Radio Retailing

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

March 26, 1929

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 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,

Ovid Blasco
Assistant Editor

May, 1929

National Radio News

Published in the interest of N. R. L. students and graduates, by the NATIONAL RADIO INSTITUTE

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J. E. SMITH, Publisher; E. R. HAAS, Editor

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NATIONAL RADIO INSTITUTE

Washington, D. C.

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-round 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. But 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 $29,000,000 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 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 promotions, group 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. L. 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 so 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

Editor's Note—Be sure and read the letter from Mr. Risco reprinted on the opposite page. As Assistant Editor of a large Radio Magazine, Mr. Risco knows the Radio situation from all angles. He agrees with the views of both the Editor and the Assistant Editor of Radio that the remaining months of 1929 will be the best yet for his profits in Radio Sales and Service.
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 era 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 9 p.m. They include Secretary of Treasury Mellon, Secretary of State Stimson, Senator Moses of New Hampshire, Congressmen Longworth of Ohio, and Congressmen 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," said Mr. E. H. Williamson, 1880 Portsmouth Ave., Portland, Ore., "I would not part with my course for $100,000, and I tore up the Menkes-Bach Agreement the first month I enrolled." Stanley E. Campbell, Rt. 1, Box 199, Petaluma, Calif.

"My employer wrote me requesting a catalogue and some information about your course and I was considering taking some course in Radio. Although he is a graduate of another school, he recommended your course to me, because he said he thought you gave the most thorough training to be had in this line." Harry L. Nourse, 6 Mapleton Radio Shop, Mapleton, Iowa.

"I would not sell my knowledge gained from first 10 lessons for $100." Mr. J. Gates, P. O. Box 389, Salisbury, N. C.

"Out of about twenty applicants, Mr. Blackmore, Certified Master Radio-Technician 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, Crossleys, Majestes, Bremer Tully, Orthorns, Fadas, and quite a few outlandish, nameless and terrible creations, including three sets that were declared by quite smart men as unfixable." Mr. Louis T. Thomas, 3123 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 adventure, leading into the world of "Radio!" The N. R. I. Radio course is wonderful and interesting." Herbert F. Farin, 1933 Ahluna St., Honolulu, T. Hawaii.

"I am setting along fine with my set-building course on the apparatus you furnish with the course. I live in Nashville, Tenn., most every night with the tube circuit—that's 438 miles." E. M. Mickle, Belleville, Ont., Canada.

"We have been selling Philco Radios and have made $1500 in two months," said Mr. F. H. Williamson, 1880 Portsmouth Ave., Portland, Ore.

"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 Gower St., New Westminster, B. C.

"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 $75 in the last three weeks during my summer vacat ion. I surely got out of the rot 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 $55 or $70 in the last ten days here, not so bad for a small town." Mr. J. W. McCool, Jr., 667 Grant St., Dennison, Ohio.

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

"I have made $456.00 since I took up the study of radios with you." Robert J. Clark, R. F. D. No. 1, Box 290, St. Calie 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 isn't more tickled than I am to know that I am receiving the very best there is!" W. A. Higgin, 1115 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 made $93.30, so that's not doing bad for a small village and small district. I do believe 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 216, 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 hesitant, I should be very pleased to prove to them that the course is worth a lot more than you ask." E. M. Mickle, Belleville, Ont., Canada.

"I received my Junior Radio-Technician card and it put me a job in a large radio factory." Henry Kusheher, 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. gave me is well worth the present time I am making about $30.00 per week in my space this time and I would not sell what the N. R. I. taught me for $10,000. My servicing is increasing every day and my wages, and I thank you, and Mr. Dewes for all you are doing for me." F. H. Williamson, 1889 Portsmouth Ave., Portland, Ore.

"I've averaged about $1.75 for more every hour I've put in so far." Jos. H. Blumgart, 27598, 2068 Mend. Ave. Oxnard, Utah.
Adjusting and Neutralizing

Crosley Receivers

By N. R. I. Technical Staff.

