
INTERNATIONAL RADIO NEWS

June - July, 1933

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N. R. I. to Give Away \$5,000.00

And other important and interesting features.

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AVIATION

R A D I O N U M B E R



JUNE·JULY 1933

A FLIGHT

By W. B. BURCHALL



Sitting in the cockpit with brakes fixed and "stick" held back, the pilot "gives her the gun."

The rev-counter finger swings round and steadies. With a critical eye he flicks the switch first to one side, then to the other; satisfied, he throttles back and waves his hand.

After a last appraising glance at the wind cone, he taxies to the extreme end of the field and swings round for the take-off.

Mind-wanderings are arrested by the crescendo of the full-throated roar; then come the swift rush, the last touch of wheel to turf, the falling away of all boundaries, the circling around, the steady climb as the craft heads into the west.

The exhilaration of altitude is sobered by the definite detachment from things mundane, and in spite of the reassuring roar of the engine, a strange feeling of solitude permeates the cabin.

The whole western sky is a golden haze, reflected from each wire, wing and strut, so that the plane is limned in burnished brass against the darkening east, whose horizon is already lost in the approaching dusk.

Below, a dreamy mist hangs over the sluggish and peaceful windings of the Assiniboine, its ice-scarred banks hidden below the fringe of the deep pile carpet of the woodlands.

The green and brown checker-board of the prairies is indistinct through the curtain of smoke which floats, 'twixt plane and earth, from the smoldering strawstacks on the Portage Plains.

In the gathering gloom the lights of the farm houses twinkle in a friendly way, beacons blink mechanically and the headlight of a speeding train stares fixedly along the track.

* * * *

At our altitude it is still quite light, the sun is not yet set, but, like an archway, spans a highway paved with gold.

The radiant light which suffused the western sky has disappeared and against a background of delicate pale green, strange wisps of cloud take on fantastic shapes.

That golden ribbon winding westward into the sun is no longer a river, but the sunset trail leading to the enchanted city of our childhood days.

"A vision hovering o'er a sea of fire" . . .

. . . "a city walled, the spires"

"Prick'd with incredible pinnacles to heaven."

Enchanted surely, for, spite our speed, like a mirage it steadily recedes.

The vision holds, with its transcendent beauty. The surge of emotion, that in repression brings a choking at the throat, forces a shout of ecstasy. Self-conscious, we hope the pilot does not hear. Could we but see him we would know from the movement of his lips that he, too, was singing, singing out loud, but cry and song are both lost in the roar of the engine.

* * * *

PILOT'S REPORT:

"Flight uneventful."

(Reprinted by permission from "The Bulletin," published by Canadian Airways, Ltd.)

TELEGRAPHY VS. TELEPHONY IN AVIATION - RADIO

By COL. JAMES J. MILLIKEN,
Consulting Engr., Eastern Air Transport, Inc.



Looking through the side window into the control compartment of one of the Eastern Air Transport Company's huge Curtiss Condors. The aircraft Radio set with which this plane communicates with the ground may be seen.

It has long been a moot question; the advantages and disadvantages of telephony and telegraphy for Aviation Radio use. In the modern Eastern Air Transport system, maintaining constant service on the Atlantic seaboard from Newark, N. J., to Miami, Fla., this matter was given careful consideration.

After weighing the merits and demerits of each system it was decided to combine Radio telephony and telegraphy for the first time for Aircraft use. The combination of the two gives the Eastern organization the advantages of both methods without the limitations of either.

It is a known fact that telephony has certain disadvantages at long distances from the ground station by reason of fading or becoming garbled by static crashes.

Telegraphy, on the other hand, can be received through all interference. The piping signals of the telegraph key can be picked out of static without difficulty and, of course, have a much longer range than voice with the same power output.

With the two features combined into a telephone-telegraph set, the ideal system is at hand. Its range reaches the entire length of the airway and pilots in flight are never in doubt as to whether a message has been correctly received. If voice becomes indistinct, the pilot merely flips a small switch and begins tapping his key. If he wants to talk to a nearby station he uses the microphone; if he desires to contact a station a thousand miles away he uses the key.

This system is practically fool-proof. In designing the equipment the engineers desired to make it practically impossible to silence the station. Many things might go wrong, any one of which would instantly silence other sets, without putting this network unit off the air. If the entire telephone transmitter breaks down, the telegraph unit may still be used, or vice versa. The sets are so wired that any tube may burn out in either the modulator or the transmitter, or in both, and the set still be used. The entire modulator may go out without stopping telegraphic communication, and every tube except one may burn out in this latter unit without putting the station into silence.

The combination sets as installed in the Eastern airplanes weigh only eighty-five pounds, one-half to one-third as much as a strictly telephone set, and the weight factor is of great importance to aircraft.

