

NATIONAL RADIO NEWS



IN THIS ISSUE

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Automatic Tuning is Here to Stay

Alumni Association News

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Christmas Greetings

To many of us, the Yuletide season is a time for reunions with relatives and friends. We gather around the big dining-room table for a long-to-be-remembered feast, then relax for a general round-table discussion of how each and every one is getting along. Our successes seem bigger than ever at this time when they are discussed by those whom we regard most highly.

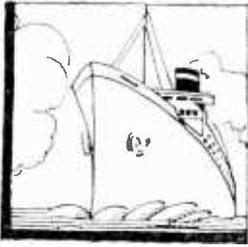
At Christmas, too, we slow the mad pace of life a bit to see if we can be of help to others less fortunate. A cheery greeting, a few words of encouragement, a small gift, often change despair to happiness for those less fortunate.

And soon the New Year will roll around, bringing with it new opportunities to gain happiness, to acquire comforts and even luxuries for ourselves and our family. Resolve to take these opportunities, to prepare for more profitable work, to get an early start towards making the next Yuletide season the happiest of them all.

May the spirit of Christmas be with you. And may the New Year bring you good health and genuine happiness. Much has been written but no words better convey our wishes to you at this season than the simple expression, with all sincerity---Merry Christmas and Happy New Year.

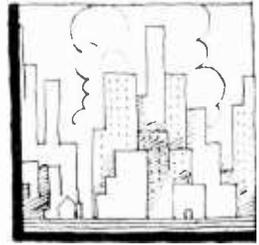
J. E. Smith, President

E. R. Haas, Vice-President



To Ships at Sea

Radio and wire telephone channels now link your own telephone with those on board the Atlantis, the Normandie and scores of other great ships somewhere at sea.



LET us suppose you are in your home in Maplewood—which is somewhere in one of the forty-eight states—calling your partner on a transatlantic liner. In the bustle of his preparations for the voyage you both forgot to exchange views on a matter of considerable moment to the firm. You pick up the telephone and ask for Long Distance.

The operator records your partner's name and the ship he is on.

"I will call you," she says. Hanging up, you glance out of the window at the wires that follow the winding highway and wonder whoever thought of connecting them up with a ship in the middle of the Atlantic.

Through your local exchange your voice is carried over Bell System wires to the Overseas Switchboard in the Long Distance Building at New York.

The ship-to-shore operator takes up the call and plugs in on a line to ship-to-shore "Control" at Forked River, some forty-five miles south of Sandy Hook, on the New Jersey coast.

"Requesting the Atlantis . . . Operator 6050."

"Right," says a technical operator.

Soon afterward a green light appears in front of the ship-to-shore operator, signifying that the Atlantis is "on the line." The operator flips a key. Another link in the chain has been added. From the Overseas board through the control terminal the voice signals now travel over more wires to a short wave radio station at Ocean Gate, a few miles from Forked River.

"Hello Atlantis . . . I have a ticket."

At the Ocean Gate station the words spoken by the operator pass through a series of vacuum tubes of greater and greater power, until they finally enter a nest of great double-ended tubes,

water-cooled to dissipate the great heat developed. This is the catapult which hurls them from the antenna into the blue vault above the Atlantic's billows.

By the time they take the air, the words just spoken in New York—part of the faint murmur that rises from the group of operators at the switchboard—have been amplified millions of times. In the process of turning them into radio impulses, there has been pumped into those syllables a power which—were they to be suddenly turned back into speech—would rattle the windows for miles around.

Picked up out of the blue by the tiny wires that sway to and fro aloft with the heaving of the ship, these impulses, faint after their long trip, are converted back into words. The operator on the ship replies and takes down the information.

"Thank you, New York. We'll have a report for you in a few minutes."

The Atlantis is ploughing eastward in the long dark swells southeast of the Grand Banks. A bugle has just sounded first call to lunch. Your partner, having finished a game of shuffleboard, enters the lounge where he learns, from a freshly posted bulletin, that the ship is enjoying moderate seas from the southwest, a light westerly breeze and rising barometer. A page halts beside him.

"New York calling you, Mr. Wiggam."

Having crossed the big puddle many times, Mr. Wiggam is not one to gape at learning of some new convenience aboard a modern ocean liner. He nods. "There's a booth just forward of the smoking room, sir. Will you take the call there?"

Mr. Wiggam says he will, and repairs to the booth. The ship's operator throws a key, twists a dial.

"Hello, New York."

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To Ships at Sea (Continued from page 3)

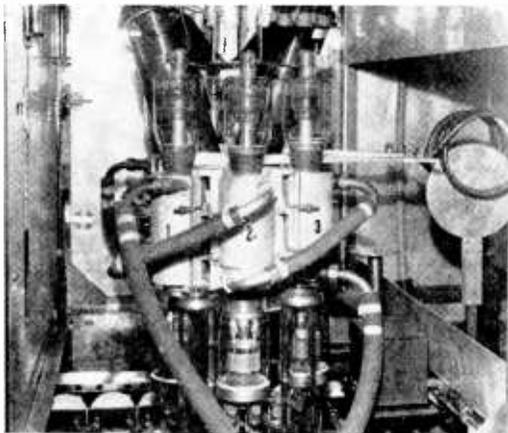
"Hello, Atlantis."

"Serial five . . . I have your party."

A few moments later your own telephone rings. "This is the overseas operator . . . We are ready on your call to the Atlantis."

A second's pause and then a familiar voice:

"Hello, Jack. This is Wiggam."



These six water-cooled tubes, each rated at 10 kilowatts, are used in the output stage of the Radio-telephone transmitter.

From the wires that stretch between the ship's masts, radio impulses carry your friend's voice across the churned and flattened billows in her wake, through the last haze of smoke that lingers on the western horizon . . . onward into the early forenoon, to the ship-to-shore receiving station that adjoins the control terminal at Forked River.

Fainter than the breeze in a cobweb after their long journey through space, the impulses from the ship are picked up on a receiver of high sensitivity. Here also there is amplification—an amplification even greater than that at Ocean Gate, reaching at times the prodigious figure of a billionfold.

Transformed again into audible sound, the voice from seaward passes through the Forked River control terminal to wires ending at the New York overseas switchboard, whence it continues to your own telephone in Maplewood.

A word about this problem of maintaining con-

tact with a ship that moves along a path thousands of miles long—a problem that is as difficult as it looks.

Service to ships on the high seas is operated over short wave or high frequency circuits. The wave lengths used range between 17 and 70 meters (roughly 17 to 4 megacycles).

While short wave radio impulses have certain characteristics which make them the logical vehicle for speech to ships at sea, they are given to many irregularities of behavior. A wave length that carries well to a ship within 500 miles may not be so effective at 1,000 miles and perhaps useless at 1,500 miles.

This is only part of the problem. A wave length that is good for a distance of 2,500 miles at noon, may be something less than perfect later in the afternoon—will, perhaps, gradually turn sour, ultimately reaching the stage known to the technical operator as "uncommercial." Indeed, all wave lengths used on this service go through some such variation in the course of the day. It is a fortunate circumstance that when one wave length is sour, one of the other wave lengths is generally working well.

But the problem is closely akin to that of a mariner in a region of continually varying winds—ranging from light airs, representing the radio engineer's "optimum conditions," to the hurricane that is let loose upon radio by the magnetic storm.

One of the advantages of short wave radio is



San Francisco. The switchboard through which Radio-telephone calls flow between shore and ships in the Pacific Ocean.

that signals may be concentrated within a narrow arc. By means of a directive antenna, radio impulses may be sprayed in a stream, much as water is shot from a fire nozzle. At the same time, the receiving antenna is so designed that it is particularly sensitive to signals from the desired direction (viz: the transmitting antenna). By lining these up like pitcher and catcher, it is obvious that the energy can be more effectively concentrated, with a consequent increase in efficiency.

For the service to ships in the Atlantic, the Ocean Gate station is equipped with a series of antennas aimed at various points along the steamer track to Europe. The scheme is similar to that of the artillery dropping his barrage at intervals along a road down which the enemy is advancing. A similar plan is used at the San Francisco station.

While this system covers effectively the routes to Europe, it is not, of course, as satisfactory for ships on a cruise in the West Indies, in the Mediterranean or on the other side of the world. For such purpose, special antennas are set up; and generally speaking, a ship with modern equipment is seldom out of contact with Bell System telephones in whatever part of the Seven Seas it may be.

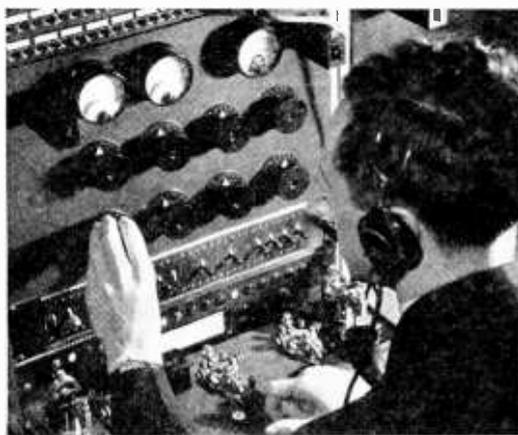
The Overseas Switchboard through which these calls pass, also handles telephone traffic with Europe, South America, Bermuda, Africa, Australia and other parts of the Far East. It is staffed by girls whose work is exclusively the handling of traffic with countries beyond blue water or with ships at sea. Although English is the prevailing language on all the circuits, most of these operators speak at least one foreign lan-

guage, which facilitates their handling of an international traffic in speech. At the same time, daily contact with these foreign operators has given them an understanding of the other half of the problem of weaving wires and wireless together, that makes for a high order of teamwork.

The ship-to-shore control terminal at Forked River furnishes the technical service on these same circuits, employing the numerous devices which the ingenuity and unremitting tests of research engineers have developed to put the soft pedal on static and magnetic storms. It is



From the telephone in one of the 500 cabins of the Queen Mary, voice signals pass through the Radio room to the ship's antenna.



A "circuit patrolman" behind the scenes, monitoring a Radiotelephone connection without interrupting the conversation.

—his way of doing things, even his accent and his personality.

Ship-to-shore telephone service was formally inaugurated on December 8, 1929, in a conversation between Commodore H. A. Cunningham, Captain of the Leviathan, and President Walter S. Gifford of the American Telephone and Telegraph Company.

The ship was about 200 miles off Ambrose Lightship. Mr. Gifford was in his office in the headquarters of the Telephone Company at 195 Broadway, New York. The conversation, inaugurating commercial telephone service between passengers on an ocean liner and Bell System subscribers throughout the country, was the culmination of prolonged experiment. From the very begin-

(Page 6, please)

nings of wireless telephony. Bell System engineers had been engaged in attempts to drive these new carriers of speech through the walls of silence that stretched across the seaward horizon.