All circuits involving the neutral dyne method of balancing of tuned Radio frequency sets must take into account the fact that there is a variation in the characteristics of the 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 re-balance any receiving set using a neutral dyne circuit in case the particular tubes used in that set are somewhat off 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 is one to lack in sensitivity, the method of adjusting this 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 neutral dyne 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.

The 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 more convenient if this affects only the three Radio frequency coils, 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 by a great deal and any objectionable oscillations completely eliminated.

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 he must work on to the whim. Concurrent with this change of attitude on the part of the listener, Radio has advanced from a device working on month-months of watts to a powerlessness 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 18)
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 $5 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 Greatlock 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 covered. 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, Japan, Brazil and many other countries. Radio has me in its grip. I'm going to keep up with new developments and do my best to come 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.

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.

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 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-
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:


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.

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.

### 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

<table>
<thead>
<tr>
<th>Voltage Test Chart—Atwater Kent A.G. Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Measurements made while set is in operation)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power Unit</th>
<th>Test Terminals (Colors of cable leads)</th>
<th>Model 36 Type Serial No. 1,005,001 and up Approx. Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detector Red-white tr. to black-white tr.</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>R.F. &amp; 1st A.F.</td>
<td>Red to black &amp; Red-green tr. to black-green tr.</td>
<td>1.4</td>
</tr>
<tr>
<td>Power (2nd A.F.)</td>
<td>Plate Voltages (Use high resistance D.C. meter) Detector R.F.</td>
<td>1.6</td>
</tr>
<tr>
<td>Bias Voltages (Use high resistance D.C. meter)</td>
<td>R.F.</td>
<td>1.65</td>
</tr>
<tr>
<td>On Power tube</td>
<td>1st A.F.</td>
<td>160</td>
</tr>
<tr>
<td>F to 0 (socket 2A, thru eyes)</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>On R.F. and 1st tubes</td>
<td>160</td>
<td>160</td>
</tr>
</tbody>
</table>

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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 of tubes in order to determine if it is normal.

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

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

<table>
<thead>
<tr>
<th>Test</th>
<th>Correct Reading</th>
<th>Wrong Reading Indicates</th>
<th>Remarks and Further Possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Across 2nd A. F. filament Supply.</td>
<td>Full</td>
<td>None—open 2nd A.F. fil. winding and open 2nd A.F. filament shunt resistance.</td>
<td>Nearly full—open filaments winding. (Unsolder one fil. winding connection and test winding and fil. shunt resistance separately.)</td>
</tr>
<tr>
<td>Across Detector Filament Supply.</td>
<td>Full</td>
<td>None—open det. fil. winding and open detector filament shunt resistance.</td>
<td>Nearly full—open filament winding. (Unsolder one fil. winding connection and test winding and fil. shunt resistance separately.) Full—shorted speaker choke.</td>
</tr>
<tr>
<td>From Ground to +B Detector.</td>
<td>None</td>
<td>None—open 1st A.F. plate cir. res.</td>
<td>Shorted by-pass condenser.</td>
</tr>
<tr>
<td>Ground.</td>
<td>None</td>
<td>None—open plate supply filter choke.</td>
<td>Full—shorted bias res.</td>
</tr>
<tr>
<td>F1 to P2 (on Rectifier Tube Socket).</td>
<td>Nearly Full</td>
<td>None—open high voltage sec. winding.</td>
<td>Inspect AC cable and switch leads for accidental grounds.</td>
</tr>
<tr>
<td>Each Terminal of A.C. Plug.</td>
<td>None</td>
<td>None—open high voltage sec. winding.</td>
<td>Grounded primary of power transformer.</td>
</tr>
<tr>
<td>Other Tests</td>
<td>Full</td>
<td>Open connection to center tap of detector filament shunt res.</td>
<td>Examine connections under panel assembly.</td>
</tr>
<tr>
<td>F1 to P2 (on Rectifier Tube Socket).</td>
<td>Full</td>
<td>Full—shorted bias res.</td>
<td>Examine connections under panel assembly.</td>
</tr>
<tr>
<td>Grounded primary of power transformer.</td>
<td>Full</td>
<td>Open primary of transformer or open cable or switch leads.</td>
<td>Open primary of transformer or open cable or switch leads.</td>
</tr>
<tr>
<td>Open rectifier filament winding or connections.</td>
<td>Full</td>
<td>Full—shorted bias res.</td>
<td>Full—shorted bias res.</td>
</tr>
<tr>
<td>Open connection to center tap of 2nd A. F. filament shunt resistance.</td>
<td>Full</td>
<td>Open primary of transformer or open cable or switch leads.</td>
<td>Open primary of transformer or open cable or switch leads.</td>
</tr>
</tbody>
</table>