Eastern Air maintains ground bases at Newark, N. J.; Baltimore, Md.; Richmond, Va.; Greensboro, N. C.; Spartansburg, S. C.; At-

(Page 10, please)

The interior of one of the Eastern Air Transport Ground Radio Stations, with the operator using his modern equipment to communicate with flying airplanes.





from the
PRESIDENT'S PEN

By J. E. SMITH, President, National Radio Institute

THE SAME OLD QUESTION

Are there too many Radio Service Men?

Sure there are—far too many—if you base this statement on the fact that not all Radio Service men are making a good living.

By this same line of reasoning, there are also too many lawyers—too many doctors—too many preachers—too many grocery stores—and so on, and on, and on!

* * * * *

Are there too many GOOD Radio Service Men?

Too many experts?

Well—that's a different question.

Of course there are NOT too many *good* Radio Service Men.

There will *never* be enough *good* men—enough *experts*—in this world, no matter what their trades or professions may be. It is true that every business is overflowing with bungling, half-trained incompetents—but no field of work has enough *good* men. The fact that many incompetent men even make a living is proof that there are not enough *experts*.

When you hear a man say his field of work is so overcrowded that new men do not have a chance, look him over carefully. You'll usually find he simply fears competition. He doesn't want new men in the field, because he realizes they may show him up.

You rarely hear a truly successful Radio man—Doctor—Lawyer—or Engineer, say that a new man in his profession does not have a chance. Why, many such successful men spend part of their time in training new men! You'll find successful Engineers—Lawyers—Doctors—lecturing to classes in all of the great professional schools, and over the Radio, and urging young men to enter the professions to which *they* have devoted their lives. You'll find many sons of successful men being carefully trained to follow in their father's footsteps.

Let's now look at this from another angle. Say that something would come about to make it impossible for even one more man to prepare to enter the Radio business.

What would happen?

Why, you know very well that men already in the business would realize they had "a cinch"—and being human like the rest of us, they would take

things easy—let down on efforts to improve their knowledge of Radio—and eventually give such poor service that the public would become disgusted with the thought of Radio.

It is a simple and well known fact that unless new men are constantly pushing into a business, *competition* dies—and when competition dies, the business dies.

When a man tells you that you should not go into Radio, because the "field is overcrowded," ask yourself if he is not doing it for one of three reasons:

Does he believe *you* are not good enough to buck competition?

Is he afraid to face the competition you may give him later on—OR—is he the sort of fellow who would claim that all babies should be drowned, because there are already too many people in the world?

I claim that if you are a man with an average set of brains, with an average amount of "fight" in you, and with the willingness to constantly improve your knowledge of the work you are doing—then it is your right as a free-born citizen to go into any line of work you choose—Law, Medicine, Radio, Politics, Undertaking, Preaching, Selling, Boxing, Flying—ANYTHING that you feel you'd like to do, and that you can prepare yourself to do well.

That's the privilege of *any* man who is not born a slave! **

You have the right to *live*—and the right to *work*! If you work, and live, according to the rules of the game, no one should deny you these rights. And the only persons who will *attempt* to deny you these privileges are those who are blinded by their own selfish interests.

The Public—and the Public alone—will decide whether you succeed in your work, or whether you fail. The Public will base that decision on the *service* you render.

If you can not offer the Public honest, result-getting, satisfying service, you have no more right to success than a quack doctor, a shyster lawyer, or a grocer who labels rotten eggs as "Strictly Fresh."

But as a *good* Radio man—an expert in your business—you will find that ever increasing opportunity, and profit, is yours.

You will find the field overcrowded *ONLY* by "screwdriver mechanics"—"experts" who diagnose every Radio ill as "bad tubes!"

PHOTOELECTRIC PROTECTIVE ALARM SIGNAL SYSTEMS

By J. A. Dowie, Chief Instructor

Photoelectric burglar alarm systems possess a distinct advantage not found in any other types of protective systems. This advantage arises from its flexibility or ready adaptability to varying situations. By providing a beam of light across a door or window, or across the front of a cash register or safe, onto a photoelectric relay, the movement of any person entering or moving about may be detected and an alarm or signal operated. Incidentally, a photoelectric alarm system will also respond to dense smoke and thereby provide some protection against fire.

In a store or any like installation, it is usually desirable to scan the spaces behind the counters as well as the spaces near the doors, trap doors and other possible entrances in order to insure the detection of anyone seeking to trespass.

Such spaces are usually a "straight throw" and permit the beam of light to be easily projected at the desirable level of two to four feet above the floor. When especially long distances are involved, it may be necessary to use concave rather than plane mirrors in order to limit the spreading of the light beam and so conserve the light.

While the concave mirrors permit the beam of light to operate the Foto-Switch at a greater distance, they must be designed especially for each installation, and are not to be generally recommended unless they are absolutely necessary.

The light source and mirrors may be located in any convenient place almost without regard

Fig. 1. Drug Store Installation.