Service to ships at sea was accepted as a logical adaptation of radio and experiments began soon after the company had successfully transmitted speech across the Atlantic to Paris.

In the spring of 1916, the year following the historic occasion when words spoken at Arlington, Va., were heard in Paris, A. T. & T. engineers installed equipment aboard the battleship *New Hampshire*. In May of that year Josephus Daniels, Secretary of the Navy, at his desk in Washington, talked with Captain Lloyd H. Chandler, commanding the *New Hampshire*, which was off Cape Hatteras.

Interrupted by the war, these tests were resumed, along with the experiments in transatlantic telephony. Apparatus was rudimentary, designed more for use ashore than afloat, and scarcely capable of maintaining regular contact with vessels at any considerable distance off-shore. But apparatus and technique improved rapidly. Greater distances were spanned, atmospheric causes fewer interruptions. The feasibility of commercial service had been demonstrated. As a result, two years after America and Europe were talking by telephone, service to ships was inaugurated.

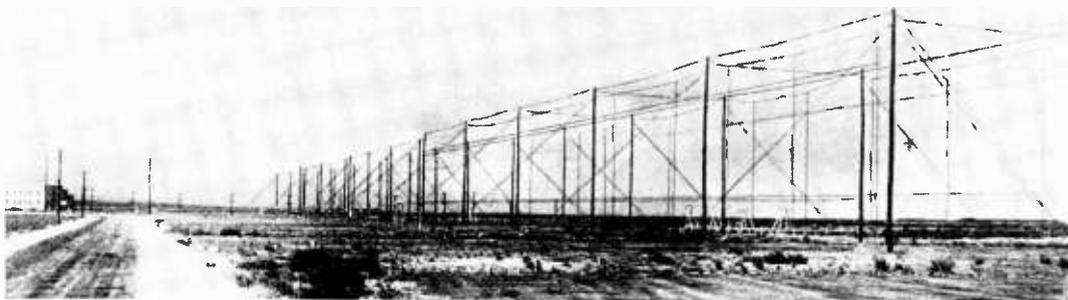
On December 23, 1931, the "hello" of an American telephone operator travelled across the Pacific, with the opening of a short wave radio channel to Hawaii. Shortly afterward, contact was established through San Francisco with the Canadian Pacific liner *Empress of Britain* as she entered the Orient on her world cruise and came within range of the powerful transmitter at Dixon, 65 miles northeast of San Francisco. Since that time Dixon and Point Reyes, the receiving station just north of San Francisco, have each year maintained a circuit with this liner during the latter half of her voyage eastward around the world.

On October 30, 1936, radio telephone service was established with the *Chichibu Maru*, of the N. Y. K. Line (Japan Mail). This inaugurated regular ship-to-shore service in the Pacific, the *Chichibu Maru* being the first ship on regular run across this ocean to be within talking distance of America.

The equipment at Dixon and Point Reyes is similar to that at the transatlantic ship-to-shore stations—powerful vacuum tubes that kick the voice into space from a highly directive antenna; sensitive and delicately attuned receivers that pick up faint murmurs from the other side of the world and translate them into audible understandable language. At the San Francisco Long Distance office is another overseas control room and switchboard, where operators keep talk flowing between America and Hawaii, China, Japan, the Philippines, the Netherlands Indies and vessels far and near.

There are others who go down to the sea in ships. There is the industrious tug, puffing and churning about some great steamer or a row of hulking barges. There is the trawler laboring in heavy seas off the Grand Banks.

Each of these is now within reach of telephones ashore, through Bell System radio stations along the coast. The service has already brought rescuers alongside a sinking trawler fatally stricken by storm or collision, besides proving itself a convenient and reliable means of communication in the work-a-day life of fisherman and tug. Beginning with a station near Boston, the service has been set up at ports on both sides of the continent. On the east coast, New York, Philadelphia and Miami are already in operation. On the west coast there are stations at Seattle, San Francisco and Los Angeles, while a station of the Lorain Telephone Company at Lorain, O., reaches vessels plying the Great Lakes. Present plans contemplate stations at various other points along the nation's coastline, from Maine around the Gulf of Mexico to Puget Sound, and on the Great Lakes.



Ocean Gate antenna arrays—whence Radio waves flash seaward.

The Laboratory Page

By GEORGE J. ROHRICH



George J. Rohrich, Engineer
in Charge N. R. I. Laboratory

The purpose of this department is to furnish supplemental experiments to students who have completed their Home Laboratory Course, but who wish additional laboratory experience. You are not required to perform these experiments, but you will gain increased knowledge by doing so.

Most of the material required will be that received as part of the Laboratory Course. Any other material necessary can be purchased very reasonably and will constitute an investment rather than an expense, as it will serve as replacements in service work or be useful in your shop later.

EXPERIMENT NO. 60

Objects: 1. To show the effects of shielding on electrostatic coupling.

Apparatus Required: Any operating radio receiver having antenna and ground terminals; an antenna system; two coils; several metal plates of materials such as copper, brass, aluminum or tin. The coils may be any type; home constructed by winding in any fashion 50 to 100 turns of wire on two coil forms or else use items 22 and 32. The metal plates need not be elaborate, copper screen wire, a piece cut from a tin can, etc., may be used. The size is also not important, 5 inches square or so being practical.

Apparatus Assembly: The coils are to be placed end to end as shown in Fig. 91, being separated by a space wide enough to permit the shield to be placed between them. The effects will be more pronounced if the coils are placed on two boxes about 1 or 2 inches high as shown. This will cause the coils to be nearer the center of the shield when used. If the experimental coils (items No. 22 and 32) are employed, place the tickler at the ends shown.

Experimental Procedures: 1. Turn on the receiver and tune in a station having a weak signal, using the antenna and ground normally employed. Much

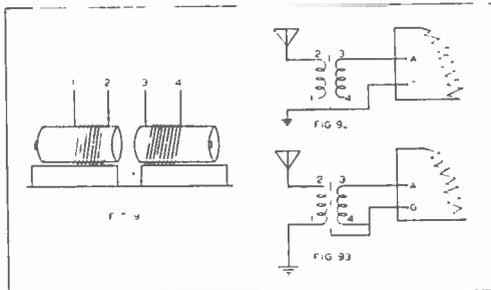
will depend on the type of radio receiver employed and on the signal strength picked up. The signal must be from a fairly weak or distant station to prevent the exposed wiring and coils from picking up too much energy. If the receiver has A.V.C., the results will not be so pronounced as the A.V.C. tends to level the output unless very weak signals are picked up. It may be necessary to try several stations in order to obtain proper observations.

2. After adjusting the receiver, leave the ground wire connected, but disconnect the antenna from the receiver. Connect the antenna terminal of the receiver to coil terminal 3 of Fig. 91 with a short piece of wire. This one coil may pick up some energy from the station, however the signal should be weaker than that picked up by the antenna system.

3. Connect the antenna lead-in to coil terminal 2 of Fig. 91. As the coils are brought closer together, the signal strength will increase with the increase in coupling. Place the coils end to end and insert a metal plate between them.

4. Connect a wire to the ground post and touch it to the plate. You now have the circuit shown in Fig. 92. Notice the

(Page 8, please)



The Laboratory Page (Continued from page 7)

results of grounding the shield. Also try several different materials if available.

Theory and Observations: The type of coupling employed in this experiment is capacitive; in fact, any capacity coupling means could be used in place of the coils, such as two metal plates. In order for inductive coupling to exist a current must flow through the coil, which is impossible when one terminal is left free.

Theoretically, placing the shield between the coils without grounding the shield, as in pro-

cedure No. 3, will result in an increase in signal as the capacity is slightly increased. Practically, no change or even a slight decrease may be noted, depending on the radio and signal strength.

In procedure No. 4, grounding the shield will eliminate the coupling between coils as the capacity between the antenna coil and the shield passes the energy to ground. This will reduce or eliminate the signal energy passed to the receiver.

EXPERIMENT NO. 61

Object: To show the effect of shielding on electromagnetic coupling.

Apparatus Required: Use the same materials used in experiment No. 60.

Experimental Procedures: 1. Tune in the radio as in experiment No. 60, procedure No. 1.

2. After adjusting the receiver, disconnect both the antenna and ground wires. Connect coil terminal No. 1 to the ground wire; terminal No. 2 to the antenna lead-in; terminal No. 3 to the antenna post of the radio and terminal No. 4 to the ground post of the radio, using short pieces of wire. See Fig. 91 for the coil terminals and Fig. 93 for the electrical connections. The signals should be found increased over those obtained by the capacity coupling of the previous experiment.

3. Insert the shield between the coils. The signal should be reduced to a noticeable extent.

4. Connect a wire from the ground post of the radio to the shield so as to have the circuit shown in Fig. 93. The signals will be reduced more than in procedure No. 3.

Theory and Observations: Inductive coupling can exist in this experiment as the circuit through the coils is complete. This coupling, together with the capacitive coupling still existing results in a greater signal strength.

In procedure No. 2, the shield affects only slightly the capacitive coupling however the inductive coupling is reduced to a very low value, consisting of stray fields around the shield.

Grounding the shield in procedure No. 4 again eliminates the capacity coupling as in the pre-

vious experiment. The only remaining coupling is the stray magnetic fields mentioned above.

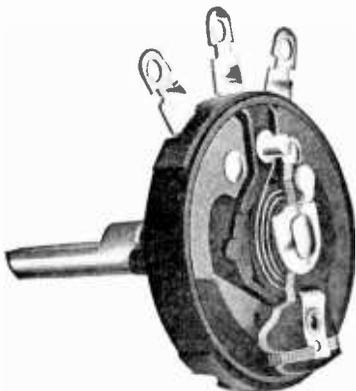
Practical Applications: Shields are used in many ways, in radio devices and allied fields. They confine magnetic and electrostatic fields to the desired circuits, preventing undesired feed-back; they prevent coils from picking up undesired signals; prevent electrostatic coupling while permitting magnetic coupling, and also will be found preventing the radiation of interference from such noise sources as motors, ultra violet ray equipment, etc.

In sharply tuned circuits, weak coupling is desirable. In some receivers a small copper plate or ring is inserted between the coils to weaken the coupling. A similar ring is employed to eliminate capacity where inductive coupling alone is desired. A special shield consisting of a wire mesh is employed for this purpose in some cases.

While this demonstration has been limited to radio frequencies we frequently find shield applications designed for audio work also. At lower frequencies, iron is most effective and is the most common shield. Such shielding will be found on high grade power transformers and chokes to prevent the radiation of A.C. fields and on audio transformers to confine the leakage field and prevent interfering fields such as A.C. fields which would produce a hum from being picked up. A copper shield will be found on some power transformers between the primary and the secondaries. This copper shield has little effect on the low frequency (25 to 60 cycles) electromagnetic field produced by the power line voltage but will act as an electrostatic shield preventing the introduction of high frequency line disturbances into the radio by capacity coupling.

