radio-frequency system.

(3) The application of a bias voltage that can be used to control volume, resulting in volume control which certainly approaches the ideal.

(4) The possibility of automatic volume control with a minimum number of tubes.

The pentagrid converter tube is obtainable for 2.5 volts A.C. heater operation, 6.3 volt A.C. or D.C. heater operation and 2.0 volt D.C. filament operation. The 2.5 volt and 6.3 volt tubes, known as the 2A7 and 6A7 respectively are identical except for the heater characteristics. The 2.0 volt filamentary type is known as the 1A6. The conversion conductance, that is the ratio of the intermediate frequency component of plate current to the radio frequency signal voltage input, the ratio usually being expressed in micro-omhos is 275 for the 1A6 and 475 for the 2A7 and 6A7. Lower screen grid, anode grid and anode voltages are used on the 1A6 than on the heater types. The signal frequency or modulator grid 4 is brought out to a cap on the top of the bulb. The elements are enclosed in the new small dome shaped bulbs. The bulbs are coated internally, to prevent extraneous noises from being generated within the tube by stray electrons which are set free by the high velocity primary electrons from the cathode and which in turn strike the glass wall with sufficient impact to release other electrons which are attracted to the positive plate and contribute to the plate current.

Present-day design seems definitely to call for a reduction in the number of tubes to be employed in receivers, primarily because this reflects lowered production costs and, as a corollary, an increased consumption by the purchasing public. The pentagrid converter tubes mark a definite step forward in the simplification of the most popular type of receiver which, today, seems to be the superheterodyne.

EARNSHAW PRODUCTIONS

The position of Hollywood as a production center for the making of transcriptions for radio stations has been materially strengthened by the formation of the Earnshaw Radio Productions by Harry A. Earnshaw, who, as president of Earnshaw-Young, Inc., wrote and produced Chandu, Black and Blue and many other radio hits of a year or so ago.

The new organization, which does its technical processing at Freeman Lang's sound studios, went into production for the first short story series in December and immediately started a second series in January. Each episode is complete in itself.

Coast stations releasing the radio discs include KNX, Hollywood; KFIO, Spokane; KOH, Reno; KQW, San Jose; KMJ, Fresno; KJBS, San Francisco and KFOX Long Beach.

BOOK REVIEW

Radio Physics Course — Ghirardi — Radio & Technical Publishing Company, 45 Astor Place, New York City—$4.00.

Ghirardi's Radio Physics Course is well-known in the radio profession. This second edition, revised and enlarged, brings the subject completely up-to-date. This book describes in a simple and easily understandable way the very latest developments in the field of electronics. The book is compiled in such a manner that it may be used as a text book in school and it becomes a very valuable reference book for those who are pursuing a regular course of study in radio. It is recommended as a most necessary volume in the radio technician's library.

Radio Engineering—Terman—McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York City—$5.00.

This is a comprehensive engineering treatment of the more important vacuum-tube and radio phenomena. It analyzes electrical circuits and vacuum tubes and reduces them to quantitive relations that predict with accuracy and certainty the performance of radio circuits and radio apparatus. It is thoroughly up-to-date and includes much original material. The footnotes include a carefully selected list of references. It is recommended as a standard engineering book on radio and should be in every technician's library.

All-Wave Receiver Design — G. S. Granger—Manson Publishing Company, 521 Fifth Avenue, New York City—50c.

This is the second of three booklets covering the development of the modern receiving set from its earliest stages to present high fidelity design. In this booklet problems peculiar to short wave reception are discussed, including receiver design and antenna design.

All points of importance are adequately covered and the series of booklets is recommended to all radio technicians as a part of their radio library. The complete series of three booklets may be purchased for $1.00.

TRIUMPH DISTRIBUTOR

The Electric Products Service announces its appointment as authorized distributor for Triumph test equipment. This company, long recognized as one of the foremost distributors and service stations of all types of radio test and service equipment, will be glad to demonstrate the new Triumph instruments to readers of the "Technician."

73's TO CHAPPLE

It is with sincere regret that we must report that on February first of this year our radio inspector for the past several years will be transferred to another locality. Mr. James M. Chapple, friend and counsellor of countles thousands in the radio industry of Southern California, will be sorely missed by those of us who have come to know him and value his friendship and the rare understanding and efficiency with which he has dispatched his duties during his location in Los Angeles. We know we speak for all our readers when we wish Mr. Chapple the greatest possible success and happiness in the pursuance of his work in other surrounding.

W6LRP

A new amateur station is being erected in Inglewood on top of the three story building of the Universal Microphone Co. FCC has given the call letters of W6LRP to E. E. Griffin, who is vice-president and chief engineer of the microphone firm.

The new station will be 100 watts. Towers will be decorated with aluminum variated paint, and electrically lighted at night because of the close proximity to the Los Angeles municipal airport nearby at Mines Field.

Mr. Griffin holds a class A license to permit station operation of any of the amateur bands for voice and CW. During the war Mr. Griffin was a naval radio operator stationed in Alaskan waters. Later he became chief engineer for KFWC Pomona (now KFXM, San Bernardino) and also for KMIC, Inglewood (now KRKD, Los Angeles). Both were owned at that time by James R. Fouch, who is now president of the Universal Microphone Company.

AEROVOX REDUCES PRICES ON INTERFERENCE-FILTERS

In keeping with the far-reaching purposes of the interference-prevention campaign launched by the Radio Manufacturers Association during the recent I. R. E. convention at Rochester, N. Y., a marked reduction in list prices of interference filters is announced by the Aerovox Corporation, Brooklyn, N. Y. The reductions on four items are intended to stimulate the greater sale and use of interference-prevention devices so that various localities may enjoy present-day broadcast and short-wave reception to the utmost.

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Ghirardi's Radio Physics Course is well-known in the radio profession. This second edition, revised and enlarged, brings the subject completely up-to-date. This book describes in a simple and easily understandable way the very latest developments in the field of electronics. The book is compiled in such a manner that it may be used as a text book in school and it becomes a very valuable reference book for those who are pursuing a regular course of study in radio. It is recommended as a most necessary volume in the radio technician's library.

Radio Engineering—Terman—McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York City—$5.00.

This is a comprehensive engineering treatment of the more important vacuum-tube and radio phenomena. It analyzes electrical circuits and vacuum tubes and reduces them to quantitive relations that predict with accuracy and certainty the performance of radio circuits and radio apparatus. It is thoroughly up-to-date and includes much original material. The footnotes include a carefully selected list of references. It is recommended as a standard engineering book on radio and should be in every technician's library.

