

NATIONAL

RADIO

NEWS

FROM N.R.I. TRAINING HEADQUARTERS

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WASHINGTON, D. C.

MAY, 1929



You're Out for Success — Which Example Will You Follow?

Radio Retailing

Mc Graw-Hill Publishing Company Inc.
TENTH AVENUE AT 36TH STREET
NEW YORK, N.Y.

March 26, 1929

Mr. J. E. Smith,
National Radio Institute,
16th and U Streets,
Washington, D. C.

Dear Mr. Smith:

My analysis of a number of factors which I think will have a decided influence on the radio business during the coming summer leads me unhesitatingly to express the opinion that there will be a greater volume of business done — all through the radio industry — in the hot weather months of 1929 than ever before.

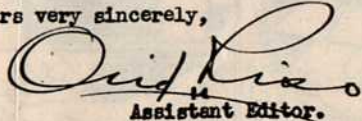
Chain programs are now being put on an all-year-round basis. Figures issued by the National Broadcasting Company show that sponsors of chain programs have practically doubled and that there is but a negligible falling off in summer broadcasting, especially as compared with previous years. Officials of the broadcasting chain systems estimate that \$25,000,000 will be spent in 1929 on chain programs alone. These facts indicate that both the quality and quantity of programs will show decided improvement this summer.

It will be remembered, also, that next summer will be the first in which the station reallocations ordered by the Federal Radio Commission last November will be in effect. The reallocations have had such a favorable effect on the broadcasting situation that they will undoubtedly prove a remarkable stimulus to summer sales.

Another favorable indicator is the radio survey among the farmers recently conducted by the Pennsylvania Department of Agriculture. This showed that 75 per cent of the farmers are using the weather and market reports which are broadcast daily. As farmers appreciate the business value of owning a radio set, hot weather will have no effect on radio sales in rural districts.

Do you not agree with me that these are excellent indications that the summer of 1929 will mark the beginning of the annihilation of the summer slump bugaboo?

Yours very sincerely,



Assistant Editor.

Ovid Riso

RR-8 PUBLISHED IN THE INTEREST OF RADIO AND ALLIED INDUSTRIES
MEMBER OF AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS

May, 1929

NATIONAL RADIO NEWS

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National Radio News

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NATIONAL RADIO INSTITUTE

Washington, D. C.

May, 1929

EDITOR'S NOTE.—Be sure and read the letter from Mr. Riso reprinted on the opposite page. As assistant Editor of a large Radio Magazine, Mr. Riso knows the Radio situation from all angles. He agrees with the views of leaders in all branches of Radio that the remaining months of 1929 will be the best yet for big profits in Radio Sales and Service.

Summer—Growing Months for Radio Profits



IF THERE is any one thing that the Radio industry is certain of today, it is this—that Radio has lost much of its seasonal character and now maintains an all-year-around balance of Radio profits.

We must admit that there was a time when Radio activity was limited principally to the Spring, Fall and Winter months, while the Summer was rather "slow going," but that is a thing of the past now.

No matter in what direction we look we see added evidence of uninterrupted Radio prosperity throughout the Summer months of 1929 and the years ahead. Why, even last Summer Radio practically banished the bad Summer business bugaboo by piling up an unprecedented volume of sales and service profits.

With that as a start, the new Radio designs, and the many improvements in A. C. operated sets indicate that the Summer ahead offers some of the very best opportunities for profitable Radio sales and service work.

There are any number of factors contributing to this era of Radio prosperity. One is the improved quality of broadcast programs evidenced by the new Star Radio Forum which is mentioned on page 4 of this issue of the News, and also the fact that \$23,000,000 will be spent this year on chain programs alone, is another sign that Radio activities will continue at a high level.

