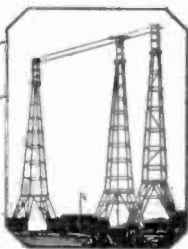


NATIONAL

RADIO

NEWS



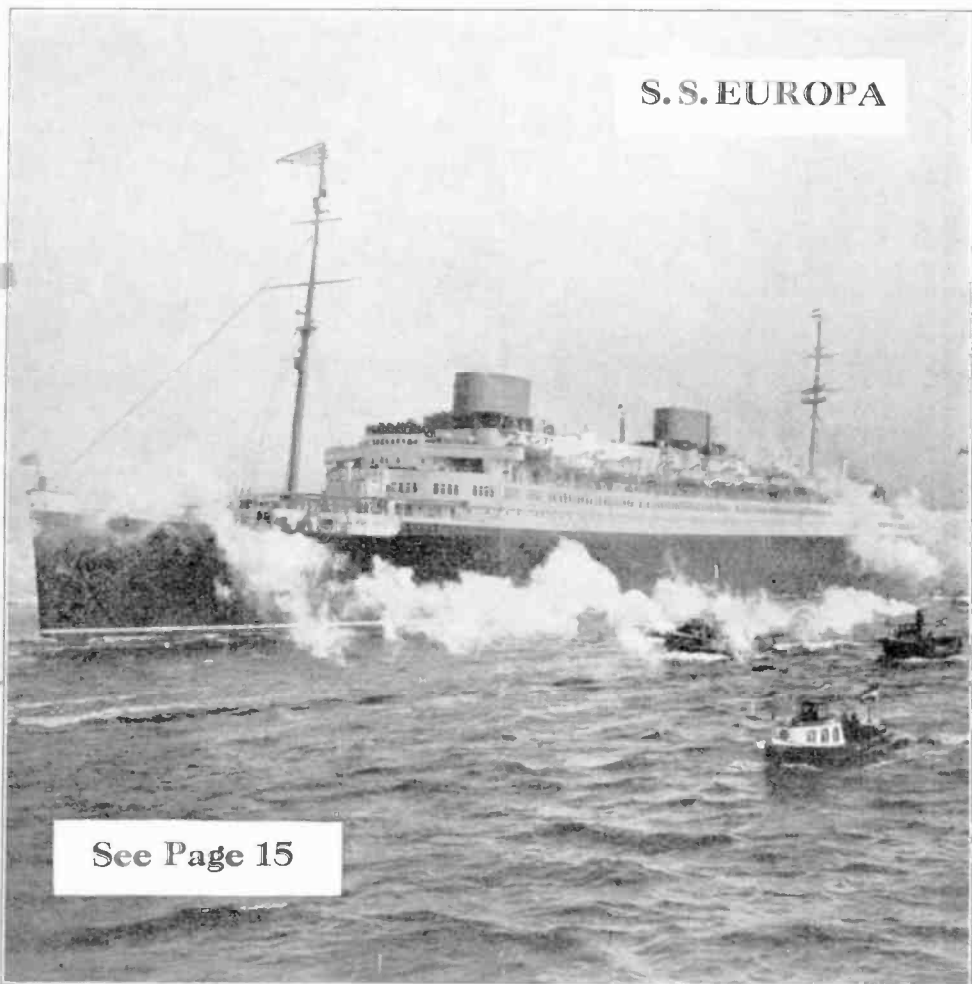
FROM N. R. I. TRAINING HEADQUARTERS

VOL. 2—NO. 12

WASHINGTON, D. C.

JULY, 1930

S. S. EUROPA



See Page 15



J. E. SMITH

The PRESIDENT'S PAGE

ONE hundred and fifty-four years ago the fourth of this month, a great paper was signed to make all men equal —to raise the lowly to the plane of the lordly. Yet this Declaration of Independence which marked the birth of the United States did not create all men equal, but rather gave all men equal opportunities.

Every citizen of the new-born republic was given a chance but they were required to carve their own opportunities to succeed. Hardships, dangers, disappointments were faced — overcoming many and overcome by a few. Those who overcame these difficulties grasped rich rewards and founded some of the greatest fortunes existing in America today. Those who were overcome are forgotten. Who they were, what they did, is not known. They have simply dropped out of the picture.

The same chance that was given every man back in July 4th, 1776, is open to every fellow today—the only difference is that hundreds of opportunities now exist which were then unknown. No longer are the musket and sabre the necessities of preservation—that day has passed. Today it's training and determination which decrees whether the future will find us forgotten or famous; in poverty or wealth. Today's history was made by the men whose untiring efforts and sacrifices created this nation out of a wilderness. Tomorrow's history will be made by the men of today possessing courage, ambition, and training.

I am certain that N. R. I. men are going to be among those counted on Radio's Honor Roll. Already many students and graduates are making records for themselves—many more are preparing right now to follow in their footsteps. The future is indeed bright for these fellows. I am proud of every one of them.

IT is a long jump from 1776 to 1930 as time is measured. It is even a greater one when viewed in the light of the many advances made by science.

1930 TO ? Had Washington predicted that in less than two hundred years carriages would run without horses; that man would talk with his neighbor hundreds of miles away; that light would come from glass tubes; that man would fly; that pictures would be flashed from Europe to America—had he even mentioned these common facts of today, he would not have been elected President. Instead, people would have thought him crazy and probably confined him in a mad house.

Yet the developments made from 1776 to 1930 are nothing to those which will be made during the next few years. Radio—the latest and greatest of all new developments is still in its infancy. Music broadcasted today; electric power tomorrow. Sound today; synchronized sight and sound tomorrow. More than 300,000 men employed in Radio today; 3,000,000 will be needed tomorrow. A Billion Dollar industry today; a \$10,000,000,000 one tomorrow. The future has never been so bright and the men who are tying up with the rapidly advancing Radio industry are staring real opportunities in the face.

N R. I. is growing right along with Radio. Right now carpenters, plumbers, masons, and other workmen are adding a new story to N. R. I. headquarters. All

NEW ADDITION this activity naturally creates some confusion but we are doing the very best we can to see that no hitches arise in giving our students good service. Should, by any chance, our reply to one of your letters be delayed, or a lesson late in reaching you, bear with us during the time this construction work is going on.