**Will Power Carries a Punch**

By DIRECTOR E. R. HAAS

A GREAT deal is written and spoken about will power. Some try to leave the impression that it is a very mysterious, elusive force. Others wrap it up in all sorts of technical phrases and hint that it is a God-given power.

But when we strip all of these high sounding phrases from it and carefully analyze it we find that, after all, there is really nothing magical or weird about will power.

On the football field the word “will power” is given a much more masculine name—it simply means digging in and putting everything you have behind a desire to do a definite thing. In other words, a man can’t have a strong will power and be lazy at the same time—nor can he be slovenly or indifferent.

Will power is the force that drives a man on to accomplishment—the power that pushes a man on from smaller to bigger jobs the same as electricity drives a street car.

It is safe to say that will power has never been underestimated—it is that vital force that’s back of most successful men today. All about us we see its results—big jobs done by men who had the will power to win.

We see men handicapped by the lack of sight or hearing who hold some of the most responsible positions. For instance there is the late Charles P. Steinmetz, the hunchback, who dogged his way to the top in the electrical world and became the recognized electrical wizard of the day. It is needless to mention any number of such men whose chief asset was an undying, irresistible will power—the will to do, the will to win!

Wishing will never do the job that will power only can do! You must be up and doing. Carry out your plans—start working on that job you have had in mind for sometime—finish up that lesson you’ve let slide for awhile.

If you’ll notice—it’s the fellow with the will power to improve himself by work and study that gets first consideration when the job higher up is to be filled. It’s only natural that he should. Employers are looking for men who can do a job better than the average man and who has the will power to keep behind a plan or idea until he puts it across. Furthermore, that kind of fellow just naturally radiates enthusiasm and quickly develops into executive material —acquires the ability to direct the work of others.

It’s true that every one does not have strong will power, and it’s because of this very fact that the really good jobs that pay good money are hard to fill. They are the jobs waiting for men who will step in, and do the work expected of them.

This desirable quality of will power can’t be acquired overnight. Don’t say, "I’ll wait until I finish my training and then I’ll start doing things right." Start developing that power in you right now! Every new lesson is a challenge to you. You can weaken, lay the lesson aside and lose your time away or you can bolster up your courage, get the old “will power” to working and smash through the next lesson with the force of a battering ram. And if you’ll do that to every new job you tackle you’ll stand out head and shoulders above the crowd.

I say, make a clean-cut decision and put plenty of pep and energy—will power—behind your decision or plan and you’ll develop a power that does not recognize the possibility of failure. You have will power—don’t let it lie latent—use it.

Success or failure in business is caused more by mental attitude than by mental capacities.—

Walter Dill Scott.

Theodore Roosevelt once said, "If a man wants a thing bad enough to work hard enough, he is bound to get it."

"A man's accomplishment is not limited to the mere success of his abilities, but to the extent of his persistence, his perseverance. For, nine times out of ten, success is merely a matter of keeping at some one thing until you win success at it."
Lands Firestone Job

Dear Mr. Smith:

I have the pleasure of advising you that I have accepted a Radio Job with the Firestone Tire and Rubber Company at Akron, Ohio, in their short-wave telegraph department—also in their Radio research department. This pays me $200 per month to start with. As my plans were laid more than two years ago when I started your course, to try my best to get some place in the Radio game, I now see them materializing. It looks like my chance—"go from here" in the Radio game. I thank you for your part in my preparation. It is now possible that I may some day be able to visit you in Washington.

