« The »
"TECHNICIAN"

February Issue

CRTA ASSOCIATION

WARNING

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This is effective in the entire state of California.

JOHN A. ORME, Sec. C. R. T. A.

WHOLESALE CODE APPROVED BY PRESIDENT ROOSEVELT

By JOHN A. ORME, Sec. CRTA

President Roosevelt, on January 12, approved the Code of Fair Competition for the Wholesaling or Distributing trade. This Code embraces wholesalers in Hardware, Cycles, Electrical Supplies, RADIO, Twine and Cordage and nineteen other commodity divisions.

This Code contains eighteen articles and definitions of some length. It is too lengthy to cover in the limited space available here but an extract of the most significant articles follow:

Article II defines Wholesaler or Distributor as any individual, partnership, association, corporation, etc., which is definitely organized to render and rendering a general distribution service, which buys and maintains at its place of business a stock of merchandise * * * which does not sell in significant amounts to ultimate consumers. Ultimate consumer is defined as a purchaser for home and personal use, and not for use or consumption in trade or business or by institutions.

Article VII provides that no member of the trade shall publish advertising of any nature, which is misleading or inaccurate in any material particular, nor shall any member in any way misrepresent any goods * * * credit terms, values, policies, services or the nature or form of the business conducted. Section 2 prohibits false billing of any kind. Section 3 refers to false labeling and packing in a manner which is intended to or does deceive. Section 4 prohibits misleading advertising about competitors, their goods, service, terms policies, etc. In other words one jobber cannot refer to another as a "wagon peddler" because he doesn't make you wait a week for your order. Section 5 prohibits publishing or circulating unjustified or unwarranted threats of legal proceedings. Failure to prosecute in due course shall be evidence that any such threat is unwarranted. Section 6—No member of the trade shall secretly and directly offer to or make any payment or allowance of rebate, refund, commission, credit, unearned discount or excess al-

(Continued on page 6)

"THE FIVE METER BAND"

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

PART THREE

Two Tube Circuits

Many experimenters, especially Eccles and Jordan have shown the superiority of two tube symmetrical circuits. The tubes are arranged in push-pull. Provided they have similar characteristics, both tubes will tend to oscillate. A typical circuit is shown in figures 9 and 10.

It will be seen that they are so connected that they will mutually help one another to oscillate in opposite phase. It will be seen that the input and output are again connected across opposite corners of the bridge. The mutual induction between the plate and grid coils may be approximately represented by capacities between opposite ends of the two coils. Provided the circuit is arranged as symmetrically as is possible electrically and the tubes have similar characteristics, little or no difficulty is experienced in getting such circuits to oscillate at 5 meters or below. At present this circuit is used by most amateurs on five meters. Comparatively strong oscillations may be generated by this method, even at very high frequencies, and the arrangement being symmetrical, the wires connecting the batteries to the circuit carry no high-frequency currents, so that the choke coils and by-pass condensers may be dispensed with entirely, and the effects of battery capacity to ground are also eliminated.

THE RECEIVER

It is in design of a suitable receiving apparatus for these very short waves that the greatest scope for technical improvement seems to exist.

Out of the region of the direct field, the attenuation of these waves is apparently so rapid that, if they are to be successfully used for communication at or near ground level, an entirely new technique in receiver design is likely to be required.

At long ranges, or under difficult conditions, the field strength at the receiver is extremely small, and variable, according to local conditions. This calls, primarily, for an extremely sensitive and efficient detector, as at these frequencies, radio frequency amplification of the received energy is, at the present stage of development, out of the question.

The only solution, or partial solution of the problem at the moment is the use of super-regeneration. The receiver most universally used today consists then of a detector circuit with super-regeneration, the detector being followed by a convential audio amplifier.

The high frequency oscillator is patterned after the "Gill" circuit, often referred to as the "Huxford' circuit in this country. Fundamentally the circuit is shown in figure 11.

