NATIONAL RADIO NEWS

FROM N.R.I. TRAINING HEADQUARTERS

Vol. 1—No. 7 WASHINGTON, D. C. JAN., 1929

A Simple Comparison SHOWS RADIO'S BIG GROWTH

1922 Here's the first broadcast station —KDKA. Today it is one of the biggest and best known in the country. Compare this first station with the apparatus in the new German station below.

1928

The huge switchboard that will control the world's most powerful Radio station that will be opened at Zeesen, Germany—near Berlin—in February, 1929. Radio owners the world over will be able to listen in to its broadcasting and the station itself will be able to communicate with any other station on the face of the globe.

AND even these two pictures do not give a true picture of Radio's rapid growth in 6 years. The first KDKA programs were heard by a few amateurs gathered around crystal sets and a few primitive tube outfits. Today 40 to 50 million people hear programs over 12 million receivers from over 600 stations in the U. S. alone. Today Radio movies are being televised and picked up by thousands of amateurs. Today automobiles, airplanes and battleships can be controlled by Radio without a man on board! The volume of Radio business done 7 years ago was only two million dollars—last year over 600 millions was done. What does Radio hold for TOMORROW? We are now on the threshold of the glorious Radio "Age."

Let's Talk Over 1929 Together

THIS is a time of the year that I would like to meet each one of you N. R. I. men face to face—to have you sit right down beside my desk and go over a few things with you. I would like to know what the past year has meant to you in Radio and what plans you are making for 1929 and the years ahead. I do know that many of you Graduates who have been out in Radio for quite some time now have gotten more out of Radio in the way of genuine satisfaction, pleasure and profits this past year than in any previous five years combined. To you, I want to say "Congratulations" and hope that this New Year will mean still more to you in every way. To others of you who are just getting started in the course, or who have been studying for some time and have not been able to carry out your plans—I want to say that your big opportunity is right ahead of you.

Fellows, 1929 offers 365 full days of Golden Opportunity. Make each one mean something to you. One thing is certain—Radio is not waiting for anybody. In eight short years it has developed into the sixth leading American industry. Railroading, automobiles, steel, mining, agriculture—industries that are many, many years old, find Radio in their company after eight short years of popular existence.

Radio is riding on the crest of a wave of new developments—Television, Short Waves, new applications of Radio principles in Aviation and the Movie Industry, etc.—and will pass a few more milestones before the year ends.

Of course you want your share of the profits and success that this huge growth and expansion offers, and it is up to you to tie up with it and keep in step with its progress.

Think of your possibilities—see what there is to accomplish. Make a definite and careful plan to follow this coming year. Visualize some definite object or goal you want to reach.

Of course most anyone can sit and dream about doing things—it is ACTION that really counts after all. Anybody can make resolutions—it takes a man with back-bone, stamina, stick-to-itiveness and courage to transform his dreams into concrete realities.

You may be planning to open up a Radio business of your own, or doing some spare-time service work to add to your income, or you may be planning to get back to your regular schedule on the Course, finish up your lessons and get your Diploma. Whatever your plans are—carry them out! Begin right now. Get off to a flying start with the New Year. Make each new day yield something toward the fulfillment of your Success Plan. Then the rich rewards of happiness, prosperity—Success will be yours.

J. E. SMITH.

SUCCESS

Success doesn't mean so much sitting up nights, as being awake in the day time.

Never leave that till tomorrow which you can do today.

—Franklin.

"I made $22.50 Saturday night after doing my day's work. I am getting tired of working in the mines for $2.80 per day when I can make more outside working on Radios." Jackson Wallace, Majestic, Ky.

"I have run a Radio repair shop here for two years, but have learned more of the actual why and wherefores of Radio in your three lessons than I learned in the two years of experience. There are lots of laws governing Radio you can't learn by experience." W. A. Collins, Box 102, Maramec, Okla.

"I believe there is more information in the first six lessons of your course than anyone would be able to pick up in five years by just experimenting." C. W. Erney, New Middletown, Ohio.

"I am with the DeForest Crosley Co. here in Montreal. When I applied for the job they asked me what experience I had had, so I told them I was studying with the N. R. I., and showed them my Junior Radiotrician card. They started me right away, so you see I have the N. R. I. to thank for putting me where I am." Jack McPherson, 4755 Lafontaine St., Montreal, P. Q., Canada.

"I have opened a Radio sales and Repair shop in one of the best locations in Spencer, a town of about 5500, and have the Zenith and Atwater Kent lines, and all the repair work that I can do. Have sold one $379.00 Zenith and 29 Atwater Kents since the first of September, the day that I opened." Jno. F. Kirk, 1514 North Main St., Spencer, Iowa.

"In my opinion one would have to be pretty thick not to be able to master your lessons. They are wonderful. Just like sitting down and having a nice chin with a pal." Martin Moran, 610 Gallagher St., Springfield, Ohio.

"I am making on the average of $40.00 a week in my spare time right now." Vern S. Warner, 2615 Pingree St., Detroit, Mich.

"I want to tell the whole Institute that I wish to thank them for the way they have looked after my lessons, etc., and I will tell any man, young or old, that if he misses these lessons he is letting a $100,000 check slip through his fingers." Bert B. Dyer, 1010 Nesquehoning St., Easton, Pa.

"I now have full charge of the service department of the largest Radio distributor in this territory. I have serviced about every make of receiver on the market and have never had any difficulty due, of course, to N. R. I. training." Harold Ware, 1707 8th Street, Portsmouth, Ohio.

"My sales on parts and accessories amount to about $200 every week. This is about three times more than what I used to make per week before taking your course." George Y. Miyagawa, 921 Boerman Avenue, Kalamazoo, Mich.

"The business cards you sent me sure hit the spot. I just figured that I've made $209.00 and have turned down some of the work for I could not take care of these jobs account of my other job. I'm 50 years young." J. A. Maynard, 215 N. Pearl St., Albany, N. Y.

"I get lots of pleasure out of experimenting with these Units. I will tell the world that this is some course and would recommend it to anybody." Leroy F. Cool, R. F. D. No. 1, Little Falls, N. Y.

"I have earned up to date at least six times what my course cost me. When I started this course I was way in debt; now I am almost cleared up, and besides I have a $265.00 Fada A. C. set of my own." Frank Capaccio, 14 Howell St., Walton, N. Y.

"I have all the work I can handle in spare time. I make on the average of about $50 a week." H. J. Gensenleiter, 1118 Washington St., Allentown, Pa.

"I have repaired such sets as Kolster, Steinite, Fada, Freed-Eisemann and Zenith. I have only reached my 19th lesson." Harry J. Quinn, 2022 So. Opel St., Philadelphia, Pa.

"I could say if the first 16 lessons were all I would get for $97.50 I would sure be satisfied because I can make $500 or $1000 with the knowledge that I have gained already through the course." Walter J. Cloyd, Box 545, Ponca City, Okla.

"Radio is the most fascinating work I have ever found and with the way you have of explaining it, a person would have to be naturally "dumb" not to understand it." Verne Cimmiyotti, White Salmon, Washington.

"I've just accepted a position at the Bosch Magneto Company as a Radio Inspector. My Junior Radio-trician card did it." Zigmont J. Gregalis, 129 Monroe Street, Springfield, Mass.

