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# « THE » "TECHNICIAN"

OCTOBER, 1935

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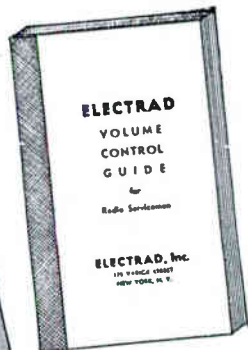
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# The "TECHNICIAN"

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NORMAN B. NEELY  
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Vol. III

October, 1935

No. 1

## All Hands On Deck!

By The Editor

All Hands on Deck to make ready for the SECOND ANNUAL RADIO BANQUET to be held (tentatively) December 14, 1935! The banquet held last year seems to have set a precedent and established a custom which the entire radio industry of Southern California wishes to perpetuate.

This winter is a most suitable time to celebrate and give thanks, as the indications and facts at hand indicate rather definitely that 'Old Man Depression' has his shoulders on the mat and is permanently disabled. Increased volumes of sales and the establishment of more reasonable and honest price structures mean the beginning of the recovery of the radio business from its anaemic state. The life is returning to our industry, and the strangulation bruises caused by price cutting and chiseling, which were by-products of the depression, are rapidly disappearing.

Your editor has recently returned from a rather extensive tour of the East and Mid-West where conditions showed every evidence of improving. Factories are working overtime and orders far beyond their capacities to fill keep pouring in.

The fact that our increased business and generally improved conditions are accompanied by similar changes in all the principal centers of industry throughout the United States should give us every reason to feel encouraged and optimistic for the future.

Although the depression has been an unpleasant and trying experience for us all, it has served to temper the radio in-

dustry and now we can carry on and move to greater heights aided by closer cooperation of all the various branches of the field.

Engineers, experimenters, production men, salesmen and business executives in the radio industry have found that their abilities to produce and accomplish worthwhile things are increased by a very close association of all the various departments and divisions. The gathering together every year, at the Christmas season of all these men for an evening of good fellowship, fun and mutual enjoyment is certainly one of the most effective ways of building a sound foundation for our industry.

The affair, in itself, will be well worth your support and attendance as its success is assured by the fact that the leading broadcast stations have offered talent and other support; the leading jobbers, wholesalers and manufacturers' agents have promised all possible support and donations of door prizes totaling many hundreds of dollars.

There will be outstanding entertainment, prizes, and dancing, as well as the pleasure of personal contacts with your friends and acquaintances — and NO SPEECHES. We'll be expecting to see all the readers of the Technician there as well as many others. Watch the newspapers, store windows and listen to your favorite radio station to learn more details concerning the SECOND ANNUAL RADIO BANQUET. The next issue of the Technician will contain complete information.

## EXCERPTS FROM MODERN RADIO SERVICING

Published by Alfred A. Ghirardi, Radio & Technical Publishing Company

(Editor's Note: By special arrangement with Mr. Ghirardi and the publishers of "Modern Radio Servicing" we are privileged to reprint in the "Technician" beginning with this issue, a series of excerpts from this outstanding volume. The first subject to be reprinted is taken from Chapter 23, entitled "Obscure Receiver Troubles Not Revealed By Set Analyzers." The introduction to this chapter points out that the most perplexing troubles incurred in radio service work are those which do not manifest themselves in the usual way. Analyzer readings may be normal, the tubes may test within acceptable tolerances and yet the receiver may operate poorly, intermittently or not at all. The author points out that the usual preliminary tests should be made in all cases and that for problems of radio servicing, the receiver should not be considered as a complete unit but rather as being composed of a number of main correlated parts. Rather obscure troubles which the set analyzer will not reveal, also cause the same symptoms as ordinary troubles easily located. These are the types of troubles with which this chapter deals).

**23-2. Obscure Troubles in R-F and I-F Amplifiers.** The main trouble symptoms which may result from "obscure" troubles, in radio-frequency and intermediate-frequency amplifiers are:

1. Lack of sensitivity.
2. Oscillation or regeneration.
3. Station interference.
4. Double-spot tuning.
5. Code interference.
6. Hum.
7. Fading.
8. Intermittent reception.
9. Distortion.
10. Noisy reception.

These will now be considered in detail in the above order.

**23-3. Lack of Sensitivity Caused by Coupling Coil or Condenser.** Lack of receiver sensitivity, resulting in weak signals, is often due to some failure in the coupling arrangement employed to transfer energy from one r-f stage to the next. To illustrate this point, let us consider the r-f amplifier stage circuit at (A) of Fig. 23-1. In this case  $L_1$  is a high-impedance plate choke constructed so its resonance point occurs at some frequency near the low-frequency end of the broadcast band. It may be located at some distance from tuning coil  $L_2$ , as the transference of energy does not depend entirely upon inductance coupling between  $L_1$  and  $L_2$ . Coupling is also obtained through another "coupling" winding  $L_3$ , which usually consists of a few turns of wire loosely coupled to  $L_2$ , or by means of a low-capacity coupling condenser,  $C_c$ , as shown at (B) of Fig. 23-1. In the former case,  $L_3$  is usually a single turn of heavy bus-bar. An open-circuit in the lead connecting the

coupling coil  $L_3$  to the plate of the tube or an open-circuited coupling condenser  $C_c$  causes the set to be insensitive and weak reception results. In some instances, the set fails to operate altogether.

An open circuit in either the coupling coil or coupling condenser cannot be disclosed by a voltage-current set analyzer. A point-to-point resistance check may reveal the open coupling action of the receiver. A study of their function in the receiver will show why they may cause lack of sensitivity. The primary  $L_1$  is usually a universal-wound coil placed inside and close to one end of the secondary,  $L_2$ . Transfer of energy takes place from  $L_1$  to  $L_2$  inductively, mostly at the low-frequency end of the tuning band only. Near the high-frequency end, the current actually flowing through the coil

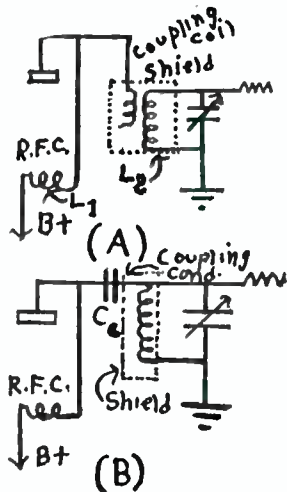
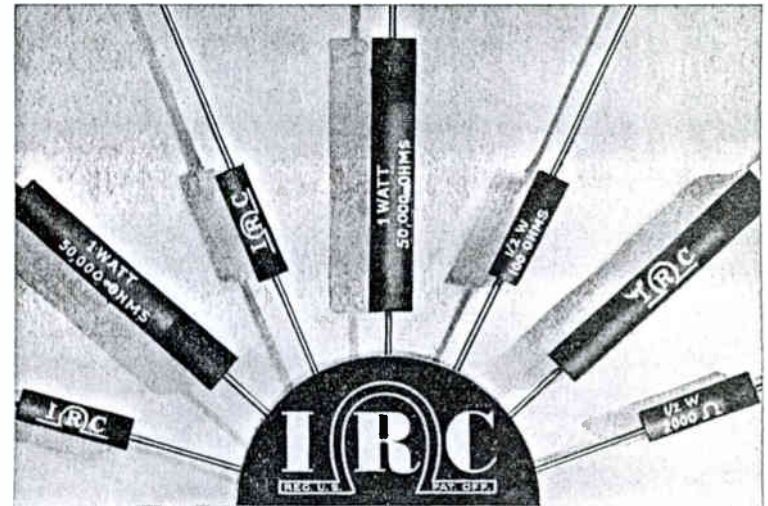


Fig. 23-1—An open circuit in either the coupling-coil circuit shown in (A), or in the coupling-condenser circuit shown in (B) will cause lack of sensitivity in an r-f or i-f amplifier which employs them. These obscure troubles would not be revealed by the usual voltage-current or resistance analysis of the receiver.

is small compared to that through the distributed capacity of the coil (it is usually tuned by means of its distributed capacity to about 600 meters in a broadcast receiver), so that the amount of energy transfer is small. The additional coupling coil is placed as shown at (A) or a small amount of capacity is added, as shown at (B), in order to bring up the high-frequency response. Therefore, if a