On the opposite page there is a letter from the Assistant Editor of Radio Retailing which is worth your careful reading and thought. Look it over—note the factors that make for Radio prosperity this Summer, and then add to them the many signs of such prosperity in your

local surroundings. Why, there is no question about it at all—Radio sales are going ahead at a high pitch, and the man who lays down on the job this summer certainly is going to lose out on some mighty good profits. On the other hand, the man who digs right in, takes every possible chance he can to increase his business and income will certainly put some nice, tidy rolls of currency in his pockets.

You can make your profits even larger by laying out a systematic plan to follow in building up a good business this summer, and following it out to the letter. Map out a schedule for the Summer—lay aside so much time for studying on the course, figure out how many prospects you are going to see, drum up some new ways of demonstrating and selling sets to campers, for special Summer outing groups, lawn parties, etc., think up as many different plans for cashing in big on your Summer business as you possibly can, read this issue of the News carefully and make use of some of the money-making ideas we are giving you in it, and then after you have organized your Summer campaign—follow it out carefully and thoroughly.

You'll have a better opportunity this Summer to cash in big on a summer business than you have ever had in any previous Summer, and I want every N. R. I. man to get his full share of these rich Radio sales and service profits.

One thing more—we know that you can do the best work and go farthest in Radio when you know that we are right here on the job working with you. We have a glimpse into the future—we know what Radio holds out for well-trained men in the years ahead, and we aren't losing a minute here—we are going to be on the job all Summer, working hard, giving you the very best possible training, and ready to give you many tips and pointers to help you increase your Radio business.

So let's keep in step, work together now and make the remaining months of 1929 the most profitable months ever for you.

J. E. SMITH.



Prominent United States senators who were the speakers in the first three programs of the National Radio Forum. Left to right: Senator Jones of Washington, Senator Smith of South Carolina, Senator Borah of Idaho who was the first Forum speaker, Senator Harrison of Mississippi and Senator McNary of Oregon.

National Radio Forum Major Broadcast Event

THE formation of a National Radio Forum by the Washington Evening Star in cooperation with the Columbia Broadcasting System is an event of great significance in Radio.

Nationally known speakers will discuss questions of great importance in these weekly broadcasts over a chain of 50 stations. This signifies a new day in the era of broadcasting. It fills a real demand for programs of the highest quality, and furnishes a constructive information service on the problems before the government to people in all sections of the country.

The first speaker of this new series of programs was Senator Borah of Idaho. Senators Jones and Harrison spoke on the following Saturday evening on "Farm Relief," and Senator Smith and Senator McNary spoke on the third Saturday evening on the same subject, and were followed by Congresswomen Ruth Bryan Owen of Florida and Ruth Hanna McCormick of Illinois. Many other notables are scheduled to speak over this Forum every Saturday evening at 10 p. m. They include Secretary of Treasury Mellon, Secretary of State Stimson, Senator Moses of New Hampshire, Congressmen Longworth of Ohio, and Gar-

Mr. Oliver Owen Kuhn, originator of the National Radio Forum, and managing Editor of the Washington Star



ner of Texas, and other members of the Cabinet, senators, and congressmen.

It is significant that a Washington newspaper should sponsor a program of such magnitude, reach out beyond its circulation and bring to the people in all corners of the land the best thought of government officials and other nationally prominent men and women.

And yet it is only natural that Washington, the Capital—where leading Radio activities and regulations converge, should also be the source of one of the most noteworthy of the chain broadcast programs.

It is developments of this character that reflect the growth of Radio and its strong grip on the American public.

This is just one of the many "signs of the times" that indicate that interest in Radio activities will continue at a higher level this Summer than ever before.



"I would not part with my course for \$100,000 and I tore up the Money-Back Agreement the first month I enrolled." Stanley E. Campbell, Rt. 1, Box 199, Petaluma, Calif.

"My employer wrote you requesting a catalogue and some information about your course, as I was considering taking some course in Radio. Although he is a graduate of another school, he recommended your school to me, because he said he thought you gave the most thorough training to be had in this line." Harry F. Nourse, c/o Mapleton Radio Shop, Mapleton, Iowa.

