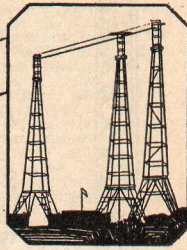


NATIONAL

RADIO

NEWS



FROM N.R.I. TRAINING HEADQUARTERS

Vol. 2—No. 4

WASHINGTON, D. C.

NOVEMBER, 1929

Speech Input
Monitoring Panel
of the Deal Beach
Trans-Atlantic
Radio Station



WINNING AGAINST ODDS

By J. E. SMITH

THE other day I saw a football game. A plucky tackle caught my eye early in the scrimmage. Somehow he stood out from the others. He held up under the battering of much heavier men. He was alert, kept his eye on the ball, recovered a fumble in last quarter and scored!

After the game I asked the coach about that tackle. He said: "That man has convinced me that **determination** will win against all odds. When he first came out for football he was awkward, underweight. Why, he was even refused a uniform in his freshman year—told him he might play checkers but not a chance on the gridiron." "Well, sir"—the coach continued—"the boy began training; he studied the game from all angles, mastered it. Last year he 'made' the team, became one of our best men—and this year sport writers are picking him for the all Southern eleven!"

This morning a graduate stopped in my office on his way to New York to take an excellent position with a Radio manufacturer. I remembered a letter he wrote when he first began his course. He was a doubter—had no determination, no self-confidence. But he got hold of himself before it was TOO LATE. He saw that without training he would have just as much chance in Radio as a "straw man" has on the football field. Now, he is not only master of himself—he has mastered Radio! I'm keeping my eyes on him—he will make good! So, after all, there's not much difference between making good in football and crashing through to win in Radio. For, in Radio, you must be in tip-top shape, well trained, and play a smashing, never-give-up game! Let's have still more N. R. I. men with that spirit and determination!



The picture shows the son of President Hoover working in his position as Radio Communication Specialist with the Western Air Express. He left his position as Instructor at Harvard University to enter the Radio field. The extent to which Radio will be used in aviation is shown by the action of the Federal Radio Commission of October 7, in granting to the Western Air Express 35 licenses for communication between plane and ground and from point to point. Read this interesting article. It was taken from young Mr. Hoover's recent Radio address. J. E. S.

RADIO--A Great Aid to Aviation

By HERBERT HOOVER, JR.

Radio Communication Specialist, Western Air Express

OVER 5,000 planes are daily in the air on commercial business. But before there can be commercial success there must be two certainties, safety and regularity of service. The Radio now assures us a large measure of both. To be able to fly with certainty by night, to pilot through or avoid fog and storm can in large measure be made certainties if constant communication can be maintained between the ground and the plane—and Radio provides the missing link for just that communication. In fact, the development of Radio applied to aviation assures just that margin of safety and regularity which gives the plane a definite position as a regular and safe means of transportation. It thus makes commercial application of aviation a certainty. Commercial air transportation is becoming vitally dependent upon it. Prior to the application of Radio communication with the plane—there was no certainty of regular service; there was great danger from hazards of storm, fog and snow.

The pilot of a regular scheduled plane must know two things. First, he must be able to keep track of constantly changing weather conditions that are beyond his range of vision and, second, he must be able to locate his exact position, even though the ground may not be visible. Furthermore, he must be able to get this information or any other aid he may need at any moment he may desire it.

This, briefly, is the job that Radio must perform in aviation. If the pilot is to receive weather information and be able to talk with those on the ground, there must be a series of Radio stations along the airways, and if these stations

are to be useful they must have a complete weather observing system to draw upon. It is not, therefore, merely a matter of putting a Radio set on each plane, but a large and complicated organization of ground Radio stations, weather observers, and airports must be tied together with some quick and dependable method of communication, and made to function together smoothly as a unit.

The Government, through the Department of Commerce, has undertaken to provide this service, and it has been a tremendous help to all branches of aviation. A series of 2,000 watt broadcasting stations using wavelengths of about 1,000 meters have been erected along the principal airways, each located two or three hundred miles apart. Once an hour, or oftener, they send out weather reports collected along the route together with landing conditions at each of the airports in their vicinity. This service is free for anyone who cares to tune in for it, and although intended primarily for aviation, many other people will undoubtedly make use of it.

The large transport companies who maintain daily schedules over their routes must be able to carry on two-way conversations with their planes wherever they are in flight. Obviously the Government stations which broadcast weather reports cannot be expected to keep in contact with the large number of commercial planes that will soon be flying near them. The transport operators have, therefore, found it necessary to establish their own ground stations along the particular routes which they fly.

I believe that within a short time the Government will require Radio on commercial airplanes just as it now requires all ocean liners to be equipped before they can leave port. In fact, Radio will be even more important in aviation than it is in shipping, because a boat, rarely traveling at over twenty miles an hour, can ride out a storm or anchor off port almost indefinitely, while an airplane must travel at over a hundred miles an hour and must find its airport immediately.

APPLY FOR THOSE JOBS!



Work closely with the Employment Department when a job is referred to you. Apply for it at once and report the outcome. Team work will land many of the good jobs open to N. R. I. men.

By P. J. MURRAY
 Manager Employment Department



A GOOD job in Radio is the ambition of every man who takes the N.R.I. course.

This is quite natural, because the job is the thing that counts. Because he realizes this, and because he wants to help everyone of our Graduates to success, Mr. Smith has caused the organization and maintenance of one of the best Employment Departments known to home study schools, to help the Graduates of N.R.I. fulfill their ambitions.

Thousands of dollars are expended every year in the operation of this department—to keep in touch with Radio employers of this and foreign countries, and Mr. Smith placed me in charge of this department because he felt that I would not only do my best to help the fellows who applied for the services of this department, but would spend the Institute's money in such a manner as to get the most for our Graduates out of these funds.

