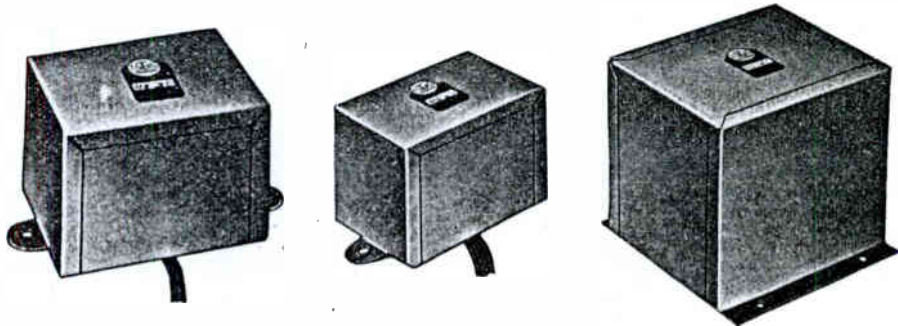




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Vol. II

NOVEMBER, 1934

No. 3

EDITORIAL

By The Editor

"Affiliation for Radio Associations"

The dissolution of the Radio and Music Trades Association of Southern California made it necessary for its various groups to organize separate associations. Although this abrupt breakdown of an organization of such age and consequence caused, momentarily at least, a chaotic condition in certain branches of the trade it undoubtedly was to the eventual benefit of the local radio industry.

It is not feasible nor desirable for one executive body to endeavor to act for and control an organization whose members have such widely diversified interests as did those in the Radio and Music Trades Association. This association had endeavored to grow and expand its activities in keeping with the rapid advance of radio development. When the crash came, so to speak, it became necessary for all these groups of divergent interests to organize their own associations.

The music dealers, the washing machine and electric stove dealers, the electric appliance dealers and all similar members of the old association formed their own individual groups with which we, of the radio trades, are most certainly not concerned.

The Certified Radio Technicians Association was formed and has made remarkable progress in the matter of raising the plane of the radio service business to something approaching a profession and improving the calibre of its members. The Radio Manufacturers' Association of Southern California came into being, consisting of the leading local manufacturers of quality radio receivers. The broadcasters have formed another

group and are honestly endeavoring to aid the entire industry. The Radio Parts Jobbers Association of Southern California has recently been formed and is making a very active effort to improve general conditions.

Even though it was certainly not successful to have one main organization composed of several specialized groups (as borne out by a recent unsuccessful attempt to organize a similar body) their is still something very definitely lacking which is essential to the best interests of all these groups. Each group has competent, sincere and energetic leadership but progress seems to be hindered by lack of concerted action on the part of all interested groups.

What then could be a more logical solution to the problem than an affiliation of radio associations in Southern California? A representative from each group could be selected to meet with the others and a definite program of concerted action towards definite aims could be intelligently outlined and each association delegated to do its own part.

A move is already on foot to do these very things and every member of the radio trades in Southern California should lend his support to such a movement. We are all striving individually toward the same ultimate goal—that of keeping the radio industry on a sound, honorable and money-making basis so that we all may profit from our chosen profession.

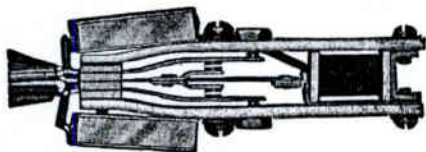
This, we feel, is the answer to a large majority of the rehabilitation problems of our industry today. We may help and be helped and the result will be improvement, advancement, greater profit and consequent greater happiness for us all.

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LOW-PASS FILTERS

By CHARLES J. LEIPERT, Radio Engineer

(Editor's note—This is the first of a series of articles dealing with low-pass, high-pass and band-pass filter circuits by M. Leipert. Mr. Leipert, formerly assistant chief engineer of radio station WOR, has had a great deal of experience in practical radio engineering and is in possession of much valuable information on this timely subject.)

Whenever a new device makes its de-prevails because of its adoption. These prvails because of its adoption. These circuits may be new to the radio buying public but on the other hand were perhaps developed years ago, shelved and apparently left there until they were incorporated into some workable circuit for the edification of the radio minded public. Thomas A. Edison, in his early lamp experiments using a two element lamp before the days of radio, observed a very peculiar effect—electricity being conducted from one electrode to another. This he called the "Edison Effect." After his discovery, an English electrical firm bought this invention and with some further experimentation produced a two element radio tube called the "Fleming Valve", and was successfully employed in wireless telegraph reception. It created quite a furore when it came on the market, few people knowing its actual history—as it was invented years before, shelved, resurrected, and then put into practical use.

With the radio public demanding something new, and becoming more "quality-conscious," some of the bigger radio firms have commenced to "feel-out" the public's reaction to this high fidelity. High

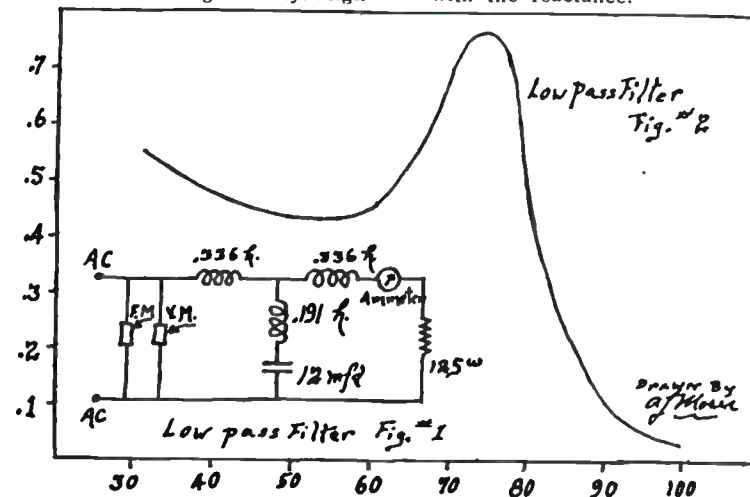
fidelity filter circuits are getting to be more popular and their scope no doubt will be greatly enhanced in the near future.

The author a short time ago made some interesting experiments and curves showing the operation of high and low-pass filters. These curves were obtained with ordinary commercial frequencies. The values in the circuit may be changed to take advantage of any particular frequency cut-off that is desired. This article giving the low-pass feature will be followed at a later date by another, explaining the high-pass measurements. No mathematics are employed — merely a picture which is self explanatory and simplicity in itself.

The frequency meter, in diagram 1, across the A.C. source, was of Hartmann-Braun vibrating reed type used to check the accuracy of frequency step by step. The other meters checking the voltage and current.

Diagram No. 2 shows the curve as plotted, the current beginning at .55 amps at 30 cycles, decreasing slightly before reaching a maximum of .735 amps on the peak at 75 cycles—then falling off rather sharply to a minimum current at 100 cycles.

In conclusion we may say that the curve shows a condition of high current at low frequency and a low current at high frequency. A much sharper cut-off point can be obtained by incorporating low-loss construction in the coils. In other words, the value of R, must be kept as low as possible in comparison with the reactance.



THE PENTAGRID CONVERTER TUBES

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

Part One

With a public demanding smaller and cheaper receivers of good sensitivity the set manufacturers naturally turned their skill to reducing the number of tubes employed in the larger superheterodyne type of receiver, with the object of building a midget receiver for little money, but with a sensitivity at least comparable to that of its big brother.

With the general acceptance of the superheterodyne type of circuit by the general public a number of manufacturers attempted to build a receiver employing a single tube as a composite first detector and oscillator, employing such tubes as the 24 as a pliodynatron. However, due to the wide variations in characteristics of tubes when so employed and the rapid decay of the dynatron characteristic, this circuit was soon abandoned.

Up to this time it had been customary to employ either a triode or tetrode as a first detector and a separate triode as an oscillator, the difference in frequency between the oscillator and signal being kept constant over the entire range and equal to the frequency to which the intermediate amplifier stages were tuned. A number of schemes presented themselves for coupling the oscillator output to the first detector or mixer tube. The simplest was an inductance placed in the first detector cathode lead, coupled to the oscillator tank inductance. Set manufacturers soon heard about a peculiar scratching noise similar in sound to that made by a lead pencil being sharpened on a piece of sandpaper. Investigation disclosed this to be due to irregular leakage currents between filament and cathode being superimposed upon the oscillator voltage induced in the coupling coil. It then became a tube problem and was solved by employing a special insulator which possessed much better insulation qualities at the high temperatures employed in vacuum tube heaters.

Although such combinations were made

to perform satisfactorily, the conversion gain was lower than the gain of the same type of tube when used as an amplifier. By conversion gain is meant the gain from signal-frequency input to the intermediate frequency applied to the grid of the first intermediate frequency amplifier tube. The gain is thus measured from the grid of the first detector to the grid of the first i-f amplifier tube.

Returning for a moment to the foundation circuit of a separate tetrode detector and triode oscillator, the oscillator voltage is applied to the cathode of the detector tube by a cathode coil coupled to the oscillator. Effectively the signal and oscillator circuits are in series between cathode and grid. It is best to couple the cathode coil as close to the oscillator as possible so that as large a voltage as is possible to obtain will be induced in the cathode coil without causing grid current. This follows from the fact that for a given r-f carrier strength, the intermediate frequency output is proportional to the local oscillator strength and to a constant of the tube which governs the proportionality between plate current and the square of the grid bias measured from plate current cut-off. This optimum value of oscillator voltage is maintained uniformly by a combination inductive and capacitive feedback arrangement. The same series condenser which acts to assist in maintaining a constant frequency difference between signal and local oscillator provides the necessary feedback coupling at the lower frequencies while the inductance will furnish the necessary feedback at the higher frequencies. By properly proportioning the condenser and coil uniform oscillator output is obtainable over the tuning range.

It is possible to eliminate the triode oscillator tube entirely by using the tetrode as the oscillator-modulator. In such a circuit the cathode coil acts as

(Continued on page 40)

BRAIN AND MUSCLE

By ROBERT J. JAMES, M. D.