"I would not sell my knowledge gained from first 10 lessons for \$1000." Mr. J. Gates, P. O. Box 389, Salisbury, N. C.

"Out of about twenty applicants, Mr. Blackmore, Certified Master Radio-Trician of N. R. I. and myself secured positions with Kemper Radio Corp. I am now employed as service manager of the Oakland branch." Mr. Wade W. Wightman, 847 44th Street, Oakland, Calif.

"I have successfully serviced Radiolas, Crosleys, Majestics, Bremer Tully, Orphens, Fadas, and quite a few outlandish, nameless and terrible concoctions, including three sets that were declared by quite smart men as unfixable." Mr. Louis T. Thoma, 3125 Vine St., Cincinnati, Ohio.

"I can't express myself or my feelings in words just how much I value and treasure my association with the National Radio Institute." Cliff D. Johnson, Columbia, So. Dakota.

"The study of Radio is full of thrills and adventures. Each lesson is a book of adventures, leading into the great jungle 'Radio!' The N. R. I. Radio course is wonderful and interesting." Herbert G. Faris, 1953 Ahuula St., Honolulu, T. Hawaii.

"I am getting along fine with my set-building experiments on the apparatus you furnish with the course. I set Nashville, Tenn., most every night with the one tube circuit—that's 850 miles." E. M. Mickle, Belleville, Ont., Canada.

"I have been selling Philco Radios and have made about \$750.00 in 3 months." Mr. F. H. Williamson, 1880 Portsmouth Ave., Portland, Ores.

"Before enrolling I had worked at most everything but did not seem to be satisfied with anything very long. I am now employed by a large music store handling most of the leading Radios and electric Phonographs at a fine increase in salary. Words cannot express the benefit I have received from your course." J. R. Lewis, 1154 Corona St., Denver, Colo.

"Your Radio Job and Service Sheets are a great help to me." Homer F. Saville, 503 W. Main St., Blanchester, Ohio.

"I have made about \$275 in the last three weeks during my spare time. I surely got out of the rut when I took up N. R. I. course. It is worth twenty times what it cost me. I will always be a booster of N. R. I." H. G. Perkins, Box 661, Greenville, Penna.

"I made about \$65 or \$70 in the last ten days here—not so bad for a small town." Mr. J. W. McCool, Jr., 607 Grant St., Dennison, Ohio.

"I have averaged better than \$275 per month for the last eight months." M. Eckenbeck, Skamokawa, Wash.

"I have made \$436.00 since I took up the study of radio with you." Robert J. Clark, R. F. D. No. 1, Box 390, St. Calir Shores, Mich.

"I met an N. R. I. graduate the other day. He sure gave the N. R. I. and faculty a good send-off! He advised me as you have done, to stay with it EVERY DAY and not to play off as some do! He certainly is 'tickled to death' that he graduated from your, or rather, our school. He can't be more tickled than I am to know that I am receiving the VERY BEST there is!" W. A. Higgins, 11156 Burbank Blvd., North Hollywood, Calif.

"I've been so busy servicing sets around this district that I've not had an hour to call my own for the last two weeks, and I've another busy week ahead. You know I can only service in the evenings. Since I wrote you last I have made \$91.30, so that's not doing bad for a small village and farming district. I feel sometimes that I'd like the servicing to slacken up a bit so as to give me a chance at my lessons." John Johnston, Box 240, Richmond Hill, Ont., Canada.

"Your lessons are so interesting and very clear. I am Swiss French. When I wrote to you the first time, I could speak English, but not read or write very well. Now I can. If you know some people here that would like to join the N. R. I. and are still hesitating, I should be very pleased to prove to them that the course is worth a lot more than you ask." Mr. H. Giroud, Rua Jacequay, No. 45, Sao Paulo, Brazil.