To show the extent to which the N.R.I. will go in an effort to do everything they can for their graduates, let me cite just two instances which occurred recently.

On the 1st of September the Employment Department made contact with every Radio employer in the United States; Dealers, Jobbers, Manufacturers, etc. We sent them an expensive booklet and other literature to promote good will for the N.R.I. Employment Department—to interest these employers in calling on us for trained Radio men.

Then, last week I was in New York—attending the World's Radio Fair—at quite an expense to the Institute, meeting and talking personally with the very men who can do our graduates the most

good in-so-far as Radio employment is concerned.

Don't you think that such efforts on our part are worthy of your heartiest cooperation?

Now I am of the opinion that some of our Graduates don't take this matter with sufficient seriousness. They do not realize the time, personnel and money which must be used to put this thing across in the proper manner. It is surprising, the number of fellows who receive notices of employment possibilities from my department, who fail to report the outcome to me until I write them special letters requesting the information. And still a greater number do not even apply for the jobs when I refer them. Every time it is necessary to write a man a letter asking him to report on a job, every time I have to write to a man and ask why he did not apply for a job—that costs the Institute money—money that is not doing anybody any good, but which could well be expended to further our employment campaign.

It causes me to use up time which could be utilized in lining up other jobs—jobs for fellows who really want them—and who will really appreciate an opportunity to apply for a position.

I have almost been tempted to accept Mr. Haas's suggestion that the name of every man who fails to apply for a position that has been referred to him and who fails to report on a possibility of a position which I send him, within 15 days, be permanently removed from our Employment Department files. But I don't want to do this—I don't want to take any drastic measure, because after all I am for the N.R.I. graduates, first, last, and always. So I am going to make one more appeal to you fellows before I take any steps along that line.

I am going to ask you to cooperate with me. I am going to ask you to put your shoulders to the wheel and help me put this thing across in the right way. My aim is a job for every N.R.I. man who will really work to get it. But I can only accomplish my purpose if you fellows will come through with the cooperation I have asked for.

And I want you to know that some mighty good jobs have been referred to our Graduates through N.R.I. Employment Department recently. Jobs from large companies, and small. Of course—not all jobs look so good right at the outset, but there's an old saying, "you can't judge a book by its cover," neither can you tell until you have worked at a place just what the possibilities for the future might be.

I am depending on you fellows from now on. Apply for every job I refer to you and report the outcome to me within 15 days.

National Radio News

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 N. R. I. students and graduates, by the
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NATIONAL RADIO INSTITUTE

Washington, D. C. November, 1929

We have been advised that Popular Mechanics Magazine can use Radio Kin's and Construction Articles and will pay for any accepted.
 Many N.R.I. men will find this an opportunity to make some extra money. If you have some novel, unique method of doing some Radio job you might cash in on it this way. If interested, refer to the Radio Section of any recent issue and get an idea of the type of material required. Simple pencil sketches and diagrams illustrating your ideas and a short descriptive article is all that is necessary. In some cases a photo will help. When submitting anything, send it direct to Radio Editor, Popular Mechanics Magazine, Chicago, Ill. J. E. S.

THE latest Radio developments, about which authoritative instruction material can be written, quickly find their place in the N.R.I. Course. Below is a list of several new text books, and service sheets recently added to N.R.I. training:

- Texts
- Carrier current systems (Wired Radio).
- The Screen Grid vacuum tube.
- Marine and aircraft Radiobeacon and Directional Finders.
- Alternating Current operated Radio Receivers.
- Radio Interference and its Elimination.
- Service Manuals Servicing A. C. Receivers.
- Servicing B power supply units.
- Philco Screen Grid receivers, Model 65.
- Atwater Kent, screen grid model 55.
- Kolster, models K20, K22, K25 and K27.

N. R. I. men may be interested in knowing that the complete N. R. I. Radio course is on the shelves of the reference libraries of these and other big companies: Westinghouse, Grigsby Grunow, Thomas A. Edison, Inc., General Electric, A. C. Dayton, American Bosch Magneto, Silver-Marshall, Goodyear Tire and Rubber Co., Zenith, and the Studebaker Corporation.

To The Top's Right!



Contributed by Student H. B. Allen of Wayzata, Minn. Jack, like all other N. R. I. men, knows what it takes to reach the top in Radio—sound, thorough technical training and stick-to-it-iveness. I'll stake my faith on Jack.—J. A. Dowie.

"Before I took your course, I honestly could not have told you the difference between a grid leak and a condenser. Without the practical knowledge I acquired by working with your units I doubt if I would have been able to go out and service Radios as I have done. If the units help every other student as much as they helped me you may figure whatever amount you have invested in them well spent." William Hartley, Troy, N. H.

SOMEONE asked the other day "Just what is this National Home Study Council that's getting so much favorable attention?"

Could you have answered that question? If not, you'll be interested in knowing what it is and how much it means to you and others who are training by home-study methods.

When the home-study system first came to the front years ago, a large number of schools were founded. Many were unable to give thorough practical training; others didn't take a personal interest in their students; and others looked at it as simply a money making proposition. That situation made it hard for those schools that were giving good training and helping men get ahead. Furthermore, that wasn't fair to their students.

Therefore, a small number of the outstanding schools formed an association known as the National Home Study Council with headquarters in Washington, D. C. This Council set up a high standard of ethics and service to which the member schools pledged themselves. The very highest standards of instruction, and fair, square dealings must be given by members of the Council or they will be subject to discipline. The N. R. I. is a charter member, and takes pride in being one of the first institutions to help put home-study methods of training on a high plane. The N. R. I. is working hand-in-hand with the Council to make home-study training still more practical and helpful. You, as a N. R. I. man, will get the benefits of this association.