(Editor's Note—It is hoped that our readers will derive considerable benefit from the information contained in this article inasmuch as we are all apt to abuse our bodies and a little study in the art of how to conserve physical welfare is certainly important. Dr. James is a prominent physician and surgeon, specializing in industrial surgery).

Millions of years ago life began on this planet, which we call the Earth. The first records we have of life on the earth are found in the Proterozoic (beginning of life) rocks, and the only traces of life we find in them are vestiges of simple plants called algae, and marks, like tracks made by worms in the sea mud.

Overlying the Proterozoic rocks are the Palaeozoic (ancient life) rocks, and the fossilized remains found in them, show us that the seas of earth are teeming with creeping and swimming creatures of a lowly order.

Eons later the jelly fish, snails and crabs appeared, and so, through the numberless centuries life evolved to an ever higher plane, until the wonderful mechanism of muscle and brain, the human being of today arrived.

However the evolution of the body is still going on. The directing principle is known, whatever muscle and nerve is no longer necessary to life is burdensome and must go.

The mouth was once a mill for biting and grinding of coarse foods, but now it is mostly used as a talking machine. The molars, as we call them, are in the course of disappearance, the wisdom teeth are doomed and are only in the way. The incisors are not needed for cutting or gnawing, but instead are used for making ingratiating smiles. Our little toes have practically gone out of business, and our little fingers would share the same fate were it not for the ambition cherished by millions to become a second Paderewski.

As for our muscles, which constitute so much of our bulk and weight, and which make such large demands upon our digestion and blood upkeep, they are also, undoubtedly in a process of degeneration. We may practice Physical Culture, aim at weight lifting, and worship the pugilist, but we may easily go wrong therein. The pugilist eventually gets muscle bound, punch drunk and insane from injury to the brain, the long distance swimmer or

Marathon runner will do wonders, but these exertions are abnormal, and he will later develop hypertrophy, or enlargement of the heart, and the coronary arteries which supply the heart muscles cannot proportionately enlarge, hence sudden death following sudden strokes, pneumonia, or influenza.

It is a noteworthy fact that athletes do not live to a ripe old age, and if we must admire and emulate them, let it be in base ball, tennis, or golf, and not football, long distance swimming and the Marathon. The light games develop the muscles and quicken the mental tempo.

If muscles and bones, teeth and hair, etc., are to diminish and disappear, is anything to remain and increase? Yes, indeed, and that is the brain.

We live in a material world, to which we must adapt ourselves, and we cannot as yet abandon bodily mechanism and that brings us to the subject matter of this article. Accident Commission statistics reveal that about eighteen per cent of men in industry injure their backs or rupture themselves by not knowing how to lift.

A man's back was not made to lift off the ground more than one-third of his body weight. If a tendon, muscle or joint has been strained, it must be given rest, and not active treatment or exercise, the duration of the period of rest should be governed by the extent of the injury.

One should not use the back or abdominal muscles to lift while in a more or less horizontal position, or while off balance; instead the lifting should be done by means of the leg muscles. Occupational and postural weakness soon become structural weakness. If your occupation requires heavy lifting, wear a well fitting back support and learn the art of proper leverage, better still let us hope that the time will come soon when man will be the master of the machine instead of its slave.

Our present civilization, called the machine age, is producing thousands of cripples daily—due mostly to intensive work and long hours—such conditions and the toll of injured is becoming an appalling expense to the State. All high minded citizens should give their energetic support to shorten hours of labor and broadcast information to protect our workers.

Better living conditions, more hours for play, old age pensions and Utopia will

(Continued on page 39)

Line Noises And Today's All-Wave Receiver

By Engineering Department Technical Appliance Corporation

Static is blamed for many background noises not of its own creation. Especially during the past few years, with many-fold increases in transmitting power, broadcasters have succeeded in dominating the average run of static or atmospheric disturbances within their local service range. But when it comes to inductive interference or man-made static, particularly in close proximity to the super-sensitive receiver of today, there is little more the broadcaster can do. Combating such background noise is strictly up to the receiving end. And that is where the service man comes in . . . for some extra work . . . a bit of glory . . . and certainly a few dollars to prevent the cash register from going rusty.

We all know that inductive interference is caused by tiny sparks in making and breaking electric circuits. Especially high-tension discharges, such as violet ray devices and X-ray equipment. Acting as miniature radio transmitters, such disturbances broadcast noisy signals in their immediate vicinity. Fortunately, those pseudo radio waves travel only a short distance. They seldom reach the roof of the building. An aerial swung high above the roof is quite out of reach of most inductive interference. But unfortunately, the usual downlead is also part of the aerial, doing its share of the pickup. And that's where the trouble comes in. The downlead, passing right through the zone of man-made static, picks up many of those noises. Others travel along the electric power line and wiring, like wired radio signals, and get into the radio set via the power transformer or even the antenna circuit; because the house wiring may act as a huge radiating antenna. Hence we have the backdoor and the front door entry of man-made static.

Let's take the front door variety first. The thing to do here is to employ a modern noiseless antenna system. Fortunately today there is available the all-wave noiseless antenna, operating equally well in broadcast and short-wave bands. Amy, Aceves & King, Inc., and other engineers specializing in antenna problems and noiseless reception, have evolved all-wave noiseless antenna systems.

The elimination of background noises by means of such an antenna is achieved primarily by utilizing an ingenious downlead immune to surrounding electromagnetic disturbances or waves. It simply refuses to pick up anything. It becomes

a transmission line conveying the signal energy picked up by the lofty aerial proper, to the radio set. Such an antenna system comprises an antenna unit coupling aerial with downlead, a twisted-pair cable downlead, and a set coupler between downlead and radio set. Such systems are readily installed in a comparatively short time and effectively eliminate noises that might otherwise get in through the front door.

But the backdoor usually remains wide open. Spurious electro-magnetic waves traveling along power line and wiring, gain access to sensitive r. f. circuits through the power transformer of the set. It becomes imperative, therefore, to have some form of filter or electrical screen to keep out those backdoor noises.

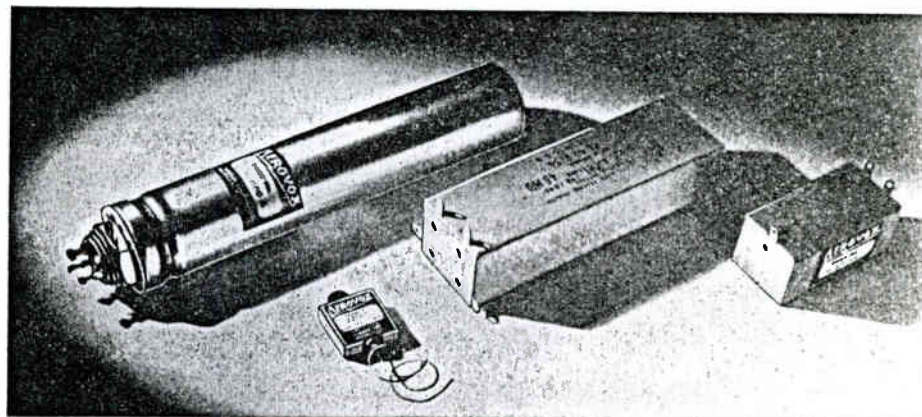
Here again, Amy, Aceves & King, Inc., have spent much time and effort in evolving a line noise filter suitable for use with present day all-wave receivers. For years past line filters have been available. But only for filtering out noises falling within the broadcast band. Extending the filtering operation to cover the short-wave band as well has been a real engineering feat.

The present TACO all-wave line noise filter comprises two filter circuits in a single unit, one covering the broadcast and the other the short-wave band. Each circuit comprises chokes and by-pass condensers of correct values, the components being permanently sealed in a mass of compound for protection against mechanical and atmospheric damage, and placed in a sturdy metal case.

The device is provided with a receptacle to take the usual radio set attachment plug and an attachment cord and cord for insertion in nearest electric outlet. The installation, therefore, is simply the insertion of line filter device between radio set and usual outlet. A binding post on the device connects with either set chassis or ground terminal, or with a separate ground connection, when desirable. In some cases no ground connection is necessary. The connection between set and line filter is kept as short as possible so as to avoid fresh pickup of line noises.

In some cases it is preferable to tackle the line noises at their very source, so as to prevent widespread propagation over power line and house wiring, and also to eliminate troublesome radiation of disturbances through space by such a pseudo

(Continued on page 18)



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CONSIDERATIONS IN USE OF TUBE TESTERS

Through Courtesy of W. BERT KNIGHT, Inc.

The use of the conventional counter type tube checker has now become so universal in the retail merchandising of radio tubes that it seems worth while to consider some features of this instrument that are perhaps not self-evident to the user. Its utility is unquestioned but its limitations are probably not so well understood.

The legitimate function of the tube checker is to provide the salesman with a convenient, convincing and reasonably accurate indication of the condition both of used tubes from the customer's set and of new tubes sold for replacement. By a reasonably accurate indication is meant that the verdict of the tube checker must not be in violent disagreement with the results of an operation test in the receiver. This point brings out the fundamental limitation of all commercial tube testers namely that they do not and cannot test the tube under rated operating conditions. Current is taken directly from the AC line and applied to the tube. Therefore plate and screen voltages are AC and limited to approximately 110 volts whereas in normal operation the plate and screen supply is carefully filtered direct current of the correct voltage which for different tube types and applications varies from 67.5 volts to 300 volts or more.

The limitation of tube checker indications to a single characteristic would not be so serious if the most appropriate characteristic for each type and application could be selected. Power output indications on output tubes gain on radio frequency or intermediate frequency amplifiers etc., would give much more consistent results than the present system of making a universal "grid shift" test on all types.

In view of these facts a tube checker reading should be interpreted as an indication only and not strictly quantitative. The present practice of dividing tube checker dials into rather broad sections designated as "bad," "poor," "fair," and "good" instead of using the numerically calibrated scale employed in earlier tube checkers is intended to take care of this condition but there is still a tendency on the part of some users to interpret a slightly higher scale reading as indicative of superior quality.