This type of oscillator never fails to work if C is large enough. For work on 5 meters the circuit is but slightly modified, a condenser being connected across the plate and the grid of the tube to spread the band properly over the dial of the tuning condenser. Instead of the L_1 and L_2 being distributed inductances, lumped inductances are used with some magnetic coupling. The mutual inductance is negative in sign. Reaction is controlled by means of a rheostst in the plate supply lead if cathode type tubes are used and a filament rheostst serves admirably well if directly heated filament type tubes are used. Both methods have the outstanding merit that no appreciable frequency change during adjustment, within normal working limits, can be noticed. It also has the obvious merit of simplicity. The type of quenching circuit used is that of Figure 12.

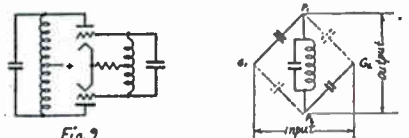
Fig. 9

Fig. 10

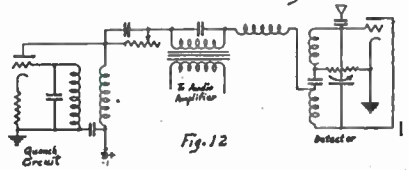
Fig. 12

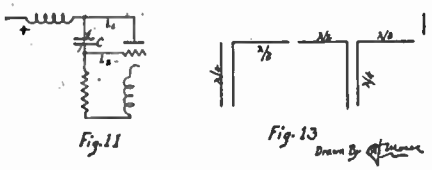
Fig. 11

Fig. 13

If the quench is not strong enough, weak signals are not sufficiently amplified and if it is too strong, the signals are "drowned" by the enormous amount of background noise which resembles the

(Continued on page 14)

The "TECHNICIAN"

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

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EDITORIAL

By The Editor

"To Chisel or Not To Chisel"

To chisel or not to chisel—that is the question! It seems that a very severe and pronounced epidemic of the old army game known as "passing the buck" has broken out in the radio industry. Each group accuses the others of chiselling. The jobbers blame the dealers and technicians for fostering and encouraging illigitimate methods of business. The technicians and dealers arcuse the wholesalers and distributors of not keeping faith with their customers. A little observation will also show internal strife within the ranks of each group. The result of this observation gives us the moral for our story—Before any of us accuse other branches of the industry of chiselling we must be sure that our own house is clean. Whenever any division of the radio field can truthfully claim its ranks to be free of chiselling in any of its various and sundry forms then, and then only, may it step forward with the caustic and righteous criticism of others who its members may consider as outside of the borders of fair, square and honest dealings.

Shall we all continue a warfare wherein the victory seems to be the attainment of bigger and better price and throt-cutting or shall we all decide to live and let live by making a conscientious and reasonable truce within the industry and actually abiding by it one hundred per cent?

Of course, we must admit that unfortunately there will always be unscrupulous individuals in any field who will endeavor to violate the dictates of honest dealing and fair competition by creating a false impression of the services and commodities offered. Instead of "stooping" to meet this man on his own home territory and endeavoring to out-chisel him we must make the life of a chiseler so short and unpleasant as to automatically elininate him.

Instead of each branch of the radio industry fostering its own racketeers and trying to eliminate them within the group and at the same time outwardly denying the existence of such let us adopt a new plan of attact. Let all of the fair, honest and legitimate men in the entire field combine and stage a furious battle to the death against all the so-called chiselers in every part of the radio industry.

Only then can we expect to be able to pursue our chosen profession in the straightforward way which we desire and still accomplish the all important and necessary feat of earning the bare necessities of life and perhaps a few of the luxuries.

CODE APPROVED

(Continued from page 3)

lowance, whether in the form of money or otherwise, nor shall a member of the trade secretly offer or extend to any customer any special service or privilege not extended to all customers of the same class, for the purpose of influencing a sale. Section9—Coercion. No member of the trade shall require that the purchase or lease of any goods be a prerequisite to the purchase or lease of any other goods. Section 10—Protection to Retailers. It shall be unfair trade practice for wholesalers who secure a substantial portion of their business from members of the retail trade to enter into competition with retailers by selling merchandise at wholesale prices to ultimate consumers for personal use or to sell to civic, institutional and/or similar types of wholesale customers merchandise for the personal use of employees of such customers. Nothing in this section however shall be construed to prevent bona fida sales by such wholesalers to their own employees of merchandise that is for the personal use of such employees.