(Continued on Page 11)

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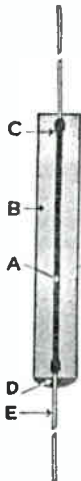


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# DOUBLET ANTENNA APPLICATION

By FRED H. COLE Jr., Engineer  
Electric Products Service

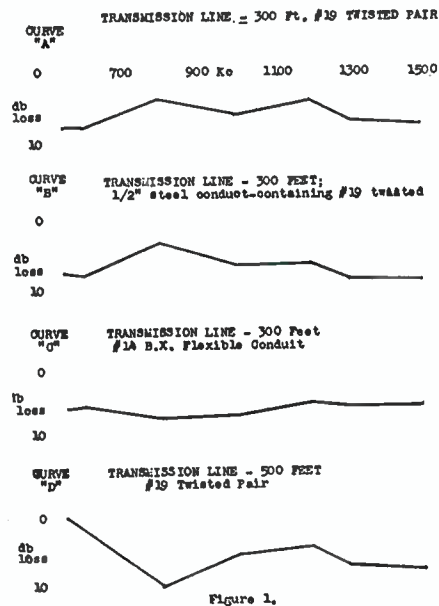
To continue with our discussion of the application of doublet antenna systems to long transmission lines embodying the operation of many receivers from a single antenna we shall refer to the curves "A", "B", "C" and "D", in which are graphically shown the transmission efficiency with different types of antenna lead-ins and different lengths of lead-ins. Basing this efficiency from the signal strength that would actually be received by the receiver, if it were connected directly to the antenna without any lead-in whatever. In discussing each curve in brief we will first consider curve "A" which is from a doublet antenna system using coupling units at each end of the transmission lines. The transmission line being No. 19 open twisted pair 300 feet long. It will be noticed from this curve, the loss in the transmission systems vary from approximately 2½ to 7¼ db, or from 25 to 57 percent. It means that 43 to 75 per cent of the signal present at the antenna will be delivered to the receiver at the far end of the transmission line. With an ordinary 300 foot open lead-in, only 10 to 35 percent of the signal voltage at the antenna will be delivered to the receiver under similar circumstances, and would of course be accompanied by a large amount of noise. A lead-in made of shielded wire or wire inside a metal conduit would have even a far greater loss, and incidentally an ordinary lead-in does not permit a number of receivers to be connected to one antenna.

The curve "B" is the same as curve "A" except that the No. 19 twisted pair is run inside of ½" steel conduit, and in this case it will be found that the performance is approximately equal to that of the open transmission line.

In curve "C" we have similar conditions with the exception that the transmission line consists of No. 14 BX flexible conduit, and it will be noticed in this curve that the effect of the BX conduit is to flatten out the curve and make it a little more uniform.

Now in curve "D" we find the effect of a longer transmission line (500 feet) in comparison with curve "A" of Figure 1 for the 300 foot open line. We find that the additional length of transmission line does not cause, on the average, an increased loss.

An examination of these curves therefore brings out the following: First, either open or twisted pair, twisted pair in ½"



steel conduit or No. 14 BX flexible conduit makes a satisfactory transmission line. Second, long lengths of transmission line may be used with entire satisfaction. Third, the use of two coupling units keeping the transmission line at extremely low impedance, make performance more uniform over the broadcast band. And fourth, the maximum losses likely to be encountered need not exceed 10 db., or 67 percent, which in most cases represents much smaller loss than would be encountered in running in a lead-in from a separate aerial for the same distance to the receiver.

And of course the doublet antenna system will balance out local noise interference to a great extent and will permit excellent reception, where an ordinary antenna is very objectional because of noise. The above curves were taken from doublet antenna systems using General Motors Radio Corporation type 1050 coupler. And the following figures taken at 1180 kc on a General Motors Corporation type 101 coupled antenna system, in a typically noisy location, actually shows the great improvement in signal to noise ratio when using this type coupling.

(Continued on Page 8)

## ON OPEN LETTER FROM SUPREME

To All Interested Branches of the Radio Industry:

It has come to our attention that some radio set manufacturers are departing from the use of true octal type sockets. What is happening is that on the various sockets used, holes are pierced for only the actual pins employed by the proper tube to be used in those sockets.

Basically, the octal base and socket were designed to simplify matters for all branches of the radio industry. The original idea was to have only one basic socket type in use. Either the unused contacts were not to be wired in or the contacts proper not assembled into the socket—but the holes were all to be in the socket.

The new trend in omitting certain socket holes will not be of material assistance to the radio set owner. Briefly, the 6A8, 6C5, 6F5, 6F6, 6H6, 6J7, 6K7 and 6L7 will all fit the socket of the 6A8. Again, all these tubes but the 6A8 will fit the sockets of five other existing types. And so we can continue to show that blanking out socket holes cannot be of any real help to the set owner.

Were the original idea followed out, that is, all eight holes being always present in all sockets, the service man would need to invest in but one adapter for his analyzer, and this one is now included as standard equipment. Under present conditions, taking into account only those tubes announced to date, he will need five more adapters.

This simply means that the set manufacturers are forcing the service industry to equip every radio set analyzer with these five additional adapters at a cost of \$.75 each, or a total of \$3.75 per analyzer at dealers prices. We can quite safely assume the present use of about 40,000 analyzers which will now require an investment of \$150,000 in adapters to meet present day needs due to variations in octal socket piercings.

Following through to a not unreasonable conclusion, let us consider what adapters might conceivably become necessary:

1. Assume in future tubes that any one of the eight pins except No. 2 may be dropped; we need additional adapters ..... 7
2. Assume that any two adjacent pins, except No. 2 be dropped; we need further additional adapters.... 7
3. Assume that any two pins at ran-

dom be dropped, except No. 2; we need further additional adapters .....40

This, of course, can be followed out for both cases of three and four pins in adjacent and random groups, but already the serviceman has to buy and carry 54 adapters at a net value to him of \$40.50 per analyzer, or more than the instrument proper probably cost him.

For 40,000 analyzers, a total of \$1,620,000 must be spent and then we do not include all the adapters that may ultimately be necessary. Just so the service men may be in readiness to serve the radio public. Surely, it is hard to justify such an enormous burden, both actual and potential, on an integral branch of the radio industry and all for a very doubtful advantage to the radio public.

It would seem that the day has definitely arrived for the radio industry to acknowledge the radio service profession, its needs and problems and to standardize certain design details enabling the service man to do his work as simply, quickly and economically as possible.

This letter is to be construed as a long distance but accurate view of how the service equipment problem is becoming unnecessarily complicated and, for their own good, the radio set manufacturers must correct certain matters promptly.

Sincerely yours,  
SAMUEL C. MILBOURNE.

## HANDY GARAGE DOORS

With the automobile industry enjoying its greatest year since 1929, fresh interest has been awakened in the safe and convenient housing of new cars. Perhaps the most interesting angle developed in the garage field in recent years, is the upward-acting door. It is remarkable that the idea has not been brought out on a large scale before. Garage doors are large and heavy, yet must be easy to operate. With so many women handling the family car these days, this need has to be recognized. The new upward-moving door is counterbalanced by weights or springs, and very little effort is required to raise or lower it. The manufacturer and distribution of this product is developing into a veritable industry, since any carpenter can install one in a few hours. The financing of such an improvement is possible under the terms of the National Housing Act.

### DOUBLET ANTENNA APPLICATION

(Continued from Page 6)

Ord. Antenna G. M. Antenna

Signal and Noise (1180 kc)	70 microvolts	40 microvolts
Noise (1180 kc)	50 microvolts	.5 microvolts
Signal to Noise ratio	1.4/1	80/1

The improvement of signal to noise ratio through the use of this type coupler and antennas is therefore in this particular case more than fifty-seven times. This measurement was made on a 300 foot open transmission line, the same antenna being used for both measurements. Similar measurements have been made showing improvement in signal noise ratio ranging from 20 to 1 up to as high as 200 to 1. The greater amount of noise present the greater is the ratio. Through careful installation nearly all the local noise can be balanced out. This is an advantage which is exclusive to this type of antenna system, and is of great importance.