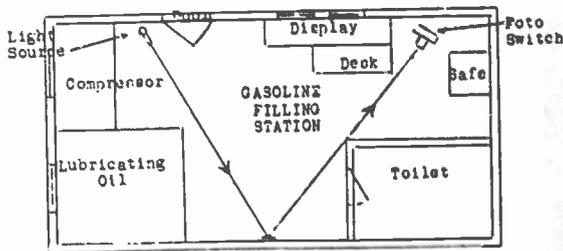
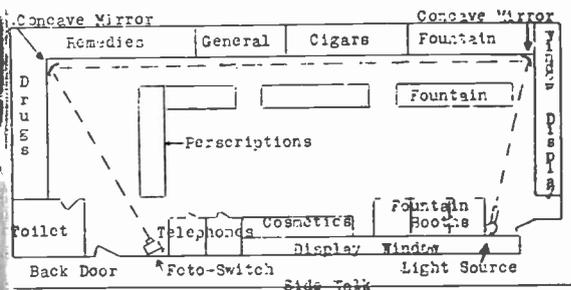


Fig. 2. Gas Filling Station Installation

to extraneous light, such as street lamps, moon light, sun light or lights from passing autos. However, the Foto-Switch itself should be more or less shielded, as by locating it in a remote corner or some place where it will receive light from the light beam or mirror.

Figs. 1 and 2 illustrate two typical Photoelectric Protective Systems. Fig. 1 is a suggested plan for a Drug Store installation, and Fig. 2 is a system suitable for an Automobile Gas Filling Station.

The G-M Foto-Switch (Model 1252-L47KS6) is suitable for burglar alarm installations because it can be used with a light source having a deep red filter so as to give a practically invisible beam of light.

However, in designing an installation using the red filter, the large absorption loss should be taken into consideration.

For this reason, the projective distance should be as short as possible if the filter is used.

In using this special type Foto-Switch, the base illumination should be as near zero as possible, since the high sensitivity of this type of circuit is lost if the light reaching the Foto-Switch is not almost completely interrupted when the unit is intended to operate.

In general, burglar alarm systems are used only at night, when the illumination level in the place to be protected is very low. The Foto-Switch should be located in such a part of the store or room that the extraneous light from the street or other sources will not reach the light-collecting lens.

In mounting the light source and mirrors in this type of installation, it is very important that each part of the optical system be absolutely rigid, otherwise they may produce a false operation of the alarm system.

In this special Foto-Switch, which has been designed particularly for burglar alarm systems, a power relay is employed to control

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A FEW WORDS WITH THE N.R.I. DIRECTOR

E. R. HAAS, Vice President and Director, National Radio Institute



When it comes to confidence, you've got to hand it to this Radio Industry.

Folks in Radio don't believe in laying down on the job—they believe in progress, work and profit. That's one of the reasons why so many trained Radio men have been making money during the hard times we have been passing through.

Take one small branch of Radio, for instance: Automobile Radio. Back in 1930 only 35,000 Radio sets were installed in automobiles. In 1931 the Radio Industry stepped on the gas and made 108,000 installations—three times the number they made in the previous year. Then, in 1932, with everybody howling about business conditions, the Radio Industry calmly went forward and pushed the year's output of automobile Radio sets up to 140,000.

Now do you know what they are doing this year—the year 1933?

Well, to all indications, they are going to install just one quarter of a million automobile Radio sets. And a quarter of a million of anything is a whole lot. That means that somebody is going to produce enough raw material for 250,000 automobile Radio sets. That means that 250,000 automobile Radio sets are going to go through the entire process of manufacture and that a like number of automobiles must be prepared and installed with Radios. And it means 250,000 more car Radios to be serviced eventually. It means work—employment all the way down the line. More chances for the trained Radio man to make good money.

You know the old gag about the sailor who always goes boating on the lake whenever he had a vacation?

Well, Chief Dowie advances the idea in different form.

The Chief figures that policemen or detectives might find it much to their pleasure when off duty to listen in on the police Radio signals.

We bet there are a number of policemen in your neighborhood who could be sold Short Wave Sets or Short Wave converters which would cover the police signal frequency bands.

It's worth trying anyway—and you may dig up a lot of service work too.

The only difference between a rut and a grave is the depth.

With this issue National Radio News brings its readers a new service in the form of TUBE DATA SHEETS. This is in response to numerous requests to the Alumni Association and N. R. I. Instruction Department.

It is planned to cover eventually all tube types, giving characteristics and other pertinent data, giving readers of National Radio News a complete set of Tube Data Sheets—a very valuable addition to the Radiotricians Library. Tube data sheets will appear in National Radio News whenever data is available and space permits.

The first of this series appears on pages 15 and 16 of this issue. We feel sure our readers will appreciate this service.