"'Tis a consumation devoutly to be wished," but I wonder? If Section 10 of Article VII could only be translated into fact, half the ills of the radio industry in Los Angeles would cease to exist. We have, so called, wholesalers competing with every other branch of the industry. As I meet them in the course of my work I am compelled out of courtesy to listen to volumes of complaints. Each one going to great lengths to show how pure he is and how unspeakably unethical his competitors are.

May I say, as the humble opinion of one who contacts every branch of the radio industry from the suppliers of raw materials to the consuming public inclusive, that until the day arrives when all branches of the industry can sit down at the same table and dispassionately and in the spirit of fair play contribute to regulation of all for the benefit of all instead of the regulation of everybody else but "me" by everybody else, "me" included, for the sole benefit of myself at the unfair advantage of everyone else we will continue to have a "Chiseler's Paradise" instead of a BUSINESS.

(Editor's Note—Amen)

AN INTERESTING EVENING FOR ASSOCIATION MEMBERS

By A. PAUL, Jr., President CRTA

After the regular meeting held Monday February. 5th, in the Auditorium of the National Radio and Electrical School, an additional program was given by the school. It was a program highly interesting and informative to every member present.

After our regular talk by Mr. Leitner, we were given a short talk of welcome by Mr. Ed. Howes, an official of the School, who in turn introduced Mr. E. C. Hall, of the faculty, who gave us a most interesting and educational talk on Radio Broadcasting, outlining the various steps in this important branch of radio.

At the completion of his talk, Mr. Hall stated that all departments of the school would be open to inspection to the members, and invited them to make a tour of these departments.

Members Enjoy Tour Through Shops And Studios

Every single department created great interest and most members were surprised at the complete facilities at the National Radio and Electrical School for teaching all phases of radio, electrical and automotive work.

Television particularly was an attraction. Mr. Swift, also of the school faculty, had the equipment operating and was showing a fine picture. Mr. Swift also was kind enough to answer all questions that the members wanted to ask in regards to the different phases of television.

After the tour had been completed in all departments, the members were invited into the broadcasting studios of the School, where Mr. Hall gave some interesting information on the sound properties of these modern studios. Everyone present enjoyed this talk immensely and found it educational.

I personally wish to take this opportunity of thanking the National Radio and Electrical School, and in particular Mr. Howes, Mr. Hall and Mr. Swift, for the very interesting evening that was arranged for our members. We shall be happy to again have some member of the faculty give us another talk on some interesting branch of radio work, in which we are all vitally interested.

A Simple Method of Matching Impedances in Audio Amplifiers

By B. L. GRIFFING, M. A., Prof. of Physics, Glendale Junior College

Frequently the service man is confronted with the problem of output transformer or speaker replacement. If one attempts to use a dynamic speaker on an output transformer designed for a magnetic type speaker, the results are both displeasing as to quality and inefficient as to output. Usually one has to check by ear, and select the type of output transformer that sounds the best. This is only approximate, and demands a sufficient stock of transformers from which to select. A method of matching transformer and voice coil to the plate is outlined below and is simple and accurate enough for all practical purposes. It requires very little mathematics, and can be performed with a 50 or 60 cycle A. C. supply and an ordinary output meter or A. C. Milliammeter.

Why Bother About Impedance Matching?

The answer is two-fold: (1) for reasons of efficiency; (2) for reasons of quality. In case (1) consider the case of a dynamic speaker coupled by condenser and choke to the plate of a 250 tube. Let the voice coil have 15 ohms A. C. impedance, and assume it to be resistive. From Ohms law it follows that the output into the speaker plared at "re" in Figure 1 (neglecting) the effect of condenser and choke) will be:

$$\frac{M^2 Eg^2 Re}{(Re + Rp)^2} \qquad (1)$$

Where "μEg" is the audio voltage generated in the plate circuit of the 250, "Re" is the resistance coupled externally and "Rp" is the rated plate impedance of the tube. If "μEg=100, "Rp"=2,000, and "Re"=15 Ohms, the power delivered to the speaker would be:

$$\frac{(100)^2 (15)}{(2015)^2} = .037 \text{ Watt.}$$

The input, or total audio power in the circuit would be:

$$\frac{(100)^2}{2015} = 4.963 \text{ Watt.}$$

The efficiency of this coupling arrangement would be:

$$\frac{.037}{4.963} \times 100 = .75\% \text{ or less than } 1\%.$$

Suppose a speaker of 2,000 ohms impedance be placed at "Re". The same equations give:

Power output=

$$\frac{(100)^2 (2000)}{(2000 + 2000)^2} = 1.25 \text{ Watts}$$

The efficiency in this case would be 50%. If one plots power output against "Re" the external load resistance, the curve shown in Figure 2 is obtained.