Metal-to-Metal Sliding Contact Eliminated in Replacement Controls

Definite elimination of sliding, metal-to-metal contact in volume controls, with resulting elimination of the most common cause of noise, has been announced by the International Resistance Company in its new line of special replacement Metallized type Controls.



This exclusive IRC development which comes as the result of two years of engineering research is known as the Silent Spiral Connector.

By means of a spiral spring wire, positive and continuous electrical connection is obtained between the center terminal and the volume adjustment arm. Thanks to this replacement of slide and friction with solid, positive contact, there is no chance for noise to develop at this point where most control noises originate.

The Silent Spiral Connector comes as IRC's answer to the demand for better, quieter controls for those critical special replacement jobs that cannot be handled with standard control types. These controls are readily identified by the letter "J" preceding their part number in the IRC Volume Control Guide.

This new IRC Guide, just completed, is heralded as one of the most comprehensive ever issued, listing the proper standard and special IRC replacements for almost every Radio receiver made up to the present time. It also contains a wealth of volume control information, resistance calculation data, etc.

The Guide is free upon request, either through IRC jobbers or direct to the International Resistance Company, 401 N. Broad St., Philadelphia, Pa.

New Antenna Systems in Handy Kit Form

An antenna system for every purse and purpose, put up in handy kit form, is realized by this season's TACO line just announced by Technical Appliance Corp., 17 E. 16th St., New York City.

Where price is the prime factor yet better reception is sought than is possible with the old-fashioned straight-wire aerial, there is Model 400. This is a self-selecting system with fair noise-reducing properties. Automatically provides for broadcast or short-wave reception. Requires minimum roof space.

Then there is Model 510 providing excellent signal pickup and minimized background noise. Fully automatic, eliminating need of switching for broadcast or short-wave bands.

For superlative performance especially in localities notoriously poor, due to severe electrical disturbances, there is Model 210 kit, designed for outstanding reception in broadcast and short-wave bands.

The Radio outlet requirements of apartment houses, hotels, hospitals and other large buildings, as well as the private dwelling, are met by the new TACO Master Antenna System. This comprises a foundation kit for aerial proper and downlead, as well as necessary number of couplers. This system is also employed for Radio set demonstrations in stores. Various set couplers, line noise filters and wave traps, and even a straight-wire aerial kit, rounds out this season's TACO line.



A new Master Antenna System Manual just issued may be had from the local TACO jobber or by writing the Technical Appliance Corp., 17 East 16th St., New York City. This latest edition covers the profit-making possibilities of the master antenna system as applied not only to apartment houses and other large buildings, but also to individual dwellings wherein many Radio set outlets are required. It deals with the theory, installation and operation of such a system, as well as the survey of buildings and estimating.

Winners in Radio Business-Getting Idea Contest

ENTRIES in the Radio service business-getting idea contest announced in the August-September issue of NATIONAL RADIO NEWS show that N. R. I. students and graduates are doing some very effective advertising. With no two entries alike and each presenting an idea which worked out satisfactorily in a particular community, judging involved a careful study of each entry and consideration of its value in other localities.

First prize—\$10,000 in cash. This was awarded to Graduate W. B. Parrish of Frankfort, Ky., for his low-cost but effective door-card idea shown at the upper left in the greatly reduced illustration. Excerpts from his letter follow:

"The following idea has proven very successful for my Radio service business. It is the only form of advertising that I need now to keep two of us busy servicing Radios six days a week.

"I am enclosing a copy of what I mean—a simple door card. When I deliver a customer's Radio, I fill out a supply of these cards, and hang one on the front door knob of each neighboring house.

"It is hard to estimate the percentage of new customers obtained in this way, but the results have been amazing during the five months which I have used the idea. I find this advertising very economical (these cards can be obtained at a cost of less than \$3.00 per thousand). Very little time is required in filling out and distributing the cards, and they serve to establish confidence in the quality and reliability of my work."

W. B. PARRISH.

Second prize—\$5,000 in cash. Two entries were considered equally worthy of second place, and therefore duplicate prizes of \$5,000 each were awarded to Graduate Ray Collier of North Adams, Mass., for his combination advertising and fire-alarm box listing card, shown at the upper right in the illustration, and to Graduate Ralph S. Harrison of Bethesda, Ohio, for his very effective detachable-stub card, shown at the bottom of the illustration. Excerpts from their letters follow:

"As a part-time service man, I have found the enclosed fire alarm box card to be of great help in bringing in business. I distributed three hundred of these cards door-to-door and to friends, and during the first week made enough profit to pay for another two thousand at \$5.00 per thousand. Since some people cut advertising matter from cards which they want to keep, I divided the fire-alarm box listing into two sections and placed my name and phone number in between, where it was not so likely to be removed.

"Each time I get a new customer, I place one of these cards in a conspicuous place in his home or place of business where it will be seen by as many people as possible. I carry a small box of thumb tacks along and ask permission to tack it up at a place where it will serve as a permanent advertisement instead of being hidden in some desk drawer."

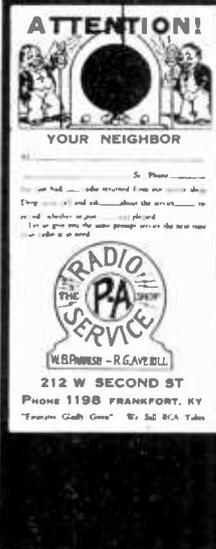
RAY COLLIER.

This listing of fire-alarm boxes may not apply to your own town, but the idea can be modified to include other useful information, such as the times when news flashes are broadcast by nearby Radio stations.

"Enclosed is a sample of the literature which I use to get Radio service business. I mailed out several hundred of these cards to people for whom I had done Radio work before and to others whose names I secured from the telephone directory. I also left one card at each house in my town and in several neighboring towns. In a few days the detachable stubs from the cards started pouring in. I got quite a bit of service work and made several sales. This won me new customers and paved the way to a bigger and better service business. I play up my amateur Radio activities in all advertising, for I have found that it brings in considerable extra service business."

RALPH S. HARRISON.

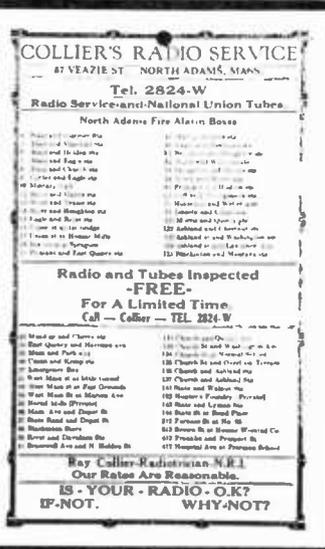
Prizes have also been sent to the ten third-prize winners. Their names and some of their entries will be given in a future issue of NATIONAL RADIO NEWS.



ATTENTION!
YOUR NEIGHBOR

YOUR RADIO SERVICE

212 W SECOND ST
PHONE 1198 FRANKFORT, KY



COLLIER'S RADIO SERVICE
87 VEAZIE ST. NORTH ADAMS, MASS.
Tel. 2824-W
Radio Service—National Union Tubes
North Adams Fire Alarm Boxes

Radio and Tubes Inspected
-FREE-
For A Limited Time.
Call - Collier - TEL. 2824-W

PUT THIS CARD INSIDE YOUR RADIO

CERTIFIED RADIO & ELECTRIC SERVICE

ANY MAKE RADIO REPAIRED

RALPH S. HARRISON
1630 W. 10th St. CLEVELAND, OHIO

FREE INSPECTION

We will gladly inspect your Radio and Test the Tubes Free of Charge if you will fill out this Card and Mail it to us

Your Name _____
Address _____
Name of City _____
Reception Good Fair Poor

Novel Radio Items

—BY L. J. MARKUS—

Radio Traps Dogs!

When an irate housewife in Denver complains about a stray dog, police notify the dog catcher via short-wave radio, in order that he can arrive at the scene before the culprit escapes.

— n r i —

Electric Ears Aim Guns!

Electric "ears" developed by the War Department can automatically aim anti-aircraft guns at an approaching plane until a hit is obtained. Each "ear" is a sensitive microphone feeding into an A.F. amplifier.

— n r i —

P. A. Invades Train!

Sightseeing trains on a New Jersey railroad have a complete public address system, with microphones in the dining car, baggage car and locomotive cab, and a loudspeaker in each coach. The chef can thus call all passengers to dinner at once, while an announcer in the baggage car can give interesting facts about scenes being passed.

— n r i —

Television Goes Places!

A dancer in Moscow was seen in England, 1,200 miles away, by a youth operating an old 30-line television receiver. It is rumored that Moscow will have high-definition television by the end of this year.

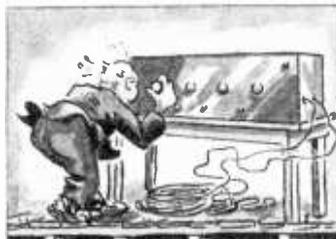
— n r i —

Electrons Tune Pianos!

A special cathode ray oscillograph which is connected to a microphone and twelve electrically driven tuning forks can be used to tune musical instruments or analyze any singing voice.



RADIO WAVES INDUCE SLEEP!
A Soviet scientist, after putting a frog to sleep with high frequency radio apparatus, tried out the experiment on himself. While radio waves penetrated his body he slept soundly, but woke up immediately when the apparatus was switched off.



IS THIS A RADIO HOAX? In the cellar of their home in Czechoslovakia two young men recently demonstrated to professors their ability to act as human radio sets. The men joined hands, drew long, deep breaths for twenty minutes, then picked up a radio loudspeaker whose connecting wires had been removed. Softly at first but growing ever louder, music—an orchestra broadcasting from London—came from the loudspeaker! Could the men have concealed in the loudspeaker a coil which picked up by induction the energy from a coil connected to a radio receiver in the room above?

World's Smallest "B" Battery!

A 45-volt "B" battery smaller than a flashlight cell and weighing less than 2 ounces has been developed for radio meteorograph use. Layer-built construction gives it a life of several hours, which is more than ample for use in broadcasting weather data from pilot balloons in the stratosphere.

— n r i —

Bugle Goes Electrical!

A phonograph record, crystal pick-up, audio amplifier and giant loudspeaker have replaced the bugler at the 2nd Area Air Base at Mitchel Field, N. Y.

— n r i —

Antenna Is Irrigated!

A three-foot levee surrounds the transmitting station of KYOS in Merced, California. Water is run into the area from a nearby irrigation canal to increase the efficiency of the ground system.

— n r i —

KROW Electrocutes Mice!

Mice nesting in the main power transformer of KROW short-circuited the terminals, causing this Oakland, California station to lose its voice for 83 minutes.

— n r i —

Quaint Old Boston!