Considerations of size, cost and simplicity of operation require that most types be checked under abnormal voltage conditions and usually for only one characteristic. It is also desirable that the custo-

mer be able to see and appreciate the meter indication even if he does not fully understand it. The average retail purchaser of radio tubes could watch the testing operation in a modern tube factory where tubes are checked for a large number of characteristics and with great accuracy and still be unable on the basis of his own observations to choose between the good tube and the lowly reject bound for the scrap barrel.

Since the tube checker does not test tubes under rated conditions its original calibration is entirely empirical. That is, the circuit is so arranged as to give the desired reading on selected tubes whose characteristics have been previously determined by standard methods. Such a calibration is open to the objection that two tubes may have identical characteristics at rated voltages but differ rather widely under the abnormal conditions imposed by the tube checker. This is frequently the case if the tubes are of different manufacture and often results in the observation that a given tube type of manufacturer "A" is uniformly better than the same type of manufacturer "B" if tested on tube checker "X" while the reverse may be true if tested on tube checker "Y." In most cases a thorough investigation shows that the two tubes have approximately the same characteristics and are equally good.

In general it will be noted that tube checker indications become less significant as the tube structure and its application become more complicated. A test of a simple rectifier is entirely satisfactory and not much trouble is experienced with the simpler tubes of other types. On the more complex tubes, especially the pentagrid converters, the tube checker indication which is usually a single transconductance approximation by the "grid shift" method is not particularly useful as the determination of several characteristics is necessary.

In addition to the principal indication, usually grid-plate transconductance, most tube checkers include a test for shorted elements. This test is very important and should be as complete as possible. In some cases an attempt has been made to extend the short test to include gas (grid current) and inter-electrode leakage. These characteristics involve the accurate measurement of currents of the order of one micro-ampere (one millionth ampere) which can be measured only by delicate and ex-

(Continued on page 39)

They Said---

"It Couldn't Be Done."

But---

"We've Done It!"

NOW READY FOR DELIVERY

THE NEW MODEL 36

Packard-Bell

SIX TUBE SUPER

Foreign and American Broadcast—

Full Illuminated Airplane Dial with stations

Calibrated directly on the Dial—

Full Automatic Volume Control—Tone Control

Original New Cabinet Design—RCA Licensed

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PRICE **\$29.95**

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PRospect 0151

Phone request to have salesman call.

TRAVELING THE TERRITORY WITH MILTON

What ho, what ho, AND what ho! Yowah. Now that Hallowe'en is once more a memory, and the reincarnated spirits of Banquo, Deademona, Confucius, Juliet, Napoleon, Disraeli have again passed to the shades, we radio people can once more maintain our attention on mikes, radios, and such. To get down to business:

The Traveler says hello to his old friend Melvin Wagy, who, after several months in and around Sacramento, has decided once more to gambol in home pastures. "Mel" brings to the Radio Service Co., in addition to a handsome countenance, a wealth of radio experience. Welcome home!

They say one has to travel south for real hospitality; but the Traveler has found evidence to gainsay this statement. After being greeted with such sincere cordiality on his visit to R. A. Feliz's cozy establishment, the Traveler insists that hospitality is most certainly not limited to any single section of the country. Hasta la vista muy pronta, senores Feliz y Essington.

If you-uns would like to know what is an appendectomy, just ask our old friend Frank Trunick of Coast Radio Shop. Frank has always made it a point to follow the fashions; so, when he heard that an appendicitis operation was just the thing to put one in style well,—just look at my operation!

Thousands of us radio people lie awake nights hatching plots against manufacturers of AC-DC and other radio misfits; but as for Gecman's Radio Shop hatching devices are limited to those concerning the mere hatching of ordinary eggs. The Traveler is still unable to determine if the radio business is a side-line to the hatching business or if it's just plain vice-versa. Now it's your turn to tell me!

Ahal We think we've found the reason for that far-away dreamy look in the eyes of Sid Borbridge. The reason might possibly be a most charming blond young lady (now in Connecticut) to whom Uncle Sam is carrying much mail from the radio shop on Victoria Street.

And way up there where "Doc" Harriman fills doctors' prescriptions as well as prescribing for radio ills, there persists the firm conviction that business (like prosperity) is just around the corner. What corner did you say?

Les Anlauf has always followed the precept of "little children should be seen as well as heard." Which might possibly account for the new 100-foot aerial tower gracing his trim little radio shop.

Are there green eyes floating over the atmosphere? Don't ask. The whole radio fraternity is looking with soulful longing at that new Ford convertible truck of which Stanley Dawe is the justly proud possessor. But here's a thought, boys: just remember that the best things in life are free. Oh, yeah?

Meters to the right of us, panel boards to the left of us, into the valley of—well, anyhow in rode the 600; that is, the 600 people among the many who call on R. E. Daniels for their radio service in his district. "R. E." boasts of the most completely equipped radio service shop in his section of the country; and after one worm's eye-view of the bird the Traveler nods his head very much in the affirmative. Keep it up, "R. E."

They say you "can't find a needle in a haystack"; but by golly the radio customers can sure find what they want at Ray Weigle's emporium. Can yuh hear me?

Congratulations are in order for both Louis Snow and Mark Staires. These two dealers are to be complimented on their new quarters, which admirably reflect the spirit of achievement characteristic of both these merchants.

Everything is still "kosher" at Derby's Radio Shop even though the shop is now boasting a "ham" operator's license. Such a business!

And now that it's almost time to go in and carve the turkey, the Traveler once more says, "au revoir". Brethren, we exhort you to tune in on us in the next issue, in which the usual choice scandal will be dragged from the closets of unsuspecting clients who so unwittingly pour their troubles into our avid ears. Hasta luego!

REMEMBER the Annual Radio Banquet December 6th.

SYLVANIA TECHNICAL MANUAL

The wide array of radio tube types now available is reduced to a logical ready-reference listing of characteristics, circuit application, base connections and other data in the Sylvania Technical Manual, just issued by the Hygrade Sylvania Corporation of Emporium, Pa. The manual contains 104 pages. It is of convenient pocket size, bound in durable black cartridge paper. Aside from the data on all types of receiving tubes in current use, the manual presents sections on fundamental properties of vacuum tubes, amplifier classifications, definitions, general tube and circuit information, shielding, filtering, heater voltage supplies, volume control considerations, tube and base diagram symbols, and typical receiver circuits in current use. The manual is available to anyone sending 10 cents, in stamps or coin.

CORNELL DUBILIER PAPER REPLACEMENTS

For some time past the Cornell-Dubilier Corporation of New York City, pioneer condenser manufacturers, have been manufacturing their type "PE" paper units, which are in exact appearance, the same as their electrolytic condensers. This type is made in single 2 mfd., 4 mfd. and 8 mfd., also dual 4 mfd. and dual 8 mfd., in cardboard containers with individual leads. All standard types are also made in metal containers, inverted or upright mounting type.

Many servicemen actually prefer a paper dielectric bypass or filter condenser and this new line was brought out with the specific idea of supplying the wide demand for Cornell-Dubilier condensers in this particular style. All "PE" types are readily interchangeable with electrolytic units.

THE MODERN SERVICE LABORATORY

Must be equipped with instruments approaching laboratory precision — BUT! Laboratory Equipment is Expensive!

See Page 41 for TRIUMPH INSTRUMENTS at Popular Prices

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Radio Tubes

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Los Angeles

TECHNICAL QUESTION AND ANSWER DEPARTMENT

Conducted by CHARLES MILLER
Chairman, Technical Board

Q. The PP input transformer has developed leakage between primary and secondary. The set is too old to justify replacement with a transformer of the original quality and a cheap replacement does not give satisfactory tone. Can anything be done about it?

A. If the leakage resistance is fairly high, a half meg or higher, the old transformer can be used by removing the B voltage from the primary. Ground one side of the primary and parallel feed the plate through a fifty to one hundred thousand ohm resistor. Couple the plate to the primary through a condenser rated 400v or higher. The capacity may be determined by trial for the best response.

Q. How is it that a so-called "universal" output transformer having a tapped secondary but a simple primary can match output tubes of widely different load impedance?

A. The output transformer is used primarily as an impedance matching device to make the voice coil impedance "look" like the correct load impedance to the output tube. Hence, the product of the voice coil impedance and the impedance ratio (the term ratio squared) the transformer gives the load impedance on the tube.

Q. I wish to use a transformer having only one 2.5 volt winding on a set that now has a separate winding for the 45 filament. Will it hurt to operate the heaters in parallel with the 45 filaments which are some 48 volts above ground potential?

A. You might get satisfactory results with the heaters 48 watts positive, for a while at least, but a more satisfactory job will result if you operate the heaters and filaments at ground potential. This will necessitate changing the speaker field and filter over to the negative side of the "B" supply circuit and obtaining the 45 bias from a voltage divider across the field. An RC filter must be added to the bias circuit to prevent the ripple from reaching the 45 grids.

BE SURE TO COME to the Annual Radio Banquet Dec. 6th.

Q—1 have a Majestic 90 in which the voltages all test 30 per cent low at low volume but raise to about 20 per cent high at loud volume. All tubes are O. K.—W. R.

A—Check for open grid return on 45's. The C-T of the push-pull input transformer may not be grounded.

Q—1 have a Class B amplifier wherein the tone is ragged and the output very low. All voltages check O. K. However, an a.c. meter (1000 ohms per volt with condenser in series) shows only about a fifth as many volts from plate to plate as from grid to grid on the 46's. What can be the cause?—S. D.

A—Assuming you have the correct output transformer to match the 46 plates to the speaker voice coil, check the output transformer for shorted layers in the primary windings. The d.c. resistance of the two halves of the primary should agree within 2 per cent and the a.c. voltage across the two halves of the primary, when low voltage a.c. is applied to the secondary should be equal.

Q—What is the proper voltage rating for the buffer condenser in an auto set having a vibrator, transformer and tube rectifier?—Q. R. M.