"I received my Junior Radio-Trician card and it got me a job in a large radio factory." Hymen Kushner, 718 N. St. Louis St., Los Angeles, Calif.

"I have been so busy that I haven't had time to write you but I will say that the training the N. R. I. gives a man sure is good. At the present time I am making about \$30.00 per week in my spare time and I would not sell what the N. R. I. taught me for \$10,000. My servicing is increasing by leaps and bounds. And I thank you and Mr. Dowie for all you are doing for me." F. H. Williamson, 1880 Portsmouth Ave., Portland, Oregon.

"I've averaged about \$1.75 or more for every hour I've put in so far." Jos. H. Bingham, 7259B, 2068 Merd. Ave., Ogden, Utah.

Adjusting and Neutralizing Crosley Receivers

By N. R. I. Technical Staff.

All circuits involving the neutrodyne method of balancing of tuned Radio frequency sets must take into account the fact that there is a variation in the characteristics of vacuum tubes. In the Crosley Showbox, Jewelbox, and Bandbox models, the method of balancing is by means of small adjustable condensers.

It is generally known that the balancing of the set has much to do with the amplification gain. All Crosley Radio sets are balanced in the factory, using vacuum tubes which are carefully selected and frequently checked, having average standard characteristics. Every Radio-Trician knows that it is occasionally necessary to rebalance any receiving set using the neutrodyne circuit in case the particular tubes used in that set are somewhat off of the average standard. The Crosley Gembox does not have the small variable neutralizing condensers. It utilizes what is known as the grid-to-grid method of balancing. The balance of this set depends largely upon the critical angle of the Radio frequency coils or transformers. They are occasionally adjusted in the factory for average standard tubes just as are the other Crosley models, and as a general rule, these sets will function perfectly with the average tubes with which they are equipped in the field.

However, if any set tends to oscillate with the tubes with which it is equipped, or if the set seems to lack in sensitivity, the method of adjusting the set is extremely simple to adapt it to the tubes with which it is to be used. Simply remove the lid when the set is in operation; change the coil angle by slightly raising or lowering the top of the Radio frequency coil; replace the lid; turn the dial throughout its entire range. If it oscillates at any spot, remove the lid and again change the coil slightly in the opposite direction.

A sensitivity test may then be made by tuning to a weak signal and adjusting the coil or coils until the loudest signals may be had. With the lid again replaced, again test to see if there is any point on the dial where the set oscillates. In other words, get the maximum volume

without oscillation. The movement of the coil is only very slight, probably not a variation of over one-sixteenth to one-eighth of an inch.

The most critical coil in this balancing operation is the first coil in the front of the set. The second coil is far less critical and it is seldom necessary to touch the third coil. This balancing operation is required no more frequently than is required in any other condenser balanced neutrodyne circuit. Probably the majority of sets that you receive from the factory will require no balancing, but for those comparatively rare cases where rebalancing is necessary, the above is the method of doing it.

This method is far more simple than the method of balancing by means of the condensers. It requires no tools, simply a slight bending of the coil angle by means of the fingers.

The same method outlined above can be used in adjusting the coils in the Gemchest, except that it is unnecessary to remove and replace the lid. Of course, it is needless to tell you that this affects only the three Radio frequency tubes. Sometimes the same results can be obtained by shifting the tubes in the set from one socket to another.

Wherever a set is lacking in volume or sensitivity, or if an occasional set is found which oscillates, this simple method of adjusting as outlined will work very satisfactorily. The sensitivity can be increased a great deal and any objectionable oscillations completely eliminated.

OUR COVER

Did you study the story of two N. R. I. men on the cover of this issue of the News? One man studies consistently and works hard for Success—the other one loaf the summer away. And as sure as the sun rises, one man will stay in the rut and the other one will soon be trained to earn big money in a good Radio job. The story of these two men reminds us of Aesop's fable of the lazy grasshopper and the thrifty ant. It pays big to use the growing summer months to store up Radio knowledge and Radio profits for the times ahead. If you really want success you'll lose no time deciding which example you'll follow.