It is unlawful to run a radio in any Boston hotel lobby on Sunday without a special permit.



New High in Holiday Mail Expected

By Gordon Birrel, Personnel Director

The National Council of Business Mail Users in their members' service letter of a month ago, said, "There is ample reason to believe that Christmas mail this year will be the heaviest in the entire history of the Post Office Department. On this expectation, plans are already under way at Washington to handle the extraordinary volume, and local postmasters are being advised already by Department Officials to start preparations NOW."

Bigger Christmas mails mean a bigger Christmas for more people. We rejoice to think of more happy folks than ever before through the length and breadth of the land. We hope that the N.R.I. family from Alaska to Florida, from Laborador to California, and all points between and beyond, get—and send—their share and more of holiday gifts and greetings.

We hope, also, that you will, one and all, make some allowance for the heavy strain thrown on the postal system by the avalanche of extra mail. A moment's thought will show you that the peak in postal volume between December 10 and January 5 each year is like the five o'clock traffic jams in every city in the country every day, or like the middle of harvest on a farm—there is simply too much work, too much traffic, for the facilities and workers to handle. The wonder is not that Christmas mails are a little slower than the average for the year, but that they do not pile up in hopeless traffic jams and stall completely.

You can definitely expect some delays in service between yourself and N.R.I. in December and the early part of January. We do not believe these delays will have any serious effect on your progress in the Course if you make up your mind that you are not going to let them. Maintain your study schedule; send your lessons off as soon as read; and be philosophical about any delay that neither you nor we, nor anyone else could possibly be expected to prevent. Your actual progress is much more likely to be interrupted by holiday festivities

than by slow mails, unless you take advantage of time at home for extra study.

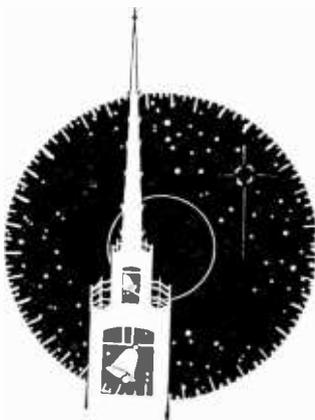
Here at N.R.I. we try to do what we can to cooperate with postal authorities and level out the peak. We suggest that you plan now to mail your Christmas packages, letters, and cards to relatives and friends earlier this year than last year. Postmasters, postal clerks, railway mail clerks, carriers, and many others will thank you.

Here are a few suggestions and Post Office rules for better mail service.

Wrap every package securely. (In ONE YEAR 153,508 articles sent by parcel post were found *loose in the mails*. If Uncle Abner is to get his new ear muffs, or your ONE and ONLY is not to be badly disappointed December 25, use sturdy boxes, plenty of wrapping paper, stout cord, and tie securely.) Don't fail to apply postage stamps of the required value! The local first class mail rate is 2 cents an ounce, elsewhere 3 cents (to some foreign countries it is higher). Unsealed greeting cards can be mailed for 1½ cents.

Addresses should be PLAIN and CORRECT. (Reason—400,660 parcel post packages and 12,328,618 letters had to go to the dead letter office in ONE YEAR alone.) Don't forget your RETURN ADDRESS. (Of the 12,328,618 dead letters, only 2,828,291 could be returned.) Register valuable letters. Insure packages.

For a Merry Christmas without needless disappointments, *mail carefully and early.*



Business Problems in Radio Servicing

(Concluded from October-November issue)

Few servicemen think of considering depreciation on their testing equipment, shop furniture, fixtures, or automobile used for business as an operating expense—but it is. And don't neglect the many lesser items in figuring overhead—they can total up to a sum which will eat away a great deal of your profit. Knowing the yearly overhead cost, the operating cost per business day can readily be determined and a fair portion charged to each job.

The bookkeeping system used for a Radio service business need not be at all complicated or expensive. Simply-designed forms for recording each business transaction and for summarizing at regular periods of time are available at low cost from Radio manufacturers.

Accurate records tend to show up possible economies, and therefore often pay for themselves. Inventory records, for example, reveal merchandise which should be sold before it becomes obsolete or even worthless. Records tell how much depreciation to charge to each piece of equipment used in the business. Records are reminders of discounts granted by firms for bills paid within a certain time limit. Records tell whether a new cathode ray oscillograph can be afforded, whether it is cheaper to operate a delivery truck or have a transfer company make deliveries of large Radio cabinets, and records show how much salary and profit can be taken out of the business without endangering its success.

How to Determine Service Charges. First you must determine a fair hourly rate for your labor on a service job, considering how much you could earn doing the same type of work elsewhere and considering the amount of time you must spend each day on other than service work. The charge for a job will then include charges for labor, for parts used, for overhead and for a business profit. Some judgment must be used in applying this method: however, it would not be fair to charge a customer for mistakes or for a lack of knowledge of a particular set. On the other hand, jobs on which the serviceman has had previous experience may require only a few minutes of work. To charge only for those few minutes would place a penalty on experience and knowledge, as well as set a precedent which the customer might expect in the future. Serviceman: Be fair to yourself as well as to your customers.

Routine Procedures. The value of a routine procedure in locating Radio receiver trouble is unquestioned; it is just as important to follow a carefully planned routine in conducting a busi-

ness. Establish a regular daily period of business; see that the shop is cleaned at regular periods, stock is checked regularly, jobs are delivered when promised, advertising is carried out according to a schedule, bills are paid promptly—in other words, do not let a rush of servicing work interfere with the proper handling of the business end of things.

Meeting Unfair Competition. Competition from other servicemen in a locality must of course be considered, but too much attention to the other fellow can prove disastrous. Take the case where a competitor keeps no records, doesn't know his costs and therefore cuts prices to get business, without knowing whether or not he is making money—to meet such cut-rate prices would simply mean that eventually two businesses rather than one would crash.

There are many ingenious ways of meeting unfair competition—of combatting those who advertise free inspection, no labor charges on service work and high discounts on receivers. Boldly pointing out how it is necessary to pad prices on parts and charge for fictitious repairs is just one of the many methods which honest servicemen are using in combatting the servicing "gymps."



Chief Instructor Dowie, on vacation, making friends with a chimpanzee. Mr. Dowie asked the Editor to point out that he is the one wearing the hat.

Automatic Tuning Is Here To Stay

By J. A. DOWIE, Chief Instructor

frequency control circuit proved to be the answer to this problem.

An automatic tuning unit tunes the receiver circuits to approximately correct frequency while the automatic frequency control circuit completes the job and insures good fidelity over long periods of time, even though the characteristics of several of the tuned circuits may have changed.

Three Basic Systems. There are three basic systems employed in the 1938 radio receivers in order to obtain automatic tuning. They are: 1, an electric motor driving the tuning condenser shaft; 2, a condenser switching system; that is, pre-adjusted condensers for each frequency, introduced into the R.F. amplifier, first detector and first oscillator tuned circuits by a selector switch; 3, a mechanical system which simply aids in setting the dial of a radio receiver rapidly and exactly to the correct setting.

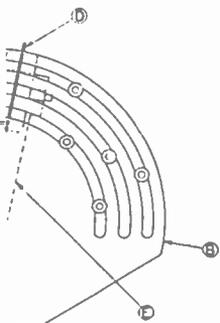


Figure 1

There are various ways of accomplishing automatic tuning with these three basic systems. In some models, push buttons on

which the call letters of the desired stations may be seen are mounted on the receiver panel. All you have to do is to push one of the buttons and in comes the desired station. Such systems use either the electric motor or condenser systems.

Several receiver manufacturers use the telephone-dial type of automatic tuning. This is a mechanism which locks the tuning condenser at the correct dial position when the dial is rotated to approximately the correct position with the forefinger.

Remote Control Automatic Tuning. With a radio receiver having a motor-drive push button control system, it is possible to use a remote control tuning unit which may be located at any point in a room. The remote control unit, about the size of a small book, is connected to the receiver by a single flexible multi-conductor cable. This cable is oftentimes flat and thin enough to be placed on the floor under a rug.

Although at this early date complete details on 1938 automatic tuning control systems are not available, a careful analysis of the different systems which I am going to describe will help you to understand the basic principles involved in the operation of the other systems.

(Page 18, please)

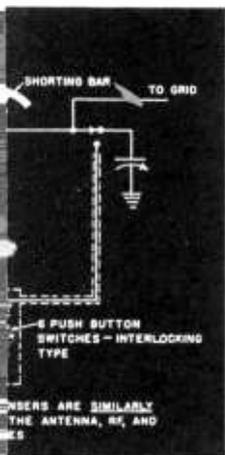


Figure 3

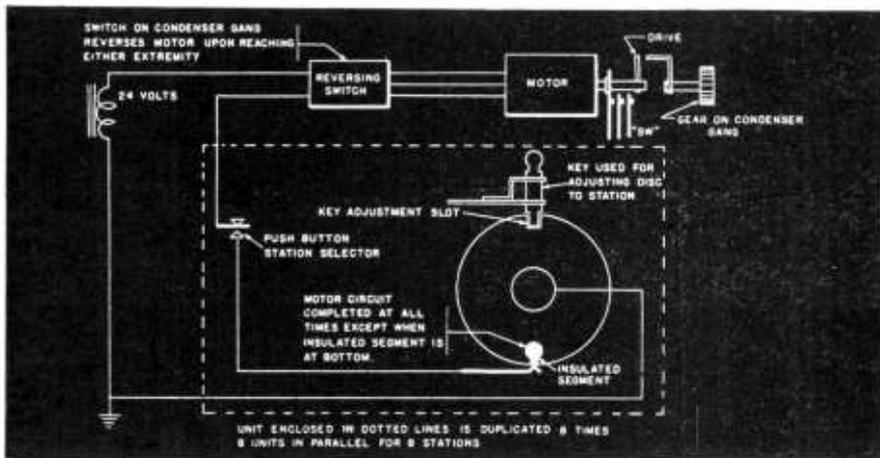


Figure 4

Automatic Tuning Is Here To Stay (Continued from page 17)

The G.E. Automatic Tuning Unit. The automatic tuning system incorporated in the 1938 G.E. radio receivers is of the motor-driven type and operates under much the same principle as the combination used in the R.C.A. receiver. In G.E. receivers, the tuning condenser is stopped when a contact is made which operates a relay rather than opens a circuit as in the case of the R.C.A. system.

In G.E. receivers there are sixteen push buttons on the front panel, thirteen being selector buttons which are connected to adjustable contact pins mounted in three semi-circular rows in a die-casting installed at the rear of the tuning condenser shaft. The tuning condenser shaft is coupled to a roving contact which passes over the pins. The other three push buttons are used for scanning, manual tuning, and for turning the set on.

Figure 1 shows the arrangement of the contacting mechanism used in G.E. receivers. You will note that the adjustable contacts *A* are arranged in three semi-circular rows so that stations may be tuned in which are but 10 kilocycles apart.