Tell "Chief" Dowie about this too—you both have certainly been a great help to me. Accept my regards and my thanks.

NORMAN R. HOOD, 1022 S. Ash Street, Casper, Wyoming.

Congratulations, Graduate Hood—and good luck! You have made a splendid start. Come to see us the first chance you get.

Editor.

1929 REGULATIONS GOVERNING THE ISSUANCE OF RADIO OPERATOR'S LICENSES

1. Commercial extra first class—To be eligible for examination, an applicant for this class of license must have held a commercial first-class license and must have been actually engaged as an operator at stations open to public correspondence for at least 18 months during the 2 years previous to his application. A speed in transmission and reception of at least 30 words per minute, in code groups, Continental Morse Code, and 25 words per minute, in plain language, American Morse Code, 5 characters to the word, must be attained. The questions in this examination will cover the same subjects required for a commercial second-class license but considerably wider in scope.

2. Commercial first class—To be eligible for examination, an applicant for this class of license must have held a commercial first-class license and must have been actually engaged as an operator at stations open to public correspondence for at least 12 months. Applicants for this class of license must pass code tests in transmission and reception at a speed of at least 20 words per minute in Continental Morse Code, in code groups, and 25 words per minute in Continental Morse Code, in plain language (5 characters to the word). The practical and theoretical examination will cover the same subjects as required for the commercial second-class license.

3. Commercial second class—Applicants for this class of license must pass code tests in transmission and reception at a speed of at least 15 words per minute in Continental Morse Code, in code groups, and 20 words per minute in Continental Morse Code, in plain language (5 characters to the word).
Applying Ohms Law to "B" Power Dividing Resistances

Chief Instructor J. A. Dowie

The relation between volts (pressure potential or electromotive force) amperes (current) and ohms (resistance) from which any one of the values may be found when the other two are known, is called Ohms Law. The rules based on this law are very useful in Radio, therefore it is advisable for students to become familiar with their application to practical problems.

Fortunately, Ohms Law is very simple, and a common school arithmetic (ordinarily multiplication and division) is sufficient to work out problems which may arise under it. It may be stated forward or backward; and in its three formulas, will give the rules: (1) for determining the voltage "applied to" or "across" or "dropped in" a circuit when both the flow of current and the resistance in the circuit are known; (2) for determining the flow of current when both the voltage and the resistance are known; and (3) for determining the resistance when both the voltage and the current flow are known.

The voltage or potential, as it is sometimes called, existing in an electrical circuit is equal to the product of the current passing through the circuit by the resistance in the circuit. As the potential or pressure is expressed in "volts," the current in "amperes" and the resistance in "ohms," we may say that the voltage equals the product of the amperes multiplied by the ohms. This is written as our first formula.

\[ E = I \times R \]  

The above formula (1) is useful when we wish to know the voltage and know the current and the resistance in the circuit. We may turn this formula backward in two ways. To determine the current when the applied voltage and the resistance are known, we use it in this form—

\[ \text{Current} = \frac{\text{voltage}}{\text{resistance}} \]

\[ A = \frac{E}{R} \]

Or, supposing that we know both the voltage and the amperage, we can determine the resistance by dividing current into voltage:

\[ \text{Ohms} = \frac{\text{volts}}{\text{amperes}} \]

This is the third formula:

\[ R = \frac{E}{I} \]  

In designing a voltage dividing resistor for any power unit, it is first necessary to know the exact voltages and the amount of current which will be required by a receiving set which is to be operated from the power unit. This is absolutely necessary; as any change in current will produce a different voltage drop, with the result that the tubes of the receiver will not be operated at their rated voltages.

The data supplied by the manufac-
Figuring the Resistances

We are now in a position, after studying the previous paragraphs, to determine the current and voltage demand on the B power unit. Let us consider a 6-tube receiver using three 220 radio frequency tubes, a 227 detector tube, a 226 audio frequency tube, and a 171 power tube.