All-Wave Receiver Design — G. S. Granger—Manson Publishing Company, 521 Fifth Avenue, New York City—50c.

This is the second of three booklets covering the development of the modern receiving set from its earliest stages to present high fidelity design. In this booklet problems peculiar to short wave reception are discussed, including receiver design and antenna design.

All points of importance are adequately covered and the series of booklets is recommended to all radio technicians as a part of their radio library. The complete series of three booklets may be purchased for $1.00.

TRIUMPH DISTRIBUTOR

The Electric Products Service announces its appointment as authorized distributor for Triumph test equipment. This company, long recognized as one of the foremost distributors and service stations of all types of radio test and service equipment, will be glad to demonstrate the new Triumph instruments to readers of the "Technician."

73's TO CHAPPLE

It is with sincere regret that we must report that on February first of this year our radio inspector for the past several years will be transferred to another locality. Mr. James M. Chapple, friend and counsellor of countles thousands in the radio industry of Southern California, will be sorely missed by those of us who have come to know him and value his friendship and the rare understanding and efficiency with which he has dispatched his duties during his location in Los Angeles. We know we speak for all our readers when we wish Mr. Chapple the greatest possible success and happiness in the pursuance of his work in other surrounding.

W6LRP

A new amateur station is being erected in Inglewood on top of the three story building of the Universal Microphone Co. FCC has given the call letters of W6LRP to E. E. Griffin, who is vice-president and chief engineer of the microphone firm.

The new station will be 100 watts. Towers will be decorated with aluminum variated paint, and electrically lighted at night because of the close proximity to the Los Angeles municipal airport nearby at Mines Field.

Mr. Griffin holds a class A license to permit station operation of any of the amateur bands for voice and CW. During the war Mr. Griffin was a naval radio operator stationed in Alaskan waters. Later he became chief engineer for KFWC Pomona (now KFXM, San Bernardino) and also for KMIC, Inglewood (now KRKD, Los Angeles). Both were owned at that time by James R. Fouch, who is now president of the Universal Microphone Company.

AEROVOX REDUCES PRICES ON INTERFERENCE-FILTERS

In keeping with the far-reaching purposes of the interference-prevention campaign launched by the Radio Manufacturers Association during the recent I. R. E. convention at Rochester, N. Y., a marked reduction in list prices of interference filters is announced by the Aerovox Corporation, Brooklyn, N. Y. The reductions on four items are intended to stimulate the greater sale and use of interference-prevention devices so that various localities may enjoy present-day broadcast and short-wave reception to the utmost.

ACETATE RECORDING DISCS

By W. H. SNOW, Chief Engineer Radiotone Recording Co.

Due to the present growing interest amongst experimenters and home recording enthusiasts, in the new field of instantenous recording, the engineering staff of the Radiotone Recording Co. feel that this should be an opportune time to release certain technical information on Acetate recording discs, which will be of help to those already using this material and to those who contemplate changing over from aluminum or celluloid discs.

The advantages to be obtained are two-fold—lack of surface noise and greater recording brilliance. With a flat amplifier and high fidelity cutting head it is possible to record the entire audible frequency range on Acetate, and if the blank is correctly recorded the finished product will be comparable to the highest type of wax recording.

Since the texture of this type of recording disc is different from any other, a certain procedure is necessary in order to produce perfect results.

A cutting head such as those in general use for wax recording cannot be used as the length of its mounting arm and the distribution of weight in same will not permit it to move up and down fast enough to follow the surface of the record, which in turn will cause the cutting head to bounce badly.

A good quality low impedence pickup with the fulcrum point of its mounting arm located about 2½" behind the stylus and about ¾" above the record surface will give the best results. The head should be mounted on the arm so that the angle of the stylus can be varied.

No rider jewel is used, the depth of the cut being regulated by the weight of the stylus and cutting head which should be from 2½ to 3½ ounces depending on the depth of the groove is the same as for wax.

It is important that the stylus angle be correct to obtain the best results. Depending on the stylus used, the angle varies from 87 degrees negative rake to 90 degrees. The correct angle is that at which the stylus makes no noise when cutting. Any noise which the stylus makes while cutting will show up as surface noise in the finished groove.

While this material can be cut without suction, it is advisable to use it if possible, for if the cut thread of material rides back under the stylus it will cause a defect in the groove which will show up as surface noise in the finished groove.

In cases where a number of copies are required this type of disc may be plated and processed similar to wax.

In order to insure long playing life to the Acetate disc, the recorder should apply a light lubricant such as machine oil, with a soft cloth, to the disc after cutting but before playing back.

RIDER'S NO. 5

Volume five of the famous Rider's Service Manuals is now in the field and the large number of technicians who already have their copies report that this Manual is even more extensive, more useful and enables greater benfits than ever before. This famous series of service manuals by the well-known John F. Rider has become a permanent fixture in every progressive radio service shop and Mr. Rider is certainly to be complimented on his outstanding achievement along these lines.

HIGH-PASS FILTERS

By CHARLES J. LEIPERT, Radio Engineer

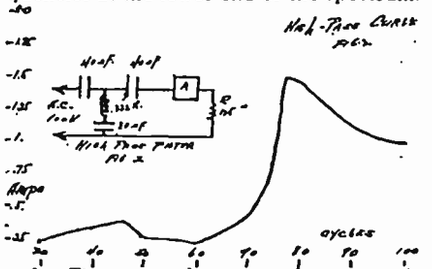
(This is the second article of a series on this subject by the former assistant chief engineer of WOR.)

The common wave-trap is a splendid example of a high-pass filter simplified. Instead of the action occurring at audio frequencies, it represents a radio frequency phenomenon.

A set-up may be obtained by designing a circuit to pass all frequencies above 800 kc-800,000 cycles and to eject all below this frequency. An approximation to a similar condition for a wave-trap application to be used for the broadcast frequencies would consist of 50 turns of No. 26 wire wound on a 3 inch tube and directly over this wind 10 turns of the same wire. A variable condenser of about .00035 mfd. would serve the purpose. It is mounted in shunt to the primary or 50 turn coil. The 10 turn coil is placed in series with the antenna and antenna binding post of the set.