"I distributed your cards and I have cashed in enough to pay for your course twice over but that would not buy my knowledge of Radio, as it is not for sale. I have fixed Radiolas, Atwater Kents, and numerous other makes of sets and I have not found one yet that has stumped me and I don't think there will be one that I can't fix." Roswell W Cox, 425 N. 8th Street, Santa Paula, Calif.

National Radio News

Published in the interest of
N. R. I. students and graduates, by the
NATIONAL RADIO INSTITUTE
16th and U Streets, N. W.
Washington, D. C.
J. E. SMITH, Publisher; E. R. HAAS, Editor

Washington, D. C. January, 1929

Our Technical and Student Service departments want to be of as much help to you as possible, and, in order to give you quick service on your inquiries, I want to ask all students who write in to be sure and give the kind of information we must have to help you.

For instance, if you have some question to ask or some problem about a Radio Receiver to be solved be sure and write the name and model of the set, the name and type of tubes used, whether it is a one, two, or three-dial control and other facts concerning the particular problem. With this information in hand we can give you more accurate and prompt service.

The mails are mighty heavy around the Christmas season and your graded lessons and other correspondence may be held up a few days on that account.

Of course we're getting your lessons graded here and starting them out to you as quickly as possible—in fact, we're making an extra effort to overcome this delay caused by a condition beyond our control. So if you do not receive your graded lessons on time you may just wait a few days before writing in about them for they will be delivered to you as soon as possible.

Thinking

If you think you are beaten—you are.
If you think you dare not—you don't.
If you like to win, but you think you can't
It is almost a cinch you won't.
If you think you will lose—you are lost,
For out of the world we find
Success begins with a fellow's will
It is all in the state of mind—
If you think you are outclassed, you are,
You have got to think high to rise.
You've got to be sure of yourself.
You can ever win a prize.

Life's battles don't always go to the strongest or fastest man, but sooner or later the man that wins is the one who thinks he can.

Radio Follows Comdr. Byrd in Antarctic

Provides Only Means of Contact With Civilized World.

While Commander Byrd and his party explore the ice wastes of the Antarctic regions, their discoveries will be made known to an anxious world by means of Radio.

Most elaborate plans have been made in obtaining and installing the Radio apparatus for the Expedition. During the three years the expedition will be stationed at the Ross Ice Barrier, Radio will be the only means of contact with the outside world.

In addition to the expensive apparatus aboard the base ship, City of New York, dog sled parties, airplane and walking parties will at all times carry transmitting and receiving sets for communication with the base ship which will in turn broadcast their discoveries and adventures to listeners all over the world.

When questioned about the importance of Radio apparatus, Commander Byrd declared that next to food and navigating instruments it is probably the most necessary equipment of the expedition.

Not only will members of the crew be able to flash word to relatives and close friends at home, but they will be able to tune in on long and short wave Radio programs which will shorten the long nights for them. The entertainment value alone will tend to keep the crew in good spirits, and keep them informed of what is taking place at the top of the globe, too.

No doubt Radio amateurs and ham operators will play a big part in making known their discoveries to a waiting world, as they have done in former instances where news of importance depended upon amateurs for its final delivery.

But the amateur operator will not provide the only means of communication from civilization to the Antarctic wastes, for 15 carefully arranged broadcast programs are being planned in order to send personal messages, news and entertainment this winter to explorers in both the Arctic and the Antarctic.

Millions are looking forward with much interest to the progress of the Byrd Expedition and other exploration parties, and must depend upon Radio as an unfailing line of contact with them.

Picture shows Miss Zandonini and her transmitter in her Washington home.

N. R. I. Graduate Flashes Message Home By Radio

Miss E. M. Zandonini Sends Words to Her Father Advising Her Arrival In Europe.

Most of "my boys" ARE boys, and some of you may be surprised to learn that we have a number of women graduates who have caught the fascination of Radio.—J.E.S.

The pleasing experience of having sent a personal Radio message to her father in Washington, D. C., within two hours after her arrival in Paris, France, has just been reported by Miss Elizabeth M. Zandonini, of the Radio laboratory of the Bureau of Standards, upon her return to America. Going to Europe for a two months' tour—mixing pleasure with study—this N. R. I. graduate and member of the American Radio Relay League, upon reaching Paris, first visited the French amateur station 8HE. Taking the Radio telegraph key in hand she was soon in direct communication with 1BYV, an amateur station of Farmington, Conn. Her safe arrival was reported to this operator, who dispatched the message by telegraph to Miss Zandonini's father in Washington.

Miss Zandonini, who owns and operates an amateur transmitting and receiving station at her home in Washington, while abroad visited amateur stations in France and Italy. Her itinerary included the following cities: Bologna, Florence, Milan, Rome and Lago d'Iseo. At the latter point she made use of the Radio facilities of the Italian amateur station EI1CN, and "worked" a couple of French stations and was in direct communication with two amateur stations in New York State. On returning to Paris, the amateur station which she visited, by mere coincidence, was host to "hams" representing five nationalities—French, Russian, American, Italian and Czechoslovakian.

Miss Zandonini, who, as a member of the laboratory staff at the Bureau of Standards, is a student of Radio conditions at home and abroad, seized the opportunity afforded by her two months' sojourn in France and Italy to observe the trends of Radio in these European countries. For instance, she noted relatively fewer amateurs and broadcast listeners compared with the increasing numbers in the United States. Fortunately, however, American-made broadcast receivers are finding popular favor in France and Italy, according to an observation of Miss Zandonini. Broadcast listeners in Europe, she noted, are so advantageously situated as to be able to hear music and speech from neighboring countries almost nightly, an ambition not always realized by DX listeners in America. This full-fledged woman member of the American Radio Relay League found Radio operating conditions for amateurs quite propitious and, before embarking for America, she practically shared these pleasing Radio conditions by readily exchanging greetings with NU1CEJ, an amateur station at Hartford, Conn.

INSTALLATION of a short-wave Radio communication system to be used during emergency periods when their transmission lines may be interrupted is being planned by the Florida Power and Light Company. The frequent hurricane destructions have shown the need of a more stable and reliable means of communication there.

The tremendous growth of the Kolster Radio Corporation has resulted in the erection of a laboratory for Radio research and development purposes in New Jersey. This gives the Kolster Company plants in Palo Alto, California; Toronto, Canada; Newark, New Jersey, and Slough, England.

R. C. A. announces the opening of a direct Radio circuit between San Francisco and Tokio to take care of the steadily increasing volume of business being exchanged across the Pacific.

A radio in every room is as necessary to the standard equipment of the fine hotels today as the steam radiator was 20 years ago. One of the latest hotels to install a radio in each of the 600 rooms is the new $5,000,000.00 Sir Francis Drake of San Francisco.

Complete figures show that the record production of Radio apparatus in 1927 was 8.4% more than 1925—the last year on which accurate figures are available. In a few short years Radio has jumped to sixth place among America's great industries.

A new device to control the tuning and volume of a Radio receiver from any part of the home in which it is used was announced recently by the Kolster Radio Corporation. The invention was developed by Dr. F. A. Kolster, Chief Research Engineer of the company. With the new invention it is possible to operate from any point in the room in which the Radio is installed or from adjacent rooms.

Authorities claim that over $100,000,000 worth of oil lands have been found by Radio prospecting in the past few years. Leading American oil companies now are asking the Radio commission for use of five short-wave channels for this use in Radio prospecting.