**TABLE I**

<table>
<thead>
<tr>
<th>Type Tube</th>
<th>Plate</th>
<th>Grid</th>
<th>Plate</th>
<th>Grid</th>
<th>Current (m.a.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power tube 171</td>
<td>160</td>
<td>40</td>
<td>160</td>
<td>40</td>
<td>4.4</td>
</tr>
<tr>
<td>A.F. tube 226</td>
<td>99</td>
<td>4</td>
<td>99</td>
<td>4</td>
<td>2.6</td>
</tr>
<tr>
<td>Detector tube 227</td>
<td>43</td>
<td>3.6</td>
<td>3.6</td>
<td>43</td>
<td>0.3</td>
</tr>
<tr>
<td>3 R.F. tubes 226</td>
<td>90</td>
<td></td>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Total)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>34.4 milliamperes</td>
</tr>
</tbody>
</table>

Current coming from the power unit has two well-defined paths to follow. Twenty milliamperes will be delivered to the plate of the power tube, to be returned to —B; the rest of the current will flow through R1. At the 90-volt section, the plate current of the A.F. and R.F. tubes will be drawn. A total of 11.9 m.a., to be returned to —B; the rest of the current will flow through R2. At the 45-volt terminal, 2.5 m.a. will go to the detector tube and the rest will flow through R3.

In addition to the current required by the receiver some current greater than 34.4 m.a. must flow into the output resistor, since there must be some surplus current left to flow through R3 to establish a voltage across it. Taking a value of 0.3 m.a., the current from the power tube and the output will add to a total of 34.7 milliamperes.

Thus the total current, 34.7 milliamperes, must be delivered by the power supply for the plate circuits of the tubes.

In calculating the values of resistances necessary for a B power unit, it is only necessary to keep clearly in mind just how the direct currents are to be distributed. Consider the voltages and currents as outlined in Table I. Let us picture just where these currents are going. Figure 1 pictures the distribution of currents from the B power unit to the set. At the 180-volt terminal point on the voltage divider, we are going to draw off 90 m.a. for the plate of the 171 power tube. Also, at the 90-volt terminal, we shall take off enough current for the plates of the R.F. and A.F. tubes.

Succeeding in the Service and Repair Business

(Continued from page 7)

been employed on a broader scale by theinecraftsmen of those who have bought custom sets, with the consequence that many an independent service business has been built up from small beginnings. At first, the worker confined himself to night work in Radio repair, earning his living during the day by some other trade or profession. Since the overhead of receiving sets are not high, it is often to be at home at night, this permits of building up a substantial volume of business, often enough to justify giving up regular employment during the day and concentrating thereafter on service work.

As I have indicated, most of the independent service men have learned their Radio repairing by practical experience. Experience depends on repetition and where the troubles encountered are not unusual, the school of hard knocks turns out useful service men. But, more often than not, such instruction is given on a difficult or unusual case, or one involving a new technique introduced by advances in the Radio art. On the other hand, he who has a general grounding in the history of the art and a study of practical service methods through a reputable school is more fully prepared to meet the unusual and the unexpected. The addition of such elements as power packs, dynamic speakers, alternating current transformers, shielded cathode, single diode control and power tubes make guess-work methods uncertain and unreliable.

There are a few outstanding instances of specialized service businesses in the United States which have grown to consider considerable proportions, employing as high as twenty to thirty men and meeting a good part of the service needs of large communities. These are, however, only the modest beginnings of what we may look forward to within the next few years. A new situation is gradually arising. Most of the receivers in service up to three or four years ago were in the hands of persons having a special aptitude for electricity and a familiarity with Radio sets, manufacturers of their own receivers or by technical study of the subject. With the coming of the modern manufactured receiver, operating directly from the light socket, however, millions of receivers have been put in daily use in the homes of persons totally unskilled in the Radio art. As these receivers become older, they will naturally require repair service and the calls upon existing service organizations will multiply rapidly. A Radio receiver is remarkable in the small amount of service attention which it requires, but many components are far sighted enough, probably because of their automobile experience to realize that greater satisfaction will be gained if their sets are periodically examined by experienced service men.