Figure 2 shows the antenna as two parallel wires, one operating above the other. This has proven to be a very satisfactory installation, where space would not allow sufficient antenna length to be installed to supply the required amount of signal strength to the transmission line. It is suggested that when this type of installation is used the upper antenna wire be separated not less than

twelve feet from the lower wire. And that the lower wire be at least ten feet or more above the roof or surrounding objects and, if at all possible, above the level of such interfering sources as high voltage lines, power lines, telephone lines, etc.

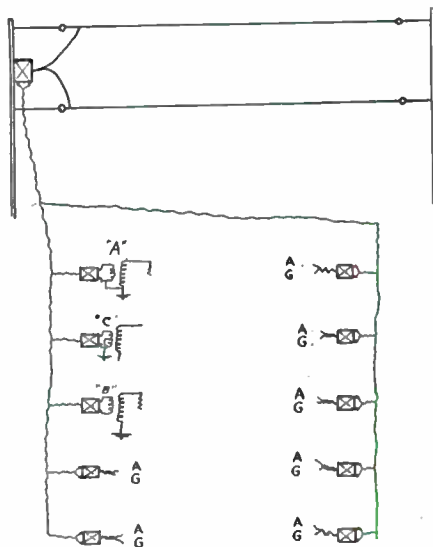


Fig 2.

The leads from the antenna are brought together, and kept to equal length, but directly to the transmission line coupling unit. From that point on the transmission line. (Continued on Page 21)

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### SUPREME TESTS NEW 6P7 TUBE

The new type 6P7 octal tube is accommodated by all current models of Supreme testers, without the necessity of adapters or extra sockets, according to an announcement made by Mr. Floyd Fausett, Chief Engineer of the Supreme Instruments Corporation.

"Although the heater element of this new 8-pin tube is terminated by pins numbered 2 and 3, instead of having heater pins corresponding to previously announced octal tubes, all current models of Supreme testers were originally designed in anticipation of such new types as the 6P7," Mr. Fausett said. "By incorporating in Supreme testers a specially designed Filament Return Selector switch by means of which any pin, or even the top cap terminal of octal tubes may be disconnected from other parts of the tube tester circuit and connected to the filament or heater windings of the power transformer.

### LANSING "TWEETER"

Jim Lansing of the Lansing Manufacturing Co., reports the development of an unusual high frequency reproducing unit for use with two or three channel high-fidelity audio systems. The unit itself is constructed of accurately-machined parts and has been developed after a great amount of research and experimental work. It employs a multiple chamber horn, making possible a wider range of coverage. The usual high frequency unit with a single horn confines the high frequencies rather closely to a narrow field, making high fidelity reproduction in large spaces difficult. Coincident with the development of this unit is a special low frequency unit, possessing a very high degree of efficiency. The problems overcome in the development of this unit were considerable, due largely to the necessity of providing for great excursions of the cone. The two units work together most admirably for high fidelity systems when properly connected with a frequency division network.

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## EXCERPTS FROM MODERN RADIO SERVICING

(Continued from Page 4)

receiver operates well over the low-frequency end of the scale, but the response falls off gradually as it is tuned to a higher and higher frequency, any coupling arrangements such as these could be suspected if they are employed. The receiver response may be tested by feeding a signal of constant strength to it by means of a test oscillator, and measuring the receiver output by means of an output meter while the tuning of both the test oscillator and receiver are varied, in step, over the entire broadcast range.

**23-9. Obscure Causes of Oscillation in R-F Circuits.** Oscillation in a t-r-f receiver may be recognized instantly by audio-frequency beat notes between broadcast stations tuned in and the oscillations in the receiver. Thus, if a 1,000 kc. station is tuned-in, and the receiver is oscillating at a frequency of 1,001 kc., a 1,000-cycle note will be heard in the loud speaker. This 1,000-cycle note will usually overlap the modulation of the original signal so that intelligent interpretation of the original audio modulation is impossible. Oscillation of this form may be checked by turning the tuning dial slowly. As a station is approached, the beat note will decrease in pitch to nearly zero, and then, as the tuning dial is turned further, the note will gradually rise in pitch until it is beyond audibility or the station is tuned out completely.

This test is an important one, for the mere presence of an audible note is not always an indication of an oscillating receiver. If the carrier waves of two powerful transmitters are but 5 kc. apart, and each is modulating up to 5,000 cycles, then there will be interference between the two modulations. It is true that the carrier frequencies of local stations are separated by at least 10 kc. but a low-powered local and a high-powered distant station may be separated by only 5 kc. in which case both will be received with audible strength and interference will result. But turning of the tuning dial will not produce a changing-pitch beat note in this case, for now the beat-note frequency is determined by the frequency separation of the two stations, not by the receiver adjustment.

Oscillation in a t-r-f receiver may also be detected by placing the finger lightly on the control-grid terminal of each of the r-f amplifier tubes. At one of them the beat note will stop, and the audio will

come through clearly. This is almost a certain indication of oscillation in the receiver and in the stage corresponding to the tube on which the finger was placed.

The removal of the antenna lead will often make a receiver oscillate. The antenna places a certain load on the first r-f stage of the receiver, just as a resistor across the secondary of a transformer places a certain load on that transformer. If the load is too small, the tube will break into oscillation for the following reason: every stage in every receiver has a certain amount of regeneration, regardless of how small it may be. In most instances, the amount of regeneration is not great enough to cause the receiver to oscillate or become unstable. However, we know from our study of oscillator action that when the energy fed back from the plate to the grid circuit is great enough to supply the losses in the grid circuit, oscillation will be sustained. This means that if the antenna system is removed from the input terminals of the receiver, the losses attributed to that stage are reduced, and the tube may generate self-contained oscillations.

A receiver may oscillate if the aerial to which it is connected is too small. The remedy here, of course, is to make it longer. An excellent test for oscillation due to insufficient aerial length is to tune in a strong local station that can still be received if the aerial is disconnected. This station must also be such that a beat note is produced when it is being received with the aerial connected normally. Now, short-circuit the aerial and ground posts of the receiver and note if the beat note is still produced. If it has disappeared, then the aerial length must be increased.

Another test is to tap lightly the control grid of the first r-f tube. If oscillations exist, a distinct "click" will be heard every time the finger is touched to and is removed from the cap. With the aerial-ground posts short-circuited, the clicking should disappear if the aerial needs lengthening.

"Home, Sweet Home" might well be the theme song and slogan of the F.I.A. The administration, however, is endeavoring to re-write that one line: "Be it ever so humble" and get in something about all homes becoming ideal in construction.

## TENNESSEE JOINS NATIONAL ASSOCIATION

The Association of Radio Service Engineers of Tennessee, Inc., held their regular annual convention in the Noel Hotel at Nashville, Tenn., August 25th, 26th. New officers installed were: Robert A. Hudson, President, of Nashville; and J. C. Carter, Secretary, of Knoxville, Tenn.; Mr. P. F. Metzler, Executive Secretary, of the National Radio Service Association, attended and explained the workings of the National Association to the Tennessee boys, after which the convention voted to affiliate with the National Radio Service Association. The next convention of the Tennessee organization will be held in the fair city of Knoxville, Tenn. The Nashville chapter has high hopes of winning the 1936 National Convention, and has enlisted the aid of the Nashville Chamber of Commerce and various business and civic organizations in the city, and at the present time is doing a mighty good selling job. Galveston, Texas, is another city that is working hard for the 1936 convention.

## "URBAN"?

The term "urban" as referred to in explanations of questions for borrowers under Title II of the Federal Housing Act is used to define the location of properties utilizing the government insured loans. The property to be eligible must be located in an urban community defined as "a group of properties devoted predominantly to residential use and associated with properties devoted to other non-agricultural purposes, such as commercial, industrial, educational, recreational or religious uses; the whole being provided with a system of streets, served by certain common utilities and services, identified by a name, and presenting a concentration of population, buildings and enterprise".

For improvements on any one property, depending on the borrower's present and anticipated capacity to repay in a period extending up to five years, character loans for as much as \$2,000 for single residences may be negotiated under the FHA.

## Triumph Leads Again!

The First to Announce to the Trade a New TUBE TESTER  
As Specified by the Radio Mfgs. Assn.