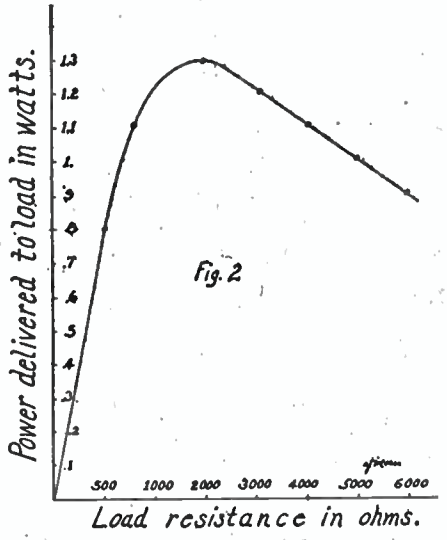

Fig. 2

The maximum occurs at the point where "Re"=2,000 and the external resistance equals the internal resistance. The problem then arises: How can this condition be obtained in practice? The answer is, the output transformer. If the secondary of a transformer has connected to it a resistance, "Rs", (Figure 3) then the primary will have an effective resistance which we will call "Ra." This will have a value which depends on "Rs" and the turns ratio of the transformer. Assuming an ideal transformer, which holds reasonably well in most cases, the effective resistance in the primary wil be:

$$Ra = \left(\frac{N_1}{N_2}\right)^2 Rs \qquad (2)$$

However, instead of having the load resistance equal to 2000 ohms, the value for greatest power output, experiment has shown that higher plate load resistances greatly reduce the percentage of harmonic content. Usually a compromise between power output and allowable percentage of harmonics is made. This value is for most triodes about twice the load resistance of the tube. In the case

(Continued on page 10)

SERVICE KINKS AND PET EQUIPMENT

In servicing a late model receiver using a 53 tube in the output stage I was troubled with a decided a. c. hum. After spending some time in checking the filter circuit I discovered it to be caused by unbalanced grids in the 53 tube. If these grids are not in perfect balance a. c. hum will result. A new 53 tube proved to be a permanent remedy.

—MEL FOSTER.

A very convenient and neat way to arrange the average stock of pigtail resistors to be found in every service shop has recently come to my attention. Drive ten penny nails about two inches apart in a line and hang resistors on them. Each nail will hold several resistors and allows an instant inventory of the stock on hand.

—V. N. PRICE.

QUESTIONS AND ANSWERS

Q. Does the phase-changing tube in a resistance coupled push-pull AF circuit contribute any amplification?—A. A. S.

A. The phasing tube gives little or no amplification. In circuits where this tube acts only upon the signal to one of the PP tubes the amplification should be exactly unity or there will be distortion introduced due to unbalanced input to the PP tubes.

Q. An AK-40 is weak on all stations and plays nearly as loud with either the second or third RF tubes out. What causes this?

A. Check for an open RF +B bypass in the little can under the chassis.

Q. Can a burned out AF transformer be repaired?

A. In the old days when transformers cost real money it was a more or less common practice to "shoot" them with high voltage across the open winding with varying degrees of success. In those days the transformers had no "quality" to begin with so that a layer or two shorted out had little noticeable effect upon the resultant performance. It is a good idea not to attempt to repair anything more serious than a pigtail broken at the surface of the winding, and then DO NOT use paste.

MATCHING IMPEDANCES

(Continued from page 8)

of the 250 tube this value is between 3700 and 4600. It is not very critical.

In the case of the 15 Ohm speaker cited above, if the turns ratio had been 17.1, the value of resistance measured in the primary circuit would be:

$Ra = 289 \times 15 = 4335$ ohms.

which is close enough to the ideal for all practical purposes.