When things go wrong, as they sometimes will,
When the road you're trudging seems all up hill,
When the funds are low and the debts are high,
And you want to smile, but you have a sigh,
When care is pressing you down a bit,
Rest, if you must—but don't you quit.

RADIO-TRICIAN SERVICE SHEET

REG. U. S. PAT. OFF.  COMPILÉ SOLELY FOR STUDENTS & GRADUATES

FADA RA RECEIVER—MODELS 74, 76, 83, 87, 88, 89

**CONTINUITY AND VOLTAGE READINGS ON
FADA RA RECEIVER - MODELS 74, 76, 83, 87, 88, 89**

Line voltage 115 A.C. (60 Cycle) -- Wattage 95
No signals -- Ant. & Ground leads tied together

TYPE OF TUBE	POSITION OF TUBE	PLATE VOLTS	PLATE (MA) CURRENT	CONTROL GRID VOLTS	SCREEN GRID VOLTS
F-58	R.F. & I.F.	180	7.0	4.2	110
F-58	1st Detector	173	1.1	11.0	103
F-56	Oscillator	70	4.0	--	--
F-56	2nd Detector	--	--	--	--
F-56	1st Audio	164	2.0	10.0	--
F-247	P.P. Audio	248	34.0	15.0	262
F-280	Rectifier		112 total		

Note:- Bias readings are to be taken across each respective bias resistor. Correct readings cannot be obtained at control grids due to use of series resistors.

VOLTAGES ACROSS VOLTAGE DIVIDER AND BLEEDER RESISTORS

Voltage across	280 ohm	AF filter choke	(1933-X)	31 volts
"	800 "	speaker field	{3-1266-Ms}	95 "
"	7,000 "	Resistor	{3-1264-Ms}	92 "
"	25,000 "	Resistor	{3-1450-Ms}	161 "
"	30,000 "	Neon control	{3-1440-Ms}	115 "
"	200 "	Bias resistor	{3-1283-Ms}	15 "
"	300 "	Bias resistor	{3-1444-Ms}	4.2 "
"	5,000 "	Bias resistor	{3-1445-Ms}	10 "

VOLTAGES ACROSS ELECTROLYTIC CONDENSERS

1st -- 402

2nd -- 371

3rd -- 276

DC RESISTANCE VALUES

		<u>PRIMARY</u>	<u>SECONDARY</u>
1927-X	Antenna coil	-- ohm	3.5 ohm
1929-X	R.F. Coil	71 "	3.5 "
1939-X	Oscillator coil	.8 "	3.5 "
1924-X	I.F. transformer	97 "	97 "
1925-X	I.F. transformer	97 "	97 "
2-2036-Y	Suppressor coil	15.5 "	1.47 "
1926-X	Input AF transformer	2933 "	9600 "
1934-X	Output AF transformer	745 "	.75 "
1933-X	Choke -----	280 ohms	
2413-Y	R.F. choke -----	134 "	
3-1266-Ms	12-E speaker field --	800 "	

The foregoing voltage and current readings were taken beneath the chassis with the meters available in an ordinary set analyzer with the idea in mind of approximating the conditions the average service man has to contend with. Permissible variations in tube characteristics as well as commercial tolerance allowable in portable test equipment may result in a deviation from the above readings.

Readers who file Service Data in separate binders remove page carefully; trim on dotted line for same size as Data published heretofore.

???

QUERIES AND ANSWERS



Question: I have built a modulated I. F. oscillator but can not determine at what frequency it is oscillating. How can I ascertain its approximate or exact frequency?

Answer: Use a broadcast receiver having a frequency calibrated dial. Couple the oscillator to the receiver. Turn on the oscillator and receiver and tune the receiver dial from the lowest to the highest frequency of its tuning range with the oscillator set at any fixed frequency. Note the lowest frequency dial setting when the first signal from the oscillator is heard. Turn the dial further until another signal is heard from the oscillator. Ascertain the frequency of the broadcast receiver at this setting and subtract the former value from it. Since the two frequencies will differ by one harmonic, the difference will be the fundamental frequency. The precision of the result depends on the sharpness of tuning and accuracy of calibration of the broadcast receiver. The average broadcast receiver will serve for oscillators up to 450 kc.



Question: I have recently heard of a Radio blind landing aid for aircraft. Can you give me briefly an idea of the principles of this system?

Answer: A directional ultra high frequency transmitter sends a beam from the ground over the airport runway directed at about 6° from the landing field level. The shape or field pattern of the beam is made such that there exists an equisignal zone along the natural glide or landing path of an aeroplane in a vertical plane with the line of maximum transmission. A second transmitter establishes this vertical plane and the pilot receives indications to guide his vertical and horizontal displacement by means of a dual meter with vertical and horizontal needle indicators. By manoeuvring his plane to keep the meter needles vertical and horizontal, respectively, a good landing may be made without seeing out of the plane.