The Russian Commissariat of posts has ordered the construction of three powerful radio stations in Central Asia.

Radio operators along the transcontinental airways will broadcast hourly weather reports to pilots under a new system put into effect by the Department of Commerce and the Air Transport Co. Radio is the eyes of the aviator and is one of the biggest single factors today in the development of aviation.

The U. S. Dept. of Agriculture is cooperating with more than 200 broadcast stations in sending weather, market and general information to producers on over six million farms. Secretary Jardine regards this as an invaluable service.

The Serbian government is building two Radio broadcast stations. Both will be operated by the government.

A young San Francisco inventor has invented a television device that operates without any moving mechanical parts. The tube replaces the scanning disk—electron beams produced by cross vibrations form images on screen.

An American company has secured the contract for constructing a new wireless station in Shanghai for the Nationalist government. A range of 2500 to 9000 miles is guaranteed.

The Philadelphia Storage Battery Company, makers of Philco all-electric Radios, announced the purchase of an additional one hundred thousand square feet of ground with a large factory building, which will enable the company to double its output of Radio sets. Improvements to cost nearly $750,000 already have been begun on the property and buildings which are located at Alleghany and C Streets, just one block from the present Philco factory in Philadelphia.

The Splitdorf Radio Corporation announced its purchase of the Park City Electric Company at Bridgeport, Conn.

Several motor car companies, including Studebaker and Chrysler, are building cars with Radios on the dash. The first models have been regarded as very successful and have commanded wide attention among dealers and patrons. This opens up a big new field for the trained Radio man.

By
JAS. A. DOWIE
Chief
Instructor

Airplane Altitude Measurements By Radio Echo

One of the most important aids to navigation of the sea is depth sounding. By means of his soundings and his chart the sailor can usually find his way in foggy weather. We are told that a corresponding aid is needed in aviation and many suggestions have been made. One of these proposals is to make use of the echo or reflection of a radio wave. Depth and distance measurements are sometimes made by sound waves in water and in air. In that case the time is measured for the return of the reflected wave. With radio waves traveling at the velocity of light, this time interval is extremely short, and indirect methods of measurements must be adopted. Below you will find a description of a method that has proven successful according to Dr. E. F. W. Alexanderson, Consulting Engineer of the General Electric Company.

If we decide to measure the time interval in units equal to the time of one oscillation or cycle of the antenna current, the time interval of the echo is equal to the number of wavelengths the reflected wave has traveled on its way from the antenna to the ground and back again. If this distance is varied by an amount which is a fraction of a wavelength, this variation will manifest itself in a variation of phase of the returning wave relatively to the phase of the transmitted wave. If the distance is varied by an amount of several wavelengths, then the chase of the returning wave will go through the corresponding number of cyclic changes of phase. Thus, if we have means for ascertaining the phase of the returning wave and are able to count the number of cyclic changes, we are thereby able to make absolute measurements of the height over ground.

The problem thus resolves itself into finding means for detecting the phase of the reflected wave in relation to the transmitted wave. A direct measurement of phase under these circumstances is difficult and we are therefore taking advantage of a fact which we discovered during tests made from an airplane, that the reflected wave modifies the frequency of the original wave. This change in frequency is dependent on the strength as well as the phase of the reflected wave. These cyclic changes in frequency are used to detect the phase of the reflected wave. The cause for these changes of frequency will, however, need some further explanation.

Ordinarily, we assume that the frequency of an electrical oscillator is determined by the inductance and the capacity of the circuit, in the same way as the frequency of a mechanical oscillator is determined by the inertia and the restoring force. From these considerations, we are tempted to draw the conclusion that the transmitted wave has the natural frequency of the antenna and that the reflected wave, which has the same frequency as the transmitted wave, will only modify the phase but not the frequency of the original oscillations. This conclusion is, however, a fallacy as we discovered when we started to make practical tests. The reason for this

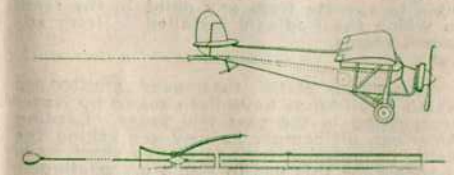


Fig. 1. Arrangement of Antenna and Reel in tests of Radio Echo on Airplane. (Courtesy of General Electric Co.)

(Continued on page 14)

Radio-Trician's Service Manual on The Eveready A. C. Receiver

The Eveready A. C. receiving set is a 7-tube, single dial antenna type, receiver, using R. C. A. or Cunningham A. C. tubes. The circuit used in this receiver consists of three stages of neutralized tuned radio frequency amplification, detector and two transformer coupled audio stages, ending in a push-pull power stage employing two UX-171-A or CX-371-A tubes.

The features of this receiving set will now be pointed out.

Circuit Description

In the three stages of r.f. amplification the latest improved form of r.f.l. circuit is used which was developed and patented by the Radio Frequency Laboratories of Boonton, N. J. This circuit employs a unique bridge method of neutralizing tube capacities, and its principal advantage is that it allows a much greater transfer of energy between the r.f. stages. In designing the high gain r.f. amplifier in this A.C. set, more than usual precautions have been taken in connection with the shielding system. Each r.f. stage is separately shielded by heavy, seamless copper shields, and a second shield, outside of these individual shields, effectively closes the entire r.f. amplifier.

Instead of coupling the antenna to the input of the first tube through the usual stationary coupler, this receiver employs a small adjustable variometer, tuned by one of the condensers in the main tuning gang. This antenna trimmer acts as an auxiliary tuning control and can be used to bring the antenna circuit into resonance when desired. Adjustment of the antenna trimmer is not necessary when tuning the set to local signals, but when it is desired to bring in the occasionally weak signal from a distant station, a slight adjustment of the antenna trimmer brings the input circuit into resonance, with a marked gain in volume.

In the Eveready A.C. set, volume control is accomplished by a high resistance potentiometer shunted across the input circuit of the detector. The detector grid is connected to the moving contact and may thus be transferred from the low voltage end of the resistor (minimum volume) to the high voltage end (maximum volume) or left at any intermediate point without affecting the operating characteristics of any of the tubes.

A filter system consisting of a fixed resistance, choke coil and condenser, has been incorporated in the plate circuit of the dectector tube of this receiver. This filter has two important advantages. First, it greatly improves the tone quality of the receiver by minimizing the tendency to feed-back action through the B supply unit, and second, it materially simplifies the wiring of the set.

Two stages of transformer coupled audio frequency amplification are used with a stage of push-pull amplification using two power tubes. In an A.C. set, much better tone quality can be obtained from two tubes in push-pull than from one larger tube having equivalent power output, for two reasons: First, the demand for plate current of the two tubes is constant, because as the current increases in one tube, it is decreasing to the same extent in the other. This places a steady drain on the B supply unit, and avoids the fluctuating voltage on its terminals which results when only one tube is used, while in turn, affects all the other tubes in the set and produces a tendency to over-emphasize notes of certain frequencies. Second, the second harmonic which causes distortion and which is always present when an output tube is producing loud volume, is absent in the push-pull arrangement, because the two tubes, working in opposite phase, cancel out the second harmonic, leaving the output uninfluenced by this disturbing factor. The output of the last audio stage is coupled to the loud-speaker terminals through an output transformer which is an important part of the set. The output transformer prevents the heavy plate current of the power tubes from flowing through the loud-speaker windings, thus protecting the loud-speaker against danger of burn-out, and aiding materially in improving tone quality. It also confines the high

voltage of the power tubes to the interior of a power plant, the only voltage emerging from the set being the safe, low voltage of the secondary of the output transformer, in addition to the generous filter within the B power supply unit.