A—Transient voltages having extremely high peaks may be applied to the buffer in sets of this type. A paper condenser with a working voltage of 800 volts or higher should be used and then only brands of the highest quality should be trusted. A new type of oil filled condenser has recently been brought out for this particular service and should give excellent results.

LINE NOISES

(Continued from page 12)

antenna. Again the installation is the same as before, namely, insertion between the noise-causing appliance and its power supply.

While the antenna is usually considered as the main source of background noise pickup, widespread experience points to the power line as an equally common source. It is generally best to install a noiseless antenna first, and if background noise still persists, to complete the job with a suitable line noise filter.

SERVICE KINKS AND PET EQUIPMENT

Zenith Model 460

Watch out for defective on-off switches on Zenith Model 460 auto sets. The symptoms are a decided loss of volume and usually the receiver will not respond to frequencies lower than about 700 kc. Check the voltage (filament) on the detector-oscillator tube and it will probably read about 3.8 volts instead of the normal voltage of 5.5 volts. Best to replace the switch instead of attempting to repair it.

C. Nichols.

Majestic 70 Dial Cable

To install a dial cable on a Majestic 70 in fifteen or twenty minutes without snagging the cable, remove the condenser housing and remove the condenser gang. This can be done without removing the bottom cover of the chassis. Lay the condenser gang on the bench and the cable can be installed in a very few minutes without the cable slipping and without loss of the technician's temper.

E. H. Darrow.

Zenith 50 Series

Zenith Model 50 series receivers use a tuned plate tuned grid system in the r. f. portion of the set and consequently two of the variables are "hot." In case of trouble due to plates shorting or arcing due to dust, connect a .1 mfd. condenser in series with the variables that are "hot" and your troubles should be over. Of course, you had best clean out the variable with a pipe cleaner and straighten any plates that may be badly warped.

C. Nichols

Spring-Type Knobs

If you break or lose the spring in a spring-type knob an emergency repair may be effected by cutting the fibre from an insulated staple to the correct width and inserting it into the knob. This will be found quite satisfactory until a spring or new knob can be had.

John A. Orme.

TRIUMPH TUBE TESTER

The Triumph Mfg. Co. of Chicago announces the release of a new and improved tube checker which reads dynamic mutual conductance. It has neon leakage tests showing leakage as high as two million ohms, individual short tests and provides for separate tests on each section of hybrid tubes. It will be available in counter and portable styles.

SERVICE and Dependability PLUS

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Eveready Batteries

Radio Products Sales Co.

1314 South Hill Street
PR. 0490 Los Angeles

SEEING THE WORLD FAIR WITH THE EDITOR

By NORMAN B. NEELY

THE LAMA TEMPLE

One of the outstanding exhibits of the exposition is the Golden Temple of Jehol, a Lama Temple. It is a resplendent shrine which is an exact reproduction of the original temple built for the Manchu emperors of China in 1767.

Dr. Sven Hedin, the celebrated explorer, was sent to the Orient to bring back to the World Fair a typical Lama Temple. He found this brilliant replica of the Manchu dynasty which was crumbling to ruin. A staff of Chinese craftsmen under the direction of Mr. W. H. Liang, famous and competent Chinese architect was set to work and the structure was duplicated piece by piece. No nails were used in the entire structure and more than 28,000 different parts were carved, numbered and shipped to A Century of Progress.

It is scarlet and gold and the center is 70 feet high. On the exterior there are 28 columns in red lacquer which support the lower deck of the double decked roof. 28 other columns form part of the wall and inside twelve columns 37 feet high support the gilded ceiling and upper deck. Carved grilles in yellow, red, blue and gold cover the windows. Images of cats, dogs and dragons are carved upon the cornice beams which are gilded. The roof of copper shingles is covered with 23-carat gold leaf valued at more than \$25,000.

Treasures of Taoism

Many historical and interesting treasures are displayed inside the temple which is equipped and arranged for Lama worship. Among these is a huge bronze incense burner dating to the Ming dynasty—1368 to 1644. Other treasured relics include a large antique wooden statue of the "smiling Buddha," the throne and screen of the Ta Lama, or high priest, and his ceremonial robes, bronze prayer wheels, prayer tables with scrolls of the Lama scriptures, a great bronze temple bell, prayer rugs, a drum made of two human skulls joined together and ceremonial weapons for banishing demons.

The Temple also contains a treasure of pagodas, offerings of jewels in carved jade and carved work. The collection includes many antique bronze religious statues of various periods.

The Chinese Pavilion

While on the subject of the Orient the Chinese Pavilion should be mentioned. There is a beautiful and gorgeously

carved teakwood Gate of Honor before the pavilion. The central feature of this exhibit is the Jade Pagoda. It is fifty-one inches high and required over sixteen years of constant labor in its construction. Even the bells and supporting chains hanging from the curved roofs of each story are carved from solid jade. Surrounding the pagoda are many other large jade pieces including lamps and flower baskets carved to eggshell thinness.

A Century of Progress Fountain

Extending 670 feet south into the center of north lagoon from the bridge connecting the mainland and the island at the north end of the fair grounds is the Century of Progress Fountain. It is the largest fountain ever constructed. The water jets lead from the bridge to the water-dome which is 40 feet high and 200 feet in diameter. Around the dome are three single sprays which throw water 75 feet into the air.

On the lower level of the bridge, back of the fountain is a bank of 40 powerful searchlights which can be operated either manually or automatically from a control room below the bridge. The fountain uses 68,000 gallons of water per minute while the next largest fountain in the world uses 14,000 gallons per minute.

The spectacle presented at night by this marvelous fountain defies description. The powerful sprays throw water high into the air and the searchlight beams of many colors can be seen through the vaporized water giving the spectator a sight of breath-taking beauty. This giant rainbow, rivaling the Aurora Borealis in beauty, can be seen from nearly any spot on the entire fair grounds. This illuminated fountain seen from the skyride observation towers which are quite near and 628 feet high presents a never-to-be-forgotten spectacle.

NEW LABORATORY EQUIPMENT

Dr. John F. Blackburn, well-known consulting physicist and radio engineer, has recently installed a large amount of new laboratory equipment making his one of the most completely equipped privately owned laboratories of this type in Southern California. Dr. Blackburn is fully equipped to make all conceivable tests and calibrations on radio and allied electronic equipment.

SOMETHING CAN BE DONE ABOUT RADIO INTERFERENCE

By FRED B. DOOLITTLE

Radio Engineer, Southern California Edison Co., Ltd.

Part Three

4. Receiver - Shielding. Any radio receiver which will pick up broadcast signals when operated without an antenna or ground will also pick up radio interference and there are millions of sets in service which are doing so. The real remedy for this is complete shielding of the circuit elements by enclosing them in metal casings which are grounded. Fortunately for those engaged in interference mitigation, the modern trend in the better grade of radio receivers is toward complete shielding. In some cases unshielded receivers will operate satisfactorily (particularly when power supply filters are used) in one part of a room and will be subject to interference in another location in the same room. This phenomenon can usually be traced to the presence of concealed wiring within the wall adjacent to the place where the set is subject to the interference.

Transposition Antenna. Where space is available, the so-called "transposition" or "doublet" antenna system gives superior results. Such a system consists of a half-wave antenna erected at a distance of from several hundred to two thousand feet from the radio set. The antenna is generally about 600 feet long so as to be one-half wave length in the broadcast band. It is broken in the center by an insulator and one conductor of a No. 19 duplex telephone drop wire is connected

to the antenna on each side of the center insulator. The telephone duplex acts as a radio frequency feed line with practically no pick-up along its length. The aerial and ground posts of the radio receiver are connected respectively to the two wires of the duplex.

In conclusion it is desired to point out that mitigation of electrical interference with radio broadcast reception is a problem involving three factors, namely, influence, coupling and susceptibility, each of which may be controlled. In the past ten years, the influence of electric power distribution systems has been greatly reduced by the systematic elimination of many sources of interference and this work will continue as new methods of locating and correcting causes of interference are developed. If the most satisfactory results are to be generally obtained much remains to be done in the way of reducing coupling between electric wiring and the radio installation in the average home. The susceptibility of high grade modern radio receivers, with their complete chassis shielding and built-in power line filters, is so low that if provided with reasonably good antenna and ground systems satisfactory operation is obtained in spite of considerable interference caused by the frequent operation of Mr. Radio Dealer's unfiltered cash register being carried about the neighborhood on the power companies' broadcasting network.

CRTA BOARD MAKES WINTER PLANS

At a recent special meeting of the Board of Directors of the CRTA many plans were made for the coming year and an especially ambitious program for the fall and winter months was formulated. A drive for new members will be made but at the same time the qualifications for membership will be made even more stringent in an effort to maintain an ever-increasing high level of member standing. A new educational committee under the direction of Mr. Edw. Guilford and Mr. Richard G. Leitner has been created and many plans for bringing greater educational facilities to the members of the CRTA are now under way.

UNIVERSAL ADVISERS

The Board of Directors of the Universal Microphone Co., Inglewood, Cal., has appointed a consulting advisory committee to aid in the research laboratory development and distribution of new products.

H. A. Waggoner, M.D., Hollywood physician and surgeon, will advise for the hearing aid devices; Jack Adams, in charge of communications at the Hearst Ranch in San Simeon, for public address systems; K. G. Ormiston, chief engineer for KNX, with broadcast problems; Ralph L. Power, Ph.D., public relations consultant, for marketing and distribution and Albert R. Rethey, construction engineer with the Consolidated Steel Corporation, for laboratory research.

ANNUAL RADIO BANQUET

Thursday Evening, Dec. 6th, at the Breakfast Club

For a long time the need has been felt for a general get-together and social evening of fun and enjoyment for the entire radio industry in Southern California. The Certified Radio Technicians' Association being keenly aware of this need took upon themselves the tremendous responsibility of arranging and staging a great radio banquet.

After a great deal of consideration and preliminary planning the final details have been arranged. The banquet is to be held on Thursday evening, December 6, at the Breakfast Club.