"ONE TIMERS"

By John Howie Wright

(Editor, Postage and The Mailbag)

PERSISTENCY is a blue-white flawless diamond. Show me the man that is persistent and I'll show you either a present success or a future success. I am sick and tired of the "one timers"—the men who tremble and shake before they try anything; then say, "I will try anything once," knowing in their shaky hearts they won't have the nerve to try again. Their cylinders are full of carbon. Their valves need grinding. They can roll down hill but they won't fight the uphill battle. Give me the man who works out a good idea, shoots out his lower jaw, sets his teeth, and tackles the work with persistency. We once knew a business man who had the tenacious persistency of a whole litter of year-old bull pups. He knew not failure. Another business man of the "Jelly Fish" family once said to him: "It is a good idea but you will never put it over. You are butting up against a stone wall." "I will show you," said B. P. Persistency, "I will go over the wall or under the wall; if I cannot do either I will go through it"—and he did.

The "one timers" are everywhere. They are producers of many popular melodies such as "I Never Had a Chance," "Opportunity Came His Way," "He Was Born with a Silver Spoon," "He Is a Lucky Dog," etc., etc. Luck be hanged. Luck is not a patented prescription. It has three simple ingredients—think, work, stick. A man who will think; a man who will work; a man who will stick, can accomplish anything. If a man applied to me for a position and wrote but one line—"I am a thinker, a worker and a sticker"—that would be enough. Let him be long-haired or bald; lean or fat; short or long; blonde or brunette; Jew or Gentile, I care not. He has the pass-words.

The fellow who studies a few lessons and quits is a "one timer." The men who "think, work, stick" are the All-Timers.

—J. E. S.



John Howie Wright

You all know the "one timers." Those who try one cigar and knock it for the rest of their lives, forgetting that their liver was upside down when they smoked it.

Those who try one make of tire and knock it for the rest of their lives, forgetting that no tire can stand car tracks, car switches and 60% inflation. Those who advertise once in a newspaper or magazine and never advertise afterwards, forgetting that their copy might not have been well written. And, I could go on indefinitely.

They are legion, these "one timers," and they are all failures. I defy anyone to name a success in anything who was a "one timer." Just stop and think. Can you recall a single successful man of your acquaintance who lacked persistency? Almost any business is a good business. Nine out of ten business men fail because they are "one timers." Some men think but don't work. Some men work but don't stick.

The happy combination is think, work, stick. There are thousands of towns in the United States with a population less than 500. We know half a hundred business men who could start a six-story department store in practically any one of them and make it pay. Why? They are not "one timers." They have developed their Bump of Persistency to the nth power. Try it. It's wonderful. Don't forget this—Persistency can be developed just as a muscle or a brain.

What The Well Equipped



By JOSEPH KAUFMAN
Chief of N. R. I. Consultation Staff

Every Radio-Trician is eventually faced with the question—what tools and testing equipment shall I buy? A wise selection of equipment is a good investment while pitfalls exist for those who waste money in elaborate apparatus which is seldom used. Mr. Kaufman gives valuable suggestions on what to buy and when to buy it; he tells you of the most necessary tools and equipment for the service man.—Editor.

New students of Radio who have never done service work should consider the necessary tools as a "stock in trade" in actually rendering service. While it is wise to defer purchasing the more expensive equipment for repairing complicated electric receivers until the student has studied at least 20 or 25 lessons when he will have a definite mental picture of the actions which take place in the receiver, it is advisable that he actually prepare himself as quickly as possible to do this work with all the diligence and thoroughness of a master mechanic.

Simple Tools

It is not simple to solder two wires, a wire to a lug, or make a neat connection unless one is trained to do it and unless one has the proper tools to do it with. A set of simple but necessary tools should contain 1, 2 or 3 screw-drivers, one for very small screws, one for the larger screws, and the largest one for wood screws. Several pliers are desirable, among which are: an electrician's pliers with side cutters, a combination nickel plated plier which can be expanded to take large nuts or bolts, a diagonal plier to clip wires lying close to the subpanel or to the side or end panel. The hook nose plier is also desirable for certain work. Many Radio-Tricians would never be without a Spintite wrench to use with the 6-32, 8-32 and 10-32 nut as it does a better job than ordinary pliers, without butchering the appearance of the receiver.

An electric soldering iron is about the most valuable tool of the Radio-Trician. An alcohol torch is, of course, a valuable

device to use when necessity requires but practically all the work can be done with the electric soldering iron. A good iron is an investment that will give the best service in the long run.

When additions or corrections are being made or when the Radio-Trician is asked to build a device, a hand drill and set of steel drills are unquestionably handy tools. Reamers, too, can be inserted into a hand drill and used to enlarge holes when necessary. A steel scriber for marking is useful for the man with the building bug. A sturdy jack knife holds its place in practically every trade and the Radio-Trician, too, finds it a handy tool for cleaning wires, scraping insulation, and doing, illegitimately, a good many of the duties of a hammer.

Buy Slowly

Most fellows have a good many of these tools but to those who do not, it is recommended to buy gradually, during the early part of the course. Many jobs which will bring in extra money such as installing aerials or making installations can be performed with these tools. These profits can, in turn, be used to purchase additional equipment.

Along about lesson 15 or 16, a good deal of testing work is required. Simple, but important, tests can be accomplished by means of a small flash-light battery connected in series with a pair of ear-phones, with the two free ends connected to insulated points. With such a continuity testing device, resistances, transformers, condensers, in fact, circuits can be tested for open or shorts.

When the student actually starts servicing receivers, questions arise whether

Service Man Carries

to buy a set analyzer or a couple of meters for actual voltage and current checking. If the student is handy with tools and can do fine assembling work, it is advisable to buy a good milliammeter with four or five multipliers, and an A.C. voltmeter having ranges of 0-5, 0-15, 0-150 and 0-750 volts. The milliammeter should be 0-1 with the necessary resistances so as to be connected in series with the milliammeter and used as an 0-10, 0-250, 0-600 volt source. A single shunt might be required to perform measurements of 0-20 milliamperes.

Such measuring devices, which are free and detached, will enable the Radio service man to build direct reading ohmmeters, capacity meters, output meters and even vacuum tube voltmeters which might not be as easily accomplished if the devices were in a completed set analyzer. These instruments can be so arranged and placed in a complete container as to actually be a set analyzer. These instruments besides being the fundamental ones required for ordinary bench work are the base of all testing outfits and are a good investment to the student planning to do any volume of service work.

Of course, a set analyzer is a worthwhile investment for the man who continually does repair work in the customer's home. It gives the appearance of dignity and completeness which is valuable from a psychological point of view besides furnishing a practical testing outfit for service work. A good set analyzer is the only one worth having and in many cases, greatly assists in securing a good service job.