The set is liberally by-passed at every point in the circuit where troublesome potentials might develop. There are a total of 8 by-pass condensers in the receiver. These condensers insure continued stability of the receiver and contribute largely to the tone quality of the set.

Power Plant

The power unit is complete within itself, and in addition to the "A," "B" and "C" supply, it also contains the last audio stage and output transformer.

The power transformer has 3 taps in the primary to compensate for variations in the line voltage encountered in different localities. These 3 taps correspond to normal line voltage of 105, 115 and 125 volts. This compensator takes the form of three holes on a terminal board. A plug which comes with the set is inserted in the hole corresponding to the average line voltage prevailing at the point where the set is installed. If the correct hole is used, and if the line voltage does not swing through abnormally wide limits, long and satisfactory A.C. tube life will result. The connection between the power plant and receiver proper is made by a multiple plug and socket, requiring no tools to connect or disconnect. The rectifier is the UX-280 or CX-380 full-wave rectifying tube. The filter is a new and improved type having a very small unfiltered ripple in its output. "C" biasing resistors are incorporated in the power plant, and automatically supply the correct C voltage under a wide variety of line voltage conditions. The entire power plant is filled with a special sealing compound which absolutely excludes all moisture.

In the schematic diagram, Fig. 1, the numbers shown in the circles refer to the different parts used. Table No. 1 lists these numbers and apparatus which they indicate.

Testing and Servicing

No hard and fast rule can be given concerning the best method to use in locating trouble in this receiver. However, the procedure given will be found satisfactory in the majority of cases.

Procedure for Trouble Shooting

First see if all tubes are in their proper sockets and that the multi-stage plug is connected to the power plant. NEVER TURN ON THE OPERATING SWITCH OF THE SET FOR ANY LENGTH OF TIME WITH THE CONNECTOR PLUG OR TUBES OUT OF THEIR SOCKET AS DAMAGE TO THE POWER PLANT WILL RESULT.

No. 1. Turn on the set switch and notice if all the tubes light in both the chassis assembly and power plant. Tube filaments should show dull red.

If all tubes fail to light look for: (A) loose A. C. connecting plug (b) house current turned off (c) fuse blown out in house lighting circuit (d) defective set switch (e) loose key or prongs in transformer tap switch.

If this does not locate the trouble apply a continuity test to the power plant.

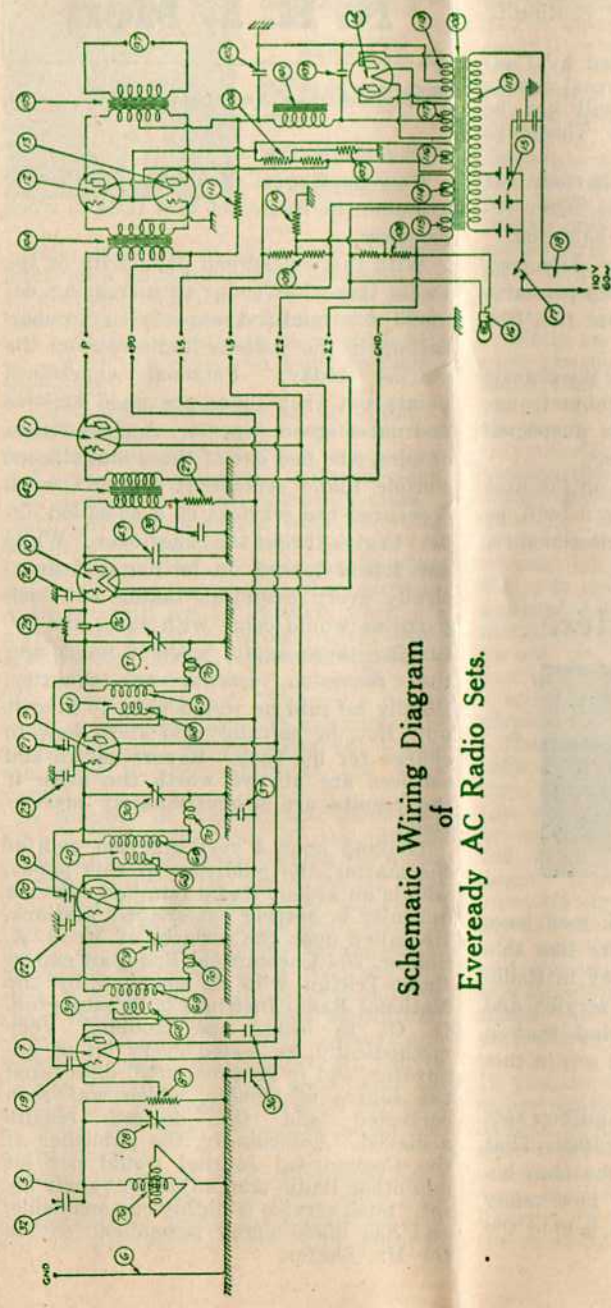
No. 2. If some tubes light and some do not, turn set off and examine tube sockets for bent or defective prongs, and check to see whether the tube prongs are clean.

If this does not locate the trouble leave tubes in their sockets and measure the voltage obtained across the filament prongs of the lighted tubes. Sockets 7, 8, 9 and 11 should show 1.5 volts across the filament prongs. Sockets 12, 13 and 14 should show 5.0 volts. Socket 10 should show 2.2 volts.

Tube No. 14 will have to be removed from its socket to allow access to the filament prongs with a meter. If the voltage readings obtained are more than 10% higher than those specified above, turn the set off and change the tap switch key to a higher socket. If the voltage readings obtained are not more than 10% higher than the values specified turn the set off and replace the unlighted tubes with new ones, or, check tube filament for burn outs. If this does not locate the trouble, apply continuity test to the power plant and chassis respectively.

No. 3. If all tubes light properly but reception is unsatisfactory, examine aerial, ground and loud speaker. If this does not locate the trouble measure the plate, grid and filament voltages on all tubes with tubes in their respective sockets. If no grid and plate voltages are obtained, apply the continuity test to the power pack. If all tubes light and no signal is obtained examine the plate of tube 14. If the plate becomes red hot, the filter condensers in the power plant are probably shorted. Check

I hope that every one of you students and graduates will be able to keep this series of practical, helpful articles on the late hook-ups that's being printed in the "News." Watch each issue for them and save them and in time you'll have a complete service manual on these various circuits. Write me any comments you have on information of this kind. Tell me what I can do to make it still more practical and helpful to you.
J. E. SMITH, President.



Schematic Wiring Diagram of Eveready AC Radio Sets.