Figure 2 shows a simplified diagram of the G.E. automatic system of tuning. For simplicity only the apparatus for selecting one station is shown. Note that the OFF button is connected into the power transformer primary circuit. When any button is pressed, this circuit closes automatically; thus, pushing any station button turns on the set and puts the motor into operation.

The pressing of a station button places both the manual button switch and the relay contacts in a closed position. This means that power is supplied to the motor from the 6.3 volt transformer winding. The motor rotates until the roving contact strikes the contact pin associated with the depressed station button. As soon as contact is made, the relay opens up the motor circuit and also operates a friction clutch to block the motor pulley, which prevents over-travel due to the momentum of moving parts. A reversing switch connected to the condenser shaft reverses the motor when the condenser has reached the limit of its rotation in either direction. Pressing the scan button places the motor into operation, and rotation of the tuning condenser continues until this button is released.

Pushing the manual button opens the motor circuit, allowing manual tuning; pressing any one of the station selector buttons or the scan button releases the manual button. The relay which operates the clutch also actuates contacts which kill the automatic frequency control circuit and silence the tuning of the receiver.

The Sparton Automatic Tuning System. In the Sparton radio receivers the automatic tuning system does not use a motor, but instead employs what is called a Capacity-Selected-System. Push buttons are used to engage the preadjusted trimmer condensers, allowing the selection of any one of six stations.

In Fig. 3 is shown the circuit arrangement for automatic tuning of the radio frequency section of the receiver. The band selector switch inserts into the circuit the band upon which reception is desired, while the switch to the right of it selects either the main tuning condenser or the preadjusted trimmer condensers. Six push buttons operate switches which insert preadjusted trimmer condensers in the radio frequency, mixer, and oscillator stages of a radio receiver. These switches are interlocked in such a way that only the three trimmers for one station are in use at any one time. Automatic frequency control keeps the station in exact tune, and an electric eye indicates when the desired station frequency is obtained. This method of tuning being instantaneous, the station is in tune the moment a button is pressed.

The R.C.A. Automatic Tuning System. The electric motor tuning mechanism incorporated in the R.C.A. models consists essentially of a reversible motor which drives the tuning condenser through a chain of gears, and eight mechanically interlocked station selector push buttons wired to eight adjustable station selector discs (each with a motor-stopping insulated segment). These discs form a drum which is driven by the gang tuning condenser. The arrangement permits any one of eight predetermined stations to be electrically tuned in by merely touching the correct push button.

The operation of the R.C.A. system may be more readily understood by referring to Figs. 4 and 5. When the tuning motor is not energized, the armature is pushed to the rear or slightly off of the magnetic center by a spring, thus disengaging the motor shaft from the driving gear train and permitting manual tuning. Pressing in any one of the eight push buttons will complete the motor circuit through a contactor disc, assuming that the "Manual-Electric-Remote" switch is in "Electric" position. As the motor starts, the armature will be drawn forward due to solenoid action, and a pin on the end of its shaft will engage an arm on the small main pinion gear, thereby driving the tuning mechanism. At the same time contact springs "E" and "D" in Fig. 5 will be grounded, causing suppression of audio amplification and automatic frequency control during the tuning cycle. The motor will continue to

(Page 21, please)

Automatic Tuning Is Here To Stay (Continued from page 18)

operate until the insulated segment in the selector disc breaks the motor circuit, whereupon the spring will instantly disengage the motor pin from the arm on the small pinion driving gear and open contacts "E" and "D."

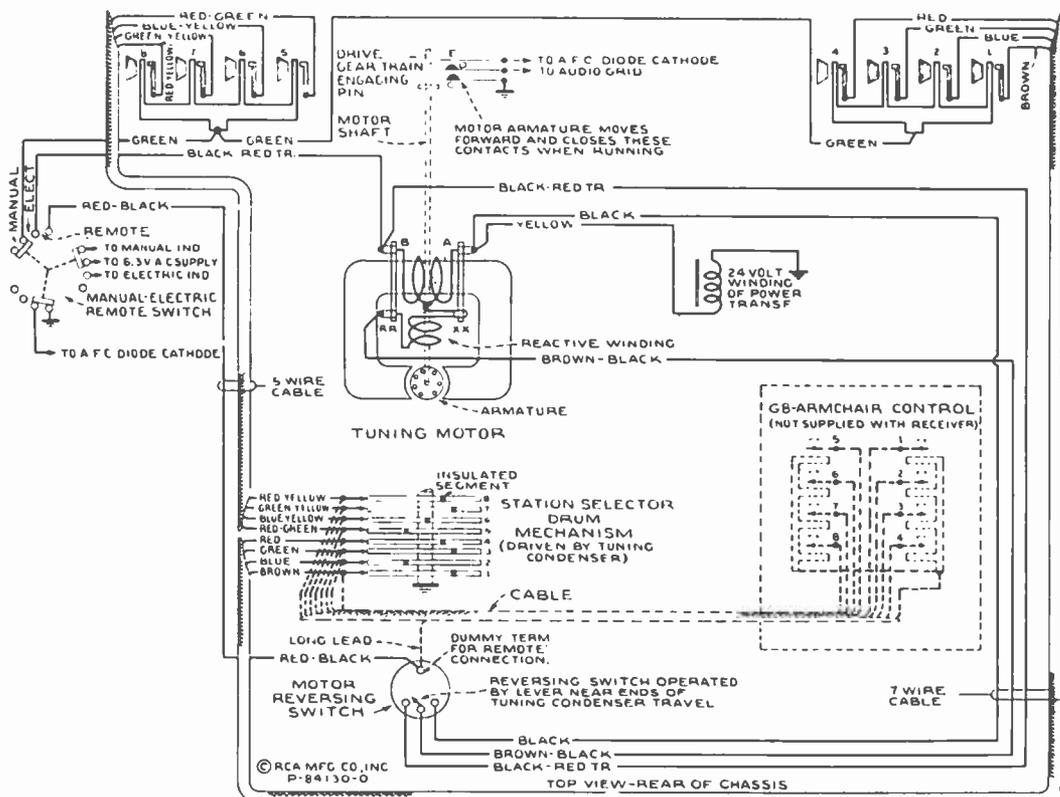
Pushing another station button will cause the above-mentioned cycle to be repeated, except that the motor will be stopped by the insulated segment on a corresponding disc. The discs are individually adjustable, providing a choice of eight "Electric Tuned Broadcast Stations." The arrangement of the motor is such that its rotation will continue in the same direction until the tuning condenser reaches the limit of its travel, whereupon a lever trips a switch which reverses the motor. A throw-out gear is link-coupled to the "Manual-Electric-Remote" control to disconnect the gear train when the control is thrown to "Manual" position.

selector drum mechanism which is driven by the tuning condenser, while Fig. 5 gives a complete picture of how one of these discs operates. Each of the eight station selector drum discs may be properly adjusted by inserting an adjusting key and then tuning the dial of the receiver manually to the desired station. After tuning in the desired station the key is removed, completing the adjustment.

Teledial Automatic Tuning Units. Manual types of automatic tuning have been developed by several leading receiver set manufacturers. For example, the teledial used in the Grunow receivers enables one to tune the receiver to any one of sixteen preselected stations with accuracy, speed, ease and silence. Tuning is accomplished in these receivers simply by pushing in the button of the desired station with the forefinger and at the same time turning the dial either to the right or to the left toward the bottom of the dial. When

Figure 5 shows the arrangement of the station

(Page 22, please)



Courtesy R.C.A. Mfg. Co., Inc.

Figure 5

Automatic Tuning Is Here To Stay

(Continued from Page 21)

the correct stopping position is reached, a click is heard; upon removal of the finger, the station is properly tuned in and held tuned in by the AFC circuit within the receiver.

The Emerson radio receivers incorporate a unique teledial system, making it possible to select ten stations throughout the tuning range. A button bearing the call letters of the desired station is pressed down and the dial rotated until it reaches a stop; this will occur when the button is at the top of the dial. The button is then released and the desired station is automatically tuned in.



A remote push-button tuning unit like this can be attached to many of the 1938 automatic tuning receivers permitting control of tuning and volume from any point in the room.

The tuning dial of a 1938 Philco receiver which has automatic tuning looks very much like a conventional dial. The call letters of outstanding radio stations are clearly printed opposite the respective frequency calibrations on the dial. Should the listener wish to tune from one station to another, a tuning handle is rotated about the circumference of the dial to approximately the correct station position. After reaching this position the tuning handle is pressed. This forces a cone-shaped cup over a preadjusted centering cone on the stationary portion of the condenser mounting. The application of extra pressure to the tuning handle thus automatically adjusts the dial of the receiver exactly to the frequency of the desired station, rapidly and accurately.

— n r i —

(The photograph on the front cover of this issue, showing a 1938 model G. E. receiver with automatic tuning, and the G. E. receiver photo on this page, have been supplied through the courtesy of the General Electric Co.)

J. E. Smith Is Honored

At a recent convention of the Knights of the Round Table, International, held in Washington, D. C., and attended by delegates from all over the country, Mr. J. E. Smith was elected President for the ensuing year.

This honor was bestowed upon Mr. Smith because of his great devotion to duties assigned to him by the Knights of the Round Table, International, which organization he served as Vice President for the Eastern Division during the year just past.

The Round Table, International, is a civic organization composed of business and professional men, with clubs, known as Tables, in many principal cities in the United States and foreign countries. These men meet once a week, at luncheon, in a spirit of good fellowship and public welfare.

Mr. Smith's unanimous election to this high office is an expression of the great esteem in which he is held by leading business men from the far reaches of the World and many graduates and students will want to join the Editor of *NATIONAL RADIO NEWS* in congratulating him.



Arcturus Announces New Equipment Deal

A new kind of equipment deal by which dealers and servicemen can obtain the finest, up-to-the-minute shop equipment has just been announced by the Arcturus Radio Tube Company of Newark, N. J. Under this plan, even the most expensive piece of equipment can be had with only a nominal down payment. The full lines of Supreme and Clough-Brengle equipment are available, including tube testers, set testers, oscilloscopes, analyzers, signal generators, combination unit assemblies and many others.

Arcturus Resale Tube Division Sales Manager Jack Geartner calls particular attention to the fact that standard list prices prevail on all tubes, thus making the proposition an exceptionally attractive one from the standpoint of every dealer and serviceman who recognizes such a deal as presenting a quick, practical and decidedly inexpensive means of obtaining modern equipment.

Details on this plan are now in the hands of Arcturus jobbers throughout the country, or complete information may be obtained direct from Arcturus Radio Tube Company, Newark, N. J.