Succeeding In The Service And Repair Business

By EDGAR H. FELIX



RADIO reception effected its introduction to the public through novelty and, as an indirect consequence, the organization of Radio servicing has lagged behind the establishment of Radio manufacturing and distributing. The listener no longer tinkers with his Radio receiver; it serves him as an entertainment fixture. He expects Radio entertainment and does not consider it a magic mystery which may or may not work according to his whim. Concurrent with this change of attitude on the part of the listener, Radio has advanced from a device working on millionths of watts to a power device of no small magnitude. At the same time, the Radio receiver is in a steel metal chassis with wiring and parts, once exposed, now wholly or partly concealed. Individual circuits are identified in bundles of twisted cable by a color code and routine tests appear in manufacturers' service bulletins so that

the principal troubles may be identified. From a happy-go-lucky following of a blue print or circuit diagram, Radio repairing has risen to a skilled task, requiring specialized knowledge and study beyond the realm of the average consumer.

The servicing organization, contacting with the consumer, is neither well defined nor widespread. Most dealers have a technical man who has manifold duties, including passing on the purchases of new makes or types of sets which the dealer may wish to add to his line from time to time; the installation of newly sold receivers in homes and the answering of repair calls when such sets go wrong. Radio manufacturers issue bulletins to assist the service man in installing and maintaining receivers. But we are far from the day that the consumer buys Radio service as he buys automobile service, through well established and recognized channels. Rapid progress is being made in recognizing the necessity for organized service, but most of the service work done in the home is nevertheless being done by the independent service worker who establishes his clientele by personal contact with Radio set owners.

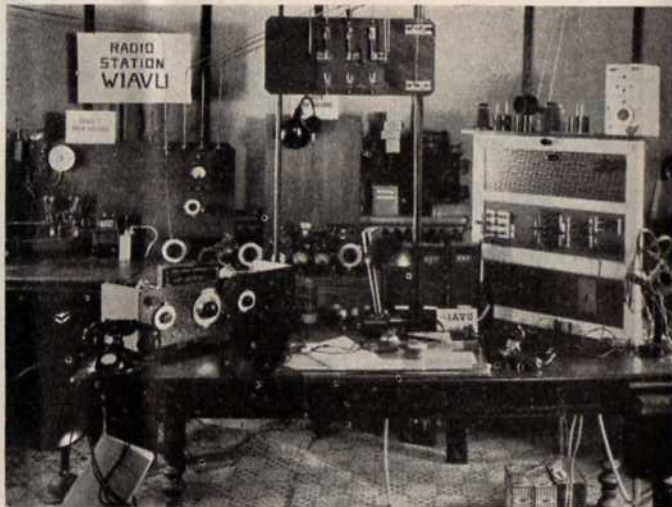
One of the reasons independent service men are so numerous is a heritage of the day when many receivers were built by specialists or custom set builders. These were independent workers, usually starting their business by building sets at night and selling them direct to consumers. It was natural that the work of keeping such sets in good order should fall to the men who built them. Being often men of considerable skill, they have

(Continued on page 19)

EDITOR'S NOTE:—The author of this article, Mr. Edgar H. Felix, is a well-known broadcasting consultant and authority on Radio allocation. He has served as a Radio Engineer for the Radio development section of the Signal Corps and later in the same military unit with Director E. R. Haas. At the present time he is Radio consultant to the National Electrical Manufacturing Association, contributing editor of Radio Broadcast and Aero Digest, as well as frequent contributor to Radio Retailing and Advertising and Selling. He is author of "Using Radio in Sales Promotion," which is accepted as the standard text book of the financial side of the broadcasting business. Mr. Felix has written this article especially for the News and we are confident that our readers will find it to be interesting, instructive and informative.