The above is given to give a general idea of how the constants differentiate—at the higher frequencies they become smaller, while at the lower frequencies they are larger. In the latter case iron core inductances and very large capacities predominating.

In Figure number one the hook-up is shown. A frequency meter, voltmeter and ammeter were employed in obtaining the curve. Another glance will show the extremely large condensers used because in this case we are dealing with frequencies at the lower end of the spectrum.



In Figure number two the curve is self explanatory. It starts at .25 of an ampere, increases slightly only to decrease to a minimum value of .20 at 60 cycles. It increases then to a maximum point of 1.5 amperes at 76 cycles. From this position it decreases gradually to 100 cycles where the current is little less than one ampere. The entire condition may be classed as one of high current at high frequency and low current at low frequency.

ELECTROLYTIC CONDENSER RATINGS FOR RADIO

In order that electrolytic condensers may be properly used rather than unknowingly abused, it is well to have an understanding of their ratings. Thus there are three principal factors involved in the rating of electrolytic condensers, namely: (1) The d.c. voltage at which they are normally operated; (2) The a.c. ripple voltage across the condenser; (3) The maximum instantaneous voltage across the condenser at any period of time, as for example at the moment the receiver is turned on. These three factors, according to Howard Rhodes, Chief Engineer for the Aerovox Corporation, are defined as follows:

By d.c. operating voltage is meant the d.c. potential as measured with a potentiometer or equivalent method.

By peak ripple voltage or a.c. component is meant the maximum instantaneous value of a.c. voltage across the condenser, due to the a.c. component in the condenser. This can be measured with a cathode-ray oscillograph or with a vacuum-tube voltmeter.

By maximum surge voltage is meant the maximum potential the condenser will withstand without breakdown or permanent injury, for a period of five minutes when applied to a series combination of the condenser and a resistance, the resistance having a value in ohms equal to $\frac{20,000}{C}$ where C is the rated capacity in mfd.

Here are the standard voltage ratings for radio type electrolytics:

D.C. Oper. Volts	Max. Surge Volts	Max. Peak A.C. Ripple Voltage at 120 cycles Mfd. 1,2,3	Mfd. 4,5,6	Mfd. 7,8,9	Mfd. 10-12	Mfd. 13-16	Mfd. 17-25
350	400	30	27	25	20	15	10
400	450	30	27	25	20	15	10
450	525	30	27	25	20	15	10
475	600	30	27	25	20	15	10
500	600	30	27	25	20	15	10

ELECTRICAL MEASURING INSTRUMENTS

By C. CLIFFORD ADAMS, Laboratory Superintendent
Quality Electric Company

Moving Coil Permanent Magnet Type

Practially all D.C. instruments in commercial use are of the D'Arsonvl type. All instruments of this type are milliammeters. Some range of milliammeter is chosen as basic range and all higher ranges of milliammeters and ammeters use this size movable system, shunted to give the desired range. Milliammeters of greater sensitivity usually have a different movable system for each range. The same principle applies to voltmeters except instead of a shunt, a resistor is added in series with the moving coil. The value of this resistor depending on the range desired and the sensitivity. The sensitivity of an instrument being the milliammperes necessary for full scale deflection. This current determines the value of the resistor or the ohms per volt necessary for the voltmeter. The ohms per volt of a voltmeter can be determined by dividing 1000 by the millamperes required for full scale deflection. From this you see if one M.A. is required for full scale deflection, there would be 1000 ohms per volt, if 10 M. A. are required, then there would be only 100 ohms per volt and so on.

Voltmeters of different sensitivity are used for various applications. In radio work where the current drain of a V.M. would have a tendency to change the circuit conditions, high sensitivity V.M. are used of the order of 1000 to 5000 ohms per volt. In other work such as reading voltage on batteries and commercial generators, voltmeters are used of low sensitivity, in some cases as low as 40 ohms per volt.

A voltmeter as the name implies is for measuring voltage or electrical pressure, It is always connected across the circuit at the point which it is desired to determine the voltage.

Ammeters which include M.A. and Microammeters, are connected in series in the circuit in which the current is to be determined. Microammeters and low range M.A. are usually not shunted and the leads are connected directly to the binding posts of the instrument. The higher range M.A. usually have self-contained shunts, and leads would be connected directly to the instrument binding posts. This also applies to the lower ranges of ammeters. In the higher ranges of ammeters, an external shunt is used and the shunt is connected in series with the circuit and leads from the ends of the shunt are connected to the instrument binding posts. An instrument that is to be used with an external shunt is marked on the scale "To be used with external Shunt", and usually the millivolt drop of the shunt is also marked on the scale. Ammeters that are shunted are actually millivoltmeters which measure the millivolt drop of the shunt but are calibrated in amperes so as to be direct reading.

Voltmeters of low ranges usually have the resistor self-contained in the instrument case, but in those of high range it is necessary to have the resistor mounted external to the instrument on account of the heat generated in the resistance units. The heat dissipated in these units in watts is equal to the square of the current times the resistance. In high ranges, even of high sensitivity, this is considerable compared with the power consumed by the instrument; as an example, the wattage dissipated in heat in the resistor of a 1000 voltmeter of 1000 ohms per volt would be one watt, while if it were 500 ohms per volt it would be 2 watts.

Damping in D.C. instruments of this type is obtained by the use of a metallic coil frame; as the coil moves through the magnetic field, eddy currents are generated in the coil frame which produce a torque that tends to oppose the movement of the coil.

(To be continued)

"TRIBUTE"

(Continued from Page 5)

would desire to have their contributions make life, labor and the pursuit of happiness more easy and enjoyable for all men. However, by a cruel distortion of powers of control by those in the "house of have" these great developments instead of easing the burden upon all humanity merely serve as a means of filling the coffers of the money lords with coin of the realm.

We in the field of radio are particularly aware of this deplorable condition, by which the life blood of our industry is slowly sucked out by Wall Street vampires instead of being allowed to flow through the arteries of the radio industry for the mutual benefit of those who earn a livlihood therein and the great American listening public who depend upon the radio for so much joy and inspiration.

How long can we endure this oppression which falls more heavily upon us year by year? Undoubtedly we owe tribute to those of inventive genius, but not to capitalistic dictators who would exploit God-given genius for selfish gain.

AEROVOX — The Single Source of Supply • • for Quality CONDENSERS and RESISTORS

AEROVOX TRANSMITTING CONDENSERS

ROUND ALUMINUM CAN TYPES

Type 1005 — 1000 v.