The man who would enter the Radio industry via the service route, either as an employee of a dealer, jobber or manufacturer, or as an independent service man, should overlook no opportunity to become proficient in Radio theory and practice under circumstances which do not jeopardize his reputation as a reliable and efficient worker. It must be realized that to succeed in Radio service, as in anything else, the worker must be skillful, efficient with his task, careful, and take no careless waste of time. This does not permit of protracted experiments in the owner's home that requires rapid diagnosis and speedy repair. If the service man must fumble around and appear to waste considerable time, searching for the actual cause of the trouble, he is not likely to find his business growing by word of mouth which recommends his service to a business which shows constant gain.

Applying Ohms Law to "B" Series

(Continued from page 18)

Power Dividing Resistances

(Continued from page 19)

of 15 m.a. to flow through R3, will give a value of resistance for that section, which will not be too large and will be suitable for the circuit design.

We have established the amount of current to be drawn from the filter circuit which will be 34.4 m.a. for the set and 18 m.a. for the resistor, giving a total of 42.4 m.a.

Now that we have studied the distribution of current in a power unit, the voltages obtained are determined by the familiar Ohms Law. E = I x R, where E is expressed as a function of the current, and the resistance. This gives us an accurate and working formula for calculating the resistance, R, required for the power unit design. E is in volts, I is in amperes, and R is in ohms. A milliamper is one-thousandth of an ampere, or expressed in figures, is equal to .001 ampere. Thus, for the values of voltages and currents outlined above, the following resistance values can be calculated:

**TABLE II**

<table>
<thead>
<tr>
<th>Resistor (R)</th>
<th>Voltage Across R (V)</th>
<th>Current Through R (A)</th>
<th>R (Ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>90</td>
<td>20.4</td>
<td>3.69</td>
</tr>
<tr>
<td>R2</td>
<td>54</td>
<td>20.4</td>
<td>2.63</td>
</tr>
<tr>
<td>R3</td>
<td>12</td>
<td>15.4</td>
<td>0.80</td>
</tr>
<tr>
<td>R4</td>
<td>44</td>
<td>15.4</td>
<td>0.30</td>
</tr>
<tr>
<td>R5</td>
<td>44</td>
<td>15.4</td>
<td>0.30</td>
</tr>
</tbody>
</table>

The resistors R4 and R5 are for obtaining the "Q" biasing voltage and the current supplied through each of these resistors is equal to the total current in the set, either the flow for 0.84 m.a. milliamperes, as no "Q" current is drawn through the tubes. The easiest way of determining the resistance through the above table when we are dealing with milliamperes is to multiply the volts by 1000 and divide by the milliamperes. For example, 0.84 multiplied by 1000 is equal to 0.840: 0.840 divided by 26.4 is equal to 0.032.

In actual practice it will usually be found impossible to buy resistors having the exact resistance values required. However, the resistance of each unit need not be exact and the standard resistors having the nearest values may be substituted.
Left: Herbert Hoover, Jr., son of President Hoover, who holds the position of Communication Specialist for the Western Air Express. Realizing the opportunities in the growing field of Radio in Aviation, young Hoover left his position as instructor at Harvard University recently to take up this new position. Rapid developments are being made in this new field with the installation of many beacon control stations and Radio equipment at airports and in the cabins of planes. This means new positions being opened up in this fascinating and profitable branch of Radio.

Something New in Radio for Hotels and Apartments

Many hotels and big apartments are installing a master receiver in the lobby and a loudspeaker in each room. Here are two pictures showing the system recently installed in Canterbury Court in Chicago. The office, reception room and 181 apartments are equipped with loudspeakers. The master set installed in the lobby plays five wave-lengths over 184 outlets. Any apartment may play any of the five stations at any time without cross-talk. There is a local intensity control at each speaker, and the set is automatic. The volume of the master set is reduced late in the evening for 24-hour service. The system is so balanced that the intensity of sound remains the same whether they are all playing on one station or divided among all stations. Each radio frequency unit in master set is filtered for a particular wave-length which results in finest reproduction.

Upper picture shows Mrs. Carroll Pyne looking over the master set. Picture at left shows Mrs. Belle Barnett and Mrs. Pyne turning on the control which operates loud speaker in upper right-hand corner.