How I Built Station WIAVU

By
GRADUATE
HARRY O.
BARSCHDORFF



RADIO is one of the closest things to my life today. Radio, with all its possibilities, is intensely fascinating and it first interested me in 1923 when I was a sophomore in high school. I bought many Radio magazines and books but was not satisfied until I started my Radio course with the N. R. I. to master Radio theory and practice completely. I started while still in school and decided right then to make Radio my life profession.

After completing my N. R. I. lessons in receiving and transmitting apparatus I became intensely interested in constructing an amateur Radio station of my own. At that time I was doing quite a bit of service and repair work for several dealers so I took the profits from this work and built an amateur station in



my room at home. In February, 1928, I received my amateur license for operating and my station license.

Then I became interested in the technical end of short-wave transmitting apparatus. After carrying out some very interesting experiments I decided to do a little short-wave manufacturing work in building short-wave stations for others. This gave me a good income—I made around \$3 per hour on transmitters and \$2 per hour on receivers.

Then, in March, 1928, I became an Army amateur Radio station in the first corps area. I continued operating this station and manufacturing short-wave apparatus until June, 1928. By that time I found my present quarters a little crowded. I wanted to build a higher powered station so I could use a microphone. So in the summer of 1928 I put up a new building on Greylock Mountain—the highest point in Mass.—which was paid for entirely with the money I had made in the Radio business. I value the apparatus in this station at \$3000. All power lines, telephone, microphone and supply lines run under the ground. There is no steel conductor within 200 feet around the station. All wiring and lines to the station are lead cable. After much experimenting I have learned that the wood towers are more efficient than steel on short wave, so I am using them with my new station.

With WIAVU I have worked many stations in Hawaii, New Zealand, Australia, Juzio-Slavia and many other countries.

Radio has me in its grip. I'm going to keep up with new developments and do my best to carve out my little niche in the Radio Hall of Fame.

Editor's Note:—We are glad that Graduate Barschdorff has written this article for the National Radio News. It is a source of pride to the Institute that we can class among our students and graduates such men as Graduate Barschdorff. He has not reached the age of 21 yet, and the remarkable success he has had in Radio to date indicates that he has a most promising future. How many of you N. R. I. men have records such as his? Let us hear from you.

my room at home. In February, 1928, I received my amateur license for operating and my station license.

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Radio-Trician's Service Manual on Atwater Kent Receivers Models 40, 42 and 52

THE Atwater Kent Models 40, 42 and 52 are 6-tube single-dial A.C. receivers with a complete power unit (sealed in a single metal container) incorporated in the metal cabinet that houses the set. The power unit supplies complete filament, plate and grid voltages to the set from the 110-volt A. C. power line.

a coupling tube in order to eliminate the detuning effect of the different antenna sizes (which would otherwise disturb the synchronism of the three tuned circuits). There is a tuned detector and two stages of audio frequency amplification.

The volume control consists of a resistance connected across a section of the antenna coupling trans-