TABLE NO. 1

5. Antenna Lead
6. Ground Lead
7, 8, 9. 1st, 2nd & 3rd R. F. Sockets
10. Detector Socket
11. 1st A. F. Socket
12, 13. Push-Pull Sockets
14. Rectifier Tube Socket
15. Switch Plug
16. Dial Light
17. Main Switch
18. Attachment Cord
19, 20, 21. 1st, 2nd & 3rd Balance Condensers
22, 23. 2nd & 3rd R.F. Alignment Condensers
24. Detector Alignment Condenser
25, 26. Grid Leak & Grid Condenser
27. Plate Resistor
28, 29, 30. 1st, 2nd and 3rd Tuning Condenser
31. Detector Tuning Condenser
32. Antenna Series Condenser
37. 90-Volt By-Pass Condenser
38. Detector By-Pass Condenser
39. 2nd R. F. Coil
40. 3rd R. F. Coil
41. Detector Coil
42. 1st Audio Transformer
43. Transformer By-Pass Condenser
68. Primary Winding
69. Secondary Winding
70. Tertiary Winding
76. Variometer
87. Volume Control Unit
97. Speaker Jacks
100. Power Transformer
101. Filter Choke Coil
102. Filter Condenser
103. Filter Condenser
104. Input Transformer
105. Output Transformer
106. 5-Volt Tapped Resistor
107. "C" Bias Resistor (5 volt)
108. 2.2-Volt Tapped Resistor
109. 1.5-Volt Tapped Resistor
110. "C" Bias Resistor (1st AF)
111. Plate Resistor
113. Primary Winding
114. 1.5-Volt Winding
115. 2.2-Volt Winding
116. 5-Volt Winding
117. Rectifier Filament Winding
118. Rectifier Plate Winding

by applying continuity test to the power plant. If plate or grid voltages are either high or low, turn set off and substitute new tubes one at a time. If this does not locate the trouble, remove the shield from the set and examine the gang condensers for shorts, dirt in plates, etc., and then apply continuity tests.

No. 4. **No Trouble Indicated by Continuity Tests.** There are several causes of receiver trouble which will not be shown by the continuity test. These are listed below:

Condensers 36 and 37 shorted. If these condensers are defective, after replacing them the set must be balanced.

Volume control shorted or defective.

First audio transformer open primary.

Open or defective resistances 109, 108, 106.

To check these units remove the chassis or power plant from the cabinet, unsolder all leads to the parts suspected and check for shorts or opens.

Note: To test the primary on the first audio frequency transformer it will be unnecessary to unsolder connections.

Good Money Here

How many of you N. R. I. men have your name over a Radio store like this one? Some of the best money in Radio today is in the Radio sales, service and repair business, and I'm glad that a large number of N. R. I. men are in this field.

There's a market for eight million sets in the United States alone in 1929. That means some big profits for the man behind the deal. So let's see how many of you N. R. I. men will get behind the "deal" and share the profits.

What Others Say About N. R. I. Men

(Reprinted from the Commercial Journal, Pittsburgh, Pa.)

The Radio-Trician—

Only the Expert should be permitted to examine the Radio set that fails to work properly.

With the widespread popularity of the Radio there has come an increasing demand for qualified experts in trouble-finding in the various Radio sets on the market today. Personal experience points out that there are good experts and not-so-good experts. A close friend of ours, who had one of those magnificent console Radio sets—that wouldn't work—secured the services of a so-called expert to give the set the "once-over." While our friend looked on he fingered practically every essential, taking out such parts as would come with ease, and returning them again, without improving the reception quality—or quantity. Finally he said he would have to give it up. But, he certainly did know how to charge for his time. **Expert advice and services are always worth the price if the results are proportionately meritorious.**

Looking upon a very different side of the matter, the publisher of this paper, who is an ardent Radio fan, had extreme difficulty in getting out-of-town stations. He called upon the services of Mr. J. A. Shafer, 204 Chesterfield Road, an expert Radio-Trician who is endorsed by the National Radio Institute of Washington, D. C., to locate the trouble. Very methodically, he tested every bit of apparatus, and in no time at all discovered the source of trouble, which was soon corrected and the desired results achieved. Accordingly, the publisher of the Commercial Journal would not let any other Radio man adjust or repair his set. Such service is highly commendable, and has made many permanent clients for Mr. Shafer.

Interviewing The Employment Manager

E. R. HAAS
Director

Most everyone, at some time or other, interviews an Employment Manager for a position. Whether or not the job is landed depends on several factors. Here are some hints that may be of some help to any of you men who want to land a Radio job:

First, when interviewing an Employment Manager, it's very important that the applicant give attention to his dress and personal cleanliness. A fresh, clean, well dressed man will naturally make a much better impression with him than one who is careless and ill-kept. Of course, the matter of dress can be overdone, and one must avoid either extreme. A tuxedo will not be suitable when applying for a job installing heavy transmitters, nor should an applicant for a job as service man wear a pair of overalls for the interview. There's a happy medium between these two extremes that every applicant should strive for—dress according to the nature of the work sought.

A number of Employment Managers have told me that one of the biggest problems facing a man looking for a job, is stage fright. He has a feeling that he'll literally be jumped on with both feet if he should make the slightest mistake. Of course, that's all wrong—Employment Managers as a rule are not such a hard-boiled lot—there's nothing about them to make one feel "shaky." Of course, their time is worth money, and they're business-like, and expect you to be the same. So keep your wits together, and keep cool—stand up and talk to them just like you would to an old acquaintance.

When talking to an Employment Manager, bear in mind that he is often just as anxious to get a good man, as you are to get employment. Be natural, don't put on a "mask" and try to "spoof" him with a lot of gab. He'll see through it if you do. Just be frank and straightforward. Briefly, give him facts about yourself that will create in him a picture of you as a desirable person to have in his organization and above all things, don't criticize your former employer; if you're asked why you quit another job make it clear that you did so because this new job you're after offers more opportunities. Never be over anxious about getting the job. Be frank and sincere in trying to land it, but if you get desperate and give the impression that you'll be out of luck for a long time if you don't get it then he'll become suspicious and feel that something is wrong somewhere, that you are inefficient and have been turned down by many other employers, and he had better do the same.

While an applicant should not fall all over himself trying to get a job, at the same time he must show that he has plenty of confidence in his ability to do the work. If you don't have confidence in yourself, very few others will. Genuine confidence is contagious, and a keen Employment Manager will sense it quickly. But don't try it unless it's genuine—don't say that you can do a certain job unless you honestly believe that you can do it. Then offer the same guarantee to your work that the large manufacturer puts behind his products—assure the Employment Manager that you will make good or step out without a whimper. Show him that you're not afraid of a stiff trial.

If the matter of salary has not already been discussed in the letter of application, or is understood by the nature of the work, don't make the mistake of bringing up the salary question before the other conditions are satisfied. It's usually a good idea to let the Employment Manager bring up this question, for several reasons. The salary to be paid is a very important factor to both you and the employer, but there are other considerations, too—the chance your particular job offers for advancement, the permanency of the job and the class of people you are to work with, etc., etc. If you attach too much importance to salary at the first interview, there is a danger of giving the Employment Manager a belief that salary is all you're interested in. Intelligent employers today want men who will take a constructive interest in their work and grow with the company. Show them you have that

171 N. Summer St.,
Adams, Mass.
November 10, 1928.

Dear Mr. Smith:

I want to tell you just exactly what N. R. I. has done for me. I have just completed a $3000.00 Radio station here that I have paid for from the proceeds received from doing Radio work. The wood antenna masts are 80 feet high. I will send you pictures of this new station of mine which is as large as a three-car garage or a three-room bungalow. All power lines, telephone, microphone and supply lines run under the ground. There is no steel conductor within 200 feet around the station. All wiring and lines in the station are lead cable. Reception here, on a noisy night in town, is as clear as crystal. All because of these "stray current" experiments that I have been carrying on.