Question: How may I change from '24 R.F. tubes to '35 or '51 variable mu tubes?

Answer: Examine your present volume control. If it controls the C bias by varying the resistance between the cathode and ground, it is only necessary to substitute a volume control having a value of around 10,000 ohms.

If a variable screen voltage type of volume control is used, remove it from the panel, and mount it on the chassis. Set it permanently at the highest screen voltage. Insert in series with the common C bias resistor a 10,000-ohm variable resistor. By-pass (.5 mfd) cathode to ground. The variable resistor will then control the volume. Replace the '24 with '35 tubes. A change in tubes is not recommended when A.V.C. is used.



Question: I have a 4-tube tuned Radio frequency midget. How can I improve its selectivity—locals cover the greater part of the dial?

Answer: There is not much you can do. With only one stage of R.F. amplification, poor selectivity is to be expected. The receiver is no doubt performing as it was designed to. You may obtain slightly better results by using a shorter aerial, and realigning the tuning condensers on a weak signal. These sets on a small aerial are for use in crowded broadcasting areas for local reception. In rural districts they should be connected to a long aerial. Don't expect too much from a small receiver.

I think you have a very fine page—this Queries and Answers section. It is particularly instructive because of the way it boils down information and gives it in concise form. Lots of times it answers questions I have in mind but which I have failed to ask about. Keep it going. —Graduate Harry Vasselmann, Chicago, Ill.

TELEGRAPHY VS. TELEPHONY

(Continued from page 3)

lanta and McRae, Ga.; Charleston, S. C.; Jacksonville, Orlando and Miami, Fla. The principal inspection and maintenance base is at Candler Field, Atlanta.

In addition to the full equipment maintained at each one of these stations, auxiliary power plants are maintained at each, so that even if the city power supplies fail, the station may operate on their auxiliary power plant and still not be silenced. The fine Radio system used by Eastern Air was developed by their Radio Engineer, Mr. F. E. Gray.

Aviation is dependent to a great extent upon Radio. Flying safety depends upon it. For this reason, Eastern Air has devoted so much time, research and expense to making its Radio facilities the best possible. Beyond all possibility of a doubt all the present Aviation Radio systems will become obsolete in a few years, due to Radio inventions which will make more ease and facility in Aviation Radio communication. Aviation Radio is ready for any inventions which will increase the safety factor of flying. Such conditions present wide opportunity to the Radio men who are now and who may later become affiliated with the Aviation branch of the Radio industry.

Graduate Walter B. Murray is employed by American Airways, Inc., as ground station operator at Lunken Airport, Cincinnati, Ohio.

THE SURVEY EDITOR REPORTS

In the April-May News we announced a survey to be made regarding stationery and business forms used by Radio men.

The cooperation received was very gratifying. The Survey Editor is now ready to make comments on the material sent in by various students and graduates. Comments will appear in the order in which the stationery samples were received.

CECIL WALLACE, WACO, TEXAS.

Your letterhead is neat and contains all the essentials of a good letterhead. We'd like to suggest in rerunning this job that the phrase "An N.R.I. Certified Radio-Trician" be centered on the page.

(Next column please)

SUCCESS STORY NUMBER 4

National Radio News pays \$1.00 for each Success Story accepted. Tell us the plans you use successfully for getting business—etc. A short letter may bring you \$1.00.

The Success Editor,
National Radio News.

Enclosed is a letter for the Success Column. It is not intended so much to show how I obtained Radio work as to verify the fact that Radio dealers call on the trained man, provided, of course, they know where the trained man is.

Sincerely yours,

John Reider,
St. Paul, Minn.

BORG & POWERS FURNITURE CO.
St. Paul, Minn.

Mr. John Reider,
St. Paul, Minn.

Dear Sir:

We have about a dozen Radios which we want repaired. Kindly come in to see the writer as soon as possible.

Borg & Powers Furniture Co.
By: L. E. Zweig.

**HERBERT J. STADLER, LAWRENCE,
MASS.**

Your business card is very good; so is your letterhead. It might be a good idea to use a goldenrod or canary paper stock for your Service Contract for added attention value. Your envelope could be improved greatly by printing your name and address rather than using a rubber stamp. Printing your circular would render it more attractive than the present mimeograph form—and when you print it you should obtain a cut of a more modern Radio than the illustration you now use.