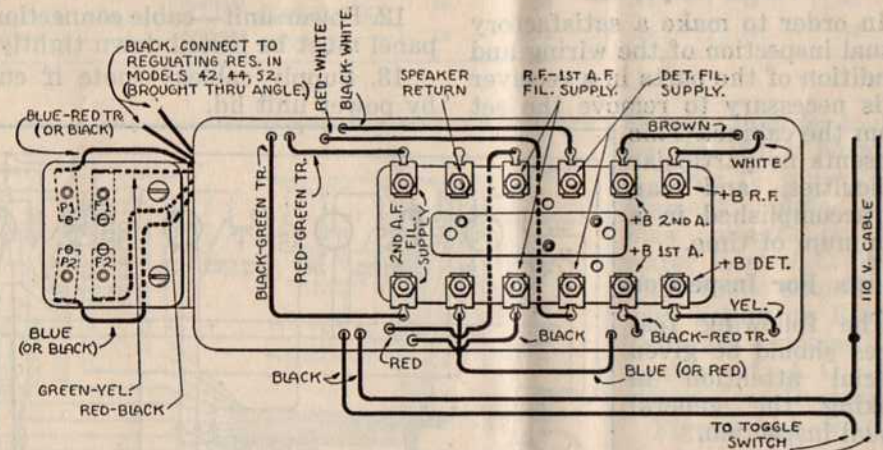


Fig. 1—View of Power Unit used in AK Models 40, 42, 44 and 52, showing connections from sealed container to panel assembly, rectifier socket and regulating resistance.

Models 42 and 52 are equipped with an automatic voltage regulator in series with one side of the A.C. line. This device is so designed that owing to the heating effect, a voltage above normal (110) will increase its resistance value, and a voltage below normal will decrease its resistance, so that the voltage across the primary of the transformer is maintained at a constant value.

The circuit of each receiver has three stages of radio frequency amplification, the first stage acting as

former. A slider on this resistance connects to the ground and the antenna is connected to one side of the resistance. By adjusting the slider, more or less of the antenna current may be shunted to the ground, thus decreasing or increasing the volume.

The schematic wiring diagram of Models 40, 42 and 52 is shown in Fig. 2. Model 52 does not have the shielded antenna lead. In that set, two 20-ft. leads are connected to the volume control, black for antenna and black-green tracer for

ground. The outside end of the antenna coupling transformer is connected to the grid contact of the first R.F. socket.

Servicing Receivers and A.C. Power Unit.

The main tests to be applied to a set when not operating properly may be classified as follows, applied in order named:

- No. 1, Visual inspection. No. 2, Continuity test, with voltmeter. No. 3, Voltage test.
- The conducting of these tests will now be outlined.

Visual Inspection

In order to make a satisfactory visual inspection of the wiring and condition of the parts in a receiver it is necessary to remove the set from the cabinet. This presents no particular difficulties, and can be accomplished in a minimum of time.

Points For Inspection

The following features should be given special attention in making the general visual inspection.

1. Soldered joints—examine for firmness. A poor physical joint means a poor electrical connection. Note especially ground lug connections.
2. Screws, bolts and nuts—must be all tight.
3. Insulation on wiring—must be perfect and not cut or frayed through where it passes metal edges of tubes, contacts, etc.
4. Tube socket fingers—should be clean and tight.
5. Switches—switch blades should be clean and make good contact.
6. Dials—should not scrape on panel.

7. Grid resistances—note if intact and tightly riveted on.

8. R.F. transformers—examine for loose or damaged coils, or bad connections at terminals.

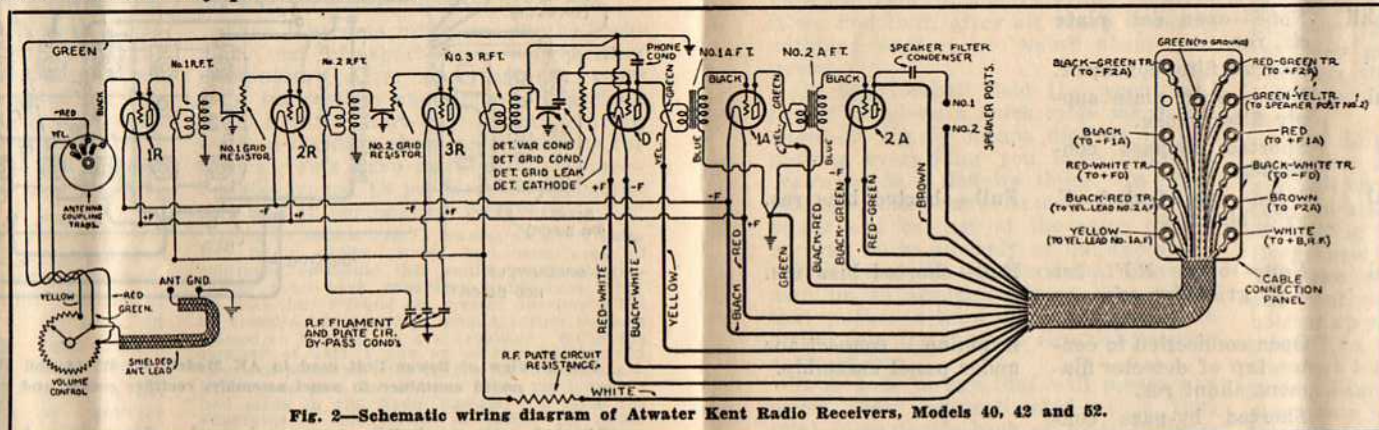
9. Variable condensers—check for foreign particles between plates and note spacing between rotary and stationary plates.