Cap. Mfds.	Size	List Price	Your Price
1	2x5⅛	$3.20	$1.92
2	2x5⅛	4.25	2.55
4	2½x5⅛	6.00	3.60

Type 2005 — 2000 v.

Cap. Mfds.	Size	List Price	Your Price
1	2x5⅛	$4.75	$2.85
2	2½x5⅛	6.50	3.90

Compare These Features:

- Pure linen paper . . . deformation-proof and flutter-proof sections.
- Sturdy, hermetically-sealed, positively leak-proof container . . . high-tension terminals.
- Adequate margin of safety for long and satisfactory service.

THESE oil-impregnated, oil-filled condensers offer quality first, because transmitting condensers must stand up. And price too, for mass production serves those 1935 pocketbooks.

for Design

Carefully wound sections which will not deform or develop fluttering plates . . . thoroughly oil impregnated . . . ingeniously sealed container positively leak-proof for oil filling. In round or rectangular cans.

for Workmanship

Pure linen paper — not kraft or cheaper substitutes . . . longest life with minimum deterioration in service. Also genuine high-tension insulators. Heavy metal containers.

for Dependability

Conservatively rated . . . best of materials selected for longest service and ample safetly factor . . . and backed by enviable record of reliable service in thousands of amateur and broadcasting and commercial transmitters.

for Low Cost

Popular demand has made possible an enormous production schedule reflected in unusually attractive prices. Just compare our prices with all others, quality for quality! See table at left.

. . . and other TRANSMITTING COMPONENTS

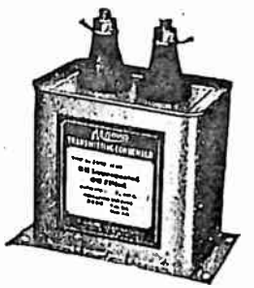
These oil-filled transmitting condensers are typical of components engineered by Aerovox and mass-produced in the giant Aerovox plant. Please note also:

A Complete Line of Condensers

Paper, electrolytic, mica, tubular, in all types, sizes and styles for every transmitting and receiving need, always with that extra touch of Aerovox engineering, and the attractive prices of Aerovox mass production.

A Complete Line of Resistors

Wire-wound vitreous-enamel either fixed or adjustable, from smallest to largest sizes . . . carbon type resistors, grid leaks, lavite resistors, mountings, etc. Fit companions for Aerovox condensers.



And at the Right Prices

When purchasing condensers and resistors, always bear in mind that Aerovox list prices are in many instances considerably lower than competitive makes of similar products. Do not pay more when you can have the Aerovox brand with its established repuation.

Write for Data: New 1935 Catalog is yours for the asking. Covers entire Aerovox line of Condensers and Resistors. Also sample copy of our monthly Research Worker—a monthly engineering service to practical radio men.

AEROVOX CORPORATION

83 WASHINGTON STREET, BROOKLYN, N. Y.

— Pacific Coast Representatives —

W. C. HITT
1341 S. Hope Street
Los Angeles, Calif.

R. R. BEAN
2124 Smith Tower Bldg.
Seattle, Wash.

TRAVELING THE TERRITORY WITH MILTON

Come on, all you brethren—confess to the old Traveler! Just how many times since the new year began, have you been caught writing the date 1934 instead of 1935? Are we leffing!

* * *

They tell us that Bill Wilhelms, 'way out at Hansen's Music in Beverly Hills has just gone and bought himself a new automobile. Who said there was a depression?

* * *

With the heartiest of congratulations the Traveler shakes hands with his old friend Harry Le Goube of Washburn & Walker, who is about to embark on a one-way voyage aboard the good ship Matrimony. And the Traveler will sure be there in the little church around the corner on that Sunday morning in March when the happy event takes place. Lucky boy! and lucky girl, too.

* * *

Those of the radio fraternity who have missed seeing C. A. Addis at his old post on South Vermont Street can find him in his new location on South La Brea. Good luck, "C. A."

* * *

The news is brought to us that Oscar Wick, over the bright ocean waves at Avalon Radio Shop in Catalina, has been solemnly contemplating joining the ranks of those in wedded bliss. When asked about the situation, however, Oscar vehemently declares that it is merely Communistic propaganda designed to undermine his reputation as one of the most rabid proponents of bachelorhood. But, as the Traveler has been informed by those qualified to know, that tender faraway look in Oscar's eye is not caused by simply curing the ills of radio sets with his trusty soldering iron, nor is it due to the dextrous manipulation of a transmitter key. Speak freely, Oscar; remember, you're among friends!

* * *

After flitting from branch to branch installing so many outside tree lights during the Xmas season, the boys at Village Electric in Westwood have decided to copyright the name "Tarzan" for their own personal use.

* * *

Any of you boys who hail from Texas would do well to say "hello" to Roy Turnage in his little shop on East Florence Avenue. Steam engines, automobiles, or radios are all the same to Roy, who has seen 'em all come and go so much that it's just an Easter parade so far as he is concerned. How's about it, Roy?

Way down there in San Pedro Ray Ogborn is still doing his share to keep the radios of his vicinity in working order. Anything from a tiny midget receiver to a transmitting station is all in the day's work for Ray.

* * *

The notice comes to us that Les Shaffer now has his own music store in his old stamping-ground, Redondo. The Traveler joins hands with those who are wishing well to the new firm of Redondo Music Co.

* * *

Favorite songs of some of the boys in the field: The Man on the Flying Trapeze, The Continental, Schubert's Serenade, The Strawberry Roan, Stay as Sweet as You Are, Grofe's The Grand Canyon Suite, Mama Loves Papa—and so, far, far into the night.

* * *

Did you know that Russ Carruthers, in addition to managing a prosperous little radio business in Santa Monica, is the leader of a popular dance orchestra?

* * *

For new kinks in installing pickups on amplifiers we take our hat off to our good friend Pol Verbecke at the House Radio Shop on Santa Monica Blvd. And, what's more, the tone is better, too.

* * *

And wishing you all a Better New Year, the old Traveler once more says Au Revoir. See you all in the next issue!

STARS SELL SHOWMANSHIP

By way of reminding radio dealers and service men that romance and glamor are an important part of their stock in trade, Sylvania News, house organ of Hygrade Sylvania Corporation, is featuring a beautiful radio star on the front page of each issue.