There will be a marvelous dinner at 8:00 p. m., followed by several five-minute talks by prominent figures in the local radio industry and two hours of superb entertainment by leading radio and movie stars. There will be dancing after the show for those who care to participate. Also, many valuable door prizes will be awarded to lucky holders of the winning numbers.

This is an opportunity for a much needed social get-together of the various radio trades in Southern California. It will promote general good will by furthering personal acquaintance.

This is an evening of care-free fun and wholehearted enjoyment, which you will not want to miss. Be sure to make dinner reservations in plenty of time, as tickets are already selling rapidly. They may be obtained from any CRTA member and nearly any jobber salesman. Should you require any information or wish to offer suggestions, please call any of the following numbers:

GRanite 0755 — Norman B. Neely, Chairman Banquet General Committee.

OLympia 5220—V. K. Hatfield, Sec. CRTA, Business and Financial Details.

ORegon 2233—A. Paul, Jr., President CRTA, Entertainment.

CAPitol 5542—Art Oodrys, Chairman Ticket Sales Committee.

KEnwood 1640—John L. Vincent, Vice-President CRTA, Door Prize Committee.

ANgeles 4509—Ed Darrow, Chairman Transportation Committee.

Should you find it difficult to contact persons selling tickets, your request, mailed directly to the offices of the "Technician," at 1656 N. Serrano Street, Los Angeles, addressed to the Banquet General Committee, will receive prompt attention. You will be sorry if you miss this great banquet and evening of entertainment, so be sure to arrange your calendar to include the Annual Radio Banquet on Thursday, December 6.

.....
Please find enclosed \$..... (\$1.50 per person) for which send me tickets to the Annual Radio Banquet.

Name

Address

City

Mail to Banquet General Committee, 1656 N. Serrano St., Los Angeles.

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BOOK REVIEW

Starting next month we will begin 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 and a short outline of the material covered and the class of men who might be most interested in each particular publication will be given. The publishers and price of each book will also be noted.

It will be most sincerely appreciated if the "Technician" is mentioned when contacting publishers of these books. An effort will be made to keep a supply of descriptive circulars on hand at all times to avoid delay on the part of readers desiring such. Please address the Book Review Dept. in care of the "Technician" when requesting information regarding any book. Your inquiries are also invited on works not appearing in this column and a special investigation will be made.

NEW RADIOTONE PRODUCTS

Among new products announced by the Radiotone Recording Co., is a new acetate recording disc which gives greater brilliance than the conventional wax recording. The company also produces a portable recording unit, which may be used in conjunction with a good radio receiver for home recording.

Mr. W. H. Snow, eminent sound engineer, is chief engineer of the firm and Mr. F. H. Brown, well-known to the radio trade, is sales manager.

MILLER ALL-WAVE

The J. W. Miller Co. has in stock a supply of special chassis for use in building up the all-wave superheterodyne from their coil kit. This is a great convenience for constructors as this very efficient receiver is proving quite popular and a special chassis, all drilled and ready for use, will be welcomed by the trade.

HOPING TO SEE YOU AT THE ANNUAL RADIO BANQUET at the Breakfast Club on December 6th

METALLIC SPONGES—GASES RADIO TUBES

Radio tubes have one arch enemy—gas. Many noises are traceable to gas. The premature demise of tubes is frequently due to gas. But only by the utmost thoroughness in the heat treatment of metal parts and in their subsequent prompt handling and stem mounting, followed by sufficient bombardment and ample exhaust, can gas trouble be avoided.

All of which accounts for long and exhaustive research and production studies conducted by the engineers of the Ilygrade Sylvania Corporation. In the Sylvania tube plant at Emporium, Pa., engineers have made a study of the degasification of metals entering into tube assemblies. Such parts—veritable metallic sponges soaked with gas and therefore to be wrung out thoroughly before inclusion in the radio tube bulb for the exhaust operation—have been critically analyzed for gas content. The engineers now know just how much gas can be taken out of given masses and kinds of metals.

In production routine the metal parts are fired in hydrogen furnaces at high temperatures so that troublesome gases are driven out of the pores of the metal while the harmless hydrogen takes their place. Hydrogen has less adherence to metals. It comes out readily during the exhaust operation. However, the hydrogen in parts exposed to the air, is dissipated after a time, so that engineers have set a time limit between degasification and exhaust, which is rigidly observed in production routine.

Then there is the question of the degree of exhaust or vacuum required for the elimination of gas troubles. Special devices have been developed for use in the exhaust lines of the sealox or combination sealing and exhaust automatic machines, whereby the internal condition of a tube can be determined during the entire pumping cycle. By these observations engineers can set pumping time schedules for any given type and particular design of tube for the guidance of the sealox departments.

Such studies applied to tube production have served to reduce gassy tubes to a minimum. Hard tubes, that is, tubes in which the gas content is so low as to remove all irregularities in characteristics traceable to ionization, are now a matter of regular tube production, inexpensive, commonplace.

Special!

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"COME UP AND SEE
US SOMETIME"

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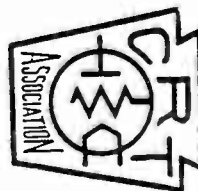
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459 Golden Avenue, Long Beach

AN ALL-WAVE LINE NOISE FILTER

An all-wave line noise filter capable of eliminating noises in the short-wave band quite as well as the broadcast band is announced by the Technical Appliance Corp., 27-26 Jackson Avenue, Long Island City, N. Y. This H-F All-Wave Filter is the result of long research and experimentation on the part of the same engineers who developed the H-F (high fidelity) antenna system for all-wave reception with minimum background noise, and becomes essential where background noise persists due to line conditions. The device connects between electric socket or receptacle, and the attachment plug device connects between electric socket or receptacle, and the attachment plug of any present day all-wave set. Or if preferred, it may connect between any electric appliance, such as electric ice boxes, oil burners, motors, causing interference and its power line. The filter is provided with receptacle and attachment cord. A binding post connects with the ground binding post or metal chassis of set. Housed in a neat, compact metal case are the filter coils and condensers, arranged in two band filters covering the broadcast and short-wave bands, respectively. The assembly is sealed in compound for permanent protection. The device handles up to 250 watts.

EXACT DUPLICATE ELECTROLYTICS

For that fussy clientele that insists on exact duplicate replacements for worn-out electrolytic condensers, there is now available a line of exact duplicate replacement units for all standard types of radio sets. In the latest Aerovox catalog there appears a list of such units exactly duplicating original condensers employed in various standard sets according to manufacturers' part numbers. The voltage ratings of many of the replacements, however, are in excess of set manufacturers' specifications where it is deemed necessary to insure longer life and more satisfactory operation in service.

Additions to the present list are planned from time to time. Meanwhile, the Aerovox Corporation of Brooklyn, N. Y., invites service men and dealers to submit samples which have proven defective and which they would like to replace with sturdier units. The make of set, model number, condenser part number, capacity, voltage rating and other pertinent data should also be sent.

AMPEREX XMTR TUBES

At a recent radio convention in Fresno, Calif., Connie Strassner, well-known factory agent, displayed samples of the Amperex line of transmitting tubes.

Amperex tubes have long been used by the U. S. Army and Navy and the Department of Commerce. Over 50 per cent of the Amperex production has been used by these agencies. The remainder of the output has been used principally by large manufacturers of diathermy equipment and broadcast stations in the east.

Recently the Company decided to expand and production has been increased to enable country-wide distribution. Connie Strassner has been named West Coast representative.

Many imminent engineers inspected these tubes during the Fresno show and complimented their design and construction. They are now on display by appointment at 1341 S. Hope Street.

UNDERWRITERS APPROVE TROY RADIO RECEIVERS

Bill Sexton of the Troy Radio Manufacturing Company has informed us that the following Troy Radio Receivers are now approved by the National Fire Underwriters Laboratories.

Model 14 in cabinet 14A; Model 15 in cabinet 15A; Model 40 in cabinets 10 and 11; Model 44 in cabinets A-E incl.; Model 52 in cabinet 52A; Model 54 in cabinet 54A; Model 55 in cabinets 1-5 incl.

Troy can justly be proud of so full a line of Underwriters Approved sets.

WESTON MEETING

Don't forget the Weston service meeting, Friday, December 7, in the Trinity Auditorium Assembly Hall, 839 South Grand Avenue. The speaker is H. L. Oleson, of the Weston Electrical Instruments Corporation. His subject will be "Modern Service Methods and Equipment." A. A. Barbera, Weston representative, assures us that this will be a technical meeting, not a sales talk. All service technicians, engineers and others interested in technical radio are cordially invited to attend.

DON'T FORGET the date—Dec. 6th—Annual Radio Banquet.

RADIO SHOW

Nov. 22-23-24

— Hours: 9 A. M. -- 9 P. M. —

PREVIEW SHOWING OF
New 1935 Models at
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Startling New Developments

in an ALL-WAVE RECEIVER
at LESS Than the PRICE of a
Regular 5-Tube Superheterodyne

First Showing of High Fidelity
in a Medium Priced Set . . .

MISSION BELL Radio Mfg Co., Inc.

TECHNICAL DISCUSSION

A new feature at meetings of the CRTA has recently been inaugurated. This consists of a technical discussion wherein members ask questions concerning particularly perplexing or unusual service problems and the answers are supplied by other members who may have had experience along the lines of the questions. Mr. Leitner acts as referee in case of dispute or differences of opinion and is the final appeal if enlightenment cannot be had from the audience.

XMTR IRE MEETING

At the regular meeting of the Los Angeles Section of the Institute of Radio Engineers October 16 a very interesting seminar was held on the subject of transmitter and antenna measurements. The speakers were Mr. Alden C. Packard, engineer with radio station KFAC and Dr. John F. Blackburn, consulting physicist. The meeting was of particular interest to all engineers engaged or interested in work with transmitters and their adjustment and operation.