Television—

Just Around the Corner!

By
E. R. HAAS
Vice
President

With the inauguration of Television transmitting stations, operating on a regular schedule, there is certain to be wide-spread interest in Television reception. Vast experimental possibilities are at hand. Next year will be the first Television Year."

The Jenkins Television Company at Jersey City, N. J., has, I understand, already turned out its first completed Televisor. It was presented to a young man as a prize for his essay on what Television means to the home. Figure 1 shows a design of television receiver. Others are expected to make their appearance soon. Mr. James W. Garside predicted recently that complete Television sets or Televisors will be on the market and in the homes by Christmas!

In the September Radio Manufacturers Monthly, Austin C. Lescarbourea, noted writer and authority, sums it up this way—"Watch Television! There are

many workers engaged in Television research and development. We predict that commercial Televisors will be available and on the market before December 31st. Television is quite lively just now—just behind the scenes. There is less shouting about it and far more hard work than ever before. Watch Television!"

I believe that as a class N.R.I. men are one of the liveliest, most aggressive bunch of Radio fellows found anywhere. I'm sure you are "Watching Television," and that

you are making every effort to keep right up to the last minute on any new developments.

Of course there is one thing you want to bear in mind—Television, fundamentally speaking, is based on Radio—in fact, it is merely an extension of the Radio science. You won't stand a ghost of a chance to make anything in Television unless you have a thorough grounding in the fundamental principles of Radio itself. As a trained Radio-Trician with the knowledge of basic Television principles that you are getting in your course, you will be prepared to reap the full benefits of Television when it "breaks" on a commercial scale. Watch Television! It's going to open up one of the biggest fields of opportunity ever known!

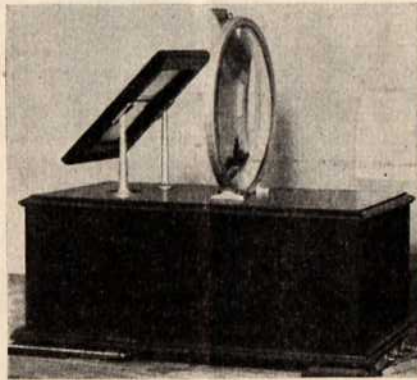


Figure 1—The Jenkins Television.

THERE hasn't been much said about Television lately. The reason is clear. ACTION—not talk is the motto of Radio engineers working on Television. Radio laboratories have been running overtime lately, smoothing out the kinks in Television and making a number of developments and improvements. Thousands of dollars are being spent in making experiments and refinements—shortening the time until the public will have good Television equipment at moderate prices. About 20 stations are now broadcasting television signals!

There is really no question about it—Television is just around the corner! At the Radio World's Fair in New York in September some very successful demonstrations of the Alexanderson Television were made. Prominent theatrical stars were flashed on a ground-glass screen, one foot square. Their voices were heard simultaneously with the showing of their faces. Experts declared the demonstration showed a marked improvement over earlier experiments.

The noted inventor, C. Francis Jenkins, has unbounded faith in the immediate introduction of Television on a commercial scale. In a recent issue of Radio-Craft, Dr. Jenkins said "I most emphatically believe that the Radio industry, during 1930, must take Television seriously.

Radio-Trician's Service Manual

on the

Victor Micro-Synchronous Radio R-32 and RE-45

The Victor Micro-Synchronous Radio is a power operated tuned radio frequency receiver of the antenna type, employing an antenna coupling stage and four stages of tuned and neutralized radio frequency amplification, a detector, a first stage audio, and a power stage of push-pull amplification.

The instrument comprises three standard units as follows:

(1) Radio, in which are contained the R. F. stages and the detector; (2) Power amplifier, containing the first audio, the power stage of push-pull amplification, and the rectifier; (3) Electro Dynamic Reproducer. The units are so designed that all parts are readily accessible for servicing.

ANTENNA.—For best average sensitivity and selectivity the antenna should be from 50 to 75 feet long including the lead-in and ground wires, and should be as high above ground as possible. A short antenna tends to decrease the sensitivity and increase the selectivity; a long antenna tends to increase the sensitivity and decrease the selectivity. For local reception sufficient sensitivity can usually be obtained without the use of an antenna by connecting the ground wire to the antenna binding post instead of the ground binding post.

GROUND.—A good ground connection is highly important for the proper operation of the instrument and must be used at all times. The connection should be made to a well scraped and cleaned portion of a water pipe by clamping with a ground clamp. If such a connection is not available, a pipe or metal rod may be driven three or four feet into the ground, preferably where the soil is moist. Attention is called to the fact that a spark may be produced if the ground is connected to the instrument while the power plug is attached. This condition, which is caused by the condenser discharge from the power line, is quite normal and will cause no harm to the instrument.

ADJUSTING HUM CONTROLS.—The two hum control potentiometers should be adjusted at the time of installation in the following manner:

a. Place the transfer switch in the "record" position to the right.

b. With a small screwdriver turn the UX-226 hum control in the base of the

power amplifier unit slightly in either direction as required until the hum is a minimum.

c. Turn the transfer switch to the left to the "radio" position, turn the radio volume control to minimum, and adjust the UY-227 hum control near the UY-227 in the radio set until the hum is a minimum.

ADJUSTING HARMONIC MODULATOR.—The harmonic modulator or tone control in the bottom of the power amplifier controls emphasis on the bass section of the scale, increasing the bass and decreasing the high notes as the adjusting screw is turned to the right. Ordinarily, the control will not require any change in setting from that made in the factory. It may be desirable in some cases, however, to change the adjustment because of unusual room characteristics, a customer's preference for stronger bass, or to reduce record scratch and static. The control arm can be turned with a small screwdriver as desired.