Also I have built a laboratory which is situated on a 200-foot hill in the Berkshires at the foot of Greylock Mt., the highest point in Massachusetts. I have a short-wave business which brings me a great deal of money. I receive from $1.50 to $2.00 per hour on receivers, and $3.00 per hour on transmitters. I am now handling the entire service work of three Radio dealers in town here at my new laboratory.

I am German in nationality, and I can speak, read and write in both German and English. I experiment every day with Radio's wonders and I now live in the Radio world. I am devoting every minute of my time to research work.

I am going right to work now to finish my course and so as to receive my diploma. Now that I have told you merely the surface of my thoughts in Radio, I'll settle down and again indulge in its boundless depths.

Sincerely yours,
HARRY O. BARSCHDORF.

interest, and your starting salary, promotions and subsequent raises will be given accordingly.

There are a number of other points an applicant should watch. Be courteous—wear a smile if possible. Many executives make that a test in picking sales and service men and others. The fellow who can sell and service with a smile is an asset to any company, and is often the margin between landing the job and being told "we can't use you."

There's quite an art in interviewing Employment Managers, and, if you ever have occasion to do so, you should find the points touched on here of some advantage to you.

Airplane Altitude Measurements By Radio Echo

(Continued from page 8)

fallacy is that an oscillator will swing at its natural period only when the restoring forces which are contained in the oscillator itself are the only ones that exist. When the oscillator is acted upon by forces from outside, these forces may add to or subtract from the inherent restoring forces. It is, however, the resulting restoring force which determines the actual period of the oscillator. Thus, if the force coming from outside is in phase with the inherent restoring force and increases it, the oscillator will swing with a higher frequency, and conversely, if the force from outside is in opposition to the inherent restoring force, the oscillator will swing at a lower frequency. This relation between the phase of the force impressed upon the oscillator from outside and its actual frequency can be demonstrated with mechanical as well as electrical models.

As soon as it is understood that the cyclic change of phase of the reflected wave manifests itself in a corresponding change of frequency of the antenna oscillator, a basis has been established for

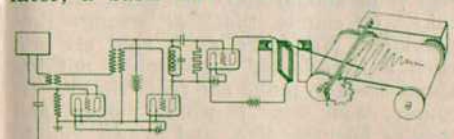


Fig. 2. Diagram of Instrument for Recording Radio Echo on Airplane.
(Courtesy of General Electric Co.)

the design of a practical altitude meter.

The object is to measure the distance that the reflected wave has traveled when it returns to the antenna. This distance

(Continued on page 18)

I'm Going to Give N. R. I. Men the Best that's in Me — Says

Phil Murray — New N. R. I. Employment Manager

That's the kind of help and cooperation that we here at the Institute like to give you and that was one of the big reasons why we have selected Mr. Murray to take charge of the important work of the Employment and Vocational Departments.

Of course, we were sorry to lose our former Employment Manager, Mr. Sutton, but many of you who knew him personally and through correspondence with him will be glad to hear that he has secured a splendid promotion as Technical Advisor to the Federal Radio Commission. In his new position he is in close touch with the Institute and is giving some fine assistance in the preparation of new instruction material and keeping us in close touch with the activities of the Radio Commission.

Mr. Murray comes to us with a long record of achievements behind him—with years of experience and training that specially fit him for N. R. I. Employment and Vocational work.

He has been in close contact with the early developments of Radio. He assisted in the U. S. Naval Service on the first Radio controlled battleship, the U. S. S. Iowa, which was controlled by Radio without a man on board. He has also seen service in the U. S. Naval Aviation Corps during the pioneer days of Aircraft Radio.

These intimate contacts with Radio at its very beginning have given him a foundation of broad experience and knowledge that will prove invaluable in fitting men into the Radio jobs of today.

Just before he came to us Mr. Murray was associated with Montgomery Ward & Company and the Singer Sewing Machine Co. in various executive capacities where he developed a keen technique in handling men, sizing them up, analyzing their abilities, and fitting them into the right jobs. Furthermore, he is a deep student of economic conditions and employment problems throughout the country.

With this broad training and experience, Mr. Murray has just the qualifications that an N. R. I. Employment Manager has to have—in fact, it seems that he has been "made to order" for N. R. I. Graduates.

The Activities of the Department

Mr. Sutton left a very efficient, smooth-working department, and Mr. Murray, upon taking it over, found himself in a position to give uninterrupted service to N. R. I. Graduates.

Here are just some of the things that this Department is doing to push the N. R. I. graduate and to help him get located in the job that means the most to him—the job that offers the biggest opportunity for advancement.

Some hard cash is being spent in advertising the services of the Employment in the leading Radio magazines, asking the Radio employer to let the Employment Department supply him with trained men.

Employment data have been published and placed on the desk of every large Radio employer and executive in the country urging them to call on the N. R. I. Employment Department for their trained men.

Furthermore, the Employment Department gets out, from time to time, an Employment Bulletin which lists the

(Continued on page 19)

The Jenkins Radio Movies

By JAS. A. DOWIE, Chief Instructor

Dr. C. Francis Jenkins, the noted Radio inventor, demonstrated in Washington, D. C., a few weeks ago, his system of Radio Photography or rather, Radio Movies. Using a frequency of 1000 kc. (300 meters), he transmitted a number of reels of specially prepared standardized motion picture films, while members of the National Radio Institute looked on. The signals were in this demonstration picked up in another part of his laboratory (although they could be picked up in homes with the proper receiving apparatus). These signals were converted into light impulses, and viewed by the onlookers through a large magnifying glass attached to the receiver. The general lay-out of the transmitter and receiver are shown in Figures 1 and 2.

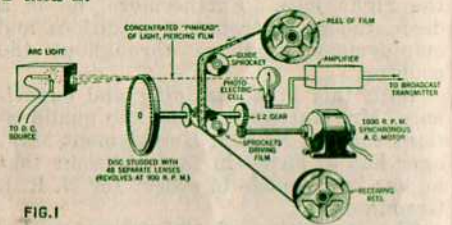


FIG. 1

General layout of the radio-movie transmitter, showing the essential parts without the supporting frameworks, etc. The leads marked "to broadcast transmitter" run to the regular input amplifier of the broadcast station through which the pictures are being sent out.

(Courtesy of Radio News.)

Details of Transmitter

The essential parts of the transmitting apparatus and the positions they occupy in relation to each other are shown in Fig. 1. The two film reels are placed one above the other and mounted on a simple framework so that the reel of film is pulled down vertically by a set of sprockets which are, in turn, driven by a synchronous AC motor, developing 1800 revolutions per minute. Because of the reducing action of the gears, the pictures are pulled past any fixed point next to the film, at the rate of 900 per minute, or 15 per second.

At the end of the shaft, there is a heavy metal disc, about 15" in diameter and approximately 1" thick. The outer edge of this disc is studded with 48 separate little lenses, each lens is designed to concentrate the light thrown off from a powerful arc lamp into an intensely brilliant pin-head beam which is caused to pierce the film as the latter travels down past the back of the disc; the disc by the way is a very expensive and well-constructed unit. The reason it is so expensive is because the lenses used in it are all matched to each other.