CREI ANNOUNCES NEW A. F. LESSONS

The Capitol Radio Engineering Institute of Washington, D. C., announces an addition to the regular home study course. This addition consists of new lessons dealing with the theoretical and practical aspects of audio and acoustical work. This very important subject is covered completely in a new series of lessons which have been added without deleting any of the previous parts of the course.

HERRNFELD TALKS TO CRTA

M. Frank Herrnfeld, engineer with the Radio Products Sales Co., delivered a very interesting and instructive paper on the general subject of tube testing at the Oct. 22 meeting of the CRTA. This talk included a brief review of the fundamental theory of vacuum tube operation. The discussion of this timely subject was well received by the members and guests present.

LEITNER ADDRESSES SAN DIEGO TECHNICIANS

On the evening of Oct. 22 Mr. R. G. Leitner, well-known radio engineer and lecturer, addressed the radio technicians group of San Diego under the auspices of the W. Bert Knight Co.

LEIPERT ADDRESSES CRTA

At the October 22 meeting of the CRTA Mr. Charles J. Leipert, formerly assistant chief engineer of radio station WOR, addressed the CRTA giving a very interesting talk on the subject of the origin of radio programs. A typical program was traced from the studio, through telephone lines, the amplifier equipment and to the antenna. Several interesting bits of information were disclosed by the speaker regarding leading broadcast equipment manufacturers.

GRUNOW ENGINEER IN SOUTH

Leut. Commdr. Fred H. Schnell, short-wave engineer of the General Household Utilities Corporation, recently visited Los Angeles and environs and delivered a number of very interesting and informative lectures on the general subject of short-wave radio reception and equipment. These meetings were held in the spacious sales rooms of Watson & Wilson, Inc., Grunow distributors.

WALKER WITH TROY

Don Walker is now back on the job as service manager for the Troy Radio Manufacturing Company. Don's many friends will be glad to find him back with Troy and ready to offer his services on their problems.

CORNELL-DUBILIER SALES SET A NEW RECORD

W. Bert Knight, local representative of Cornell-Dubilier Corporation, makers of the world's finest, most complete condenser line, announces that company sales for October are the largest in its history, and that production facilities have been continually increased to meet the demand for Cornell-Dubilier condensers.

Catalogues, literature and information will be gladly sent by Mr. Knight, to anyone interested. Address, W. Bert Knight, 115 W. Venice Blvd., Los Angeles, Calif.

MASQUER'S REVEL

The annual "Harlequin's Revel" of the Masquer's Club Sunday evening, November 4, was a brilliant affair presenting some of the outstanding dramatic talent in the United States. The audience, principally composed of Masquers, included many famous and well-known screen and stage celebrities.

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Radio Testing Equipment

We have just received the latest models. A cordial invitation is issued to all Radio Parts Dealers and Service men to see these models on Display at our store.

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PHASING LOUD SPEAKERS

By Norman B. Neely

In dual speaker and multiple speaker installations in public address and similar work a point of considerable importance which is often neglected is the proper phase relationship of loud speaker cones which are located in the same acoustic field. The proper phase condition exists when all cones move in the same direction at the same time. This is particularly important, of course, when two or more speakers are operated on the same baffle surface or in close proximity. A simple method of checking the correct phase relationship of two speakers before they are mounted consists of turning the two speakers face to face. If they are not properly phased the volume will be increased and on the contrary, if they are properly phased the volume will decrease, assuming that they are to be operated on the same adjacent baffles.

This indication, of course, is caused by the fact that when the cones move in the same direction at the same time and are face to face, they tend to buck each other and the movement of air between the cones is restricted. On the other hand if the cones are one hundred eighty degrees out of phase and are facing one another, one will be "pulling" while the other is "pushing" and the

movement of air between them will be greater than if only one speaker were moving. The action when this out-of-phase condition exists may be compared to that of two tubes in push-pull.

Distortion will result from the operation of speakers operated out of phase for the reason that while one cone is "pulling" the air back the other will be "pushing" it out. From the above discussion it may be seen that when two speakers are installed directly opposite one another in a room or auditorium with the cones face-to-face it will be desirable to have them out-of-phase in order to have them exerting their respective forces on the air in the same direction to prevent distortion. This placement and phasing will have a tendency to equalize the volume intensity in the room and will not tend to leave a dead spot in the center of the room.

To reverse the phase of a speaker it is only necessary to reverse the voice coil leads. In properly phasing a complete installation of several speakers it is convenient to use one speaker which may be referred to as a standard and connect each individual unit to have the desired relationship to the standard.

REMEMBER THE NEW ADDRESS AND
PHONE NUMBER OF THE TECHNICIAN
1656 No. Serrano — GRanite 0755

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parts and supplies.

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If You Like Us and Our Service, Tell Your Friends,—
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Make Our Parts Dept. Your Headquarters--

We Maintain a Complete Parts Service on
RCA-Victor . Tobe . Ohmite . Centralab
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Avail yourself of our Test Oscillator Calibration
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L. C. LANGE, Parts Department

PETER PAN POPULAR

Mr. Shelley, of the Peter Pan Radio Co. and Johnson and Mackey, exclusive Peter Pan distributors for Los Angeles County, report that increased manufacturing facilities have been necessary to supply the tremendous demand for "The Boy With the Flute."

PARTS JOBBERS APPROVE OF RADIO BANQUET

The Radio Parts Jobbers' Association of Southern California are really accomplishing great things and are very active, holding meetings twice monthly. The members of this group have signified their approval of holding an annual radio banquet and have offered their assistance which is most sincerely appreciated.

NIKL-SHIELD LINE

Mr. Frank LeBell of Pacific Radio Exchange reports very extensive and enthusiastic acceptance of the new UTC Nikl-Shield line of transformers. He informs us of a complete stock of this and other UTC components.

STRASSNER TAKES RADIART

Connie Strassner announces his appointment as Western representative for the Radiart Corp. Manufacturers of exact duplicate replacement vibrator units for all makes of auto radios. This line is very popular in the east and is rapidly building up an enviable reputation on the West Coast.

Los Angeles dealers find these units very satisfactory and the convenience of a complete local stock for all service needs is most appreciated.

BACK ISSUES OF 'TECHNICIAN'

A limited number of back issues of the "Technician" are available at the regular price of fifteen cents per copy. The copies still in stock are November, 1933, and January, February, April, May, June, July and September, 1934. Also a considerable number of reprints of "The Five-Meter Band," by J. J. Glauber, appearing in the December, January, February and March issues and reprints of "Pad Design Tables," by Dr. John F. Blackburn, from the December issue are available at five cents each plus postage.

PACKARD-BELL SIX

The Packard-Bell Radio Co. and Kierulff and Co. announce a new multi-band six tube super possessing many outstanding features and refinements at a surprising list price.

TRANSCRIPTION OPEN HOUSE

W. O. Watson, chief recording engineer for Radio Release, Ltd., Hollywood transcription producers, presided at the technical end of the open house which the organization held late in July.

The firm has taken over the studios on North Highland Avenue formerly used by KMTR. They include rehearsal facilities, artists' lounge, recording studios, executive offices and complete technical facilities.

PACKARD IN BAY DISTRICT

Mr. Packard, of the Packard-Bell Co., is spending considerable time in and about San Francisco where the Company intends opening an office. The production of this firm has reached a high figure and expansion is in order.

SKAGGS TRANSFORMER COMPANY

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REWOUND ORIGINAL TRANSFORMERS
FOR IMMEDIATE EXCHANGE

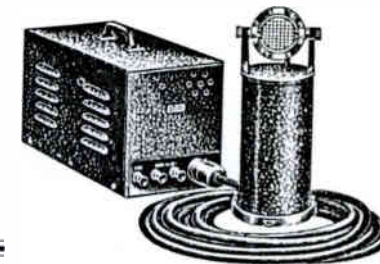
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Good rewind transformers have had the manufacturers' mistakes corrected in the use of poor insulation and corrosive soldering fluxes. They have been put together the best way, not the way that takes the least amount of time.

Just Give Us A Ring And Have It Delivered
FILTER BLOCKS REBUILT NEW SPEAKER FIELDS

PUBLIC ADDRESS ... TECHNICIANS...

E Condenser
Microphone
and
Power Pack



All AC
Operated

UNIVERSAL'S "E" Condenser Microphone now includes two types. One is for two 864 tubes for all-battery operation or filaments from battery and plate supply from AC power pack . . . The other is for two 230 tubes filaments in series which can all be AC power pack operated without batteries of any kind.

Complete line of microphones, transformers, three-channel mixers, stands, recording apparatus and discs, input stages and a hundred other items of specific interest to the trade. Catalog sheet describes products and shows net prices to dealers and technicians.

Sold by Jobbers Everywhere

Universal Microphone Co.
INGLEWOOD Ltd. CALIFORNIA, U.S.A.

SEASON'S RADIO SETS REFLECT HIGH STANDARDS

Performance—that's the keynote of the New York Radio Show and this season's sets, according to S. I. Cole, President of Aerovox Corp.

"Having probably reached the sub-basement of price-cutting and skimping as evidenced by midget, miniature-midget and miniature-miniature-midget sets of the past few years, practically all set manufacturers are now turning once more to real quality and performance at attractive prices and for real profits," states Mr. Cole. "The handful of manufacturers who stuck to performance and quality through thick and thin are now being joined by many others. An examination of the internal details of many sets displayed at the Show discloses many more quality components in place of the bargain stuff of the recent past.

"As a parts manufacturer, I am naturally pleased to see this universal trend towards quality products, better performance and longer life; for I for one have felt that if our industry continued to build solely to ridiculously low prices without regard for performance, life and customer good will, the public might well become disgusted with radio, and the entire structure might perhaps crumble.

"After all, let's always remember that we are selling something more than so much metal and glass, paper and wood, wire and insulation. We are actually selling seats to the greatest entertainment of the ages. The purchase of a seat in this theatre of the air means thousands of hours of unparalleled enjoyment. Certainly the public can afford and is willing to pay a reasonable price for its radio seat. Those who have cheapened this great institution in the recent past have no doubt come to appreciate their error. Once more our industry is turned in the right direction, ready to do full justice to the unflinching efforts of the broadcasters in providing the finest programs."