General Tests

EXCESSIVE HUM.—This condition can be caused by:

a. Improperly adjusted or faulty hum controls.

b. Defective UX-280 or UY-227.

c. Shorted condenser across UX-226 filament supply.

d. Open connections to one of the various grounds.

e. Open or shorted center tap resistor across UX-226 filament supply.

f. Shorted condenser across power line in power amplifier unit.

g. Shorted condenser in condenser bank of power amplifier unit.

HOWL.—Microphonic howl can be traced to:

a. Defective Radiotron, particularly in the detector or audio stages.

b. Improper neutralization.

c. Speaker not felt insulated from baffle. Remove speaker and arrange felt properly.

d. Open condenser.

e. Loose metal parts such as shielding, screws, etc., or improperly centered cone may set up a howl or mechanical rattle.

DISTORTED REPRODUCTION.—Distortion may be caused by any of the following:

- a. Low emission Radiotron, particularly in the detector or in the power amplifier unit. For best reproduction the plate currents of the two UX-245 should balance within 2 milliamperes.
- b. Operation with volume control advanced too far on powerful local stations, causing overloading of the detector.
- c. Incorrect setting of the tone control in the base of the power amplifier.
- d. Improper neutralization.
- e. Cone in speaker unit improperly centered.

WEAK RECEPTION.

This condition can be caused by:

- a. Faulty antenna, characterized by weak reception, intermittent reception, or grating noise. Examine the antenna for poor contact at the lead-in connection to the radio set, poor soldered connections, grounded or partially grounded lightning arrester, or contact with surrounding objects.
- b. Faulty ground, characterized by weak reception, intermittent reception, grating noise, or oscillation. Examine the

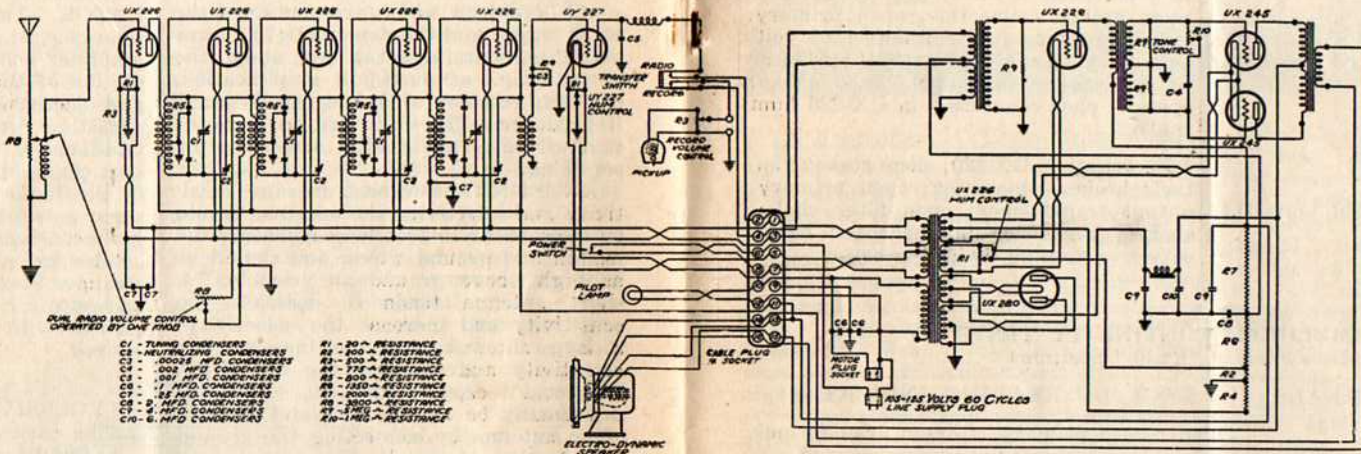
ground wire for poor contact at the ground binding post connection to the radio set, poor soldered connections, corroded connection at ground clamp.

c. Low power line voltage. Test power outlet with A. C. voltmeter. Voltage should be between 105 and 125 volts, for radio instruments and between 105 and 120 volts for instruments with Electrola.

d. Defective Radiotron in any of the various sockets.

e. Defect in radio set or power amplifier.

f. Improper neutralization. This condition is characterized by a tendency of the set to oscillate.



RADIO RECEIVER VOLTAGE TESTS

TESTS	SOCKET NO.	NORMAL VOLTAGE	LACK OF VOLTAGE OR ABNORMAL VOLTAGE INDICATES
Filament	1	1.40 Volts A.C.	Poor socket contact, broken connection, shorted condenser, C7.
	2	1.40 Volts A.C.	
	3	1.40 Volts A.C.	
	4	1.45 Volts A.C.	
	5	1.50 Volts A.C.	
	6	2.1 Volts A.C.	
Plate	1	105 Volts D.C.	Poor socket contact; broken connection; open 20-ohm resistor R1; open 500-ohm resistor R3; shorted condenser C7; open primary R.F. transformer; shorted neut. condenser; open R. F. choke; faulty transfer switch; shorted .001 mfd. condenser C5.
	2	105 Volts D.C.	
	3	105 Volts D.C.	
	4	105 Volts D.C.	
	5	105 Volts D.C.	
	6	40 Volts D.C.	
Grid	1	9 Volts D.C.	Poor socket contact; broken connection; open 20-ohm resistor R1, across filament UX-226; open 500-ohm resistor R3; shorted condenser C7; open secondary R. F. transformer; shorted neut. condenser; faulty volume control and R.F. choke.
	2	9 Volts D.C.	
	3	9 Volts D.C.	
	4	9 Volts D.C.	
	5	9 Volts D.C.	
	6	0 Volts D.C.	