**MODEL 420 R.M.A. STANDARDS TUBE TESTER**  
A TRIUMPH MASTERPIECE. The Model 420 is one instrument but has two purposes—designed as a counter type, it becomes a deluxe portable when the snug-fitting walnut dust-proof cover is snapped in place. The cabinet is of solid walnut with etched two-tone panel in Ivory and black. It tests all tubes thoroughly—glass—metal or meta-glass types, and the circuit employed has been developed to conform with the recently proposed standards for tube testing by the Tube Standards Committee of the R.M.A. A new triple load test. Each element is selectively tested and a high sensitivity leakage test accomplished while the tube is HOT. All test circuits are isolated from the power line and a unique method of checking line voltage uses a rectifier tube. No fussy line voltage readjustments for different tubes—and no confusing array of sockets. You insert the tube wherever it fits—that's the place to test it for EVERY condition. Dimensions: 12 1/2 x 7 3/4 x 10 1/4". Weight—packed for shipment, 15 lbs. To operate on 95 to 130 volts, 50 to 60 cycle. Here is Simplicity, Beauty and Convenience and the price is ONLY \$30.95 on West Coast.

**TRIUMPH MANUFACTURING CO.**

(See Advertisement on Page 19 for complete list)

## BOOK REVIEWS

**Modern Radio Servicing—A. A. Ghirardi**  
—Radio and Technical Publishing Co.,  
45 Astor Place, New York City.—  
\$4.00.

This is one of the most comprehensive and usable volumes on radio servicing which has come to our attention. Every service man should be familiar with his service instruments, so a large section of this book is devoted to that subject. Beginning with the discussion of milliammeter operation and continuing the subject through voltmeters, ammeters, ohmmeters, oscillators, tube testers, output meters, analyzers, etc., etc. In each case the underlying theory of the instrument is first explained, then constructional information and operating instructions are given. Part two deals with ordinary service problems in which the author discusses trouble-shooting at considerable length by means of point-to-point resistance and analyzer methods, and takes up the subject of aligning and other phases of service work in a most clear and understandable manner. The subject of the peculiarities of AVC and QAVC circuits receives considerable attention, being a discussion of practically all systems known and the troubles that may develop therein. The information on alignment procedure is most complete and contains up-to-date methods, including the use of the cathode ray tube. Part three takes up special service problems, including automobile radios, reduction of interference, all-wave receivers and high fidelity.

The book is written in a similar style to the Radio Physics Course by the same author, each chapter ending with a list of questions, enabling the reader to test his knowledge of that chapter. The book is intended for and is most useful as a general all-round reference and study text on the subject of radio servicing in all its phases. We most heartily recommend it to all service technicians, or those in any way allied with the service profession.

**How To Understand Electricity—A. Frederick Collins—J. B. Lippincott, Publishers, Philadelphia, Pa.—\$2.50.**

This book is intended to acquaint technically untrained persons with electrical fundamentals, giving progressive easily-understood explanations, beginning with simple magnetism and continuing to x-rays and electrical measurements. Mathematics have been kept at a minimum and whenever absolutely necessary the simple formulas are clearly shown and worked out. Understanding of the sub-

(Continued on Page 18)



**SOLDERS THAT  
ARE RIGHT  
AT PRICES THAT  
ARE RIGHT**



1/2-inch width especially for  
the Radio trade

Every roll guaranteed for  
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If your jobber cannot supply  
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Paste for over 30 years.



### SERVICE KINKS AND PET EQUIPMENT

**EDITOR'S NOTE:** Through the kindness and courtesy of Mr. H. K. Bradford, President of the Capitol Radio Research Laboratories, we are able to publish the following material taken from the manual, CASE RECORDS OF BROADCAST RECEIVER REPAIRS.

#### ATWATER KENT MODELS 188, 260, 448, 469, 489—POOR TONE

The resistance of the volume control should be 500,000 ohms but its value will often increase up to 1 meg. If its value has increased more than 10 per cent replace.

#### EDISON MODEL R-4—FADING, INTERMITTENT, DEAD

Very frequently the soldered contacts of the filament connections are responsible for these troubles. Go over all such connections with a hot soldering iron.

#### EDISON MODELS R-4, R-5—HUM AND DISTORTION

Look for grounded filament windings in the power transformer. The detector filament winding centertap should be transposed from ground to the centertap of the 45 filament winding, thus restoring the bias voltage to the 45.

#### FADA MODEL RA—WEAK RECEPTION

First try several other type 56 tubes as oscillators no matter how good the old one tests. If the volume control seems noisy try a new 56 tube in the first a-f stage before replacing the control. If troubled by static noises replace the transformer coupling to the output with resistance-capacity coupling. This may be done by cutting out the primary of the transformer, using a 25,000 to 50,000 ohm resistor in its place with a .01 mfd. condenser for coupling the 56 audio plate to the 47 grid. The .1 mfd. value will give a deeper tone.

#### LYRIC RECEIVERS—GENERAL

Many of these receivers were made with a metal shield attached to the bottom to serve as a shield. Quite often trouble would develop when the wiring would sag and short this shield. Place an insulated member of cardboard or composition between this shield and the wiring to prevent further difficulty of this nature.

#### MAJESTIC—ELIMINATOR VIBRATOR INTERFERENCE

Check the by-pass condenser connected from one side of the B supply fuse to ground. It is a cartridge type .3 mfd. In replacing be sure to fasten down the unit securely as vibration will again cause considerable trouble. Connect a 60 ohm carbon resistor in series with the small by-pass condensers connected across the vibrator primary circuit.

#### PHILCO MODELS HAVING 460 Kc. I. F. ELIMINATING CODE INTERFERENCE

Readjust the wave trap for minimum interference for models 16 and 44. On other models as well as extreme cases on the model 16 reduce the I. F. to a lower value. 440 Kc. is a good value to choose. This of course, involves readjustment of the high and low frequency compensating condensers of the oscillator circuit in order to reproduce the correct I. F. For other extreme cases which cannot be cured by this method a Philco wave trap is recommended. It is for this particular purpose.

(Continued on Page 31)

## Bruno Velocity Microphones

Are Outstanding in Quality, Price, Appearance, Durability and Performance.

Write for literature on our new Improved Line of Microphones and Associated Equipment

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New York City

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### 2,666 EMPLOYED BY KEN-RAD

The Ken-Rad Corporation and the Kentucky Electric Lamp Co., Owensboro, are now employing 2,666 persons, the largest number in the history of the organization. Their payroll for the month of August was \$145,462.50, also the largest monthly payroll. The number of employees has been practically doubled in the last six months. The plants are being operated with three shifts daily. The increase in the number of employees is due partly to the Ken-Rad's entering the field for the manufacture of all-metal radio tubes in addition to the glass tubes.

New equipment costing more than \$200,000 was necessary for the making of metal tubes. Within eight weeks time this machinery was installed and today more than 25,000 metal tubes are being turned out each twenty-four hours. The peak months in the sale of radio tubes in the past have been September and October. August sales were the heaviest in the history of the factory for that month.

\* \* \* \*

The radio business IS better than ever!

### TRIUMPH R. M. A. TUBE TESTER

The Triumph Manufacturing Company of Chicago, is the first to announce a tube tester complying with the specifications proposed by the Tube Standards Committee of the Radio Manufacturers' Association. This tester, known as the Model 420, is housed in an unusually attractive case with a slightly sloping panel, which allows the instrument to be used as a counter style, or with the cover in place, is easily portable. Although a leakage test is not included in the R. M. A. specifications, the Model 420 subjects tubes to a leakage test while the tube is hot and is of sufficient sensitivity to show leakages in the order of 1 Meg-ohm between any elements in any type of tube. The Model 420 has an individual selector switch to which each tube element connects, thereby making the instrument extremely flexible and permitting the user of the instrument to switch any element of a tube in or out of the test. This naturally takes care of freak base connections.



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Cardboard and Metal Containers

Single and Multiple Sections



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**SECOND ANNUAL RADIO BANQUET**  
 Tentative Date Is Set For

**SATURDAY, DEC. 14**

To Assure Choice Table Locations Make Your  
 Advance Reservations Now!