"For several years," states Paul S. Ellison, Hygrade Sylvania advertising manager, "we have stressed in Sylvania News the idea that the dealer who talks radio entertainment to his customers will have a distinct advantage over the dealer who talks only of sets and tubes. In picturing some of the attractive stars of the air, we believe that we will help to drive home the fact that radio is as distinctly an entertainment business as the theatre or the movies, and that showmanship is as necessary in radio merchandising as in other entertainment trades."

TECHNICAL QUESTION AND ANSWER DEPARTMENT

Conducted by CHARLES MILLER

Q. Why does Grebe use two trimmers on each section of the tuning condenser?

A. The two sections which tune the band-circuits of the SK4 and SK5 models have extra trimmers to compensate for the fixed capacitance in the following tuned stages introduced by the P-G coupling condenser.

Q. What is wrong when the calibration of a set checks OK at both ends of the dial but is off 5 to 10 KC onKHJ? J.R.P.

A. If the set is a super the I.F. is probably not adjusted to the frequency for which the set was designed. If a TRF or a cheap super the dial was probably calibrated for a different coil and condenser set-up than that used.

Q. What is the cause of a 5-tube super with 456 KC IF's bringing in KGPL at about 800 KC as well as at 1712?

A. It is an image since 800 KC is the spot where KGPL's image would fall if the IF were exactly 456 KC. A set of that class would not justify any steps being taken to eliminate the images. Adjust the IF's to a frequency which will cause the image to fall between local stations if the IF happens to be such that the image falls on one.

REPLACEMENT CONES

A long felt want has been realized and fulfilled, by the foresight of one of our most prominent wholesale service organizations, the ELECTRIC PRODUCTS SERVICE. They have been appointed exclusive distributors for the nationally known CARRON line of replacement cones and already have a large supply of over a hundred different types of replacement cones in local stock.

These cones are complete with spiders and voice coils, and come individually packed in separate cartons to assure ease of handling without damage. They also maintain a wholesale speaker repair service and will install new cones, rewind field coils and make all types of repairs to speakers for the dealer on a wholesale basis.

Cocplete price lists on all types of cones may be obtained by calling or writing the ELECTRIC PRODUCTS SERVICE.

RADIO INTERFERENCE BUREAU

MR. W. F. GRIMES, Chief Engineer Radio Interference Engineering Bureau

(This column is a regular feature and each month will consist of a report of interesting cases and activities of the RADIO INTERFERENCE ENGINEERING BUREAU. To report interference Phone Trinity 1244).

RADIO AMATEURS

With the development of short wave broadcast reception for entertainment purposes, those engaged in the sales or service of short wave receivers should have a working knowledge of the part played by the radio amateur. Contrary to the general conception of a radio amateur he is in many cases a professional man following radio amateur work as a hobby and in practically all cases is an individual of more than ordinary intelligence. These amateurs are allocated certain specified frequencies in the radio spectrum in which they are licensed to operate, under direct supervision of the Federal government.

Experience of the Bureau indicates that almost without exception the radio amateur will cooperate in every way possible to prevent his activity from in any way interfering with the pleasure of others. One of the greatest difficulties the amateur must tolerate is that a high percentage of the listening public who experience interference from a radio amateur do not report it to the amateur. This condition makes it difficult for the amateur to know whether or not his transmitter interferes with others and consequently he can do little to remedy the situation.

There are conditions over which the amateur has no control and which result in interference of his transmitter with the receiver of the broadcast listener. Conditions have been found where the amateur transmitter is located in close proximity to broadcast receivers which have extremely poor installations and consequently are interefered with by the amateur. Conditions have also been found where amateurs at a considrable distance interefere with broadcast receivers due to the fact that the receivers are of a type using one or more oscillators, which oscillators tend to produce beat note interference by the heterodyne action of the oscillator harmonics with the carrier frequency of the amateur transmitter. This type of interference is most satisfactorily overcome by providing the receiver with at least two stages of tuned radio frequency ahead of the first detector. The use of these two stages not only serves to increase the desired signal strength but also tends to prevent the receiver from picking up signals other than those of the approximate frequency to which the receiver is tuned. There are circuits for accomplishing this same purpose without the use of tubes but these circuits are in most cases difficult of adjustment and are low in efficiency.

The Bureau will gladly assist in the design of keying circuits, filters to prevent radio frequency feed back on the power service line and filters for the prevention of interference with nearby broadcast receivers. The material required for these devices is not expensive.

RADIOTONE MOVES

The Radiotone Recording Company, formerly of 6109 Melrose Avenue, has recently moved to new and larger quarters at 735 N. Seward, near Melrose. This company, designers and manufacturers of high-quality studio and portable recording equipment, is one of the leading manufacturers of this type of equipment in Southern California. They invite your inspection of their complete recording units, recording discs, both aluminum and acetate, condenser microphones and other accessories.

METER ARTICLE POPULAR

The article entitled "Electrical Measuring Instruments," prepared exclusively for publication in the "Technician," by Mr. C. Clifford Adams, of the Quality Electric Company, has met with favorable acceptance by our readers. This article, which is continued in this issue, covers the history of the design and development of all types of electrical measuring instruments and we are most certainly indebted to Mr. Adams and the Quality Electric Company for this worthwhile contribution to our editorial columns.

L. A. RAILWAY IN DOG HOUSE

The Los Angeles Railway is being severely questioned in a hearing by the State Railroad Commission. Richard Sachse, consulting engineer and vice-president of the company, during questioning by Carl I. Wheat, assistant city attorney, admitted that "the equipment of the Los Angeles Railway Co. is inherently unsatisfactory for a city the size of Los Angeles." He reported having declared in 1927 that all the yellow cars were defective in respect to loading platforms. It looks kind of bad for the L. A. Railway when its own experts go on record in the hearing as sharply criticising its equipment. It is fortunate for the citizens of Los Angeles that we have an alert and aggressive city attorney and staff such as Ray Chesebro and Mr. Wheat.

NEW LINE FOR RADIO SPECS

The Radio Specialties Company has recently taken on distributorship for CASE RECORDS OF BROADCAST RECEIVER REPAIRS, published by the Capitol Radio Research Laboratories and report extensive acceptance by the trade.

WHAT A CALENDAR!

Charlie Sexton, of Radio Products Sales Company, has given service technicians in and about Los Angeles something to think about and remember him by for the entire year of 1935. If you haven't seen one of his calendars, you should by all means investigate, as you are really missing something. We understand that a limited supply is still available to those who call in person at the Radio Products Sales Company.