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THE IMPORTANCE OF AVIATION - RADIO

By *W. A. Patterson, Vice-President, United Air Lines

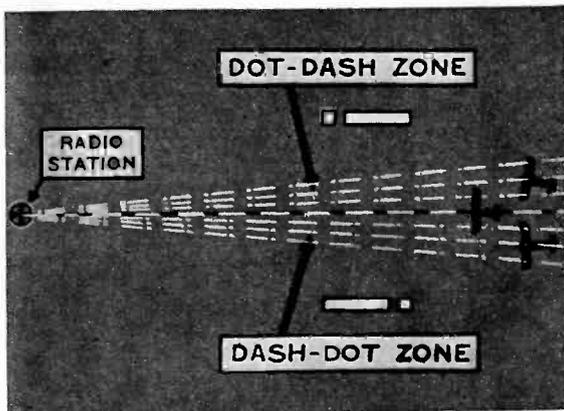
It has only been a short time since a Radio was a neighborhood curiosity—since an airplane flight was cause for a holiday to give every one an opportunity to view a “flying machine” in action. They are not so aged who remember airplanes as “box-kite” looking contraptions, flown by dare-devils who took their lives in their hands every time they left the ground. And most of us recall the “bread board” days of Radio.

Radio and Aviation as industries have grown up together. Both are young and both have made rapid progress in their comparatively few years of commercial life.

AIRCRAFT RADIOPHONE DIAL SYSTEM: Operator at United Air Lines ground Radiophone transmitting and receiving station dialing the wavelength of a plane in flight to communicate with its pilot. This is an invention of the United Air Lines communication engineers to speed up plane-ground communication.



*W. A. Patterson is Vice-President of United Air Lines, which is the largest air transport company in the world, in point of mileage flown, having recently completed its 50,000,000th mile. It now flies approximately 14,000,000 miles a year, including its coast-to-coast service, on which it has recently placed new type, all-metal multi-motored transports, capable of flying from coast to coast in eighteen hours.



DIRECTIVE RADIO BEACON SERVICE. Diagram illustrating the operation of the directive Radio beacon service established along mail-passenger airways by the Department of Commerce. The transmitting station sends signals which are received by the pilot as an “A” (—) if to the right of the course; as an “N” (—) if to the left. If he is directly on the course the signals merge and are received as a “T” (—).

One of the biggest reasons for the rapid growth of commercial flying was the increase in flying safety. And safety in the air has resulted, to a great extent, from the advances in Radio communication as applied to Aviation.

No expense has been spared by the Aviation companies in research and development of Radio safety features and in Radio communication for airplanes. As a result of fifty million miles of flying experience, United Air Lines, the world's largest air transport operator, is placing greater emphasis than ever upon research and experimentation in Radio on a plan to improve upon the already efficient equipment and facilities.

The United Air Line has established a Radiotelephone engineering laboratory in the skyscraper which houses the general offices of the company and the staff has already made several significant contributions to the field of Aviation communication.

We consider the Radiotelephone an extremely important factor in air transportation and United Air Lines depends upon it for the control of its wide-spread air mail, passenger and express operation.

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A PLACE IN AVIATION FO

Wherever man is out of touch with the world—even for comparatively short times—he turns to Radio as a means of communication—as a connecting link with civilization.

A number of years back Radio consisted in its entirety of communication by transmission and reception of dots and dashes. Even in this elementary stage of Radio—its possibilities were seen—and used by ships at sea—to communicate with land and with each other.

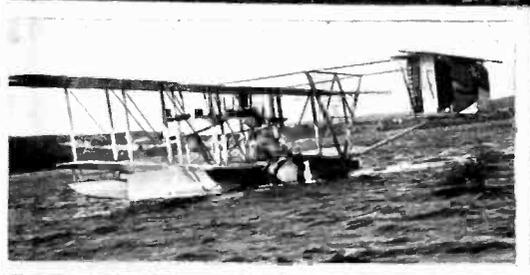
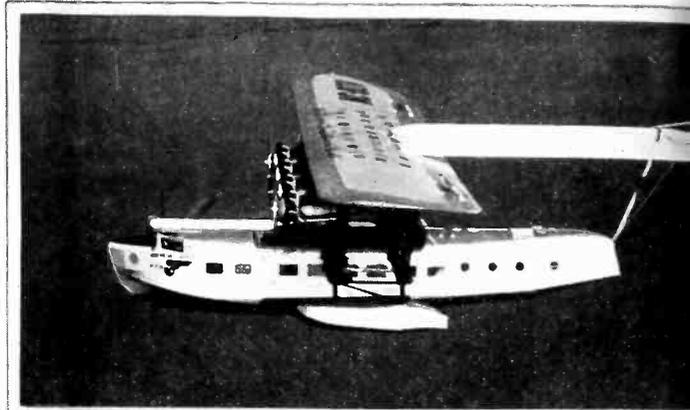
With commercial aviation building up to a major industry—what is more natural than for Aviation to utilize Radio as a means for rapid interchange of messages?

These messages may be of the nature of straight commercial Radiograms—or, they may be interchanged for the purpose of safety.

Aviation Radio is broad in scope. Both phone and code are used, some organizations preferring one, some the other, and a number using both.

It is interesting to learn that a large number of Aviation firms maintain trained staffs of Radio engineers—not alone for communication work, but for Radio experimental purposes.