The energetic Radio-Trician, in answering service calls, goes completely equipped with his tools and set analyzer carried in a metallic or imitation leather case. His carrying case should also contain an assortment of replacement parts and accessories. That is, a full set of tubes, tested and of reputable make, together with an electric flash light, staples, a lead-in strip, ground clamp, a three-cornered file, assortment of screws, nuts and washers, grid leaks, one or two small fixed mica condensers, one or two paper type by-pass condensers, sand paper, a mirror, solder and flux with which to make the necessary permanent connections, always essential with good repair work. We must not forget that



Ready to make a service call. Graduate Clarence L. Brown, Indianapolis, Ind., is prepared for all emergencies. Carefully selected tools and testing equipment play an important role in his work.

the work we do should be neatly done so a small brush and some cheese cloth to clean up the job should be tucked in a corner of the carrying case.

A last word about buying material; whether it be tools, instruments or replacement parts. If it is made by a reputable organization, and if it is a competitive article, you get a dollar's worth of value for a dollar expenditure. Do not expect a \$20 instrument to be as carefully designed and constructed as a \$75; one do not expect a 15-cent per pound tape to be as good as the 50-cent per pound variety. A service man lives by his reputation of rendering perfect satisfaction; do it right the first time.

And remember, if you don't have elaborate tools or equipment right now, or don't feel that you can afford them at this time—don't worry. After all it's not the size of the tool kit that makes the service man—it's the amount of knowledge he has. There will be plenty of time later on to get them when you have the salary earning ability your N. R. I. training will give you.

This is the first of a series of articles especially written to help N. R. I. men. In forthcoming issues of the News prominent Radio authorities and Merchandising Experts will discuss questions of vital importance to the Radio-Trician.

Watch for these practical articles.

National Radio News Get Your Friends Started

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E. R. HAAS

Above The Timber Line

THE slopes of a mountain are overgrown with timber but the peaks above the "timber line" are usually barren. The higher you climb the fewer trees you find; when you reach the top probably only one or two

hardy pines will have a foothold. The identical condition exists in every field of industry. This is shown by the following item in a recent issue of the Washington Evening Star:

"Baltimore, May 22nd.—A \$5,000 a year job is going a-begging here. Only one man, and he is not from Baltimore, has appeared to take the examination for the \$5,000 job as Construction Engineer on the Prettyboy Dam, which the city is building as an additional water reservoir . . ."

Yet on the same day this examination was announced in Baltimore papers, the classified pages were filled with advertisements for men to fill \$15, \$20 and \$25 a week jobs. Just think! One man was qualified to apply for the \$5,000 position while hundreds forced their way through employment offices to obtain the low pay jobs.

The \$5,000 a year man had training to equip him for a good job; the others were glad to get any kind of work. The employers had their pick of the untrained men: could offer to pay low wages because such labor is cheap. Yet, the man who wanted to pay \$5,000 a year could find only one man qualified for the job.

The \$5,000 a year man's training paid. While other men were walking the streets or crowding employment offices, simply fighting for a "break"—he could fill a job that paid real money. In Radio right now, there are many \$5,000 and \$10,000 a year jobs which cannot be filled simply because of the shortage of trained men. That is why there are real opportunities for N. R. I. men. The fellows who study and get specialized knowledge are the men who get the high salaried jobs.

There is plenty of room at the top but not even space to breathe at the bottom. The higher you go, the less competition and the greater rewards. Set your goal upward—don't be satisfied in the valleys. Be the man capable of filling the \$5,000 position—not one of the thousands glad to get any job that comes along.

E. R. HAAS,
Vice-Pres. and Director.

The BIG SUMMER CONTEST for new students is going over with a Bang! Make it a point to see each friend whose name you have sent in as soon as you can. Have a real heart-to-heart talk with them about their future. Radio is their big chance—you will do them a big favor by getting them interested and started.

When you help a friend in this contest you help yourself—don't forget the prize money for all enrollments received by August 16. Get your friends to start earlier if possible. If you haven't sent their names in yet do it immediately. Envelopes postmarked up to midnight, July 4, will still get you the special bonus for promptness.

The Jenkins Television Corporation, 346-370 Claremont Avenue, Jersey City, New Jersey, has prepared a very interesting pamphlet on "How To Build Home Radio-Television Equipment." N. R. I. men are invited to write for this material.

What Do You Want?

The National Radio News is published exclusively for the benefit of N. R. I. students and graduates. We want these pages filled with lively, timely items of interest to you. Authorities in leading Radio fields have frequently contributed articles; others are willing to do so. The question is—what kind of articles do you want? Do you want more articles on Ship Operating? Aviation? Service and Repair? Television? Sales Tips? Public Address Systems? Talking Movies? Drop a line telling us what you want—address it to the Editor, National Radio News. Your suggestions are welcome and will govern future issues.

Mr. Haas, "Chief" Dowie and I are going to have a busy time selecting the winners in the big "RESULT" contest. Read the next issue of the News for details.

—J. E. S.

N. R. I. SERVICE MANUAL

ON

Apex Radio No. 48 and 48A Screen Grid Chassis

The No. 48 chassis is an eight-tube A. C. receiver. It uses three of the screen grid type 224 tubes, two type 227, two type 245 power amplifiers and one type 280 full wave rectifier.

It is designed to operate from a power supply of 110 volts, 60 cycle, but will operate satisfactorily at from 95 to 125 volts. The chassis is of all-steel construction and is entirely self-contained.

Tuning Condenser Alignment

If realignment is found to be necessary, first inspect the condenser. Note that the end rotor plates of each section are slotted. The purpose of this is to permit variation of capacity for one portion of the broadcast band without radically affecting the capacity at any other portion. The trimmer condensers are small mica condensers on top of each of the four sections of the tuning condenser. They are connected directly across the tuning condenser over which they are placed and their capacity is varied by raising or lowering the center screw.

Aligning is best done with a modulated oscillator.

Ordinarily the cover of shield must be on when the set is operating or the receiver will oscillate. In aligning, however, with the shield on, it would be possible to get at the trimmers but not at the rotor plates. Fortunately, the tubes can be properly shielded and the complete condenser exposed in a very simple manner.

Remove cover of shield and turn the cover completely around so that the back end is toward the front. Then, facing the chassis, move the cover back about $3\frac{3}{4}$ " and to the left about $8\frac{1}{4}$ " and let it down on the chassis shield so that the tube shields are between the grid wires of the 224 tubes. In this way the grid wires are shielded and the complete condenser exposed.