POWER AMPLIFIER VOLTAGE TESTS

TEST	SOCKET	NORMAL VOLTAGE	LACK OF VOLTAGE OR ABNORMAL VOLTAGE INDICATES
Grid	UX-226	6 Volts D.C.	Low emission UX-280; poor socket contact; broken connection; open secondary, input transformer; defective voltage divider resistor; poor or open contact in UX-226 hum control; shorted condenser in condenser bank.
	UX-245	40 Volts D.C.	Low emission UX-280; poor socket contact; broken connection; open secondary, interstage transformer; defective voltage divider resistor; shorted condenser in condenser bank.

g. Improper alignment of tuning condensers. This adjustment requires special attention and **IT IS RECOMMENDED THAT YOU CONSULT YOUR DISTRIBUTOR BEFORE MAKING ANY CHANGES IN THE CONDENSER ALIGNMENT.**

LEFT—Circuit of Victor Micro-synchronous Radio R-32 and RE-45.

CABLE TERMINAL VOLTAGE TESTS

TEST BETWEEN TERMINALS	NORMAL VOLTAGE	LACK OF VOLTAGE OR ABNORMAL VOLTAGE INDICATES
1 and 3	1.70 Volts A.C.	Broken connection; defective UX-226 (radio) secondary winding of power transformer.
5 and 7	2.35 Volts A.C.	Broken connection; defective UY-227 secondary winding of power transformer.
2 and 9	39 Volts D.C.	Defective UX-280; broken connection, open radio primary, input transformer, open filter choke; defective voltage divider resistor; shorted condenser.
9 and 11	105 Volts D.C.	Defective UX-280; broken connection; defective voltage divider resistor; open choke; shorted condenser.
13 and 15	185 Volts D.C.	Low emission UX-280; poor socket contact broken connection; open choke; defective voltage divider; shorted condenser in condenser bank.

POWER AMPLIFIER VOLTAGE TESTS

TEST	SOCKET	NORMAL VOLTAGE	LACK OF VOLTAGE OR ABNORMAL VOLTAGE INDICATES
Filament	UX-226	1.40 Volts A.C.	Poor socket contact; broken connection; defective UX-226 (ampli) filament winding of power transformer.
	UX-245	2.2 Volts A.C.	Poor socket contact; broken connection; defective UX-245 filament winding of power transformer.
	UX-280	4.6 Volts A.C.	Poor socket contact; broken connection; defective UX-280 filament winding in power transformer.
Plate	UX-226	100 Volts D.C.	Low emission UX-280; poor socket contact; broken connection, open primary, interstage transformer; defective voltage divider resistor; shorted condenser in condenser bank; open filter choke; open or poor connection in UX-226 hum control.
	UX-245	230 Volts D.C.	Low emission UX-280; poor socket contact; broken connection; open primary, output transformer; open filter choke; shorted condenser in condenser bank; defective voltage divided resistor.

POWER AMPLIFIER CONTINUITY TESTS
(Transfer switch in "Radio" position)

TEST BETWEEN TERMINALS	LACK OF READING INDICATES
4 and 9	Open record primary of input transformer.
10 and 12	Open primary of power transformer.
14 and 16	Open secondary of output transformer.

NEUTRALIZING.—Improper neutralization is characterized by oscillation and lack of sensitivity. First be sure that the instrument has a good ground connection, since a poor ground will also cause oscillation. If oscillation still persists, the set should be neutralized in the following manner, using a dummy tube, made by cutting off one of the filament prongs of a UX-226.

a. Remove the four hex nuts which hold the plate.

b. Tune in a powerful local station, preferably near the high frequency end of the scale. If such a signal is not available, a modulated oscillator can be used to supply the signal. If the oscillator is used, it should be placed near the radio set and approximately three feet of wire used as an antenna on the set.

c. Remove the UX-226 from the first

tuned R.F. stage (socket No. 2), replace with the dummy UX-226, and adjust the corresponding neutralizing condenser to give minimum signal in the loudspeaker. The volume control may be set to obtain a signal loud enough for accurate neutralization, but not so loud as to cause the minimum to be blurred.

d. Replace the UX-226 in socket No. 2, and repeat the procedure for sockets 3, 4 and 5, adjusting the corresponding neutralizing condenser in each case. After completing the neutralization in this manner, turn back the neutralizing condenser for socket No. 5 approximately ¼ turn counter-clockwise.

If the instrument continues to oscillate, the condensers are out of alignment.

This adjustment requires special attention, and it is recommended that you consult your distributor before making any changes in the setting.



New WMAQ Equipment Shows Broadcast Trend

By CHARLES J. GILCREST
Associate Radio Editor
Chicago Daily News

ON September 17 The Chicago Daily News station WMAQ opened the most elaborate and complete broadcasting studios ever constructed for a single station. Stars of the opera, concert stage and theater took part in the gala event, officially inaugurating the studios that evening.

The huge two-story studio on the twenty-fifth floor of the building is the show spot of the radio department. The studio is finished in a modernistic motif of blue, black and silver, combining artistry and scientific perfection in broadcast engineering.

The enormous studio "A" will easily accommodate an orchestra, choral society, opera or concert company of 100 people. From its ceiling are hung the latest type of Western Electric microphones, the same kind as are used in the making of talking movies.

Adjoining studio "A" are three others, ranging down in size to the one used for one, two or perhaps three people. They are all four arranged in a "U" shape around the control room so that operators in control of the program and artists and announcers in the studios may always see each other in action. The windows between the rooms for this purpose are heavily glassed in so that no noise will cause confusion.