Methods of Measurement

(1) Measurement of turns ratio of output transformer,

Open the Secondary circuit of the output transformer, connect a voltmeter to it, and record it as "V_2." (Figure 4). Measure the primary voltage and call it "V_1." Then the turns ratio will be:

$$\frac{N_1}{N_2} = \frac{V_1}{V_2} \qquad (3)$$

(2) Measurement of voice coil impedance.

Connect a 50 or 60 cycle 110V supply, or if available, a 1000 cycle voltage to the speaker; insert either an A. C. milliammeter of 20 m.a. range or an output meter in primary circuit at A, (Figure 5)

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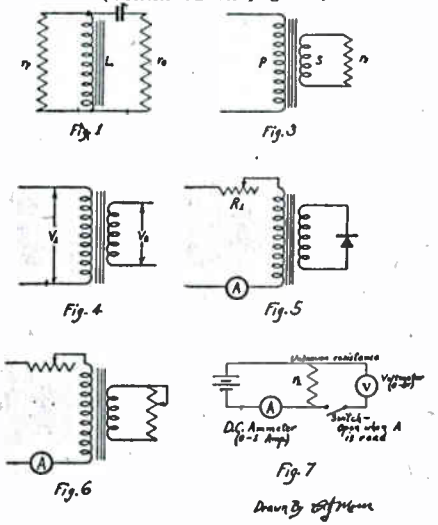


Fig. 1 Fig. 3 Fig. 4 Fig. 5 Fig. 6 Fig. 7

RADIO SPECIALTIES COOPERATES WITH CRTA

Through the courtesy of Mr. Dooley, the Radio Specialties Co., 1816 West Eighth street, presented each man attending the February 12th meeting of the Certified Radio Technicians Association a copy of the Clarostat Volume control guide. This booklet not only lists the Clarostat model number of control for replacement in every model of every standard radio set but gives the values in ohms as well as the type of taper for specific circuits. In addition, a full page is devoted to circuit data describing the proper controls for use in cases where constant impedance is necessary, such as in public address equipment and multiple speaker installations.

The Radio Specialties Company has been and is one of our most loyal and substantial supporters as well as one of the cleanest and most accomodating concerns in Los Angeles. Mr. Dooley promises more useful data in the near future and we shall certainly see that he does not forget.

SOME TIGHTWAD!

A man born in America of Scotch parents says he always resented the many jokes concerning Scotchmen until he took a trip to Scotland last year. While out walking in the country one day he stopped at a cigar store and bought a cigar. Upon asking the Scotch proprietor for a match he was informed that the only matches in the store were those in boxes at one cent per box.

"And do you know," said our tourist friend, "that that tightwad Scotchman made me walk four miles back to my hotel for a match."

WELL-KNOWN ATTORNEY PROMISES ARTICLES

Mr. Joseph Duchowney, attorney, specializing in radio law, has promised to contribute articles from time to time dealing with the legal side of the radio industry. At a recent meeting of the Certified Radio Technicians Association Mr. Duchowney gave a very interesting talk on the legal points involved in the operation of a business dealing in the sales and service of radio equipment.

MATCHING IMPEDANCES

(Continued from page 10)

variable rheostat of 2000 ohms, "R," which is put in merely to insure that the meter does not go off scale. Adjust "R_1" until a large deflection is obtained. Remove the speaker and connect a variable resistance "R_2" (Figure 6) which has at least as much resistance as the voice coil to be measured, or 15 ohms. Adjust this rheostat till the current in the primary reads the same as when the speaker was connected. This resistance will then be the equivalent resistance of the voice coil. This resistance can then be measured by a low range ohmmeter, or bridge. In case neither of these are available, the following method may be used: Figure 7).

Connect a battery through the ammeter and measure the current flowing. Then close the switch and read the voltage "V." The resistance "R_3" is given by

Ohms law $R_3 = \frac{V}{A}$ (4)

A. C. may also be used with A. C. instruments.

The value, "Ra," in formula (2) is the plate resistance listed in tables of tube characteristics. This is not the value where maximum output is obtained but that which gives least harmonic distortion. All that is necessary then, is to select the proper turns ratio that will give the proper value of load resistance. Although it is not very critical it is good practice to have this relationship fulfilled as well as possible.