First tune in a signal at 1400 kc. and adjust the trimmer condensers to resonance. If output meter is being used, set the volume control so that meter deflection shows less than 50-volt output. Adjust the two outside trimmers first, turning the screw down until the output starts to drop. Then adjust the two middle trimmers to resonance, lowering or raising the screw until maximum deflection is obtained. Adjustment may

be made with a metal screw-driver as the rotor is at ground potential.

An important point to remember in adjusting the trimmer condenser is that the screws should not be turned completely down. If they are screwed in too tightly the capacity of the trimmer condenser which is added to the capacity of the tuning condenser will be so high that the receiver cannot be tuned to a high frequency signal. In general, obtain alignment with the trimmers as far out as possible and with the screw backed off at least one turn from the maximum capacity.

After the trimmer condensers have been adjusted at 1400 kc. they should not be changed in any way when aligning the tuning condensers at different frequencies as explained below. With the receiver still tuned to the 1400 kc. signal bend slotted section of end rotor plate of each condenser section in or out a slight amount to see whether output meter deflection is at a maximum.

Next tune in a signal at 1000 kc. Bend the slotted section of end rotor plate on each side of the first bank of the tuning condenser in or out until maximum reading is obtained on output meter. Follow the same procedure with sections two, three and four of the tuning condenser. The section of the plate which should be bent is the last one which is in mesh with the stator section. The corresponding slotted section on both ends of any rotor section should be bent in or out about the same amount in each adjustment.

For each material adjustment of slotted rotor plate section the tuning or setting of rotor for resonance should be checked. In other words, after every adjustment turn the tuning knob back and forth until maximum deflection of output meter is obtained before proceeding to make the next adjustment.

Next tune in a signal at 800 kc. Follow the same procedure. Lastly tune in a signal at 600 kc. and again follow the same procedure. The condenser will then be properly aligned.

Uncontrolled Oscillation

There is very little possibility of oscillation in the No. 48 chassis. The circuit is exceptionally stable due to the low plate to grid capacity of the 224 tubes and the thorough shielding used.

Should the No. 48 chassis oscillate on being connected up it may be due to 224 tubes whose characteristics vary considerably from the standard. In case of oscillation, therefore, change the 224's around and also try out some new ones.

It is necessary to have the cover of chassis shield on when the set is operating, otherwise excessive oscillation will be experienced. The cover has on it the tube shield plates which electrostatically isolate the R.F. and detector tubes and grid circuits.

An open by-pass condenser will cause oscillation. After the tubes have been checked as explained above, check the by-pass condensers and the connections to them. A shorted detector plate choke will also cause oscillation. In general, a poor ground connection to the subpanel at any point will cause oscillation. These

transformer between the primary and secondary is not properly grounded excessive hum will result.

A heater to cathode short in one of the 224 tubes will cause an excessive hum due to the introduction of the A.C. component of the heater voltage into the grid circuit. An open cathode connection in this type of tube also causes hum.

Low Volume

The high gain of the No. 48 chassis and the 245 push-pull output provide more than ample volume. If the volume is low, there are a number of possible causes in the chassis and accessories as follows:

Probably the most prominent cause of low volume is defective tubes. In any case of low volume, therefore, procure a new set of tubes that have been tested

VOLUME CONTROL AT MAXIMUM—LINE VOLTAGE 115

Type of Tube	Position of Tubes	"A" Volts	"B" Volts	Control Grid "C" Volts	Screen Volts	Screen Current MA	Cathode Volts	Plate MA
224	1	2.4	181	3.4	90	.25	3.4	4
224	2	2.4	181	3.4	90	.25	3.4	4
224	3	2.4	181	3.4	90	.25	3.4	4
227	4	2.38	75	9			9	.2
227	5	2.39	105	6			6	4.3
245	6	2.45	187	41				12
245	7	2.45	187	41				12
280	8	5						38
								Per Plate

should be inspected for high resistance joints and lacquer at ground contact point.

Excessive Hum

The design of the power pack and arrangement of the filter condenser in the 48 chassis is such that the hum output voltage is very low. With no signal it is scarcely audible. If there is an excessive A.C. hum this may be due to a number of causes.

Among the most prominent causes for excessive A.C. hum are defective tubes, of which the 280 and 227 are generally responsible. In every case, therefore, of excessive hum try out a new set of tubes and note any difference in performance. The hum may be due to external pick-up. Disconnect antenna and ground from set and see if hum disappears.

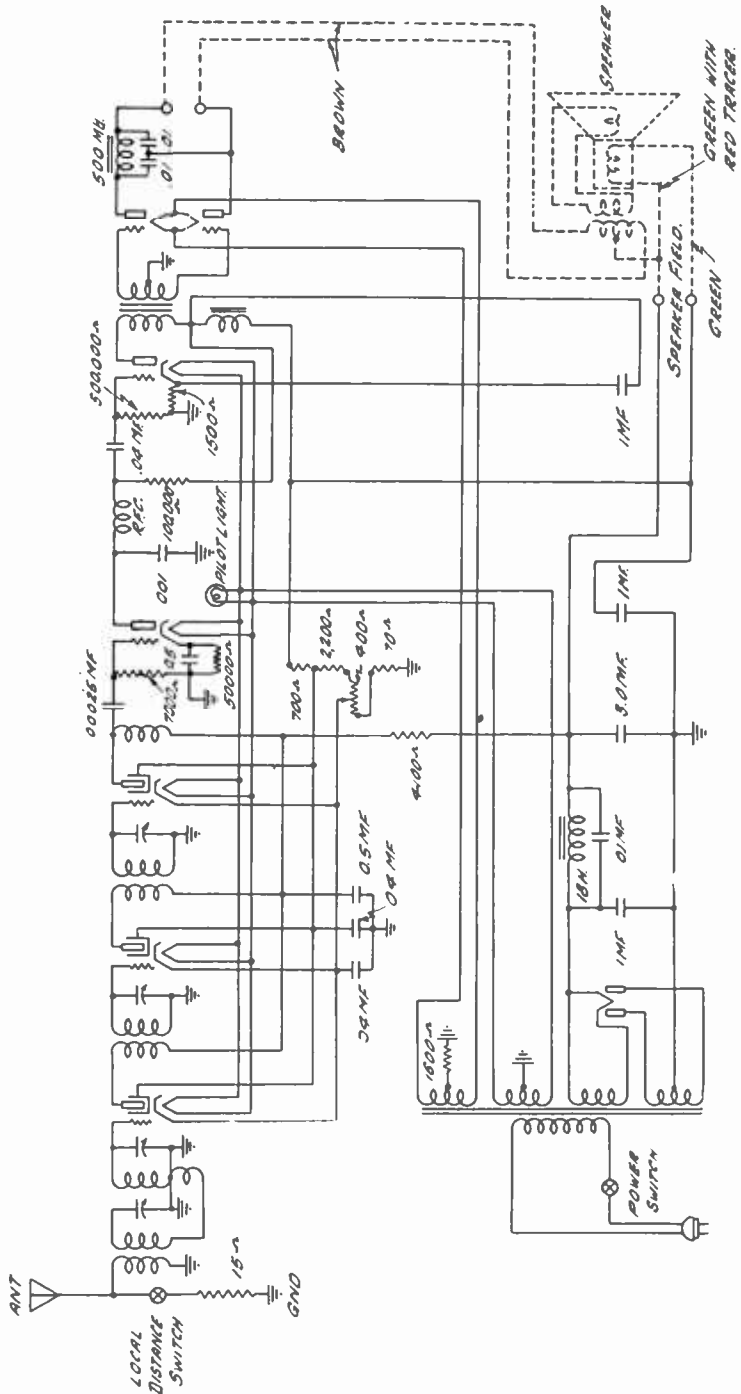
If the .1 Mfd. choke condenser is shorted or open an excessive A.C. hum will result. Other causes are shorted or grounded filter choke, open or shorted filter condenser, grounded audio cut-off choke and defective wiring in grid circuits. If the shield plate in the power