Reservation Checks Are Already Pouring in After Only a Few Days' Notice

EARLY RESERVATIONS WILL, OF COURSE, BE GIVEN  
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Out-of-Town Guests Will Be Cared for by a  
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Make Checks Payable to ANNUAL RADIO BANQUET COMMITTEE  
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THERE WILL BE PLENTY OF OUTSTANDING RADIO TALENT  
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All Entertainment Will Again Be Under the Very Capable Direction  
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**Over a Thousand Dollars in Door Prizes**

LOES OF FUN FOR EVERYBODY AND A GREAT EVENING OF  
 CAREFREE ENJOYMENT AND FELLOWSHIP FOR THE  
 ENTIRE RADIO INDUSTRY — AND  
**NO SPEECHES!**

A Daring Departure from Custom, Perhaps, But We Know You'll Appreciate It  
 and the Evening Is Not Supposed to Be a Serious One

For Further Information Telephone the Banquet General  
 Committee at GRanite 0755

**SYLVANIA NEW TYPE 5Z4**

A new type 5Z4 metal tube, directly interchangeable with the original "bird cage" 5Z4 metal rectifier, has been developed by Hygrade Sylvania tube engineers. The outstanding feature of the new Sylvania 5Z4 is the reduction in size, which was accomplished without loss in any of the electrical characteristics. Several constructional features have improved the physical structure of the tube.

The internal elements of the new Sylvania 5Z4 are similar to those used in the construction of the 83V glass rectifier. The complete assembly is enclosed in a metal shell of the same size as used for the 6F6 power amplifier tube. This reduces the height to  $3\frac{1}{4}$  inches and the diameter to 1.5-1.6 inches.

The newly constructed 5Z4 insures more perfect shielding, compactness, ruggedness, uniform characteristics and efficiency during life. The filament current drain is now 1.5 amperes as compared to the 2.0 amperes drain of the original 5Z4. The decreased filament wattage results in lower operating temperatures, comparable with the operating temperatures of other types of metal tubes.

The maximum D-C output current rating was maintained at 125 milliamperes for operation at 400 A-C volts (RMS) per plate. This feature makes it possible to directly replace the original 5Z4 tubes now in use with the new Sylvania 5Z4. The new tube will also replace type 5Y3, the glass rectifier tube incorporating the octal type base.

**CORNISH'S "NOISE-MASTER"  
GOES AUTOMATIC**

The "Noise-Master" antenna, which was so successfully introduced by Cornish Wire Co. several months ago, now announces automatic operation.

Quoting from the latest literature of this manufacturer "after Noise-Master is properly installed . . . no adjustment is necessary and no manual operation is required, because this antenna is fully automatic electrically".

This manufacturer is also distributing a meaty treatise on "All-wave Antennas", and folders in color for the set-owner may be had without charge by dealers for distribution to their prospects.

(The Technician will forward your request to the Cornish Wire Co., in New York.)

**KECA CONCERT PROGRAMS**

Radio Station KECA, distinctive in the broadcast field for its strict adherence to high quality transmissions of choice selections of outstanding better music has recently begun publication of a monthly program in magazine form. It is actually an hour by hour, day by day, program by program and selection by selection program listing by the month. This program magazine will be sent to all interested listeners at the nominal charge of \$1.00 per year which does not even cover the cost of compilation and printing. To dealers it is invaluable as a demonstration guide. Your more intelligent customers will appreciate your calling their attention to such a publication. As a listener you will appreciate knowing when your favorite selections will be broadcast by your favorite artists. Send your dollar to KECA, 10th and Hope Streets, today, and start receiving this really valuable program.

**BRUNO PREAMPLIFIER**

The Bruno Laboratories of New York, well-known manufacturers of velocity microphones, announce a new, low-priced preamplifier for use with their velocity microphones. The new unit is small, lightweight, ruggedly constructed of quality parts, and is offered to purchasers of Bruno microphones at a very nominal figure. Another innovation of this company is a special cushioned universal mounting arrangement for the velocity microphones which allows free movement of the instrument in any direction and at the same time provides a shock absorbing support.

**BRIEF EXPLANATION**

Contrary to a misconception on the part of a great many people, the National Housing Act did not put the government into the lending business, either directly or indirectly. Both Titles I and II provide for insurance only. Title III provides the machinery for setting up privately owned national mortgage companies which may purchase Title II loans. The Act encourages financial institutions to loan their own funds and is thereby liquidating the frozen assets which were one of the chief causes of the depression and is making mortgage credit for home modernization and construction available to all with the ability to make long term payments that amount to no more than monthly rent payments.





## RADIO TECHNICIANS OF SAN DIEGO

Inasmuch as there is not much copy from our San Diego correspondent this month we will use this space to cordially invite all members of the radio industry in the San Diego territory to attend the Annual Radio Banquet tentatively scheduled for Saturday, Dec. 14, 1935.

You may have a special reserved group of tables for your own members and guests and for those who wish to spend the weekend the out-of-town committee will arrange suitable accommodations.

Many well-known and outstanding radio stars will be presented for entertainment and a first class dance-band will be on hand. Manufacturers and jobbers are

offering thousands of dollars worth of door prizes and the advance reservations even though the banquet has not been publicized, assures its overwhelming success. You fellows from San Diego will not want to miss this opportunity to get together with other members of the trade in Southern California and have a wonderful evening of fun and good fellowship. Of course the ladies are invited also to make the evening a success.

We'll be seeing you December 14th, but get your reservations in as soon as possible so there will be no disappointments. The price is \$2.00 per person for the most fun you've ever had in one evening.

## BROWNING ANTENNA KITS POPULAR

The Rivard Mfg. Co. of Toledo, Ohio, reports very wide use of the new Browning Universal all-wave antenna kit manufactured by that company. They also supply a variety of other antenna kits and have long been in the business of manufacturing wires, cables, lightning arresters, ground clamps and other similar items. The new Browning kits have been thoroughly tested by the company and offer the dealer a quality item at a nominal cost.

## NEW PRESTO DISCS

The Presto Recording Corp. of New York announces the release of an improved type of acetate blank disc for instantaneous recording. This company, manufacturers of a complete line of recording equipment and accessories was one of the first in the field of instantaneous recording. It has maintained a research department constantly seeking improvements and advance in this art which has risen to such importance in the last few years. The new type disc is now being supplied and their users include many sound picture studios and broadcast stations throughout the U. S.

## DOUBLET ANTENNA APPLICATION

(Continued from Page 8)

sion line can be run to any distance desired, up to 600 feet, without material loss in efficiency. And any of the types as shown and discussed in the curves of Figure 1, may be used. Also Figure 2 shows receiver antenna circuits "A", "B" and "C". In "A" we have the ordinary old type receiver antenna circuit. In "B" we have the ungrounded type antenna circuit used in some of our more recent combination long and short wave receivers, for doublet connection. And in "C" we have the center grounded antenna coupling circuit which is used to a great extent in our more modern and latest type of receivers. In all these types, the transmission line unit will couple directly to the antenna circuit of the receiver as is shown, and will function as well on any other type, and incidentally it may also be connected to capacity coupled receivers, such as the old Sparton models, directly to the antenna and ground posts, as one would an ordinary antenna with excellent results.

In Figure 2 is also shown methods of connecting a multiple installation which is supplying ten receivers from one antenna. This is merely to show the method of connecting the transmission line couplers to the transmission line. The antenna itself may be installed as pictured in the upper portion of the figure, with the antenna wires one above the other. Or it may be the more common type of doublet antenna bringing the lead from the center, but it must be borne in mind that an efficient transmission line is necessary and that the transmission coupler should be mounted as near the antenna as physically possible. The coupler should be securely fastened to either a pole or some solid object, rather than be subjected to the strain that would be present should the coupler merely be suspended without support in midair.

Space will not permit at this time further discussion and technical details with reference to these antenna systems. The writer will be more than pleased to take up any individual problem that the readers of the Technician may have in regard to installation of such multiple systems. Again may we call to the attention of the readers of the Technician that the application of doublet antennas to multiple installations with one antenna operating several receivers has been very sadly neglected in this territory, and much business can be had in that field.