A photo-electric cell is placed behind the film so that it will receive the pin-head beam of light projected through the film by each lens. This photo-electric cell is connected to a three-stage resistance coupled amplifier, and this amplifier in turn is connected to an 8-stage amplifier.

These amplifiers are enclosed in copper cabinets to prevent the amplifier from picking up external disturbances which would register on the picture. The photo-electric cell itself is also completely sheathed in copper except, of course, for the small aperture which is left to admit the light beams from the arc through the film.

Transmitting the Picture

First, the arc lamp is lit, then the AC motor is started which revolves the disc, upon which are the 48 separate lenses. This disc revolves at the rate of 900 revolutions per minute, or 15 per second. The separation between the centers of the lenses is just equal to the width of the film. The film moves steadily downward at the rate of 15 pictures per second, the pin-head of light from one lens piercing through the lower right-hand corner of the first picture on the film. As the disc revolves, the pin-head of light travels horizontally across the film; the instant it runs off the left edge, the beam of the

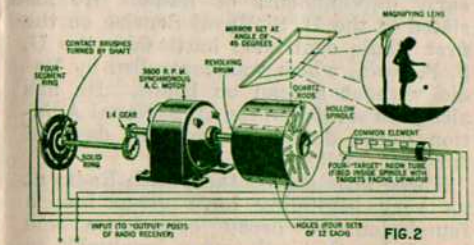


FIG. 2

General layout of the picture receiver. The whole lower assembly line is enclosed in a wooden box, on the top of which are mounted the mirror and the magnifying lens. The images are viewed through the latter.

(Courtesy of Radio News.)

next lens starts at the right again but at a point a little above the first one started. The reason the starting point is a little higher on the picture is because the film is moving downward at the same time the disc is turning. Just as the second beam runs off the left edge of the film, a third one starts on the right at still a higher point on the picture. This movement is continuous during the operation of the device. Forty-eight separate beams of light, therefore, travel across each individual picture on the film, this operation consuming one-fifteenth of a second. At the start of the second fifteenth of the second a new picture slides into position and another series of 48 light beams starts to pierce it.

While this movement is taking place, the light beams fall upon the photo-electric cell connected to amplifier at the back of the film, this cell producing an electric current that varies with the transparency of the film. This varying current modulates the output of a broadcasting transmitter in the same manner that voice and music impulses do in ordinary broadcast work. Forty-eight lines of alternate black and white areas per picture are written into the photo-electric cell and by it sent out to the receiving apparatus.

The Receiver

Dr. Jenkins' receiver is quite different from any of the other television and picture machines now in use. It consists of six essential parts arranged as shown in Fig. 2. The synchronous AC motor is attached to a shaft on which is a special hollow metal drum. In the center of this drum is a hollow spindle with a thin wall. In corresponding places on the drum and spindle are four rows of small holes, twelve holes to a row. A short piece of quartz rod between the outside and inside connects each pair of corresponding holes. The purpose of the 48 little rods is to conduct light from the inner spindle to the holes in the outer drum with as little loss as possible. Fixed inside the hollow spindle, with the flat little places facing directly upward, is a special four "target" Neon tube. This lamp is shown out of the spindle in Fig. 2 but in actual use it fits inside the latter without touching it.

The other end of the motor shaft is fitted with a 1.4 reducing gear which drives a revolving switch. The revolving element is simply a pair of contact brushes connected together; one brush effects continuous electrical connection to a solid brass ring imbedded in an insulating disc, while the other makes a wiping contact over the four sections of a split ring. The four segments connect with the four "targets" of the Neon tube while the solid brass ring goes to one input post of the machine. The common element of the Neon tube goes to the other input post.

All of this apparatus is installed in a wooden box and directly above the top of the revolving drum is a square opening in the top of the cabinet. Above this opening is placed an ordinary mirror mounted at an angle of 45 degrees to the top.

About a foot in front of the mirror, standing upright, is a magnifying glass about 10" in diameter. The input posts of the picture receiver unit are connected to the last audio amplifying tube of a regular receiver.

Reproducing the Picture

The modulated signal of the transmitter is picked up by the aerial, amplified, detected, and again amplified by the receiver, and then led to the radio movie projector. When the contact brushes have just made contact with the upper ring as shown in Fig. 2 and one of the quartz rods in the first outermost circle is pointing straight up, this condition corresponds with the start of a picture in the transmitter, just when the pin-head of light is starting to sweep across the film. As the contact brushes have just closed the circuit to the Neon tube plate at the extreme right, this target lights up immediately and fluctuates in accordance with the modulation of the signal. The fluctuations of light are passed up the quartz rods and projected through the holes in the outer drum upon the mirror. The light thus produced on the mirror follows the shading of the images on the original film so that a picture is built up in the mirror. This may be observed through the magnifying mirror. A complete picture of 48 lines corresponding to the rate of transmission is, therefore, built up on the mirror with every four revolutions of the drum. At the beginning of the second revolution, the contact brushes turn to the next segment of the switching ring and the second target of the Neon tube is illuminated. The third and fourth quarters of the picture are similarly built up from targets 3 and 4, and the cycle then begins again with No. 1 and the first spiral of holes. During one second, the drum turns 60 times; since

4 revolutions create one picture, 60 revolutions create 15 pictures. This gives us the speed of 15 pictures per second mentioned in the earlier part of this article.

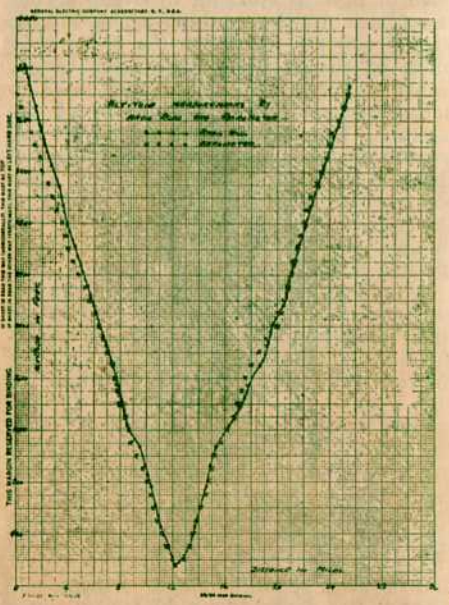
Of course, it must be realized that it is absolutely necessary to maintain perfect synchronism between the transmitting and receiving motors, as in all systems of television and radio movies. The pictures, as they appear through the magnifying lenses at a distance of about 10 feet, are clean cut, black silhouettes against the characteristic reddish glow of the Neon tube.

Airplane Altitude Measurements By Radio Echo

(Continued from page 14)

may be measured in two ways, by the strength of the returning wave which in its turn determines the amount of frequency change; and by the number of cyclic changes in phase which the wave has passed through before it returns. The indications may be oral, graphic or visual or in the nature of a warning which would call the operator's attention when certain limiting values had been exceeded.

In the measurements so far made, we have used an instrument that traces a graphic record of the frequency variations. Quite a number of such records have been taken and one of these is herewith reproduced on Fig. 3. Up to altitudes of 4000 feet, the cyclic nature of the frequency variations is unmistakably shown by the record. Observations were also made on a barometric altitude meter and the observations were written down on the graphic record, during the progress of the flight. We have thus observations of altitude by two independent means set down side by side on the graphic record. Two logs of the flight are reconstructed, one from each set of observations. The wavelength was 95 meters from which is deduced that each cycle of the wavy line in the graphic record represents an altitude change of 155 feet. The barometric log gives altitude over the starting point whereas the radio echo log gives actual altitudes over the ground. The results should, therefore, not necessarily be identical. The agreement of the general shape of these curves is, however, quite convincing that we have in the radio echo a basis for absolute altitude measurements of height over ground.