N.R.I. ALUMNI NEWS

P. J. Dunn	President
Earl Bennett, Clarence Stokes	Vice-President
E. H. Rood, F. E. Oliver	Vice-President
Earl Merryman	Secretary
Louis L. Menne	Executive Secretary

Heavy Voting Marks Nominations

Fellows, the vote is in. The nominations are closed. You have chosen your candidates for the various offices in the N.R.I. Alumni Association for the year 1938. Now for the final run-off to select the winning candidates.

Mr. Peter Dunn, better known as Pete, who has served the Alumni Association so well during the past two years, is a candidate for re-election. The heavy vote which Pete Dunn received is an expression of genuine confidence in his administration and an appreciation of his leadership.

Pete is opposed by Ed. Witherstone of Toronto, Ont., Canada, who is a mighty good man in his own right and who will receive plenty of support. Witherstone is a strong candidate and excellent timber for the highest office in this international organization. The boys in Canada are boosters for their candidate. They will undoubtedly back him heavily. Witherstone is also expected to draw much support from the border states and particularly from cities such as Buffalo, Niagara Falls, and Detroit.



For the first time, we have an election with an international aspect between two men of sterling qualities. It will be an interesting race and may the best man win.

As was expected, the four men now holding office as Vice Presidents were re-nominated by a comfortable margin. They are Earl Bennett, Evanston, Illinois; R. H. Rood, Los Angeles, California; F. E. Oliver, Detroit, Michigan, and Clarence Stokes, Philadelphia, Pennsylvania. They share the ballot with formidable candidates in the person of Dr. George B. Thompson of Los Angeles, California; Ray L. Wonderly, Sheridan, Wyoming; Allen McCluskey, Birmingham,

Alabama and Allen Arndt of New York City, New York. All of these men are staunch supporters of N.R.I. Alumni Association and worthy of your full confidence.

Earl Merryman has held the office of Secretary so long he is almost a fixture there. He is opposed by John G. Gough of Baltimore, Maryland, a loyal member and a credit to any organization.

The Constitution provides that the President and Vice Presidents shall be nominated at large but the Secretary and Executive Secretary shall reside in or near Washington, D. C., for the purpose of remaining in active touch with the Institute Headquarters. The candidates for Executive Secretary are L. L. Menne, the incumbent, and Clarence Steed, also of Washington, D. C. Keep your eye on this man Steed. Whether he "goes over" this year or not you will hear more of him. He has a fine personality to add to his good business sense. One of his strongest boosters is the man he is opposing.

Many other members of the Alumni Association received votes but not enough to be nominated. These names include T. J. Telaak, E. H. Leftwich, A. A. Arnheim, LeRoy Shepherd, R. E. James, P. G. Baker, L. J. Vanek, Robert Brady, Albert Maas, C. H. Mills, and Davis Offey. Some of these members previously held office in the N.R.I. Alumni Association. Others are also hard working members who have not yet become known to the membership at large. They will be stronger candidates for nomination next year.

You will find a ballot on page 30. Be sure to vote early. Winning candidates will be announced in the next issue of the NATIONAL RADIO NEWS.

Here and There Among Alumni Members

Graduate John E. Fetzer of WKZO, Kalamazoo, Michigan, was honored by being named to the NAB Engineering Committee for 1937-38.

—n r i—

Donald Johnston of Great Falls, Montana, finds time to do some elk hunting in season. Imagine bringing down a bull elk weighing about 800 pounds! We may take you up on that invitation next year, Donald.

—n r i—

A two-way amplified Talk-Back system has been designed by Graduate Albert C. Lent of Montrose, N. Y. He is successfully selling this system to many large business establishments.

—n r i—

Howard Spangler, who owns the Spangler Radio Service Shop in Knoxville, Tenn., has found it necessary to enlarge his shop to meet increasing business. Howard will be glad to have you drop in on him if in his vicinity.

—n r i—

Graduate Otis L. Wright of Siloam Springs, Ark., has been offered a position as Radio Instructor at John Brown University. He is also operator at Station KUOA, owned by the University.

—n r i—

A sweet bundle of sunshine came to the home of Michael Rost, Jr., of Boonton, N. J. The little lady will be trained to serve as secretary for Rost in his prosperous Radio business, so he says.

—n r i—

James Balsamello who was one of the regulars in Chicago Chapter has taken charge of the service department of E. H. Scott Radio Lab., Inc., in Los Angeles. The Chicago boys will miss him.

—n r i—

And here is fair exchange. Lloyd L. Turk returned to Chicago from Los Angeles where he had a great time for a year and a half recalibrating and relogging electric meters preparing the city for the new Boulder Dam power.

—n r i—

Erle E. White, who graduated in June, 1925, writes that he is now employed as Radio operator at Station WTMV, East St. Louis, Ill.

—n r i—

"You can tell the boys I am giving Diagnoscope service with a 555 Supreme won by me through the \$600.00 contest sponsored by Rathcon Tube Manufacturing Co.," writes Harold A. Jenkins of Chester, Penna. Congratulations!

—n r i—

J. Nicholas Roberts, Jr., sends us an excellent photograph taken on board ship in mid-ocean. He has been going to sea as Radio operator for the past three years and enjoys the adventure.

—n r i—

Dr. C. L. Miller, prominent Silver City, New Mexico dentist and graduate of N.R.I., passed

away after a brief illness. Dr. Miller was a loyal friend of N.R.I. and will be sadly missed.



Frederick A. Luning of Willoughby, Ohio, writes to say he purchased his own home on his spare time Radio earnings. In addition he gives us the good news that his family was blessed with a brand new daughter.

—n r i—

George Andre of Parkersburg, W. Va., dropped in at headquarters on his return from a vacation in Belgium. Had a grand trip but is glad to be back with the boys in the good old U.S.A.

—n r i—

Here is something unique, if not new. J. H. Pennington of Hensley, W. Va. is building a shop on wheels to travel through West Virginia and Kentucky. He has been in the Radio business for some time. The results of his new experiment will be interesting.

—n r i—

The fellows of Baltimore Chapter were so impressed with a talk made by Joseph Kaufman, Director of Education, N.R.I., at one of their recent meetings that they there and then made him an honorary lifetime member of the Chapter. Kaufman accepted the honor like a blushing bride.

—n r i—

This page is for you fellows to exchange news and personal items. Let's have them.

—n r i—

A. E. Barwood of Port Elizabeth, South Africa, is mighty happy in his new Radio job with United Motor Services, installing and repairing auto Radios. From laborer to Radio man at 30% increase in pay—who wouldn't be happy.

—n r i—

Remember Rex A. Floyd, our Eskimo member at Pt. Barrow, Alaska, who was mentioned in this column recently? Latest word is that he is building a 60 foot tower for use by the hospital and doctors at his point. Floyd does practically all the Radio and Electrical work in his community and is quite a fellow up there.

—n r i—

Cecil Johnson of Alexandria, La., is very proud of his membership in N.R.I. Alumni Association. He sends greetings to all.

—n r i—

National President Dunn sends seasons greetings to each and every member of the N.R.I. Alumni Association and thanks you most sincerely for your help in our forward march during the year of 1937.



The Service Forum

Conducted by

J. B. Straughn, N. R. I. Service Consultant

GRUNOW MODEL 6C DISTORTION

If the distortion sounds like overloading and touching the control grid of the 75 and the chassis at the same time clears up the tone, excessive bias is being applied to the 75 control grid. This in turn is due to excessive plate current on the part of the power tube. Its plate current passes through the voltage divided resistor one of whose uses is to bias the 75. Anything which is done to decrease the bias will stop the distortion, for example the grid return can be grounded, the bias resistor shorted. An 85 tube which requires more bias will work O. K. The trouble is due to leakage in the coupling condenser between the 75 plate and 42 control grid. Install a .02 mfd. 600 volt condenser in place of the old one and the distortion will be entirely eliminated.

-----n r i-----

PHILCO MODEL 54 LOW VOLUME AND DISTORTION

If this occurs after the receiver has been playing for about twenty minutes, try a new 43 type tube. The control grid of this tube sometimes opens up inside the tube allowing the tube to draw excessive plate current. A drop in plate to cathode voltage in this tube when the distortion occurs shows up this condition.

C. W. SULT, Virginia.

-----n r i-----

MAJESTIC MODEL 25 CANNOT ALIGN

When this condition occurs and the hum level is greater than normal the trouble is due to a defective electrolytic filter condenser. A new 8 microfarad electrolytic condenser should be installed and it will then be possible to align the receiver.

C. W. SULT, Virginia.

-----n r i-----

MAJESTIC MODEL 90 MOTORBOATING

Replace the .004 microfarad mica condenser from the plate of the 27 detector tube to the chassis. The use of a smaller condenser such as a .001 microfarad or .002 microfarad will increase the high frequency response.

C. W. SULT, Virginia.

TATRO MODEL EN-6-4 NOISY, WEAK OR DEAD

This condition is frequently due to a poor connection or a break in the oscillator coil. To check for it connect a 22.5 volt C battery and headphones in series with the primary of the oscillator coil. If the noise is heard in the phones a new coil should be installed.

C. W. SULT, Virginia.

-----n r i-----

PHILCO MODEL 20 DEAD

When this condition occurs and a voltage check shows 100 volts on the cathodes of the R.F. tubes through the volume control, check the voltage divider. If the 150 ohm section to which the volume control connects is open this condition will occur. The remedy is to shunt another 150 ohm resistor across the defective section of the voltage divider.

C. W. SULT, Virginia.

-----n r i-----

RCA VICTOR MODEL 262 WEAK, DISTORTED OR INTERMITTENT

Check the .05 microfarad condenser No. C-44 connected to the movable arm of the volume control.

-----n r i-----

GENERAL ELECTRIC MODELS WEAK OR E-61, E-62 AND E-68 INTERMITTENT

Check coupling condenser C-19 (.01 microfarad) connected to the grid of the audio amplifier tube No. 6F5.

-----n r i-----

ATWATER KENT MODEL 237-Q DEAD ON 49 METERS

Replace the 50,000 ohm resistor in the oscillator grid of the first detector oscillator 1C6 as this resistor changes in value.

C. C. VAN ECK, South Africa.

-----n r i-----

MOTOROLA MODEL 35 POPS AND CRACKS WHEN JARRED INTERMITTENT

Check the underneath side of the gang condensers for broken connections, especially the black wire on the middle condenser. These wires are rather

(Page 27, please)



Fellowship---As I See It

By L. L. Menne, Executive Secretary

Christmas is a good time to say some things which, in the busy rush of other months might sound philosophical. There is no better time than now to thank you for your fine cooperation during the past year, and for your friendly greetings which

have made this work a genuine pleasure.

The N.R.I. Alumni Association is an organization of fellowship. From personal experience I can say that fellowship is the stoutest link in the chain of commercial life. It involves the most magnificent rules in the big job of living.