10. Rheostats or volume control—must operate smoothly.

11. Power supply cable—note condition of insulation on lead and condition of terminals at power end.

12. Power unit—cable connection panel must be bolted down tightly.

13. Supply cables—note if cut by power unit lid.



Continuity and Voltage Test

After the receiver has been thoroughly checked by visual inspection, the next step toward locating possible defects will be to apply the series of circuit continuity tests. These tests should be made with a low range D.C. voltmeter, zero to 50 volts, connected in series with a 45-volt B battery.

It will be necessary also to check the voltages supplied to the various circuits by the power unit.

TABLE I
VOLTAGE TEST CHART—ATWATER KENT A. C. SETS
(Measurements made while set is in operation)

Fil. Voltages (Use 0-5 AC meter)	Test Terminals (Colors of cable leads)	Model 36	Model 37	Model 37	Model 38	Models 40, 42, 44 and 52
		Model 37 to Serial No. 1,265,000	Serial No. 1,265,001 to 1,385,000 and up Approximate Voltage	Serial No. 1,385,001 and up		
Detector	Red-white tr. to black-white tr.	2.3	2.2	2.3	2.3	2.35
R.F. & 1st A.F.	Red to black	1.4	1.45	1.3	1.3	1.45
Power (2nd A.F.)	Red-green tr. to black-green tr.	4.8	4.7	4.8	4.8	4.8
Plate Voltages (Use high resistance DC meter)						
Detector	Red-white tr. to yellow	30	25	30	48	44
R. F.	Red to any R.F. tube "P" contact (thru eyelet)	135	165	170	180	160
1st A.F.	Red to black-red tr.	110	135	160	160	155
Power (2nd A.F.)	Red-green tr. to brown	120	145	175	180	180
Bias Voltages (Use high resistance DC meter)						
On Power tube	F to G (socket 2A, thru eyelets)	25	30	45	45	45
On R.F. and 1st tubes	F to G (socket 1A, thru eyelets)	12	12	13	13	13

of tubes in order to determine if it is normal.

Table I gives the filament, plate and bias voltages on Atwater Kent A.C. sets. This table should be very helpful to Radio-Tricians servicing all models of A.C. Atwater Kent Receivers.

Figure I shows the connections from the power unit used in models 40, 42, 44 and 52. This view shows

A high resistance voltmeter should be used for testing B voltages, one having several ranges, such as 0 to 10, 0 to 100 and 0 to 200, any one of which can be used by changing connections on the meter.

For testing filament voltages on the tubes, a low range A.C. voltmeter is used having a scale reading of 0 to 5 volts.

A milliammeter can be used for checking the amount of plate current being drawn by one or a group

the approximate position of leads from the field container. In Models 40, 42 and 52, a hole is cut in the rectifier socket mounting angle and the two black leads are brought up through the hole and connect to the regulating resistance, which is mounted upright at the left hand end of the field container.

Table II gives the continuity test for power unit used in Models 40, 42, 44 and 52. For following test, remove table connection panel from unit.