## Genuine RCA Replacement Parts

RCA 6 and 20-watt  
Portable P. A.  
Systems

Universal Amplifiers

RCA Victor  
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for Standard

Installations

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## THE YAXLEY 1936 REPLACEMENT VOLUME CONTROL MANUAL



COMPLETELY  
OVERSHADOWS  
THE FIRST EDITION...

and that was heralded  
as the greatest manual  
ever published

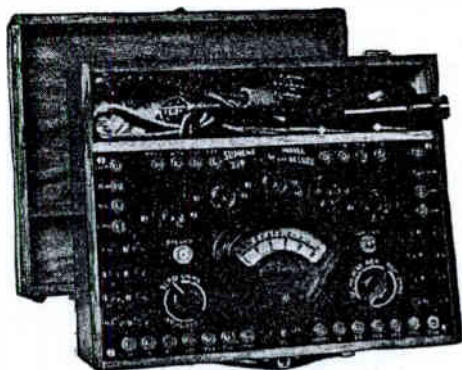
Five radio service engineers worked on it twenty-four months. Lists more set models than any others. Complete—authoritative—up-to-date—and free! Write today! Mention jobber's name.

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# S U P R E M E

— NEW 1936 —

## Testing Instruments



Model 339 DeLuxe Analyzer

THE SUPER ANALYZER  
WITH DIRECT RESISTANCE  
RANGES UP TO 20 MEGS AND  
SELF-CONTAINED POWER  
SUPPLY.

Speed and Flexibility

This analyzer is unquestionably the finest constructed instrument, both from the standpoint of quality of materials and engineering skill. The 339 DeLuxe virtually spreads the entire circuit of the set out on your analyzer panel like a diagram. It is a combination point-to-point tester and analyzer, providing a complete resistance, voltage and current analysis and tube testing direct from the radio socket, including the metal tubes.

Authorized Supreme Factory Service

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Test Equipment Headquarters

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PRospect 3681

### INTERESTING I.R.E. MEETING

The Los Angeles Section of the Institute of Radio Engineers held a most interesting technical meeting in one of the physics laboratories of the L. A. Junior College on Tuesday, October 15. The meeting was called to order by Chairman Dr. John F. Blackburn and after preliminary business was taken care of, the meeting was turned over to Dr. Charles Dailey, Chairman of the Meetings and Papers Committee, who introduced Alden Packard, engineer with KNX. Mr. Packard delivered a most interesting paper on co-axial transmission lines. Succeeding Mr. Packard, Ralph Gordon, short wave authority, delivered a very informative and interesting paper on five-meter transmission and reception. He displayed an outstanding short wave superheterodyne, which he described briefly to the members present. Routine business of the section meeting, including the appointment of a nominating committee to nominate nominees for the offices of President, Vice-President and Secretary to report at the next regular meeting of the section, was taken care of.

### NEW RADIOTONE PRODUCTS

The Radiotone Recording Company announces to the trade a new combination all-wave radio receiver and recording unit. The instrument is housed in an attractive console cabinet, which is available in various finishes. It contains an eight-tube all-wave tuner, a five-tube a. f. amplifier and a Rola dynamic speaker, in addition to the Radiotone portable recording unit. Provisions are made for all-wave radio reception, all-wave radio recording, phonograph and microphone recording and phonograph reproduction. The new instrument, known as the Model A-100, is on display at the sales rooms of the Radiotone Recording Company and may be inspected by readers of the Technician.

KHJ has installed a twin multiple drive recording machine from the Olesen sound studios. It will record its own audition discs, air checks of programs for future reference and other purposes.

Science has shown us how to build real homes, beautifully, substantially, economically. Uncle Sam is giving us the opportunity, through the FHA to finance the building of our homes, ideally.

NOW EXCLUSIVE TUNG-SOL  
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## BAY CITIES RADIO TECHNICIAN'S ASSOCIATION

JIM HESTER, President HENRY JAMES, Vice-Pres. ROBT. L. SPEERY, Sec.-Treas.

Conducted by HENRY JAMES

Lots of things have happened since the last issue of the Technician. Dick Leitner, who is lecturing for National Union Radio Corp., was called to New York on business and we have had to find some one to take his place for the time being.

Two weeks ago we had the pleasure of seeing a Cathode Ray Oscilloscope demonstration given by Electric Products Service. This demonstration took about two and one-half hours and covered the aligning of supers and found that Jim Hester's was only a quarter of a turn off. We were shown what distortion and overloading looked like on the screen.

Later in the evening membership cards were discussed and approved, and an association monogram design shown.

At the last meeting we listened to Paul O'Conner of the J. W. Miller Co., who is to take Dick's place until he returns. He told us of the various difficulties attend-

ing multi-band tuning with the same large capacity tuning condenser, and the reason for the short leads as required in a short wave set and for a half hour after his talk he answered many questions.

In the following business meeting, the monogram was approved and orders were taken for Association stickers to be used in advertising the Association throughout the Bay Cities.

### PERSONALS

Jim Hester took a few days off and went to see the Nudist Colony of San Diego, and incidentally, saw the Fair.

Bob Sperry also took a few days off and went hunting in the high hills.

And speaking of hunting, "Whitey", chief of the Commissariat across the street, just arrived back in town with a two weeks' growth of beard, a husky thirst, and no deer. He tells a tale of many breakdowns going up and coming back but—no dears!

### MAKING SALESMEN OUT OF SERVICEMEN

Not content with giving service men everything there is to know about up-to-date servicing practice in all its phases, A. A. Ghirardi, in his recently published Modern Radio Servicing, includes a comprehensive section on how to sell your service. "You can be the best service man in town," says Ghirardi, "but if you can't sell your service, all your training and equipment won't be worth a plugged nickle to you."

Consequently, he proceeds to outline various tested methods for selling, merchandising and advertising a radio service business. It doesn't matter how small or how large it is. He tells you just how to go about getting new business, how to "follow-through", how to hold your customers, when and how to use house-to-house selling, telephone selling, newspaper advertising, displays, direct mail, etc. He tells you how to meet specific objections of your prospects, and how to take advantage of many hidden opportunities for extra profits.

No service man can fail to increase his income substantially if he reads and applies the practical tips and suggestions contained in this section, which is just one of many in this 1300 page gold mine of valuable information for all service men.

Under FHA provisions, the average citizen who plans a modern home of his own becomes possessed of a means for realizing his ambitions to undertake a building or modernizing program for the welfare of his family, relieved of hazards that have heretofore been prevalent.

## TUBE CHECKERS

— and —

## SET ANALYZERS

### Repaired or Rebuilt—

All types of instruments  
Repaired or Calibrated  
Shunts or Multipliers made up  
for any instrument

PROMPT — ACCURATE  
RELIABLE SERVICE

Authorized Service Laboratory  
for Weston Electrical  
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# They say it's great!!



Editors, experts, students, technicians—radio men from all over the country are unanimous in declaring Ghirardi's MODERN RADIO SERVICING to be the finest book ever written for service men. "The most valuable piece of equipment in my shop," writes one of them, and he is typical of many others whose enthusiasm has far exceeded our most optimistic expectations. It's time for YOU to look into this!

In Ghirardi's MODERN RADIO SERVICING you'll find clearly described every phase of radio servicing as it is practised today by the most successful service organizations in the U. S. Every modern test instrument and method (including the use of the Cathode-Ray Oscilloscope in servicing) clearly explained. Shows you how to do every kind of test and repair job the best and quickest way. All the latest 1935 dope presented in clear, easy-to-understand language.

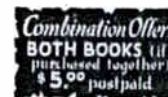
RADIO FIELD SERVICE DATA, the Supplement and Answer Book to MODERN RADIO SERVICING, contains over 25 invaluable tables and charts for quick and handy use in practical service work—including table of trouble symptoms and remedies for over 750 receivers, complete table of i.f.'s for all superhets (2,790 in all), etc., etc.

## MODERN RADIO SERVICING

By A. A. Ghirardi, Author of the World-Famous RADIO PHYSICS COURSE  
(1300 pages. 706 illus. 723 review questions  
Price \$4.00)

## RADIO FIELD SERVICE DATA

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Occupation.....

What kind of information do you need most:—On test instruments?..... On newest test methods?..... On Sales and Advertising?..... Case histories?..... Repair Methods?.....

## TRAVELING THE TERRITORY WITH MILTON

Well, boys and girls, here we are on the way to Thanksgiving, and when we say that, you know we're talking turkey to all of you!

When Dan Cupid strikes, it's generally a bulls-eye; and his last shot was no exception. Yessir, one Beryl Steele, who keeps the customers merry at Harry V. Gilbert's in West Los Angeles, has finally taken the vows to love, honor, and—well, all the rest that goes to make a model husband. Congratulations, Beryl, but how about a piece of that wedding cake!