All the rooms are acoustically treated to eliminate every kind of noise. The floors are rubber-tile, and the walls are made of sound-deadening substance made of spun glass with a gypsum binder. A reception room, information counter, ladies lounge, music room and storeroom are also on the twenty-fifth floor.

Above, on the top floor of the building are three rehearsal rooms and the visitors' reception room with a large glass panel looking into the big studio from its second floor level. Any of the rehearsal rooms may be used for broadcasting and the wiring is so arranged that six different programs may be staged at any time should The Daily News wish to broadcast its own program over WMAQ and feed five other features to outside stations.

On the twenty-fourth floor where the visitor enters the radio department are the offices. These include the executives of WMAQ, the offices of The Daily News radio editorial department, the sales and continuity departments and radio laboratories. The twenty-fourth floor also houses large lounging rooms and porches at both the north and the south ends.

So much for the studios and radio offices maintained in The Chicago Daily News building at 400 West Madison Street. Seventeen miles west of Chicago's loop near the suburb of Elmhurst is located the 5,000 watt transmitter and the elaborate home for its operators.

The transmitting equipment of WMAQ represents the last word in the development of the art and science of broadcasting. The most modern equipment constructed for The Chicago Daily News by the Western Electric Company is used and resultant quality of the broadcasting is obvious to the thousands of radio fans within reach of the station.

The antenna is suspended from two huge towers that reach 200 feet up into the heavens. The transmitter is housed in a building designed by Holabird and

(Continued on page 16)

Radio and the Young Man

By E. T. CUNNINGHAM

President, E. T. Cunningham, Inc.

One cannot too strongly emphasize that there are limitless opportunities for the young man, awaiting him in the Radio field.

With a decade of amazing growth behind, Radio stands upon the threshold of its greatest accomplishments—already indicating the magnitude of its expanding scope just ahead. The young man, who enters the field today, will participate in this progressive expansion, and will be limited only by his own ability.

To the young man who enters this field, however, I advise that he come well prepared. Already, Radio is an intricate science and one of bewildering magnitude—calling for the trained man, exacting in his background.

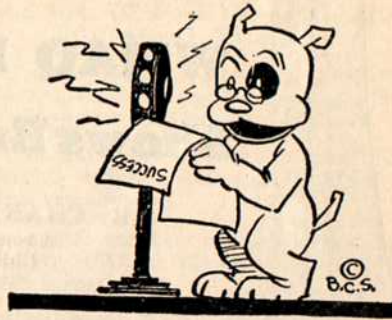
The world is the Radio's market, and it requires the man with the experience and the natural intelligence who can visionize and create upon a colossal scale. He must anticipate and recognize the unbelievable, for science is ever adding new wizardry in its conquest of the air. He must not confine his viewpoint to the ground, but must see with eyes that can visualize an agency that brings every corner of the world to his doorstep.

It is said that the airplane has conquered the air. But how much more decisively has Radio adapted the unseen elements of the airways to make space and distance but a name, and time but a matter of split seconds.

It is to the young man that Radio must turn for the proper recognition of its possibilities. It is the new generation who must bring his freshened vision, to grasp the extent of its potential goal, and to press his enthusiasm to bring about the new accomplishments of which Radio is capable.

Upon the basic experimentation of the past, he will be able to add his contributions that will hasten the developments

The Office Pup Says



The N. R. I. man will be called to fix the Radio set anyway, so why not call him first!

of Radio, so limitless that we, today, can but hazily anticipate them.

But, may I emphasize to the young man, do not be reluctant to start in this field in a humble role. Remember, that

to start at the beginning and to conscientiously work and learn all there is to know about each of the many phases of the field will bring you prepared to assume future leadership.

An exacting field, experience will be all the more valuable—and that comes only through hard work in secondary capacities. And don't fail to keep

your student's viewpoint, ever studying the progress of the field. Developments and improvements come so rapidly that you must keep up with them, or find your background has become antiquated.

Photo shows a laboratory expert experimenting with a unique test set. This special apparatus is said to have been developed and used exclusively in the E. T. Cunningham tube engineering laboratories for determining necessary dynamic and static characteristics that a Radio tube must give for satisfactory performance. Tube design and manufacture is getting to be a very specialized branch of Radio and offers rich opportunities to the trained man. As Mr. Cunningham states in his article, the young man should come prepared to assume future leadership in Radio. J. E. S.



PHOTO-ELECTRICITY

By J. A. DOWIE

Chief Instructor, Member I. R. E.

PHOTO-ELECTRICITY is a subject of major importance in television research, talking motion pictures, etc., although the word itself is not very well understood by many students. The word in question is a direct result of certain discoveries and its purpose, therefore, is to describe and make clear rather than confuse. Since it has been chosen as the title of this article, it is first necessary to define the word and disclose briefly the nature of the scientific accomplishments to which it is applied.

A study of the structure of the word may reveal the meaning which has been intended. "Photo" is taken from the Greek and means light. "Photo-electricity" may then be construed to imply light electricity. This, in fact, is the true interpretation of the word. The photo part has been prefixed to indicate the manner in which the electricity is set in motion. The natural implication is that light waves are relied upon as a means of producing electrical current.

An analogous case is found in the word "thermo-electricity" which describes the phenomenon of producing electrical current by means of temperature effects. The various combination words of this type which one encounters in technical literature designate the means by which the electricity has been produced.

The first step in the development of a means of setting electrical current in motion by means of light radiation came in the year 1817 when the Swedish physicist, Berzelius, discovered the element known as selenium. It was not until 57 years later, in 1874, that the English engineer, Willoughby Smith, found that resistances made of selenium were very unstable due to light radiations falling on the surface of the selenium.