One does not have to make exhaustive studies of the field to realize that as Aviation grows so will the Radio branch of Aviation grow. And Aviation is progressing rapidly. For instance, look at the picture (lower left) on this page. It is the U. S. Navy plane NC1, sister ship to the famous NC4, the first plane to cross the Atlantic. A very modern plane a few years ago. Compare it with the other planes pictured here. The giant "Junkers" of the Canadian Airways (lower left), a freighter which can carry a pay load of 6,000 pounds; or the mammoth



THE TRAINED RADIO MAN



"American Clipper" of the Pan-American Airways (upper left), on one of its regular trips to Jamaica or Colombia.

In the center we see one of the tri-motored planes of the Pennsylvania Air Lines about to depart from Pittsburgh municipal airport. Every facility for safety and comfort of passengers is utilized to induce the public to fly. The photo (upper right) shows an air view of ice-bound Lake Michigan (photo courtesy Milwaukee Journal) was made from a plane of the Kohler Aviation Corporation on a flight from Milwaukee to Detroit. Lake steamers are ice-bound but air traffic carries on.

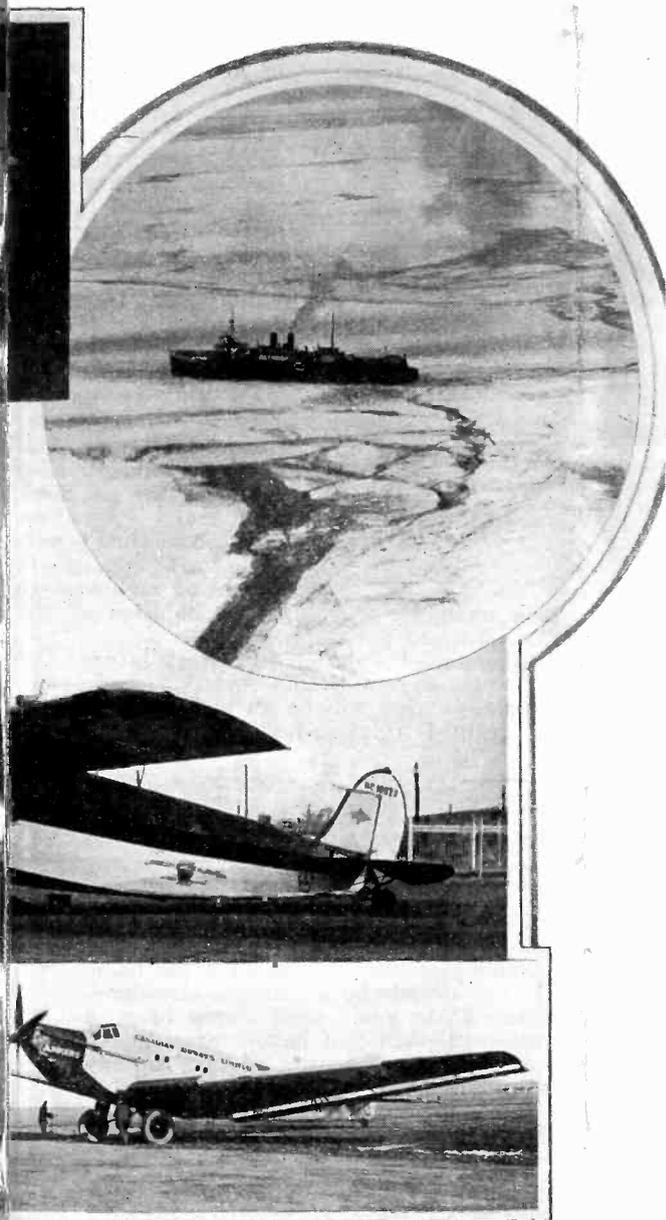
The growth of Commercial Aviation can be judged by the fact that already twenty-seven major lines are operating in the United States and Canada, to say nothing of those in other countries. These air lines are well-developed organizations running on schedule—with passenger, freight, express and mail service.

And Radio is playing an important role. It is the very nerve center of the Industry. Aviation Radio is new—it holds a bright future for a certain class of red-blooded fellows—offers a certain degree of adventure and romance—a chance to get away from the usual routine—the chance to do something different—the opportunity to grow up with a new, up and coming Industry.

Graduate Lyman Newell is operator in charge Airways Radio Station, Bellefonte, Pa.

Graduate Claude Allday is with the N. S. Army Radio Aviation Service.

Graduate R. Sigler is in the Radio Division of the Pan American Airways.