Results:

The following data were obtained on an R. C. A. type dynamic speaker:

(1) At 1000 cycles, with baffle impedance = 16 Ohms.

(2) At 50 cycles, with baffle impedance = 20.99 Ohms.

(3) At 50 cycles, without baffle impedance = 13 Ohms.

In case (3) the speaker was different, but of identical type. The two speakers showed almost identical impedances at 1000 cycles. The marked increase with baffle is due to the extra acoustical load.

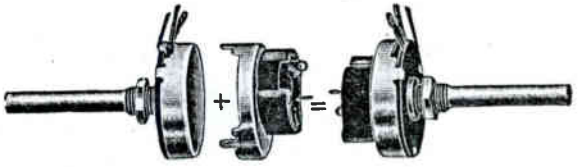
The transformer showed a voltage ratio of 22.:1 over all, and was meant for push pull '45s or '50s.

The calculated load resistance would be:

$484 \times 16 = 7744$ Ohms.

The value given in the tube characteristics is approximately 8000 Ohms, which gives a check close enough for the purpose.

Although this method is not one of great precision, it does give results that are close enough for practical purposes, and is very simple to perform once the procedure is learned and uses equipment available to practically every technician.



THE "FIVE METER BAND"

(Continued from page 4)

sound of high pressure steam escaping through a small orifice. The amount of noise heard when the receiver is in operation is no criterion whatever of its sensitivity and seems to depend to a large extent upon the method of rectification used. The quenching frequency is not critical, any frequency between 10 and 100 kilocycles being satisfactory. It is preferable to use a frequency well above audibility, about 30 kilocycles for the following reasons:

1. The quench coils, etc., can be smaller in dimensions.
2. Separation of quenching and audio frequencies is easier.
3. The use of a quenching frequency just upon the verge of audibility, 8 to 12 kilocycles according to the individual human ear, has been found, in many cases, to produce a very unpleasant kind of mental strain or fatigue. When the receiver is switched off a great feeling of relief is experienced.

This latter effect is not produced when the quenching frequency is well above audibility.

Little shielding is required, no trace of frequency shift due to movements of the operator being noticeable during operation.

Resonance is indicated by a sudden decrease in the quench noise at the point of resonance with an incoming carrier.

(Continued in next issue)

Classified Advertisements

For Sale—

We have a few 60 cycle 900 RPM synchronous Television Motors on hand. Made expressly for Don Lee reception. Price very reasonable. Phone or write to E. B. Dunn Co., 3948 Halldale Ave., Los Angeles. UNiversity 4938.

Victor 10-69—Automatic Record Mechanical, complete with matching input transformer. $15.00; and Western Electric 25B Amplifier, $10.00. Mission Radio Service, WHitney 7364.

Glass signe "Certified Technician," 8½ x 24 inches, with 2 inch gold and black or silver and black letters. $1.50 ea. Estimates gladly given on any window lettering desired. C. D. Curtis, 4223 So. Hoover St., Phone ADams 13106.

DeForest 250 and 281 tubes. $1.35 each. Brand new. Hurry. VAndike 3104.

1—Thordarson power transformer No. 2950. 1—1220 volt C. T. 2-7.5 volt 3 amp, $5.50. 1—Thordarson choke 3099 dual 30 henry, 160 mils, $3.00. Radio Specialties Co.

Phonograph parts, supplies, and expert reparis by experienced man. N. E. Worobieff, ANgelus 2713. 1826 East First Street.

For Sale or Trade—

One Weston 0-4 A. C. Voltmeter, like new. One Weston 0-19 D. C. Milliammeter. Roy K. Tate.

Wanted—

Cash paid for stamp collections. H. I. O'Brien. 1348 E. Colorado Boulevard, Glendale.

Jewell 199, Weston or other similar obsolete analyzer. Will buy for cash or trade meters, parts or ?. Box F-1, Care of Technician.

Wanted second hand or new short wave phone transmitters, also P. A. systems or any radio apparatus suitable and in working order for radio students. Address Prof. Luis Lopez Romero, 406 Sunset Blvd., Los Angeles.