MODEL "E" CONDENSER MIKE IN TWO TYPES

Model "E" condenser microphone from the Universal Microphone Co. at Inglewood will hereafter be produced in two types.

One will be for two 864 tubes for all-battery operation or filaments from battery and plate supply from the A. C. power pack.

The second model is built for two 230 tubes filaments in series which can all be A. C. power pack operated without batteries of any kind being needed.

Complete absence of A. C. hum and any power line noises is made possible by the adequate filter system which is used in the power pack, thus insuring a quietness below the hiss level of the tubes. The unit is actually quieter in average operation than batteries, according to its manufacturer.

UTC IN AIR BEACONS

The United Transformer Corp. reports exclusive use of UTC transformers in a system of airplane beacons in the East. The UTC data sheets, containing much pertinent engineering information, which are published frequently are proving extremely popular with engineers and technicians.

One of the latest sheets describes a 38 watt A prime amplifier using four 45 tubes and another furnishes some very useful data on audio equalizers. These sheets are obtainable from your UTC jobber.

NEW MISSION ALL-WAVE

The Mission Bell Mfg. Co. has recently released a new six-tube all-wave super with many outstanding features. The console model is housed in a very beautiful cabinet and is equipped with a twelve inch speaker.

RADIO SPECIALTIES CO. TAKES TRIUMPH LINE

The Radio Specialties Co. announces its appointment as authorized distributor for the Triumph Manufacturing Co. of Chicago. This line, recently introduced to the trade, fills the heretofore vacant space between service equipment and expensive laboratory apparatus at popular prices. Radio Specialties invites the trade to inspect this new line and promises immediate deliveries.

All-Wave Oscillator



Model 450. 50 K.C.-20,000 K.C.

This unit is recognized as the best test oscillator equipment and is accepted as the standard in comparing competitive makes.

Fundamental frequencies are generated from 50 K.C. to 20,000 K.C. (6000 meters to 15 meters) without the use of harmonics. All frequency bands are individually calibrated by highly accurate test equipment, the actual calibration points being accurate within less than one-half of one per cent. The calibration curves are drawn on specially prepared paper and are entirely unlike conventional charts. Any frequency may be easily located by simply setting the special celluloid indicator to the desired frequency and reading the proper dial setting directly on the engraved scale. The calibration curves are mounted in metal holders and are protected by a celluloid cover.

This is an exclusive Miller development, which will no doubt be copied, as have other Miller developments. Those familiar with our products will recall we were the original manufacturers to incorporate variable modulation, completely variable frequency range, high L.C. oscillator circuits, and complete A.C. operation, in medium priced oscillators. These features are now being incorporated in other units now appearing on the market.

Excellent stability is obtained by the use of high "Q" coils, high L.C. ratios, and electron coupling in the oscillator circuit. Modulation is accomplished by the use of a separate tube serving as the audio oscillator. Modulation percentage is completely variable, as is the R.F. output. External leakage due to R.F. magnetic fields are reduced to a medium by employing shielded coils, A.C. line filter, and complete shielding of the entire unit. The front panel is chrome plated, while the case is attractively finished in black crackle. Both the chassis and case are heavily copper plated before finishing, further reducing the leakage by the better shielding effect. The unit is, of course, completely A.C. operated. Complete, ready for use.

LIST PRICE, \$47.50. DEALER'S NET PRICE, \$28.50
No. 450—Oscillator. Shipping weight 16 lbs. Size 8in.x9in.x6 1/4 in. deep

J. W. MILLER CO.

5917 SOUTH MAIN STREET, LOS ANGELES, CALIFORNIA.

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

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SPEED UP AND INCREASE YOUR INCOME
 ADEQUATE SERVICE EQUIPMENT WILL INCREASE YOUR EARNINGS and ELIMINATE the HEADACHES of SERVICING
 See Page 41 for **TRIUMPH LABORATORY EQUIPMENT**

WESTON SERVICE MEETING

Speaker—H. L. OLESON, Weston Electrical Instr. Corp.
 Subject—"MODERN SERVICE METHODS AND EQUIPMENT"

A TECHNICAL MEETING — NOT A SALES TALK!

PLACE . . . TRINITY AUDITORIUM . . . (Assembly Hall)
 839 South Grand Avenue Los Angeles
 Friday, Dec. 7 — 8:00 P. M.

THERE WILL BE A DOOR PRIZE!

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**ARCTURUS
 RADIO TUBES**

M. D. EALY, Consignment Agent

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MISSION BELL SHOW

The Mission Bell Co. will hold a pre-view showing of its new models on Nov. 22, 23 and 24, at 1455 Venice Blvd.

This show will feature the new Mission Bell five-tube multi-band super which gives surprising performance in a low priced receiver.

NEW AUDITORIUM SPEAKERS

The Radio Products Sales Co. announces another addition to the Advance brand of radio components. This new item is a line of auditorium and public address dynamic speakers. The line includes fourteen-inch cones supplied either with or without a. c. field supply. Other Advance products include tubes, resistors and condensers of all types.

VIBRATOR REPLACEMENTS

The Radio Specialties Co. has found enthusiastic acceptance of its service in offering complete replacement service on all auto vibrator and six volt power supply parts.

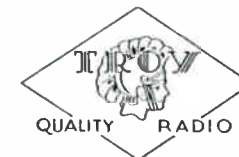
**DISTRIBUTORS, INC.,
 SHOW NEW EQUIPMENT**

Mr. Zehner, of Distributors, Inc., offers the opinion that service technicians are becoming more equipment-conscious and show remarkable interest in the new instruments.

All technicians are invited to visit his showrooms and inspect the many new models in his stock.

**DON'T MISS THE ANNUAL
 RADIO BANQUET DEC. 6th.**

Approved by
 Underwriters Laboratory



"Western made for Western Reception"

TUBE CHECKERS

— and —
SET ANALYZERS
 Repaired or Rebuilt—

All types of instruments
 Repaired or Calibrated
 Shunts or Multipliers made up
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 PROMPT — ACCURATE
 RELIABLE SERVICE
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An Evening of Fun and Pleasure You'll Never Forget!

The Annual Get-Together Banquet of the entire radio industry in Southern California will take place

*Thurs. Evening, Dec. 6, 1934
at the Breakfast Club*

Everyone of importance in radio circles will be present—be sure to attend and take part in this great evening of good fellowship and carefree enjoyment

**THERE WILL BE NO MEMBERSHIPS FOR SALE!
NO NEW ASSOCIATION TO FORM NOR ANY
PROMOTION SCHEMES OF ANY KIND.**

Just a good time for all with plenty of entertainment.

This banquet is being held under the sponsorship of the Certified Radio Technicians' Association, assisted by prominent members of other branches of the radio industry.

Arrangements are in charge of A. PAUL, Jr., President of the Certified Radio Technicians' Association, and NORMAN B. NEELY, Chairman of the Banquet General Committee.

You'll Be Sorry If You Miss This Evening of Surprise Features.

Kierulff & Company

1133 Venice Blvd.
Radio Institute Building Los Angeles
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ON CONSIGNMENT OR OUTRIGHT PURCHASE
New Models Supreme Tube Testers and Analyzers
SPECIAL DEALS ON RIDER'S MANUALS for the Balance of the
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The Latest PACKARD-BELL Sensation!
SIX-TUBE SUPER — Foreign and American Broadcast
Full automatic volume control — Tone control — Full airplane dial
Beautiful cabinet, walnut overlay

LIST PRICE \$29.95

CONSIDERATIONS IN USE OF TUBE TESTERS

(Continued from page 14)

pensive instruments, therefore gas and leakage indications by the average tube checker are not trustworthy.

A further item of importance is the control of line voltage. The tube checker without this feature is sure to give false results when used on different voltages. As the voltage even at a given socket is usually subject to variations great enough to affect readings seriously the line voltage control must always be carefully adjusted.

The user who employs the tube checker intelligently and does not expect more of it than it is capable of delivering will receive the maximum of service and profit from this useful instrument.

BRAIN AND MUSCLE

(Continued from page 11)

be here, and that petty expression, "The horny hands of the sons of toil" will be passe.

In most of the arts, the perfect co-ordination of the brain and muscles are essential, and the human being is the only living creature which has a perfectly developed hand, capable of so many different and delicate movements. All the achievements of the human race are more or less directly or indirectly attributable to the hands. In the arts, the directing power is in the brain, but the execution is a reflex muscular action. The education of the rising generation should include knowledge of how to use the bodily mechanism to bring out the most in brain and muscle, whether it is in work or play.

CONVERTER TUBES

(Continued from page 10)

the link in the feed-back circuit. The inductive feed-back must be adjusted so that the grid-cathode oscillator voltage is uniform over the desired frequency band. Grid current is prevented from flowing by employing a suitable biasing resistor in the cathode lead. It will be noticed that the primary of the i-f transformer is effectively shunted across the oscillator feed-back circuit. Due to the number of overtone frequencies to which an inductance will resonate, it will reflect considerable resistance into the oscillator circuit. By choosing a coil whose fundamental frequency is at least half the highest frequency in the oscillator tuning range this trouble is overcome. Sometimes the oscillator will resonate at the frequency of the oscillator plate coil instead of at the oscillator frequency. This may be prevented by inserting a resistor in the plate lead.

The grid to cathode capacitance may cause three deleterious effects:

1. Degeneration of the oscillator.
2. Regeneration in the signal circuit.
3. Radiation of the oscillator current from the signal circuit.

This may be readily overcome by neutralization of the grid-cathode capacitance.