SERVICE KINKS

SCRATCH REMOVER

A piece of friction tape moistened with oil or vaseline makes a very satisfactory scratch remover. JOHN A. ORME.

FADA

Sometimes the FLASH-O-GRAPH feature in the models using such fails to indicate properly. This can be remedied by shunting the 35,000 ohm resistor connected from one side of the lamp to the ground, with a .5 or larger condenser.
EGBERT JONES.

LYRIC MODEL J

Excessive hum in this model may be eliminated by replacing the condenser connected from the 47 grid return to ground. Use a .1 or larger condenser.
—JLP.

FADING IN SPARTON SETS

Cause—Condenser.

Tuning rotors loose on shaft. Rotor plates are molded to shaft in pot metal and frequently become slightly loose causing fading and noise on carriers.

Remedy—Center punch pot metal close to shaft at several places on each end of each rotor. —C. G. Esler.

MOTOR NOISE

Motor noise in automobile radio installations can often be overcome to a considerable extent by reversing the primary leads of the ignition coil.
—A. J. Moser.

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RADIOTONE MOVES

The Radiotone Recording Company, formerly of 6109 Melrose Avenue, has recently moved to new and larger quarters at 735 N. Seward, near Melrose. This company, designers and manufacturers of high-quality studio and portable recording equipment, is one of the leading manufacturers of this type of equipment in Southern California. They invite your inspection of their complete recording units, recording discs, both aluminum and acetate, condenser microphones and other accessories.

METER ARTICLE POPULAR

The article entitled "Electrical Measuring Instruments," prepared exclusively for publication in the "Technician," by Mr. C. Clifford Adams, of the Quality Electric Company, has met with favorable acceptance by our readers. This article, which is continued in this issue, covers the history of the design and development of all types of electrical measuring instruments and we are most certainly indebted to Mr. Adams and the Quality Electric Company for this worthwhile contribution to our editorial columns.

L. A. RAILWAY IN DOG HOUSE

The Los Angeles Railway is being severely questioned in a hearing by the State Railroad Commission. Richard Sachse, consulting engineer and vice-president of the company, during questioning by Carl I. Wheat, assistant city attorney, admitted that "the equipment of the Los Angeles Railway Co. is inherently unsatisfactory for a city the size of Los Angeles." He reported having declared in 1927 that all the yellow cars were defective in respect to loading platforms. It looks kind of bad for the L. A. Railway when its own experts go on record in the hearing as sharply criticising its equipment. It is fortunate for the citizens of Los Angeles that we have an alert and aggressive city attorney and staff such as Ray Chesebro and Mr. Wheat.

NEW LINE FOR RADIO SPECS

The Radio Specialties Company has recently taken on distributorship for CASE RECORDS OF BROADCAST RECEIVER REPAIRS, published by the Capitol Radio Research Laboratories and report extensive acceptance by the trade.

WHAT A CALENDAR!

Charlie Sexton, of Radio Products Sales Company, has given service technicians in and about Los Angeles something to think about and remember him by for the entire year of 1935. If you haven't seen one of his calendars, you should by all means investigate, as you are really missing something. We understand that a limited supply is still available to those who call in person at the Radio Products Sales Company.

SERVICE KINKS

SCRATCH REMOVER

A piece of friction tape moistened with oil or vaseline makes a very satisfactory scratch remover. JOHN A. ORME.

FADA

Sometimes the FLASH-O-GRAPH feature in the models using such fails to indicate properly. This can be remedied by shunting the 35,000 ohm resistor connected from one side of the lamp to the ground, with a .5 or larger condenser.
EGBERT JONES.

LYRIC MODEL J

Excessive hum in this model may be eliminated by replacing the condenser connected from the 47 grid return to ground. Use a .1 or larger condenser.
—JLP.

FADING IN SPARTON SETS

Cause—Condenser.

Tuning rotors loose on shaft. Rotor plates are molded to shaft in pot metal and frequently become slightly loose causing fading and noise on carriers.

Remedy—Center punch pot metal close to shaft at several places on each end of each rotor. —C. G. Esler.

MOTOR NOISE

Motor noise in automobile radio installations can often be overcome to a considerable extent by reversing the primary leads of the ignition coil.
—A. J. Moser.

OIL-FILLED TRANSMITTING CONDENSERS

Designed for performance rather than price, a new line of oil-filled, oil-impregnated transmitting condensers is announced by the Aerovox Corporation, Brooklyn, N. Y.

The units are available in round and rectangular metal cans, in either case with high-tension insulator post terminals. Wound with pure linen paper instead of kraft or cheaper grades, thereby guarding against deterioration even at high operating temperatures. Linen paper dielectric also provides necessary strength for tightly-wound section. Finished sections thoroughly impregnated in high-grade oil, placed in can and surrounded by protective oil bath not only for higher insulation value and long life, but also for proper expansion-contraction properties whereby an oil circulation is set up through the section for cooling purposes. Containers hermetically sealed for complete protection against moisture and leakage.

Round can type includes special reinforcement in winding process, relieving undue strain. Rectangular seamed can type has clamped section for constant pressure in order to avoid plate fluttering —a frequent cause of breakdown when clamps are not used. Units are available in popular working voltages and capacities.

NEW TROYS

Watch the next issue of the "Technician" for an interesting announcement of a complete new line of Troy receivers, which will include short-wave, all-wave, standard broadcast and auto radios—thirty-five models in all.

IRE MEETING

The regular meeting of the Los Angeles Section of the Institute of Radio Engineers was held in North Hall on the campus of the Los Angeles Junior college Tuesday evening, January 15. The subject of the meeting was "The New Wirephoto." Mr. Verne W. Bailey of the Los Angeles Times, discussed the use of this new service from the standpoint of a newspaper organization and Mr. E. H. Schreiber of the Southern California Telephone Co., discussed the technical features of this new and improved system of telephoto service. The meeting was attended by approximately one hundred members and guests all of whom received the papers delivered with extreme interest.

EARLY A. C. TUBES STILL LEAD IN REPLACEMENT

Although engineers and set manufacturers have all but forgotten the original A. C. tubes, the -26 and -27, it is interesting to note that such tubes now lead in replacement sales, according to C. G. Pyle, sales supervisor of the Hygrade Sylvania Corporation.