CALL AGAIN

The following N. R. I. men recently stopped in to chat with Chief Instructor Dowie and other members of the staff. We enjoyed knowing you better this way and hope you will call again. All N. R. I. men and their friends are especially invited to stop by N. R. I. Training Headquarters whenever you are in Washington.

STUDENTS GEORGE H. SMITH AND C. W. CRUMP
of Norfolk, Va., are both anxious to get started with their Radio business. You ought to make a big "go" of it, men—we're right behind you here.

GRADUATE CARLSON
of Washington, D. C., is looking into Radio Engineering possibilities. From past records we sure believe he'll make good in his chosen field.

STUDENT W. H. WOOD
of Philadelphia, is getting a world of good out of his Radio studies as a "hobby" and at the same time making it pay him good dividends from spare time work.

STUDENT A. W. SPINKS
of Kensington, Md., stopped by for a little special technical information. We understand that Student Spinks is "the" Radio man in his section of the country.

STUDENT JACK McQUEEN
who hails from Edinburgh, Scotland, is planning a nice little Radio business in Philadelphia.

STUDENT JACK ERSHAM
of Takoma Park, Md., springs from good old Swiss stock, and his keen interest in Radio ought to carry him high.

Phil Murray—New N. R. I. Employment Manager

(Continued from page 15)

names and qualifications of N. R. I. graduates wanting positions and this bulletin is placed on the desk of a great number of Employment Managers throughout the country.

There are a number of other ways in which Mr. Murray is willing and anxious to help N. R. I. graduates get into the right job—he will be glad to help you with your letters of application; he will write letters of recommendation to your employer—try to help you get your promotion or even a better job. Also, he is constantly working on plans to help N. R. I. men build up their own service and repair businesses, and he will be glad to give you suggestions and tips on selecting merchandise, advertising, drumming up new customers, how to keep them, and how to make your business pay a profit.

Feel free to call on Phil Murray—he is working for you N. R. I. Graduates first, last and all the time.

Police to Install Radio

CINCINNATI, Ohio, Nov. 16.—Radio sets will be standard equipment at all police and fire stations in Cincinnati and on police and fire vehicles next year. This radio system will be especially valuable in the apprehension of burglars and highwaymen.

Winged Words

It's not so uncommon today for people to talk around the world by radio. Just recently, the mayor of Schenectady, N. Y., talked with several persons in Australia over W-ZXAF. The conversation lasted a half hour; it was clear and distinct. Radio fans in Lima, Peru, are reported to have listened in on the conversation.

Radio has filled the ether with winged words—millions of them darting around the world in the twinkle of a star. It's no wonder that wide-awake men find Radio so fascinating.

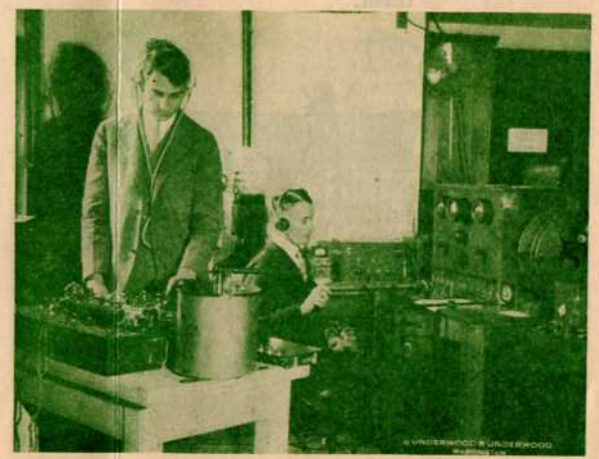
You

You are the fellow who has to decide
Whether you'll do it or toss it aside;
You are the fellow who makes up your mind
Whether you'll lead or will linger behind—
Whether you'll try for the good that's afar
Or be contented to stay where you are.
Take it or leave it. Here's something to do!
Just think it over. It's all up to you.

—Edgar A. Guest.

Bureau of Standards Helping Broadcasters Maintain New Frequency Allocations

The recent reallocation of broadcast frequencies has required most broadcast stations to obtain new precision apparatus in order to adjust their transmitters accurately to their new frequencies. This has resulted in an avalanche of piezo oscillators used by the broadcast stations as frequency standards being rushed to the U. S. Bureau of Standards at Washington for calibration. The photograph shows Dr. C. G. McIlwraithe and Mr. E. L. Hall, of the Bureau staff, checking one of the oscillators against the Bureau's standard.



Kadow Tuned In!

Dear Mr. Smith:

I make as high as $275.00 a month in Radio service and repair work as a side line in addition to my regular position.

All of my work comes to me through satisfied customers telling others—no paid advertising done. Any wide-awake student should be able to make enough in Radio as a side line to pay for the course several times over after having completed the first half of the course.

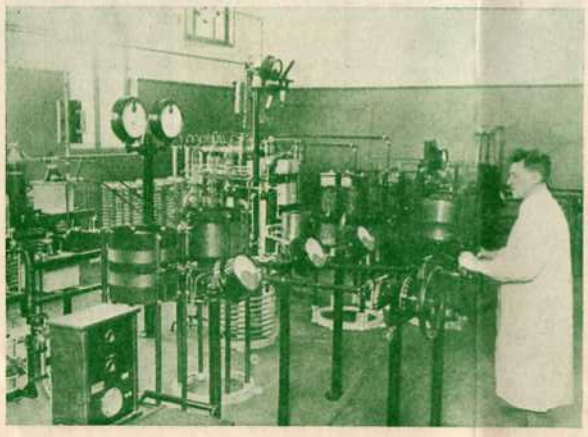
A. C. KADOW,
Radio Art Laboratory,
825 St. John Street,
Elgin, Ill.

Right: Miss Cora Dennison and James Fowlkes were the principals in the first television wedding in history. They were married on a stage in the Chicago Coliseum. The minister united them from his post in a Radio station at Des Plaines, Ill. By means of Radio, they heard his voice and he heard their responses, and by means of television they were face to face, although a score of miles separated them.

AHOY! The Good Ship 1929 Is About to Dock

It comes straight from the land of Golden Opportunity loaded to the gunwales with choice profits and new opportunities for the trained Radio man.

The captain admits he had a rich cargo when he docked last January 1, but says "Just wait until you see what I have for you here." The Good Ship 1929 is just crammed with new developments, bigger and better chances for the Radio man, and still bigger profits. Every one of you N. R. I. men has a big package on the Good Ship 1929. Don't let it fall in the hands of some one else—it's yours—get it yourself.—The Captain.



Here's the immense apparatus built into the world's most powerful Radio Station near Berlin, Germany. It will go on the air in February, 1929, and Radio listeners the world over will be able to tune it in. We don't have the cost figures on this new station, but you may be sure they are plenty high. Some of you N. R. I. men—how would you like to get your hands on the controls here? Well, stay right in there—bigger and better ones are being built every day and trained men only will be considered to operate them.