When the time comes for you and me to go to that great enchanted spirit land from which no man returns, let us be remembered not by how much worldly goods we acquired, but how we played the game. We need have no illusions about our success in life; most of us will have failed much. One might chisel an epitaph for all men: "Here lies a man who tried hard, who meant well, but failed much!"

I remember when I was a very young man, away from my boy, then two years old, for the first time. I was in a western city among strangers, feeling the cold pangs of men who were not interested in what I was trying to sell. I returned to the hotel at night, tired and discouraged. On the dresser was an advertisement, and printed on the back of it was a poem by Louise Tarkington, "The Land of Beginning Again." I read it, and in my receptive mood, it impressed me so much I memorized it. These lines I shall never forget -

"I wish that there were some wonderful place
Called the Land of Beginning Again,
Where all our mistakes and all our heartaches
And all our poor, selfish grief—could be
Dropped, like a shabby old coat at the door
And never to be put on again.

"I wish we could come on it all unaware,
Like the hunter who finds the lost trail,
And I wish that the one whom our blindness
Had done—the greatest injustice of all
Could be at the gates like an old friend who
waits—for the comrade he's gladdest to hail.

"We would find all the things we intended to do
But forgot, and remembered—too late, like
Praises unspoken, little promises broken, and
All of the thousand and one—little duties
Neglected that might have perfected—the day
for one less fortunate."

Forgotten! Yes, too often since then I have forgotten, and so have you. All the new resolutions you and I make and break this glad New Year will count for nothing. It is the one we keep which will help shape our life.

Not long ago, good friend, I stood by the fresh sod over one of my faithful friends. The sun was setting with its beautiful benediction of a perfect day; a kindly Pastor was telling of his simple virtues, but one-half will never be told. This friend of mine had done so many fine things for others, that conventional platitudes sounded out of place; one of those noblemen who had faced the drab daily grind of trying to get ahead, but who had spent most of his life wearing half-soled shoes that his children might go through school. There were those there who said he had been a failure, but still—

That place of worship was filled to the door with neighbors who had shared his fellowship; there were sobs of honest grief. He was just one of those millions who had feverishly worked for his family, paid his bills and his taxes, had a word of good cheer for his neighbors. A respectable citizen, a fond father, and a faithful husband. His life was a lesson in loyalty and service.

I hope some day as much may be said for me and for you.

Perhaps it is the season of the year that prompts me to greet you with this message. If I am a bit emotional you will pardon me, I know. I like to feel the Alumni Association is composed of men such as my friend to whom I have paid tribute. For without human fellowship and friendly contact, irrespective of the judgment of men, unless we are prepared to make fellowship part of our lives, we have failed.

As I measure my worldly goods I have no more than a year ago, but I am rich. I have the respect and confidence of my superiors, I have my family and I have friends such as you. In this spirit I greet you at this Christmas season. May the New Year bring you much peace and happiness and may it see the fruition of all your hopes and ambitions.

The Service Forum (Continued from Page 25)

stiff and the vibration in the car soon causes them to snap off. In a few sets I have serviced, the trouble was traced back to a broken connection in the second R.F. coil.

W. B. PARRISH, Kentucky.

— n r i —

PHILCO MODEL 73 WIRING DIAGRAM
This receiver is for 25 cycle operation and except for a slight change in the condenser block is the same as the Philco Model 76 whose diagram may be used when servicing it.

LEON D. MARKHAM, Michigan.

— n r i —

PHILCO MODEL 630 DISTORTION
If the distortion sounds like overloading and touching the control grid of the 75 and the chassis at the same time clears up the tone, excessive bias is being applied to the 75 control grid. This in turn is due to excessive plate current on the part of the power tube. Its plate current passes through the voltage divider resistor one of whose uses is to bias the 75. Anything which is done to decrease the bias will stop the distortion—for example, the grid return can be grounded, the bias resistor shorted. An 85 tube which requires more bias will work O. K. The trouble is due to leakage in the coupling condenser between the 75 plate and 42 control grid. Install a .02 microfarad 600 volt condenser in place of the old one and the distortion will be entirely eliminated.

— n r i —

EMERSON CHASSIS A7 DEAD
Check both sections of the cathode resistor. The section fed from the red wire has a value of 12,500 ohms. The 4 microfarad tubular electrolytic screen to chassis by-pass should be disconnected when checking the 15,000 ohm section. 5 watt resistors should be used for replacement purposes. The electrolytic condenser mentioned above usually must be replaced.

— n r i —

GRUNOW MODEL 7A INTERMITTENT
Replace the two .1 microfarad condensers in the small metal can mounted on the bottom of the R.F. coil shields. The leads come through the bottom of the R.F. coil shields, the lugs on the condenser can are dummy lugs. Also check carefully the decoupling condenser connected to the junction of the two 250,000 ohm resistors on the resistor strip. This condenser is mounted in the condenser can located on top of the chassis in rear of the gang condenser. The negative lead goes to chassis. Replace with .1 microfarad condenser.

— n r i —

MIDWEST 1934, 35 AND 36 MODELS DEAD OR WEAK
The plates of the first detector and I.F. tubes are supplied with voltage through a ½ watt

5,000 ohm resistor mounted inside the I.F. transformer cans. A .05 microfarad 400 volt by-pass condenser is connected between the resistor and the B+ end of the transformer. Leakage through this condenser allows excessive current to flow through the resistor which changes its value. Install a 5,000 ohm ½ watt resistor and a .05 microfarad 600 volt condenser.

R. THOMPSON, West Virginia.

— n r i —

APEX 8A DEAD OR WEAK
Should the receiver function properly with the 27 A.V.C. tube removed see if the screen lead of the 47 is touching the A.V.C. control grid. This will make the control grid positive and the increase in plate current through the A.V.C. load resistor will over bias the A.V.C. controlled tubes. Move the screen lead over as even the insulation should not touch the control grid due to a possibility of leakage if the insulation has absorbed moisture.

WILLIAM GROVE, Indiana.

— n r i —

**SILVERTONE MODELS OSCILLATION
1850 AND 1851**

If the receiver squeals and blocks when the I.F. is peaked replace the two 8 microfarad units housed in a single cardboard case. These act as the I.F. screen and plate by-pass condensers. At the same time it will be a good idea to replace the 35 microfarad 25 volt condenser across the 800 ohm bias resistor. A 25 microfarad 25 volt condenser which is readily obtainable will prove a satisfactory replacement. A defect in these condensers will also cause distortion.

GRAHAM WHISENANT, Texas.

— n r i —

**GLORITONE MODEL 26 POWER
TRANSFORMER
SMOKES**

This trouble may be due to a shorted 80 tube, broken down filter condensers, defective insulation on wiring or an internal short. In the latter case replacement is necessary. If the smoking and sizzling stops with the 80 removed either it or the condensers are at fault. Should it continue spread the leads from the transformer (turn set off) to eliminate a short at that point. Defective leads can be replaced with rubber covered hook-up wire. If the short is in the transformer it must be replaced.

PAUL HUMPHREY, Ohio.

— n r i —

ZENITH MODEL 4-T-26 WEAK
Check the 6-4-2 microfarad unit mounted upright on the chassis and if defective replace. This is Zenith part number 22-407.

PAUL HUMPHREY, Ohio.

Chicago Chapter



After a period of intense activity a bit of relaxation helps one to keep from going stale and becoming tired and dissatisfied. It makes little difference what form of relaxation is followed, the benefit comes from a complete change of activity. After such a respite enthusiasms should be refreshed, and unless a man is deficient in some respect he should resume his work with new zest and vigor. This is especially true when the work is worthwhile, practical and pleasant at the same time.

The Chicago Chapter of the NRIAA has enjoyed a two month lay-off during an exceptionally fine summer season, and the resumption of meetings should be hailed with keen anticipation.

For the most part, meetings to date have been almost entirely of an educational nature. Lectures have been heard covering all phases of Radio servicing, theory and practice, component parts, new developments as they arose, test equipment and its use, the business side, and at times when no lecture was scheduled there has been round table discussions of methods and principles which have been highly interesting and informative.

This educational feature is of course highly commendable and more than sufficient to justify the existence of the organization, but any association

which accomplishes nothing more than this is failing to capitalize upon its opportunities. A good organization is a powerful influence in improving general working conditions and practices, educating the public to the capabilities and integrity of the business, eliminating unethical practices and unfair competition. It should capitalize upon its opportunities in advertising, and sell its members to the public. Its possibilities are legion, and to date the Chicago Chapter has not fully taken advantage of these opportunities.

True, there has been some reason for this. The Chicago Chapter is still a comparatively new organization and was faced with the necessity of establishing itself and becoming known before attempting any elaborate and extensive program. The general apathy of Radio servicemen to organization of any kind has been and still is a serious obstacle. Finding officers and leaders with initiative and ability who have the time and will to exercise these qualities is always a problem. However, the Chapter has been established long enough now that its existence is well known to Radio men, and to manufacturers and publishers also. The indifference of Radio men to organization can be overcome if the association will get down to business and really offer them some inducement to join. Finding capable leadership is by no means an impossibility, and the larger the organization becomes, the simpler that problem becomes.

It is time the Chicago Chapter started taking advantage of its opportunities, and now that activities are to be resumed, it is to be fervently hoped we can see some motions made in this direction. Let's get going—now!

— n r i —

Directory of Chapters

Baltimore—I. A. Willett, Secretary, 2411 Arunah Ave., Baltimore, Md.

Philadelphia-Camden—Clarence Stokes, Treasurer, 3347 N. Front St., Philadelphia, Pa.

New York—L. J. Kunert, Secretary, 66-11 74th St., Middle Village, L. I., N. Y.

Buffalo—T. J. Telaak, Chairman, 657 Broadway, Buffalo, N. Y.

Toronto—Ed. Witherstone, Secretary, 363 Nairn Ave., Toronto, Ont., Canada.

Chicago—L. Lewandowski, Secretary, 3130 So. 55th Court, Cicero, Ill.

Pittsburgh—Albert Maas, Secretary, 9 S. Howard Ave., Bellevue, Pa.

Detroit—C. H. Mills, Secretary, 5458 15th St., Detroit, Mich.

Page Twenty-eight

Directory of Officers

(To Serve Until January, 1938)

President—P. J. Dunn, Baltimore, Md.

Vice-Presidents—Earl Bennett, Evanston, Ill.
R. H. Rood, Los Angeles, Calif.
F. E. Oliver, Detroit, Mich.
Clarence Stokes, Phila., Pa.

Secretary—Earl Merryman, Washington, D. C.
Executive Secretary — L. L. Menne, National Headquarters, Washington, D. C.

— n r i —

"To cultivate fraternal relations among the Alumni of the National Radio Institute, to promote the welfare of each alumnus by interchange of helpful information, to foster the spirit of unity and loyalty to our Alma Mater."