And while Walter Winchell-izing, we take pleasure in announcing the appearance in this little world of our of Carl Roy Tate, whose justly proud papa maintains the high standards of CRTA radio service in Inglewood. Incidentally, did you-uns all notice that the newcomer's initials are C.R.T.? Another radioman, and what a man, says Daddy Roy!

And on the subject of blessed events the Traveler bids you-all to know that Jack Elliott in San Pedro, has increased the population of his fair city by one young lady. If she's one bit like her papa, she's sure to be one of the belles of the town, we says, we says, we says.

The Traveler certainly enjoys his visits to The Music Shop, Hollywood Blvd.'s newest music establishment. Those of the old timers of the music and radio trade will be glad to shake hands with Wm. "Bill" Denells, the new store's manager, as well as with Fred Kahn, manager of the radio department, with Willard Bice, the popular radio serviceman, and with "Dinny" Moore in the record department. Greetings and the best of luck folks!

The Traveler's spies report to him that Harry Parker, formerly of Whittier and other Orange County points, is now keeping the solder flowing at Clarence Shippey's new store on South Vermont. You tell 'em, Harry!

It's been quite some time since the Traveler has watched real quilting in the act of construction, but a sample of this art can be readily seen by observing Mrs. Paul Lefebvre at work. Just saying "Bon Jour" to Monsieur and Madame, of the Radio Shop in Pasadena.

It may be a four star picture in Liberty or a five star final edition in newspapers, but when it comes to public address work in the Santa Monica Bay District, there's just one Bill Starr. And let the Traveler tell you that it was Bill's own hand that held the microphone for President Franklin D. when he addressed the old soldiers in West Los Angeles. Incidentally, says Bill, this same mike is on display in the window of Coast Electric in Venice, where Bill or his man Friday (Jim Henderson to you) will be glad to let you touch, fondle and caress said instrument. If you have to, you can even say, "Hello papa, hello mama, I'm having a wonderful time!"

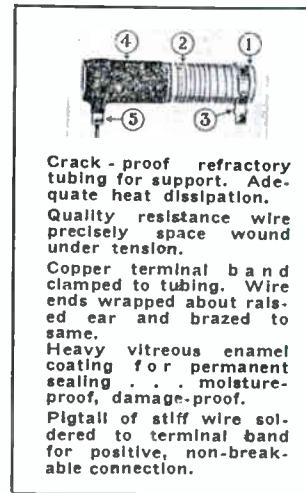
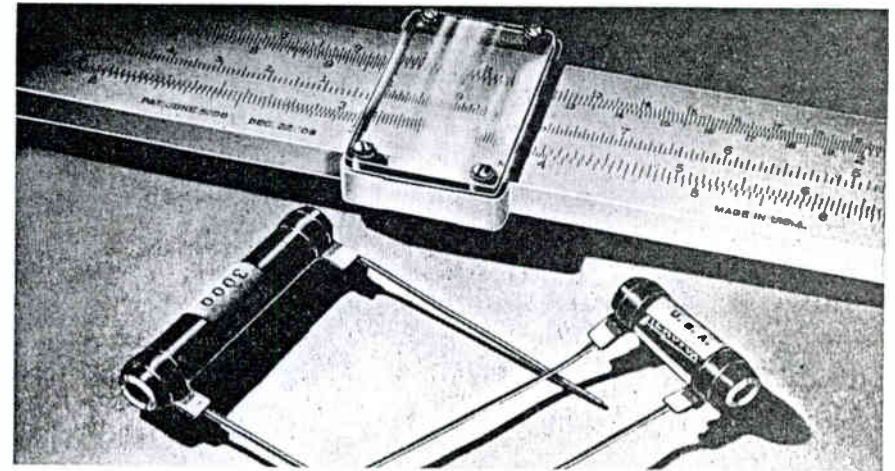
The place—Santa Monica; time—the Elks Convention; the person, Jim Hester. Yowsah, boys, when the Traveler set anchor in the Radio Sales and Service Shop during said blowout and saw Jim wearing the special convention hat, Yours Perapiringly couldn't determine whether to call him "Admiral," "Captain," or "Commodore." But you can take it from us, people, Jim Hester was one of the reasons for the complete success of the convention, and we don't mean maybe!

The Lost and Found Department brings to our attention that Steve Glovitsky is now in charge of the fixing and adjusting at Levinger's Radio Service on North La Brea; that Ed "Speed" Swift has the same job at Park Radio on South Alvarado; that C. "Smitty" Stallsmith is the reason for the satisfactory service at Hancock Music in Pasadena; that E. E. French is in charge of service at Globe Outfitting on South Broadway; and that E. B. Hinds is keeping 'em repaired at Ashton's Radio Electric in Pasadena. Keep up the good work, boys!

And so, everybody, when Hallowe'en passes from sight and the Armistice Day parade looms into view, remember that it's much better to eat your thanksgiving dinner with zest and gusto than with nobody at all. See you soon, friends!

## CARBON MIKES

Carbon microphones, despite the advent of condenser types and various ramifications of designs and models in microphones, are still substantial sellers. At least this is the experience of the Universal Microphone Co., Inglewood, Calif. Carbon microphones, because of their general adaptability, low initial cost and high output with fidelity of reproduction, still remain the most popular and reliable form of sound pick-up, say factory executives at Universal.



## Aerovox Pyrohm Jr. RESISTORS

**G**ENUINE wire-wound vitreous enameled units reduced to most compact dimensions. Nothing sacrificed except troublesome bulk . . . Available in 5, 10, 15 and 20 watt ratings. And all standard resistance values.

Just the thing for space-saving assemblies. Or stay-put, profitable repairs on radio sets and electronic equipment. These units bring together the dependability of wire-wound resistors and the compactness of non-wire resistors, for the ideal all-round job.

**DATA** The complete AEROVOX line of condensers and resistors, is presented in latest catalog. Send for copy as well as sample of Research Worker. Meanwhile, see your nearest AEROVOX jobber.

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**R. M. A. TUBE TESTERS**

Recently the Tube Standards Committee of the Radio Manufacturers Association made definite proposals for a standard type of tube tester. The method of testing tubes thus proposed is, in effect, an emission test. However, it differs in several respects from the ordinary emission tester, making the test more dependable and taking into consideration that all tubes will fall into special groups. They have designated a general purpose group, a battery group and a diode group. For each tube group a definite plate loading condition has been specified and plate voltages are specified at 30 volts. A leakage test is not included in the R. M. A. specifications.

**CORNELL-DUBILIER RUSHED**

Mr. Leon L. Adelman, Sales Manager of the Cornell-Dubilier Corporation of New York, reports greatly increased activity as indicated by unprecedented volumes of business, which are continually increasing. The Cornell-Dubilier plant is operating to fullest capacity, running three eight-hour shifts. Mr. Adelman offers the opinion after considerable investigation that this is not a false boom but is a definite business increase, which may well be indicative of a profitable fall and winter in the entire radio industry.

\* \* \* \*

Business IS increasing substantially!

To drive nails in plastered walls without tearing down the wall, dip the nail in hot water or parafin and it can be driven in the wall securely without crumbling the plaster.

**INCA EXPANDS**

The Inca Manufacturing Division of the Phelps-Dodge Copper Products Corp., has recently concluded extensive expansion of its plant. 5000 square feet of floor space has been added, and a great deal of new machinery, which increases the production of the plant approximately 20 per cent, has been installed. Also, the research, test and development laboratories have been greatly enlarged and several thousands of dollars' worth of new laboratory equipment purchased. All of this expansion, of course, necessitates considerable increase in the number of employees and is most indicative of the upward trend of business and conditions in general. Officials of the Inca Manufacturing Division report unprecedented gains in business and demands for their products. This firm, who entered the transformer field only a few years ago, has built up a most enviable reputation for high-quality merchandise at prices competitive with industrial and economic conditions. Their recently developed line of high-quality high-fidelity audio components is a most valuable and popular addition to their already complete line. Inca employs a large amount of local labor and is worthy of the support of readers of the Technician.