With the introduction of the radio frequency pentode tubes, such as 57 and 58, new possibilities were given to the circuit engineer in the development of a combined oscillator-modulator. The oscillator circuit could comprise either the inner or outer elements of the tube. If the suppressor grid and plate are made to act as the grid and plate of the oscillator portion, the suppressor grid must be given a very large negative bias before it exercises sufficient control over the plate current necessary for the production of oscillations. The bias is provided by means of an additional resistor in the cathode lead. A series resistor is used in the plate circuit to reduce the voltage applied to it for the same reason. The modulation is produced by the large

oscillator voltage on the suppressor grid. In this circuit the screen voltage and current exceeds the plate voltage and current. The circuit has two marked advantages over those heretofore described:

1. Complete shielding of the signal circuit from the oscillator and i-f circuits.
2. Complete avoidance of control grid current, regardless of oscillator voltage.

The conversion gain is not as high for this circuit as for circuits employing a separate oscillator and modulator.

If the connections to the tube elements are reversed, so that the control grid and space charge grid become the oscillator grid and plate, and the signal be applied to the suppressor grid the inner elements act like a triode oscillator while the outer elements act as a triode modulator with very low amplification factor due to the large spacing between suppressor grid turns with a resultant low conversion gain.

The circuit is the forerunner of the pentagrid converter circuit minus the additional shielding provided for in the latter.

None of the above circuits are entirely satisfactory as a combined oscillator-modulator possessing high amplification and the much desired grid-bias control of amplification. With sharp cut-off tubes, grid-bias control is unsatisfactory. With variable μ tubes, high conversion gain could not be secured. The problem of designing a tube or circuit possessing high amplification and grid-bias control of it seems inconsistent because high conversion gain requires a sharp cut-off while grid-bias control requires a gradual cut-off grid. This problem was solved by locating two separate grids in the same electron stream, each grid being so constructed as to perform its function most satisfactorily. The sharp cut-off grid is used for the oscillator, giving a maximum modulating effect. The gradual cut-off grid is used for the signal and grid-bias control.

(Continued in December issue)

and NOW!

THE MODEL 400 TUBE TESTER BY TRIUMPH

ENGLISH READING SCALE — "GOOD" — "BAD" — "DOUBTFUL"

READS DYNAMIC MUTUAL CONDUCTANCE

Neon Leakage Indicator Shows Leaks to 2,000,000 Ohms

Individual Element Short Test — Spare Socket

Needs No Line Regulator Between 95 and 135 Volts

Separate Tests on Diode or Triode Sections of Multi-Purpose Tubes

Tests All Rectifiers — Simple to Operate

Beautiful Appearance — Counter and Portable Styles

A REAL TUBE MERCHANDISER

Price Will Be Announced Dec. 1, 1934

MODEL 100 SIGNAL GENERATOR

Electron coupled — Fundamental Frequencies 100 KC to 10,000 KC. — 400 Cycle 40% Modulated Audio Note Is Available Through Attenuator—Real Ladder Attenuator Gives Complete control of signal — Maximum Output $\frac{1}{2}$ Volt — Absolutely No Leakage at any Frequency!

A Real Laboratory Precision Instrument

\$38.75 to Service Men

MODEL 300 MULTI-METER

A.C. and D.C. Scales to 1000 Volts — A. C. Scales separately Calibrated — D'Arsonval 1 MA Movement — Measures $\frac{1}{2}$ Ohm to 10 Megohms — No Zero adjustment Between Scales — Easy Reading Lance Type Pointer— Battery Compensation — All Ranges from One Selector—Test Leads on Polarized Plug — Confusing Terminals Eliminated — Shelf Life for Battery — Low Ohms on Spread Scale

Small — Light Weight — Rugged

\$19.95 to Service Men

Radio Specialties Co., 1816 W. 8th St., Distributors

NORMAN B. NEELY, 1656 North Serrano Street, Representative

Classified Advertisements

For Sale or Trade—

- 1 Type N-2 Inca trans. input from 250's, 2A3's etc. into Class "B" 203's etc.
 1 Type N-4 Inca Mod. trans. Class "B" 203's to 2500 or 3500 ohms both for \$12.00. Radio Specialties Company.

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.

Stolen—

One Jensen DA 7 a. c. dynamic speaker, complete with power supply. Reward for information leading to recovery. Communicate with A. F. Guion, 29 North Marengo, Pasadena. TEr. 7257.

NEW—1935 ALL-WAVE SET



"Western made for Western Reception"

DAYRAD Radio Service Equipment

Represented by
FRANK A. EMMETT CO.
 1341 South Hope St.
 Los Angeles, Calif.
 Richmond 6301

How Many Times

Have you 'cussed' at so-called replacement power transformers that were supposed to fit but didn't, and then after a few days of feeble effort they went up into smoke . . .

There is an easy way out of this grief as thousands of service men have found. That way is through the use of good rewinds. They have proven themselves superior time and time again and more service men are getting wise to this fact every day. They have learned that today more than ever before, quality counts . . .

"There's No Substitute for a
 Good Rewind"

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Installation Service
ONE YEAR
GUARANTEE

Filter Blocks and
Field Coils

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CONDENSERS

for unequalled condenser quality . . .
 24 years of manufacture and research.

for unlimited range . . . the most complete
 condenser line in the world. One billion
 C-D's since 1910.

for square-dealing . . . Cornell-Dubilier
 stands behind every condenser that
 bears their label.

Remember: the best condensers are the
 least expensive. Use a C-D on that next job.

SERVICE MEN! Catalog No. 125 will interest you!
AMATEURS! Get a copy of Catalog No. 126! Today!

CORNELL-DUBILIER

CORPORATION

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 NEW YORK

PETER PAN

RADIO PARTS OF MERIT

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Exclusive PETER PAN Distributors for Los Angeles County Exclusively Wholesale

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PETER PAN...

Since its origin has maintained and always will maintain the high standard of quality for which it has been noted . . .

"Look for the Boy With the Flute"

Peter Pan Radio Co.
1487 WEST ADAMS
REpublic 6093

RADIO-TEL CATALOG

Emmett Hughes of the Radio-Television Supply Co. gives advance notice of the preparation of a new and enlarged catalog which will be ready for distribution the first of the year.

NEW AIR CHECK DEPARTMENT

A new department for air checks has been inaugurated at the Hollywood sound studios of Freeman Lang, for stations, sponsors and agencies to make permanent records of their programs. Students and artists, too, can make personal recordings to test their own professional development. Studio facilities have been enlarged so that it will be possible to record a half dozen program from the air simultaneously.

NEW CHAIRMAN OF RADIO PARTS JOBBERS' ASSN.

Mr. Frank LeBell, of the Pacific Radio Exchange, has recently been elected chairman of the Radio Parts Jobbers Association of Southern California. Congratulations, Mr. LeBell.

WEATHERFORD-OGG MERGER

R. V. "Dick" Weatherford of the Radio Specialties Co. is scheduled to embark on the much discussed and turbulent seas of matrimony on November 24, 1934. The young lady taking him for better or worse at the end of a three year courtship is Miss Frances Ogg of Highland Park.

We know that Dick's many friends wish him and the future Mrs. Weatherford all possible happiness and the greatest of success in their matrimonial venture.

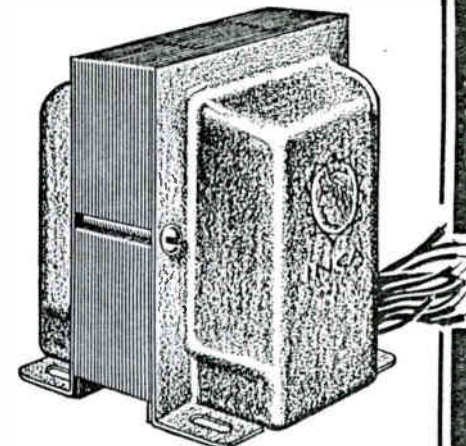
WILL YOUR OHMMETER READ

Accurately over the complete range . . . from ONE-HALF OHM TO TEN MEGOHMS?

See Page 41 for TRIUMPH MODEL 300 MULTI-METER

Try INCA Components in your next amplifier . . .

WE of the INCA Engineering Department have been surprised to find how many members of the CRTA substantially increase their income building amplifiers, both for sale and for public address rentals. Many of these men know and use Inca transformers. Some of them do not. Right now we are interested in convincing the latter group of the desirability of using Inca series VI transformers for such applications. Inca makes better transformers than our VI series. Our TC series is as good or better than any competitive line. But, for use with ordinary microphones, and with ordinary reproducers, the Inca VI line of transformers is as good a quality of merchandise as can be justified.



Expensive and unnecessary refinements have been omitted in these designs. Only substantial quantities of the best materials, assembled in the simplest practical manner, are used. The 50% to 60% saving over the more expensive laboratory types of transformers should be very acceptable.

A typical design using Inca VI series transformers would be a three stage unit ending in push-pull parallel 2A3's. Such an amplifier would have an input impedance of 50, 200 or 500 ohms feeding to a single 56, thence to push-pull 56's and to push-pull parallel 2A3's. The output could be delivered at full power to 50, 200 or 500 ohms and at reduced power to a monitor speaker. Output power maximum 30 watts with only 2 1/2% harmonics generated in the output stage. Gain 70 D.B. An additional 25 D.B. could be added where needed with another 56 input stage.

TRANSFORMERS NEEDED ARE:

		List Price
INCA I-13	Line to grid	\$ 3.35
G-16	Plate to push-pull grids.....	3.20
G-17	Push-pull plates to push-pull grids.....	3.50
F-25	Push-pull parallel 2A3's to 50-200-500 ohms and to a 6 ohm monitor	10.00
C-44	Power transformer—Primary 115 V Secondaries 850, 750 C.T. at 200 m.a., 5 V. C.T. at 3 amp, 2 1/2 V C.T. at 10 amp, 2 1/2 V C.T. at 5 amp.....	7.75
D-5	Choke — 20 henries at 200 m.a.	8.00
	(2 req'd) at \$4.00	

TOTAL LIST PRICE.....\$35.80

All of the above mentioned transformers can be obtained from our jobbers, either directly from stock or on very short notice. The new INCA Bulletin L-4 lists all of the components mentioned above as well as the more highly refined TC series and our line of replacement units. Get a copy from your jobber.



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wheels of progress
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expansion, which
continues despite
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sion . . .*



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