Baltimore Chapter

Things have started off with a bang for the fall and winter season. The meetings are well attended. It is good to see so many of the regulars and especially gratifying to have so many new members with us. The spirit of the first fall meeting was one of genuine enthusiasm. Inspiring short talks were made by Chairman Jensen, Acting Secretary Parlett, former Chairman Gralley, National President Dunn, Executive Secretary Menne and our member of long standing, one of our original organizers, John Gough.

The boys mapped out a rattling good constructive program for this winter to be liberally sprinkled with social gatherings. "All work and no play makes Jack a dull boy," said Chairman Jensen. There will be plenty of good practical talks and discussions and there will also be some affairs to which members will be asked to bring their wives and sweethearts to join in the fun.

The second fall meeting was a revelation to the officers. The fellows certainly turned out in great style. Mr. J. Kaufman, Director of Education, N.R.I., addressed the meeting on "Tuning Circuits in Radio Receivers." We will have more of these fine talks and we welcome all students and graduates in this area to meet with us on the first and third Tuesday of every month at the New Howard Hotel, 8:15 P.M.

— n r i —

Detroit Chapter

Detroit Chapter is holding semi-monthly meetings at 11305 Woodward Avenue. These meetings are held on the second and fourth Friday of each month. All members are urged to attend, and non-members, who are students or graduates of N.R.I., are cordially invited. You are assured of a hearty welcome.

Chairman F. Earl Oliver reports that work is going on in the building of a new test bench. Members will be privileged to bring in any receiver for a complete check-up and general discussion. Important announcement of special meetings will be made soon.

— n r i —

Are You Wearing Your Alumni Pin?

In response to demand, Headquarters ordered a new lot of gold filled Alumni pins. These attractive pins are now available. Only members of the N.R.I. Alumni Association are entitled to wear this pin. It is professional in appearance and is fitted with a good strong patented safety clasp to prevent loss. While the supply lasts, they are offered to members of the Alumni Association for \$1 each.

Election of National Officers for 1938 Be Sure to Vote

Soon the present National Officers of N.R.I. Alumni Association will have completed their terms for the year of 1937. They have done noble work and the Alumni Association has expanded under their able leadership.

Now we approach 1938 and again it is your duty to cast your ballot for the men whom you believe should be entrusted with the responsibility of office in this international organization.

The constitution of N.R.I. Alumni Association provides that the terms of all elected officers shall be for one year, starting January first. The membership shall submit the ballots properly marked, voting for one nominee for each office. The names of these nominees appear in the ballot which you will find on the other side of this page. Vote for one man for President, four men for Vice-Presidents, one man for Secretary and one man for Executive Secretary. Use care in making your selections.

Cut or tear the ballot on the dotted line. If you prefer not to deface this issue of NATIONAL RADIO NEWS, you may prepare a facsimile of this ballot on a typewriter or with pen and ink, and sign and mail it to the address given.

We anticipate a lively interest in this year's election. This is your opportunity to have a voice in the affairs of your organization. By all means be sure to cast your ballot. Your vote, or the lack of it, may determine an election.

Mr. B. Lavins, N.R.I. Comptroller, and Mr. C. Alexander, Bookkeeper, will count the ballots. The names of the men elected by a majority vote will officially be declared elected in the next issue of the NATIONAL RADIO NEWS.

Mail your ballot immediately to C. Alexander, Bookkeeper, National Radio Institute, 16th & U Sts., N. W., Washington, D. C. Your cooperation and support is urgently requested.



Election Ballot

Fill in this ballot carefully, following instructions given on page 29. Mail your ballot to National Headquarters immediately.

FOR PRESIDENT (Vote for one man)

- Ed. Witherstone, Toronto, Ont., Canada
 P. J. Dunn, Baltimore, Md.

FOR VICE-PRESIDENT

(Vote for four men)

- Dr. Geo. B. Thompson, Los Angeles, Calif.
 Allen McCluskey, Birmingham, Ala.
 Ray L. Wonderly, Sheridan, Wyo.
 Allen Arndt, New York, N. Y.
 Earl Bennett, Evanston, Ill.
 R. H. Rood, Los Angeles, Calif.
 F. E. Oliver, Detroit, Mich.
 Clarence Stokes, Philadelphia, Pa.

FOR SECRETARY (Vote for one man)

- John G. Gough, Baltimore, Md.
 Earl Merryman, Washington, D. C.

FOR EXECUTIVE SECRETARY

(Vote for one man)

- Clarence Steed, Washington, D. C.
 L. L. Menne, Washington, D. C.

SIGN HERE:

Your Name

Your Address

City State

Mail Your Completed Ballot to:
C. ALEXANDER, BOOKKEEPER
NATIONAL RADIO INSTITUTE
16th & U STREETS, N. W.
WASHINGTON, D. C.

New York Chapter Members Visit Headquarters

Recently a small but enthusiastic delegation from New York Chapter dropped in at N.R.I. Chairman Allen Arndt, ever-enthusiastic, predicts an unusual increase in membership based upon the interest shown in early fall meetings.



Just before departing the boys posed for a snapshot. Reading from left to right, L. L. Menne, Executive Secretary, Mack Pearce, New York Chapter, J. E. Smith, President, N.R.I., Allen Arndt, Chairman of the New York Metropolitan Area Chapter, Archie Burt and Sole Pearce, New York Chapter members.

— n r i —

Additions to N. R. I. Ham List

The following call letters have been reported since the last issue of the News. In spite of the large number of call letters so far reported, it is still felt that there are a great many N.R.I. amateur operators whose call letters have never appeared in the News. If you are one of them, make it a point to report your call letters the next time you write N.R.I., or submit a lesson for grading.

- J. N. Roberts, Jr.—W5ANA—New Orleans, La.
 L. N. Woods, Jr.—W3HAM—Winchester, Va.
 W. F. Overton—W2KRC—Bronx, N. Y.
 Louis Gamache—W9RGL—Chicago, Ill.
 Joseph Arlt, III—W4EXW—Key West, Fla.
 Alfred Wysozanski—W3GLA—Philadelphia, Pa.
 Harold Ahlstrom—W9ZMC—Minot, N. Dak.
 Chester Rector—W9BFW—Kokomo, Ind.
 Geo. H. Read—VE4AJJ—Edmonton, Alta., Can.
 Neil C. Gilchrist—ZL4DG—Oamaru, N. Z.

Tear carefully along this line



Likes Scientific Fiction Stories

Being an ardent and confirmed reader and collector of scientific fiction, I was greatly pleased to see the story, "Electronics, Inc.," by Mr. Markus, in the latest issue of the NEWS. If it can be arranged, please feature more stories of this type in the future. I find the NEWS a very interesting and educational periodical.

ROY A. SQUIRES,
Glendale, Calif.

— n r i —

Also Liked "Electronics, Inc."

I have just finished reading the fiction article, "Electronics, Inc.," which I enjoyed very much. May we have more of such articles from time to time? I believe these articles show students and graduates what may be accomplished by studying the N.R.I. Course.

H. B. SMITH,
West Springfield, Mass.

— n r i —

We Will Have More Like It

There is no magazine that I look forward to as much as the NATIONAL RADIO NEWS. The story "Electronics, Inc." is a wow. I hope we have some more like it. No one knows how true this story may be some day.

MALCOLM L. DECKER,
Lakeville, Conn.

— n r i —

Service Hints Are Help

The service hints in the RADIO NEWS are of extreme help and the whole magazine is excellent.

L. H. SCHRADER,
Bluefield, W. Va.

Quartz Crystals Was Well Explained

I congratulate you on your October-November, NATIONAL RADIO NEWS. Your article on how quartz crystals are made was very interesting. I think it was explained very well.

JACK B. WILHELM,
Sidney, Montana.

— n r i —

News Keeps Him Posted

NATIONAL RADIO NEWS sure is fine. Very interesting about Television and Trans-Atlantic Telephony. What strides Radio has taken since I enrolled. Keep it up, especially the Service Forum—it's just fine.

G. H. LATIMER,
Streamstown, Alta., Can.

— n r i —

This is Praise, Indeed

Allow me to congratulate you on the super excellent get-up of N. R. NEWS. It is by far the most informative and best publication on Radio that reaches this part of the Globe. One of the most helpful and interesting articles, from a student's point of view, was "Hints on Reading Circuit Diagrams," by Mr. Kaufman.

WALTER R. SCOTT,
Burgheersdorp, C. P., S. Africa.

— n r i —

These Comments Are Appreciated

Mr. Paul H. Thomsen's article on Equalizing A. F. Amplifiers is up-to-the-minute. Just what we need to stay with the trend of Radio. Let's have more of it. And the experiments by Mr. George J. Rohrich are good practice.

KENNETH S. HEADY,
Butler, N. J.



N. R. I. Graduate Visits Germany

From Rudolph Rakenius, of Brooklyn, N. Y., an N.R.I. graduate who spent this summer travelling through Europe, comes a number of interesting comments on German radio and television progress. Excerpts from his letter follow:

"Wandering through the Radio show in Berlin this summer, I was greatly impressed by the fact that most of the German radio receivers are table models with modernistic and ultra-modernistic lines. Many have prominent large square dials which are calibrated according to station call letters rather than in kilocycles or meters. As a rule, German sets have considerably more sensitivity than American sets considering the number of tubes. This is due primarily to the widespread use of regeneration and reflex circuits which make each stage develop the utmost in gain and thus keep the number of tubes at a minimum.

"I was very much interested in the 'Tefiphon,' a combination recording and reproducing unit which uses film rather than records. The recording stylus cuts its sound groove on an endless loop of celluloid-like material resembling movie film. The pickup unit will feed into any type of audio amplifier or P. A. system. A 300-foot roll of the film, capable of holding a twenty-four hour long sound program, can be stored in a very small can. Truly this is canned music in the strictest sense of the word!

"Two-in-one cathode ray tubes for servicemen were another German surprise for me. These tubes allow simultaneous viewing of the input and output wave forms of an amplifier stage, speeding up the locating of trouble. The projection type cathode ray tubes and the 441-line conventional television tubes were much like those now being used in this country, however. German television sets sell for 1000 marks, or about \$400.

"While at the television exhibition, our group was filmed outside of the exhibition hall, and fifteen minutes later we watched the film being reproduced on the screen of a television receiver inside the hall. I was amazed at the faithfulness of the reproduction."

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Limitless

There is nothing, I hold, in the way of work,
That a human may not achieve,
If he does not falter, or shrink or shirk,
And more than all, if he will believe,
And whatever the height you yearn to climb,
Tho' it never was trod by the foot of man,
And no matter how steep—I say you can,
If you will be patient—and use your time.

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NATIONAL



NEWS

FROM N.R.I. TRAINING HEADQUARTERS

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L. L. MENNE, EDITOR
S. M. ARMSTRONG, MANAGING EDITOR

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