or have been operating satisfactorily in another receiver. Insert these in the chassis one at a time and note any difference in performance.

Another very common cause of low volume is weak pick-up due to faulty antenna or antenna being in a shielded location. The antenna and lead-in system should be inspected for poor connections and grounds. If the antenna is in or near a steel building, the pick-up will be weak because of the shielding effect of the steel. In a case of this kind try out a new antenna in a different location.

Tuning condenser misalignment will throw the R.F. stages out of resonance and one of the results will be low volume. Realignment should not be attempted unless the other possibilities of low volume have first been investigated.

Other causes of low volume are low line voltage, wrong speaker connections, faulty speaker, defective push-pull transformer, and open audio cut-off choke. These parts may be checked as shown in continuity tests.



SECTION SHOWN IN DOTTED LINES IS IN SPEAKER

Fig. 1—Schematic Circuit Diagram of No. 48 Chassis.

Power Transformer

The power transformer supplies all filament A.C. voltages and the A.C. voltage for the 280 plates which, when rectified by the 280 tube and filtered, furnishes the D. C. for plate and grid voltages.

If the transformer heats up excessively or the voltages at the sockets are incorrect, not due to defective tubes or wiring, check the transformer by means of continuity tests shown in continuity chart.

The 224 and 227 filament winding and high voltage secondary winding are grounded through the center tap of these windings. The center tap of the 245 filament winding is grounded through a 1600-ohm biasing resistor. Place one of continuity meter test prods on sub-panel and the other on the terminals of these windings to see if they are properly grounded. The 280 filament winding and primary of power transformer are not connected electrically with the ground and there should be, therefore, no continuous circuit between the terminals of these windings and the sub-panel.

The primary of the power transformer is separated from the secondary by a

shield which is grounded on the frame of the transformer at the top.

Volume Control

The volume control is of the radio frequency control type and is made possible by the use of heater type tubes. By varying the biasing voltage supplied to the control grid of the 224 tube, effective control is obtained with a 400-ohm volume control of a wire-wound type.

There is little danger that a control of this type will ever give trouble. It is positive, smooth in operation and does not cause distortion in reproduction. It will never become noisy unless the wire is badly worn or dirt or grit is allowed to gather on the wires. The volume control is assisted in reduction of volume in the vicinity of powerful broadcasting stations by the local distance switch as explained in the next section.

Model No. 48-A

Chassis No. 48-A is almost identical in construction with No. 48 Chassis except that it is designed for 25 cycle, 110 volt operation. All parts as used in the No. 48 Chassis are used in the No. 48-A with the exception of the power transformer and the .1 Mfd. choke condenser which is connected across the filter choke.

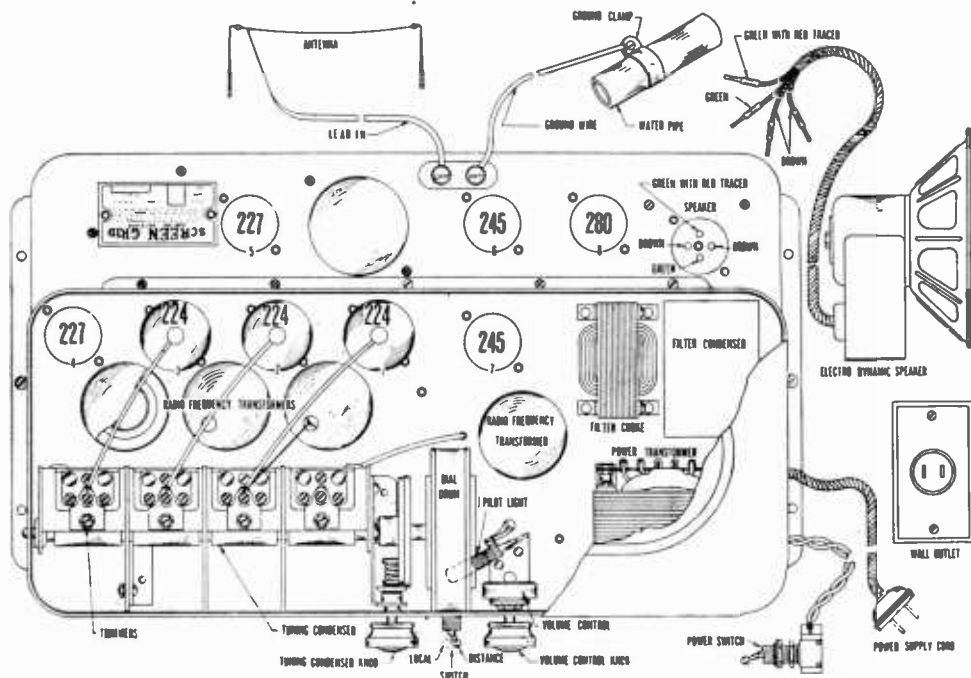


FIG. 2—Top View of No. 48 Chassis Showing Sequence and Speaker Connections.