"A survey of Sylvania tube sales to the jobbing and retailing trade during the past few months indicates the continued heavy demand for the early types of A. C. tubes as replacements in sets sold several years ago," states M. Pyle. "Indeed, types -24A, -26, -27 and -80 account for approximately 50 per cent of our total replacement sales. If type -45 is included, which was introduced some time later, our total is over 60 per cent. Also among the old times still in big demand is that pioneer among satisfactory battery-operated tubes, the -01A detector and amplifier, which averages 3.2 per cent of our sales. Also the 171A power amplifier, averages almost 6 per cent.

"Quite obviously, old sets are still in operation in very large numbers. We have made a careful study of our replacement sales so as to advise our jobbers in the matter of well balanced stocks of tubes," concludes Mr. Pyle.

NEW MODELS

The Electric Products Service, authorized factory service for Supreme, Triplett, Dayrad and Clough-Brengle test equipment, advise they now have a complete stock of the new 1935 model Triplett, Triumph and Supreme test equipment and meters

They have a deferred payment plan available to those who wish to purchase test equipment in this manner. And they will also make allowance for your old equipment on new models.

U. S. A. IN FOREIGN LANDS

American-made electrical radio transcriptions will be used all over New South Wales with the 104-program series called Pinto Pete and his boys. The hillbilly cowboy group is composed of Los Angeles talent with the discs made here.

A. E. Bennett, Australian representative for the Radio Transcription Company of America, made the arrangements for the sale of the discs to a soap manufacturer who will use the series on several stations in Australasia.

COMBINATION RECORDER

The newest item in the production schedule of the Universal Microphone Co. factory at Inglewood, Cal., is a combination pick-up and recorder, impedance 400 ohms.

The equipment is full annular ball bearing mounted; and thus eliminates side wear of grooves.

The spring adjustment is a special feature. It is so assembled that pressure can be easily and quickly adjusted down to a featherweight on the needle groove; thereby eliminating groove and needle wear.

It matches the input of standard microphone transformers. As a recording cutting head, it matches all standard line-to-mixers, tube-to-line and line-to-line transformers.

The instrument permits playing on wax and all soft material. The arm is long enough to play up to 16 inch records.

The Universal combination recorder and pick-up is described by its makers as "A scientific sensitive instrument that ensures clear, colorful recording and reproductions." It is said to be unusually sturdy, compact and long wearing.

CASE RECORDS POPULAR

The new service manual recently introduced to service technicians entitled CASE RECORDS OF BROADCAST RECEIVER REPAIRS, has proven quite popular. This manual, published by the Capitol Radio Research Laboratories of Washington, D. C., seems to fill a very definite need between the field covered by the universally accepted Rider's Manuals and technicians' scratch notes. A wealth of information has been put into these pages by Mr. H. K. Bradford, President of the company, by reason of eliminating lengthy discussions and giving detailed information in a few short words.

MATH LECTURES

The first of a series of lectures on mathmematics as applied to electricity and radio was delivered at the December 14th meeting of the CRTA. The lecturer, Mr. Edw. H Guilford, Educational Director of the CRTA, and West Coast Representative for the Capitol Radio Engineering Institute, realizing the ever-increasing need of a working knowledge of fundamental mathematics by the service technician has planned a very comprehensive course on the subject.

Through the kindness of Mr. E. H. Rietzke, President of the CREI, Mr. Guilford has secured a supply of lessons from the regular mathematics division of the CREI Radio Engineering Course.

FREE DATA SHEETS

Mr. F. L. Sprayberry, originator and director of "Practical Mechanics of Radio Service" has very kindly offered to furnish readers of the "Technician" with Data Sheets, giving valuable information on how to modernize obsolete analyzers. Data Sheets are available on the Jewell 199, Supreme 400-B, Hickok SG4600 and SG4700 and Weston 547. Technicians desiring Data Sheets should submit their request on their letterhead or that of their employer to Mr. F. L. Sprayberry, 2548 University Place, N. W., Washington, D. C. At the present time only one Data Sheet will be available to each technician.

GUARANTEE SLIP INVADES CONDENSER AND RESISTOR FIELDS

Condensers and resistors—electrical devices subjected to more use and abuse than any others—are now protected by an adequate guarantee. The Aerovox Corporation of Brooklyn, N. Y., has introduced a guarantee slip which is packed with every item distributed through the regular jobbing and retailing channels. The printed form specifies the conditions of the guarantee as regards workmanship, materials and inspection that go into the product, as well as the proper application and use of the item by the buyer. There is included a handy claim form coupon for the convenience of buyer and dealer.

LITTLE KNOWN FACTS ABOUT PATENTS

(Continued from Page 9)

At this point it may be well to indicate that when a patent is issued its value is to a great extent determined by the scope of the claims that have been allowed by the examiner. About the simplest definition of a patent claim is that it consists of a word definition of the thing that is thought to be the invention. For example; one of the claims to the three element tube or audion might well have been as follows: An electrical discharge device consisting of an envelope having a rarified atmosphere therein, a plurality of electrodes including a cathode, a grid and an anode positioned in said envelope.

Another example of a claim similar to the above claim is as follows: An electrical discharge device consisting of an envelope having a rarified atmosphere therein, a plurality of electrodes including a cathode, a control electrode and an anode positioned in said envelope.

The difference between the foregoing claims is that the first describes one of the electrodes as a "grid" and the other refers to a "control electrode". Both of these definitions may describe the same electrode yet the scope of the two claims may be different because of the difference in meaning of these descriptive words. By using different descriptive words in preparing claims the inventor's attorney may be able to write a large number of claims, each differing from the others in scope, and thus more completely cover and protect the invention for his client.

(Continued in Next Issue)

TRIUMPH TUBE TESTER

The Triumph Manufacturing Company of Chicago announces a new tube tester with many unusual features for a low-priced instrument. It checks dynamic mutual conductance on all tubes, has neon leakage test, inter-element short test and English-reading scale. This is a companion instrument to the Triump Signal Generator and Mutimeter and it is very competitively priced.

This Company also announces a substantial reduction in the price of Triumph Signal Generator.

SYLVANIA ADDS TWO MORE

Russia becomes number eighty-four and French Indo China number eighty-five in the list of countries in which Hygrade Sylvania Corporation is regularly selling tubes, according to an announcement made October 9 by W. A. Coogan, manager of Foreign Sales. Among recent guests at the Sylvania Club, Emporium, Pa., have been sales representatives from Spain, France, Mexico, Chile, Greece, Russia and South Africa.