A newly decorated interior or exterior, a long-needed repair, a rearranged kitchen, new electric or plumbing fixtures, make the home more attractive, lighten housework, and make life happier for the whole family. All or any of these can now be easily obtained through a loan insured by the FHA.

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The Set-Tested Radio Tube

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Address.....



## TROY TAKES TRIUMPH

The Troy Radio Supply Company, 1144 South Olive Street, Los Angeles, has recently been appointed an authorized distributor of the Triumph Manufacturing Company of Chicago. This Company at its newly opened quarters, which will include a complete stock of radio service replacement parts and allied equipment, will have a full stock of the entire Triumph line on display and cordially invites readers of the Technician to inspect this and other items in the large stock.

## RADIO SPECS GETS TUNG-SOL EXCLUSIVELY

The Radio Specialties Co. announce their appointment as exclusive wholesale distributors of Tung-Sol radio tubes in Los Angeles and adjacent territory. The Radio Specialties Co. is located in a district offering easy parking facilities and their free delivery service has been greatly appreciated and used by their many customers. They now have a full and extensive stock of Tung-Sol tubes and invite your inquiries and inspection.

## Jobbers and Dealers

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All-Wave  
Antenna Kits**

Have greater sales appeal, offer legitimate profits and obtain customer good-will.

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## GRAHAM HEADS SYLVANIA APPLICATION LABORATORY

Hygrade Sylvania Corporation announces the appointment of Virgil M. Graham as head of the Sylvania Application Laboratory at Emporium, Pa. He will act as consultant to radio manufacturers and engineers, a position for which he is eminently fitted both through his radio engineering experience and his wide acquaintance in the industry. Mr. Graham will be assisted by Dr. Ben Kievit, Jr., who will continue in his present capacity as direct supervisor of the work conducted in the laboratory.

Since 1923, and until his acceptance of the Sylvania appointment, Mr. Graham has been Radio Engineer for Stromberg-Carlson, and assisted in the development of the first Stromberg-Carlson radio receiver to be put on the market.

He is also well known through his active leadership in technical committee work, having made important contributions to the improvement and advancement of radio standards. He edited the early NEMA handbooks of Radio Standards. Since 1931, he has been Chairman of the Standards Section of the RMA Engineering Division, was Chairman of the joint Coordination Committee of EEL, NEMA, and RMA on Radio Reception since 1933.

He is a fellow of the Institute of Radio Engineers, and a member of the IRE Board of Directors, and has been very active in IRE affairs in the Rochester Section.

Before leaving to take up his duties at the Sylvania plant, his associates at Stromberg-Carlson gave a farewell dinner in his honor, at which he was presented with a Cine' kodak and projector in appreciation of his long service and as a token of personal friendship.

## THE DOPE ON I-F's

Ghirardi and Freed in Radio Field Service Data, supplement to Ghirardi's sensational new Modern Radio Servicing, have done a masterful job in assembling a complete table of intermediate frequencies for all makes and models of superheterodyne receivers, old and new. There are 2,790 in all. Every service man knows how essential this data is in all superhet alignment work. In addition to this, they present the actual "Case Histories" of the common troubles which occur in over 750 different common American receivers. This invaluable information will save you a lot of time in your work.

## SERVICE KINKS AND PET EQUIPMENT

(Continued from Page 14)

### STEWART-WARNER MODEL R-112 IMPROVEMENTS

To improve the quality as well as the volume of this receiver make the following changes:

1. Disconnect the B plus (yellow and red lead) side of the output transformer from the output tube screen and connect it to the cathode terminal of the rectifier.

2. Replace the 510,000 ohm resistor from the 41 grid to ground with one of 250,000 ohm value.

3. Replace the permanent tone control condenser from .01 mfd. to .006 mfd. Use a 600 volt value.

It may be necessary to reduce the tension of the relay spring by stretching it so it will operate properly with reduced excitation current resulting from the above changes.

### HUM

Because of the many sources of hum in a receiver, it is best to analyze the hum as there are many different types. By types of hum is meant ways which the particular hum will effect reception. For example, there is hum which will be only noticed with the signal and will have an intensity which is proportional to the signal. There is a hum which will remain at the same intensity all over the dial and will not be effected by the volume control or the signal intensity. There are also other types of hum which may be traced to their source much easier if their exact nature is known.

### TUNABLE HUM

Tunable hum is hum which is noticeable with each signal and variable in volume with each signal and which has an intensity which is always proportional to the signal intensity. From this source no hum will be noticed between stations on the dial.

This hum invariably exists in the high frequency section of the receiver and may be attributed to an old tube, incorrect filament, plate, or grid voltages, improper neutralization, incomplete shielding, of tubes or other components, overloading or other improper use of high-gain tubes, or instability of circuits due to over-correct alignment.

Plate voltage ripple which is normal in a properly designed receiver is not considered as a source of hum as it is coun-

tered by the proper grid ripple or by the fact that the gain and other characteristics of the tube are essentially constant over the limited variation of plate voltage encountered, thus preventing the stage from modulating the signal with hum.

It is safe to assume that the original receiver design provides for a satisfactory minimum hum. No change in design is therefore recommended. In cases where the hum can be definitely attached to inadequate design qualifications it can usually be overcome by simple design changes.

### CONSTANT HUM

This type of hum has no connection with the signal or volume control setting. Its source will be found in the detector (2nd Detector in superheterodynes), the audio amplifier, or the power supply unit. Faulty tubes, defective plate or grid load resistors, leaky or defective coupling condensers, incorrect supply voltages, in the audio amplifier, and defective filter condensers, filter choke leakage, old unbalanced rectifier tubes, and a defective voltage divider may be responsible in the power supply unit.

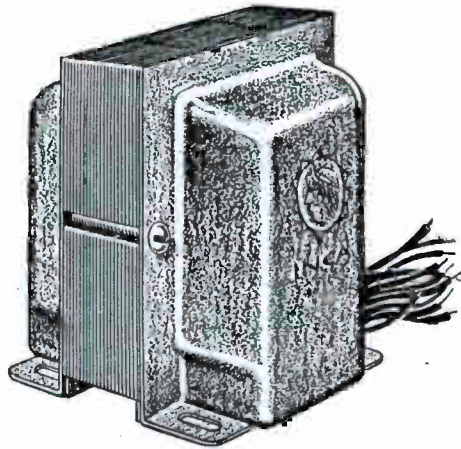
Testing of the power supply parts for specified values will often disclose the trouble as this is the quickest way to eliminate the power unit as a possible source. The signal circuit may then be quickly tested from the speaker back to detector by plugging head-phones in plate circuit of each stage successively. When the proper stage has been located individual circuit tests may be made.

The two types of hum above can occur together and there are other types which cannot be so clearly defined. Defective resistors, by-pass condensers, and tubes are responsible for the majority of hum which does not apply to the above description.

### RADIOLA MODELS 44, 46, 47—WEAK ON LOW FREQUENCIES

Wear of the tuning condenser bearings will allow the shaft to slip sidewise to some extent, thus throwing the tuning stages out of alignment. To correct this difficulty, turn the condensers to maximum capacity, loosen the set screws holding the stator sections and move the sections slightly until they are equidistant from the rotor plates. Adjust each section and tighten in this way. It may be necessary to ream out the bakelite supports in order to get the proper adjustment.

# INCA Transformers



To secure best results in your transformer applications INCA transformers should be used. The superior type construction used, embodies many years of engineering training and experience, liberal design, finest materials, modern factory equipment and the most highly developed impregnation processes now known for protection against humidity.

INCA Transformer products are available through all the better jobbers on the Pacific Coast. These jobbers are now supplied with a stock of all the new INCA bulletins as listed below:

- L-11 — Transmitting and public address transformers.
- L-14 — Transformers for service and receiver replacement.
- L-12 — Type "T" high-fidelity audio transformers and power equipment for transmitting and public address.
- L-9 — "TA" and "TS" series high-fidelity midget remote amplifier transformers.
- NL-8 — INCA hook-up and fixture wire.
- L-2 — Doorbell and Signalling transformers.

If your jobber cannot supply you with these bulletins, write direct to:



Phelps-Dodge Copper  
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In each of the indicated cities on this map of California there is located a well stocked C-D distributor.

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Insure against un-profitable service jobs and assure customer satisfac-tion by using C-D guaranteed qual-ity condensers.

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