R. M. A. Show Important To Radio Industry

Of the dozens of Radio shows to be held in different cities during the summer months probably none were more important to the Radio Industry than the Radio Manufacturers Association show held June 2-6, in Atlantic City's new \$15,000,000 Civic Auditorium. More than 30,000 members of the Radio Trade and Industry from all sections of the country attended this sixth annual convention. More than 200 Radio manufacturers filled the main 35,000 sq. ft. exposition floor with millions of dollars worth of new Radio equipment.

It was noted that several important manufacturers in the electrical and automotive field who had never entered Radio before, made their debut with a display of Radio receivers for the first time. New models of the old line Radio sets were likewise presented prior to the public presentation in the Autumn.

The Trade show answered a good many questions which had been puzzling Radio dealers and wholesalers. In the August News, Mr. Joseph Kaufman, who headed N. R. I.'s delegation at the Show, will discuss some of these important points. His survey of the problems facing the Radio industry contains valuable points for all Radio men.

N. R. I. Graduate To Manage Audition

Graduate Donnell O'Connor, Manager-Announcer of Radio Station WBT, has been appointed Manager for both North Carolina and South Carolina for the fourth Atwater Kent National Radio Audition. Mr. O'Connor will have charge of the details of arranging State auditions of the young singers in both the Carolinas who will compete this year for the \$25,000 cash award and the scholarship offered by the Foundation to national finalists.

Graduate O'Connor's voice is well known throughout the Carolinas and the South in general. He was picked for this important post because of his wide experience in broadcasting and general knowledge of the Radio industry. He will be able to offer valuable aid and advice to the young vocalists of the Carolinas who seek fame and fortune of the microphone.

The Student Mailbag

"I must give the School some of the praise and credit I have received from my first big Radio Job. I have installed the "Syncrodisk" Sound System in the Imperial Theatre here. It sure gives a fellow a thrill to put over a Job like that and I owe it all to my training with you. Incidentally every cent that my course with you cost me was repaid in this one Job." Harold W. Short, No. 16677B, 539 W. High St., Painted Post, N. Y.

"The results obtained with the business cards have been excellent. From the time I finished the 8th lesson I have made exactly \$218.35 in my spare time, of which sum \$102 I made after I had received the business cards. I made enough to pay for my course before I finished my 21st lesson and then had some money left." Dominco Baltierra, Motor Route No. 1, Box 140A, Fort Lupton, Colo.

"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.

"I have been sending in my lessons so slow lately that you probably think I am getting lazy. I have been very busy servicing the Radios that I sold as well as a lot of cash repair work." D. J. McCauley, 61 Washington St., Denver, Colo.

"I have been servicing Radios ever since I finished your twenty-second lesson and made a success of it. The few extra pennies I made came in pretty handy. My best was about ninety-three dollars in one month." Wilmer E. Hershey, R. F. D. 8, Lancaster, Pennsylvania.

"I have distributed my cards over the community so that they would reach every set owner and by the looks of things my competitor will have tough sledding from now on, as he had had no special training." C. E. Harmon, Lilly Chapel, Ohio.

"I started to work two weeks before Christmas. I do not work under anyone and I have a salesman working under me. I get \$25 a week as a salary and 10% on all radios sold. I didn't know a thing about radio before I started to take the course of N. R. I. Thanks to the good old N. R. I." Clarence R. Walker, 305 Ridge Ave., Kittanning, Pa.

"Since I enrolled the total receipts for repair work, installations, and so on would pay for my course four times over. I would advise every young man to enter Radio. You're never out of work, good pay, clean work, your own home, car, all from studying a few hours each night." Willie J. Maki, Creighton Mine, Ont., Canada.

"I received the Radio-Trilex cards, and passed out about 15 of them. In a week I had my hands full. I found that practically every set owner in my neighborhood desired some improvements on his receiver." Andrew Scotti, 331 Connecticut, Highland Park, Michigan.

"I have taken full charge of the Service Department of the R. M. Ralston, Inc. I have two assistants with me. I have earned the average of \$210 a month and I am determined to earn more later." George Miyagawa, 606 Williams St., Kalamazoo, Michigan.

The big "RESULT" contest starts August 1st. Every student and graduate is eligible. The August News will carry full details.

Radio Opportunity Fields

By P. J. MURRAY, Manager of



Mr. Murray does more than help Graduates get good jobs—he helps them select positions for which they are best fitted by inclination and temperament. He tells you now about ship operating—the requirements, opportunities and nature of the work. Students and Graduates interested in this field will find valuable pointers given by a Vocational Expert.

It's my job to fit the square peg into the square hole. That's why I put down red-blooded men who crave adventure as the best fellows for sea operating jobs. Not only is ship operating the oldest commercial branch of Radio, but it also offers travel, romance, and adventure. New York, Havana, Liverpool, Singapore—the ports of the world are the ship operator's home. From the Baltic to the South Seas these men are keeping their ships in constant communication with ports and other vessels. The lives of hundreds depend upon their ability, so it is evident that while enjoying a rich, full life, their responsibilities are great.

Right now no other field so sorely needs trained men for operating jobs than the shipping industry. The Government rulings regarding safety at sea require all ships of the first and second class to maintain Radio watches. Stiffened requirements for obtaining commercial licenses means that skilled operators are needed. Here in our own Employment Department, we cannot fill the big demand due to the scarcity of trained men.

The compensation a ship operator gets is very satisfactory as it includes many things in addition to salary. The average freight and small passenger ship lines pay from \$95.00 to \$150.00 a month; \$100.00 to \$175.00 a month on the larger passenger liners; and as high as \$200.00

a month on board privately owned yachts. The operator is ranked as an officer of the ship and enjoys an officer's privilege. The money he earns is absolutely clear since his clothing, food and quarters are provided. It is not at all unusual for an operator to save \$1,000.00 during his first year at sea. These savings provide a nice nest egg when he is ready to give up his ship and locate in some profitable branch of land Radio.

Ship operators earn good incomes because they are highly trained men. It is no longer sufficient for the operator simply to understand how to send and receive Code messages. The higher requirements for obtaining the U. S. Government license has necessitated a thorough, complete knowledge of the principles of reception and transmission.

The point of this is clear when it is considered that should Radio apparatus become out of order at sea, the lives of many would be endangered if the operator were unable to make necessary repairs. The importance of expert knowledge of Radio equipment explains why the N. R. I. leaves Code instruction until after students have mastered the necessary theoretical knowledge to answer the questions of the Government examination.