TO ALL READERS OF THE "TECHNICIAN"

The Certified Radio Technicians' Association solicits members who are actively engaged in technical radio pursuits and who are interested in assisting themselves through cooperation with others to rise above the treacherous lowlands of the often-mentioned depression and advance the radio art as a profession and themselves as technicians. You are cordially invited to attend our meetings and instructive lectures and learn more of our efforts to progress through concerted efforts and unified strength.

Classified Advertisements

For Sale or Trade—

One metal sign and a work bench (knock-down) for meters, speakers, tubes, a console cabinet or what have you. John A. Orme.

FOR SALE—Double Commutator DAY-FAN motor-generator, 110 volt driven to 450 volts, 60 M.A. D.C. and 7.5 volts 1.75 amp. D.C. Like new, $10. Phone PR. 3515.

Several new Universal and Inca mike and inter-stage transformers. Chas. Miller attenuator and several miscellaneous meters. Norman B. Neely, 1656 N. Serrano, GRanite 0755.

Laboratory Service—

All types of laboratory measurements and calibration of electronic devices and component parts. Dr. John F. Blackburn, Consulting Physicist. GRanite 8179.

MEN WANTED—Certified Radio Technicians interested in affiliating with a cooperative service organization write giving full details as to training experience and equipment. Mr. Barns, Box D-1, % Technician

A CONDENSER AND RESISTOR CATALOG

The correct condenser or resistor for practically any standard radio need, can be found in the 1935 edition of the Aerovox General Catalog just issued. Electrolytic, paper, oil-filled, mica, tubular, bakelite case and other types of condensers are listed, as well as wire-wound vitreous enamel, carbon and other types of resistors. The new edition features several new items, such as the high-voltage oil-impregnated oil-filled transmitting condensers, auto vibrator condensers, ultra-compact general utility electrolytics for service work, and exact duplicate replacement condensers, together with the Pyrohm Junior 10, 15 and 20 watt wire-wound vitreous enamel resistors. A copy may be obtained from the Aerovox Corporation of Brooklyn, N. Y.

SOLAR CATALOG

The Solar Manufacturing Corporation, New York City, manufactures of Fixed Capacitors for radio use, announce the issuance of their latest Special Service Catalog No. 6-S. It may be secured by writing direct.

Features of special interest to the service trade include Ultra-Compact Dry Electrolytics, Self-Healing Wet Electrolytic Condensers, Auto Vibrator and Suppressor Condensers and a wide assortment of Paper, Mica, Trimmer and Padding Condensers.

LATEST LOW LOSS SOCKETS

Thomas B. Pritchard, 1214 Venice Blvd., has been appointed distributor for products manufactured by the Mycalex Corporation of America.

Mycalex is now manufacturing the last word in low loss, heat resisting sockets, particularly designed and recommended for short wave and ultra high frequency communication systems. Mycalex will hold its form indefinitely (will not warp) is imperivious to moisture, heat and oil; and last, but not least, it is unbreakabe.

GUILFORD SPEAKS

Mr. Edw. H. Guilford, West Coast representative for the Capitol Radio Engineering Institute and formerly chief engineer of the Radiore Company, addressed the Inventors Congress at the Roosevelt Hotel in Hollywood, Wednesday morning, December 9th. Mr. Guilford's lecture on the subject of Geophysical Prospecting was attended by an audience of over one hundred members of the Inventors Congress and was enthusiastically received.

CREI CLASS

The special class of ten CRTA members who are studying the CREI course in practical radio engineering under the guidance of Dr. Blackburn, is progressing nicely. The class include Messrs, Neely, Vincent Mattson, Swinney, Esser, Lewis, Orme, Faust, Ekleberry, and Ullberg, and meets one night a week at Dr. Blackburn's laboratory. The entire CREI course will be thoroughly covered, lesson by lesson, under the tutorage of Dr. Blackburn, who is a practicing radio engineer and a consulting physicist of note.

LETTER WRITING IN TWO E-Z LESSONS

Gentlemen:

I have your collection letter of such and such a date and I am happy to give you the following information.

We have divided our creditors into three groups:

Class A—Those who will be paid immediately.

Class B—Those who will be paid some day.

Class C—Those who will never be paid.

In consideration of the friendly tone of your letter we are promoting you from class C to class B.

See Page 31 for T R I U M P H LABORATORY EQUIPMENT

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Get This Book and Increase Your Profits . . .

YOURS for 10c

RADIO SERVICE MEN! This book will increase your profits, because in it you will find all of the latest technical information that is necessary for your job . . . how to recognize tube and set troubles . . . and most important, how to solve these problems to get fine, sure performance!

The book contains 114 pages . . . and is crammed with useful information. Complete data on all tubes, including types 15, 18, 255, 25Ys, 2Z2, 46B1 and 182B, and complete descriptions of over 90 types of tubes.

This is Sylvania's latest service help . . . and it's yours for 10c. Take the guess out of tube application! You can if you send for this handy pocket manual.

YOURS . . . FOR 10c IN STAMPS

10c TECHNICAL MANUAL, 10c

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Please send me the new Sylvania Technical Manual. I enclose 10 cents in stamps.

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— A POPULAR PRICED TUBE TESTER THAT READS —

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Neon Leakage Indicator Shows Leaks as High as 3 to 5 Megohms
Individual Element Short Test — Spare Socket
Needs No Line Regulator Between 100 and 130 Volts
Separate Tests on Diode or Triode Sections of Multi-Purpose Tubes
Tests All Rectifiers — Simple to Operate
Beautiful Appearance — Counter and Portable Styles

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At a Price Which Makes It Possible for Every Business and Every Technician to Possess a Real

DYNAMIC MUTUAL CONDUCTANCE TESTER

NET PRICE **$34.95** F. O. B. CHICAGO

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REDUCED PRICE!

To enable all progressive technicians, service laboratories and factories to avail themselves of the use of a real laboratory signal generator the Triumph Model 100 Generator has been reduced to the Very Low

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See These Distributors for Demonstations

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1816 West Eighth Street, Los Angeles

ELECTRIC PRODUCTS SERVICE
1358 South Grand Avenue, Los Angeles

California Representative:
NORMAN B. NEELY, 1656 North Serrano Street, Los Angeles