This led to the discovery of the first light responsive electrical device known as the selenium cell. The selenium cell, due to its sluggish response, is not suitable to fill the needs of modern photo-electric apparatus.

Another type of photo-electric activity was discovered by the German physicist, Hallwachs, in 1888. The work of Hallwachs followed shortly by that of Elster and Geitel, has given the basis upon



Did you hear "Chief" Dowie speak over Station CMC, Havana, Cuba, September 15? He stole away for a day or so for a much-needed vacation. The opportunity to talk "over the air" came unexpectedly, but he grabbed the chance to say a few good words for N. R. I. men everywhere.

J. E. S.

which all modern photo-electric apparatus is founded.

The principle of the photo-electric function in question is founded by the fact that when light falls on various metallic substances, electrons are emitted from the metal. While most all substances behave in this manner under the influence of light radiation, only a few show it to a marked degree. The most important of these fall upon the chemical classification known as alkali metals. The metals lithium, rubidium, caesium, potassium and sodium are strongly photo-sensitive. They are most frequently used in modern photo-electric apparatus.

It is true that when light radiation is applied to these metals under vacuum, the electron emission is more pronounced; all modern photo-electric devices, therefore, operate in vacuum or at a low pressure of inert gas.

The term photo-electric cell is somewhat misleading, since from the word "cell" one might naturally believe that it has something to do with an electric battery operated by light. This, however, is not the case; and a more accurate term for the light sensitive tube used in talking motion pictures and television would be "photo-electric valve."

The photo-electric cell consists of a glass bulb having two lead wires or connections. One of these is connected to a ring-shaped conductor at the center of the bulb and this is the anode or positive electrode. This is always connected to the positive or + wire of the circuit. The other wire connects to the inner surface of the bulb to the light sensitive material which forms the cathode or negative electrode. This is always connected to the negative or — wire of the

(Continued on page 15)

The STUDENTS mailbag

"I have received an order for the following: 3 short wave transmitters, portable maximum weight 20 lbs.; 6 short wave receivers, portable maximum weight 12 lbs. These are to be used in South Africa by the African Missionary Fathers, for their mission work. Delivery on these to be made by February 15, 1930. Also I have two short wave transmitters to construct for radio amateurs here in Canada, delivery for November, 1929, not mentioning a long list of houses where I must go and service radio receivers as soon as my vacation is over." **Alphy L. Blais, P. O. Box 221, Theftford Mines, P. Q., Canada.**

"I charge \$1.50 an hour for service work and I have made \$53.60 on the sales of accessories and parts. I also earned \$131.25 for service work during August. At the end of the month I was able to say that I had \$184.85 more than I would have had if I did not use the knowledge I have received from your great course in Radio." **W. F. McCool, 1320 Indiana Ave., Spokane, Wash.**

"Well, Sir, your course is 'Just Fine.' In fact, I am so pleased with it that I have destroyed my money-back guarantee. The text books are worth the price alone." **H. O. Bell, 247½ Ashdale Ave., Toronto, Ont., Canada.**

"I did not know there were so many radios that needed repairing. They are still coming in. I've already got my course paid for." **Frank Annunzio, Walnut Beach, Milford, Conn.**

"Mr. Smith, I can't praise your school and its methods of teaching radio high enough. It has enabled me to pull myself out of the rut of the common laborer into a clean and better paid line of work. I made more in one day last week on my new job than I ever did in a week on my old mill job. Thanks to you. If this letter will help in getting other fellows to see the way, please use it as you see fit." **Parker Sickles, R. F. D. No. 2, Monroe, Wash.**

THIS MONTH'S TIP—

Thousands of sets will be sold for Christmas this year.

N. R. I. men, naturally, will get their share of these sales, the installation jobs, and the jobs of servicing the sets thereafter.

If you are in Radio on full time or only in spare time, start listing prospects for Christmas Radio sets right now. If you haven't already started your list! To keep sales and profits coming in, keep building a good list of good prospects. Get their names some way—make a house-to-house canvas if you have no other means of getting good names. Be business-like in your appointments—call when the time is right and talk "new sets" to them. If you haven't a franchise of your own, make an arrangement with a local dealer, get the terms of your commission well settled, and then start building up your own prospects for sales of sets. If you can't sell for yourself, sell for the other man on a commission basis. Don't overlook the market for custom built jobs. There's still a good field for that kind of work. It pays choice profits, too.

The N. R. I. men who are going to make the most money and get the most valuable experience out of this big Christmas Radio rush are the ones who are going to start planning their work early in November—if not before. You can't wait until a week before Christmas and then expect to make a lot of Christmas sales because most of the people will want their set by that time. Of course, January and February—in fact, every month in 1930 should be ahead of this year in sales profits!

J. E. S.

"After I had finished my 10th lesson I went after some Radio work—first asking the Radio dealers in the town for their service work and new installations and in this manner I succeeded in getting a good start. One of these dealers is so well pleased with my work and knowledge as a Radio-Trician that he has added a second line to the one he has. And we go fifty-fifty on profits and I have not a cent invested. I think that is quite good. My commissions on new sets sold for this month will run over \$100, while my service work will run this much or more. I am selling quite a lot of parts at a 40% profit that can be added to the above figures. So you can see that I have quite a little business worked up already." **Earl V. Norton, 500 S. Gold Ave., Deming, N. M.**

"If ever I spent \$100 for anything that I got my money's worth it was when I enrolled with the National Radio Institute. I really do believe I received my money's worth when I got the first six books. I am getting more kick out of this Radio work than anything that I was ever connected with. There is lots of work in this vicinity and only the "would-be" mechanics—these fellows are all right on some things, but when it comes to the mechanical part of a Radio they're off." **John Smoyer, Carbon Co., Farryville, Pa.**