This examination is necessary before an operator can secure his license. No man is acceptable for a ship operating

Mr. Murray will discuss other Radio Fields in forthcoming issues of the NEWS.

Ship Operating

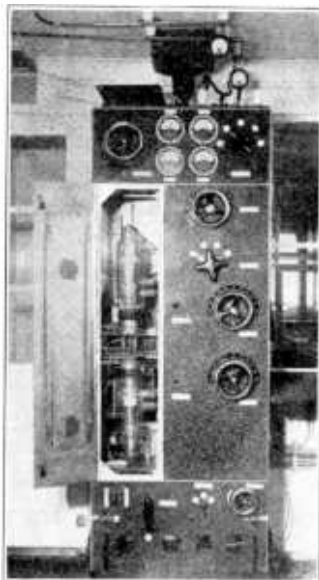
N. R. I. Employment and Vocational Departments

job until he had the second-class license. This entitles him to serve on ships of the second-class. The first-class license is required for ships of the first-class. The difference between the two grades of license is based upon the number in the vessel's crew. Ships of the first-class carry a crew of more than fifty and are required to run a continuous Radio watch; ships of the second-class have crews of less than fifty and are only required to maintain a Radio watch at stated intervals.

Here is my advice to the man interested in becoming a ship operator. First, be able to travel. If you have a large family you are quite likely to get homesick on a long cruise. Second, get thorough, complete knowledge of receiving and transmitting principles, as well as all types of Radio apparatus. Third, learn the Code. Diligent practice with the instruments furnished with the Code course will soon develop necessary speed to meet the Government requirements.

After you have the required theoretical and practical knowledge to pass the examination, get in touch with the Radio Supervisor of your nearest district. The Radio Division of the Department of Commerce has appointed these Radio Supervisors at various conveniently located places all over the United States, for the purpose of examining men who wish to become Radio operators. Examinations are held at all these offices periodically and the Supervisor of Radio in each district will be glad to cooperate by giving necessary information regarding the time and place of the examination. If you do not know the address of the Supervisor in your district, a letter or post card addressed to the N. R. I. will bring the information to you without delay.

To summarize—ship operators are required to have a knowledge of sending and receiving Code messages. They must know the "how and why" of receiving and transmitting apparatus, plus knowledge of Radio laws and regulations. Fortunately, little special preparation is



Short wave transmitter ranging from 15 to 90 meters on S. S. "Bremen," sister ship of the "Europa." This is but a small part of the vast Radio equipment on board requiring the service of many trained operators.

necessary to N. R. I. graduates. It has been my experience that the man who has finished his N. R. I. course, including the Code course, and has studied diligently, has very little difficulty in passing his license examination.

Several years' experience at sea equips a man, through actual experience, to fill the best jobs in the Radio industry. David Sarnoff, R. C. A.'s president, and a score of the biggest men in Radio today, started as ship operators. It is a live-wire field and one that needs "live wires."

Trained men who want to see the world are needed—if you have the "wanderlust" here's your big chance to see the world—and earn good money while doing so.



J. A. DOWIE

USING A VOLTMETER FOR MEASURING RESISTANCE

By CHIEF INSTRUCTOR DOWIE

Occasions frequently arise when a Radio-Trician wishes to measure an unknown resistance but does not have available at the time the proper measuring instruments necessary for this

work. When a voltmeter, ammeter or milliammeter is available any resistance can be measured by the use of Ohm's Law, but when both the voltmeter and milliammeter are not handy a single voltmeter or milliammeter can be used for measuring resistances.

When the internal resistance of a voltmeter is known it can be used for obtaining the values of resistances and for adjusting variable resistors to the correct values for grid bias and power output resistance units. Supposing a voltmeter has an internal resistance of 50 ohms per volt and a scale reading of 0 to 100 volts. The total resistance of that meter is, therefore, 5,000 ohms (50x100). Now if this voltmeter is connected across a good 45-volt "B" battery the reading of the voltmeter will show 45 volts. If an unknown resistance is now placed in series with the voltmeter and the 45-volt battery and the voltmeter reading shows 20 volts, the resistance of the unknown resistance can be obtained in the following manner.

Divide the first reading of the voltmeter, that is 45 volts, by the second reading of the voltmeter which, in this example, is 20 volts. The result is $45 \div 20 = 2.25$. Subtract 1 from this which leaves 1.25. Multiplying 1.25 by the resistance of the voltmeter as full scale reading, that is, 5,000 multiplied by 1.25 gives 6,250 ohms, which is the resistance of the resistor placed in series with the voltmeter and 45-volt battery.

Take another example. A certain resistance that is supposed to be 50,000 ohms is placed in series with the voltmeter and 45-volt battery. The reading in this example is 3 volts. Dividing 45 by 3 and subtracting 1 leaves 14. When

14 is multiplied by 5,000, the result is 70,000 ohms. The greatest source of error in this example lies in the low voltmeter reading. Therefore, it is necessary to read the voltage reading on the scale very carefully.

The accuracy in these measurements is always greatest when the resistance to be measured is equal to the resistance of the voltmeter. For example, if the voltmeter has two or more scales, the most suitable scale should be used and the voltage should be adjusted so that the reading of the voltmeter is as large as possible. Suppose that the voltmeter you are using has a scale reading from 0 to 10 volts and another scale from 0 to 100 volts. The total resistance of the voltmeter from 0 to 10 adjustment is 500 ohms. (10x50.) The 0 to 100 adjustment is 5,000 ohms (100x50).

To check the accuracy of a 400 ohm resistor we first adjust the battery voltage to say 9 volts by using six good dry cells connected in series with the voltmeter and the 400 ohm resistor. Suppose we find the second reading of the voltmeter in this case to be 5 volts. 9 divided by 5 is equal to 1.8; 1.8 minus 1 gives .8. 500 multiplied by .8 equals 400 ohms, which is correct.

Now suppose we have a variable resistor having a maximum resistance of 1,000 ohms and we wish to adjust it to a value of 780 ohms for a grid bias resistor. The voltmeter can be used to solve this problem by using this formula:

$R = r (V_1 \div V_2 - 1)$ where: R = the unknown resistance; r = the resistance of the meter; V_1 = the first reading of the meter; V_2 = the second reading of the meter.