"I am with Sun Radio, Inc., Akron, Ohio. These people are the largest retail dealers in Northern Ohio. My duties are installation with more or less service and leading to service exclusively later on. One of our chief lines is the Public Address system of which one or two are in almost daily use. This week we are broadcasting Fred Waring's Pennsylvanians from the air, using the Goodyear Blimp "Vigilant" as a base of operation. I stand a chance in favor of a three months' trip to Havana, Cuba, this winter to install and operate one of these systems." **R. C. Betteridge, 29 Richmond Place, Akron, Ohio.**

Photo-Electricity

(Continued from page 13)

circuit. In order to make a better connection with the light sensitive cell, a coating of silver is first formed within the bulb over the cathode lead-in wire and then the light sensitive material is placed on top of the silver. A round opening is left in the coating on one side of the bulb to serve as a window for the light to enter.

The valve action of a photo-electric cell such as used in Movietone reproduction will now be described and outlined.

Light passing through the sound record on the film which is in the form of alternate light and dark lines of varying density shining upon the material inside of the photo-electric tube permits an electric current to flow through the circuit in which the tube is connected. The amount of this current is directly proportional to the intensity of the light passing into the cell and this intensity is, of course, determined and varied by the sound lines on the film as they pass through the sound gate.

The cell is connected in a circuit with a battery whose electrical pressure is in the order of 100 volts. The lead from the central ring is connected to the positive wire and the lead from the light sensitive surface is connected to the negative. Under normal conditions, when the sensitive surface is not illuminated, the gas in the cell is an effective non-conductor and in the uni-illuminated condition, no current will flow in the circuit as there is nothing to carry it across this

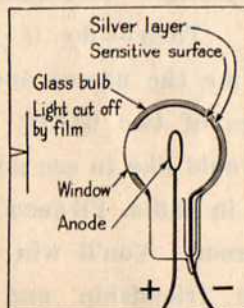


Fig. 1—Action of photo-electric cell light cut off by film. No current can flow.

space inside of the cell between the sensitive surface and the anode. This is represented schematically in the illustration, Figure 1, where the light from the sound lamp is considered to be entirely cut off by a dark line in the film.

When light passes through the film

on to the sensitive surface inside the bulb, the conditions are instantly changed. Electrons (minute negatively charged particles) are set free from the sensitive surface and are driven toward the anode by the voltage on the tube.

This flow of electrons in itself constitutes a small electric current, but by the action of the electrons on the gas in the tube, the flow of current is considerably increased. The gas becomes ionized, that is, it breaks down electrically and becomes a fairly good conductor instead of an insulator. A current now flows in the circuit and the condition is shown schematically in Figure 2. The amount

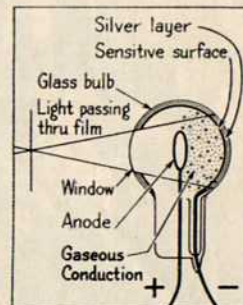


Fig. 2—Action of photo-electric cell light entering cell through window. Current can flow.

of light entering the photo-electric cell controls the current flowing through it just as effectively as a valve controls the flow of water in a pipe. Immediately current values correspond to the grey lines in the sound track, and the fluctuations of the current through the cell are a faithful copy of the fluctuations of the sound record on the film.

In other words, the current in the photo-electric cell circuit is modulated according to the sound track on the film. The photo-electric cell output is strengthened by a small amplifier and then carried to a fader, a control for regulating the sound volume during the showing of the film. From the fader, the current is carried to a public address amplifier of suitable size and power for the theatre. The output of this amplifier passes through a distributor panel and to loud speakers located behind the screen, from which the sound issues in synchronism with the picture. Photo-electricity is destined to play an important part in all phases of human accomplishments. The science of photo-electricity alone presents ample material in the future for the life time work of a great number of investigators.



through the outlying sections about Chicago. The transmitter now being used is the fourth to have been installed by The Daily News since its entry into the new field of public service more than seven years ago.

LEFT—New, ultra-modern studio A of WMAQ on 25th floor of the Chicago Daily News Building. George Simmons is announcing. Notice the two new Western Electric condenser microphones suspended from the ceiling.
—Editor.

"I am in business for myself now. I do a lot of repairing and also sell the Philco Radio in my spare time. I made \$200.00 in one month besides my other work. I must hand it to the N. R. I. for that Radio work is great. I would not take \$10,000 for my course." Earl L. Smith, 113 Straub Ave., Orwigsburg, Pa.

More About WMAQ

(Continued from page 11)

Root, who were also the architects of The Daily News building.

The transmitting plant has been laid out to provide not only a suitable broadcasting station but also a comfortable home for the staff of operators. Sleeping quarters, kitchen, dining room, garage and sun porches are under the same roof with the huge transmitting room. Thus the operators are always on the job. No matter whether or not the station is on the air, engineers are always present.

The vital parts of the transmitter, including motor generators, speech input system and batteries, are in duplicate so that there can never be an interruption in the service. Fourteen tubes ranging in power from 10,000 watts to seven and one-half watts are used in the transmitter. The larger tubes are cooled by distilled water. The other requirements of the station are supplied from a 200-foot artesian well.

The site near Elmhurst, selected by The Chicago Daily News and approved by the Federal Radio commission, was decided upon after engineers had traveled approximately 3,500 miles of roads

HAVE YOU—

started a friend on the road to SUCCESS* in Radio this year? Then—do it now! Send me the names and addresses of two GOOD MEN you would like to see getting ahead in Radio. I'll send them the proof. You'll win their deeper friendship and the commission as well.

Thanks,

J. E. S.

*Many big men owe their success today to a tip or a boost that someone else gave them earlier in life.