In this case, R is not unknown but is equal to 780 ohms, but V_2 is the unknown. Therefore, first we use the 0 to 10 scale on the voltmeter, which makes r equal to 500 ohms and we use a 9-volt battery so that V_1 is equal to 9 volts. Solving the formula we get:

$$V_2 = \frac{r \times V_1}{R + r} = \frac{500 \times 9}{780 + 500} = 3.5 \text{ volts}$$

The variable resistor is now inserted in series and the resistance varied until the reading on the voltmeter registers 3.5 volts. Then the resistance is very close to the required value of 780 ohms.

It should be understood that a voltmeter is only a sensitive milliammeter with a high series resistance built into it. Therefore, a milliammeter with a known external resistance can be used in the same manner for measuring resistance as the voltmeter. When using a milliammeter for measuring an unknown resistance, the current which the battery sends through the known resistance is first read on the scale of the milliammeter; then the unknown resistance is connected in series with the circuit and the reading is again taken in the milliammeter and the above formula can be used for determining the value of the unknown resistance. R is the unknown resistance, V_1 the first reading, V_2 the second reading and r the known resistance. For example: Suppose the known resistance we have on hand is 5000 ohms and that a certain battery passed 5 milliamperes through that resistance and the milliammeter. When the unknown resistance is placed in series with the circuit and we find the current is 2 milliamperes, the ratio of the two readings is 2.5 minus 1 which gives us 1.5. 5000 multiplied by 1.5 gives a value of 7500 ohms for the unknown resistance.

Radio Equipment on S. S. Europa

The S. S. Europa, which is pictured on the front cover, carries the very latest transmitting and receiving apparatus. The entire installation is so arranged that it is possible to operate the long wave, two short wave, and a special short-range transmitter, together with the corresponding receivers simultaneously without interference. This use of several wave-lengths at the same time is the latest application of modern Radio on a vessel of the Merchant Marine.

The S. S. Europa carries a main transmitter for long wave for direct communication with both continents; an intermediate wave transmitter for close-range communication with shore stations and ships; a special low powered short-range transmitter for the official business of the vessel; a short wave transmitter for long distance communication with almost any part of the globe, and an auxiliary quenched spark transmitter for emergency use. Even some of the motor driven life-boats are Radio equipped to provide additional safety in case of disaster.

The density of traffic on all existing Radio channels at sea, and the importance of speedy handling of this traffic, necessitates the use of receivers which require little attention from the operator. The Telefunken triple circuits used have wave ranges of 120 to 1,200 meters, 400 to 4,000 meters, and 3,000 to 25,000. The arrangement of these receivers permit duplex communication—both transmitters and receivers can be operated at the same time independently of each other. A special short wave receiver and an emergency receiver are used in addition to the regular receivers. Six antennae are used for the simultaneous operation of various transmitters and receivers—two long wave, three short wave, and one auxiliary.

Automatic equipment has been installed for high-speed communication. By means of a tape perforator and automatic transmitter, 250 words per minute can be sent, and the same number received with the syphon recorder.

On the S. S. Europa's maiden voyage six operators were on constant duty handling a new record volume of ship-to-shore Radio traffic. A Radio-minded travelling public is demanding more Radio service which calls for many more trained men to design, manufacture, sell, install and operate ship Radio equipment.

Building An Adapter For Balancing A Receiver

By STUDENT HARRY R. DREW

Of course, it is possible to carry along a prepared tube for the purpose of balancing a set, but these tubes do not always receive the best care and treatment when banged around in the service kit. Again, how many times does it happen that the prepared tube has the same internal capacity as the tube in the set that is to be neutralized? Now for the adapter I have used.

An old UX226 tube was broken, the base cleaned out and the wires unsoldered from the prong. I then procured a set panel socket of the four prong type (Pilot) and proceeded to connect wires to each socket connection except one of the filament connections which was left open. The wires were then run down through the tube prong inside the tube base and the socket pushed down on to the top of the tube base, the wires cut off even with the end of the prong and then soldered to the prong. A hole was drilled through the bottom of the tube base, and a small machine screw passed through this hole, and the hole in the socket to hold them together. The result is an adapter which takes up about one-third as much room as the dummy tube. It cannot be broken as easily as the tube and at the same time it permits balancing the set with the same tube as will be used in the set.

Of course these adapters can be purchased ready made but who wants to pay about \$1.50 for one when one can be made easily from an old tube base and a 15-cent socket? I have one for use with the 226 tube and also one for the 227. These naturally raise the tube to be balanced up a little higher in the set, but I have never found a set in which they couldn't be used and I wouldn't be without them.

Service Director Armstrong says: "Pity the Contest Judges. They're going to be swamped with letters in the 'Result' Contest."

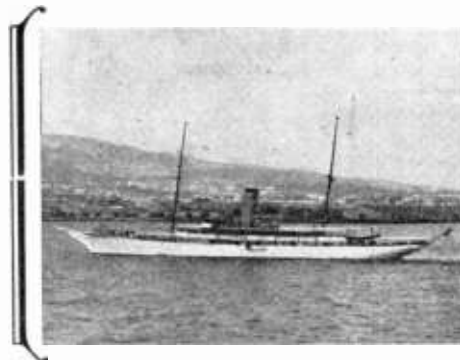
The article by Mr. Bruce Barton in the April NEWS was printed through the courtesy of the Coca Cola Company's "Red Barrel"—that well edited house organ that helps to spread the fame of that well-known beverage.

250,000 Radio Prospects In Boating Industry



The installation of screen grid battery receivers on yachts and motor boats opens up a tremendous field. Radio for small craft has been an intensely interesting subject to all boat owners for years. The perfection of Radio equipment for cruisers comes at a time when boat owners are planning to equip their craft with this innovation. Radio-Tricians near the coast, rivers, lakes—wherever there is boating—will find good prospects for Radio equipment.

A typical screen grid battery chassis installed in a built-in cabinet in the main cabin. The desk top raises to give access to the phonograph, making a unique installation for those who desire to reproduce a phonograph record through the Radio system. The phonograph is mounted on a raised panel. The Radio chassis is mounted in locked drawer. This drawer is suspended in such a manner that even if spray comes in through an open window it cannot reach the Radio set.



Large sea-going yachts such as the "Casiana," owned by E. L. Doheney, depend upon Radio for both amusement and safety. Many Radio-Tricians land good jobs on palatial yachts as Radio operators. Ships of this class carry the latest receiving and transmitting equipment which create many more opportunities for trained men to cash in on their ability. (More about such jobs on page 12.)