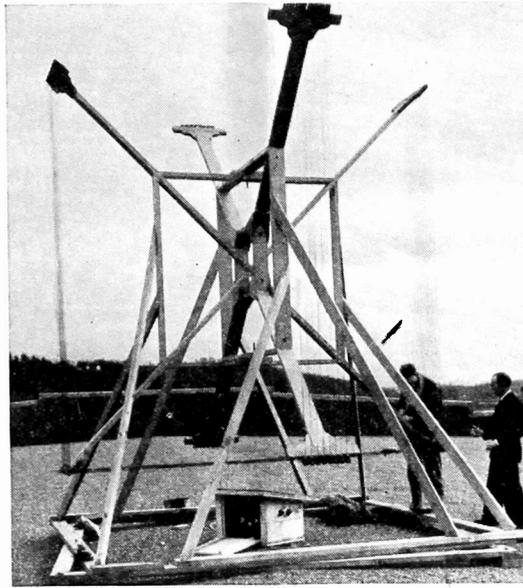
THE IMPORTANCE OF AVIATION - RADIO

(Continued from page 11)

United Air Lines is comprised of various divisions varying in length up to 2,030 miles, and the operation of planes over these routes is constantly controlled by Radiophone.

For instance, the company's coast-to-coast service is maintained over two coordinated divisions, the New York-Chicago section of 736 miles and the Chicago-Pacific Coast section of 2,030 miles. During the flight of a scheduled aircraft from the Atlantic to the Pacific Coast, the ground personnel can be in constant touch with the plane's crew by Radiophone communication.

The planes of United Air Lines pioneered the use of two-way Radiotelephone in Aviation, the engineers of this company having developed the first satisfactory equipment in 1928. Since then, United has led the way in the fields of Aircraft Communication.



DIRECTIONAL BEAM ANTENNA: The directional antenna for an airport localizer Radio beam being tested by United Air Lines to guide pilots to airports which are obscured by weather conditions of low visibility.

There is no doubt that Aviation Radio offers a promising future to specially trained Radio men. The industry is young, and, while much has been accomplished, much more will be done in the future, and it will, in all probability, remain for Radio men to add valuable contributions in the way of inventions which will still further increase the safety of flying through Radio communication and Radio aids to aerial navigation.

Aviation companies have enjoyed an increasing business for some time. Commercial travelers and tourists are using the air, more and more. Business men, whose time is valuable, are coming—in increasing numbers—to

look upon air travel as the solution of the "travel-time" program.

Commercial Aviation is still an infant. As it grows, so will Radio Aviation grow—and naturally there will be an increasing demand for trained Aviation-Radio personnel.

I'M GIVING AWAY \$5,000 THIS YEAR YOU CAN HAVE AS MUCH OF IT AS YOU WANT

Yes, sir, I'm giving \$5,000 to students and graduates of N. R. I. in a drive for new students.

Now here's an idea. Lots of young men have just finished high school. Probably they haven't yet decided what to follow as a career or possibly their parents, due to circumstances, can not afford to send them to college. What would be more fitting than a course in Radio? Talk to some of these young fellows—get them interested in Radio—then send me their names on the handy form enclosed. I'll do the rest.

Every name you send me can mean money for you. Every enrollment from a name you send in, provided the name has not already been obtained elsewhere, means \$5 to you. Send names of good prospects—men you have reason to believe are in a position to take up my training.

With a little effort you can send in the names of from two to five honest-to-goodness prospects. And don't forget your big benefit—your share in the \$5,000.

J. E. SMITH,
President.

RADIO-TRICIAN

TUBE DATA

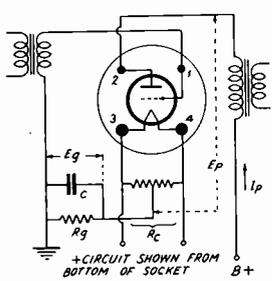
COMPILED SOLELY FOR STUDENTS & GRADUATES



1— NEW RMA TUBE CLASSIFICATION

- In the future, tube-type designations will have a number, a letter and a number.
- (a) The first digit (or two digits) shall indicate the filament voltage in steps of 1 volt, using figure 1 to mean any voltage below 2.1; 2 to mean 2.1 to 2.9 volts; 3 to mean 3.0 to 3.9 volts, etc.
 - (b) The third digit (number following the letter) shall designate the number of useful elements (filament, cathode, grid, plate, etc.) brought out through prongs or tube caps.
 - (c) The letter shall be a serial designation. Amplifiers will start with A and when the first and third digits are alike because of identical filament voltage and number of electrodes, then B, C, etc., shall be used to designate a different tube. Rectifiers will start with Z and work backward through the alphabet.

A.C. OPERATED TRIODE POWER AMPLIFIERS FOR CLASS A OPERATION

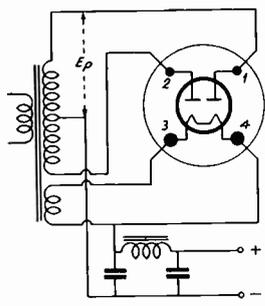


Tube	'26	'12A	'71A	182B†	183†	'45	2A3	'10	'50
E_f —Fil. volts	1.5	5	5	5	5	2.5	2.5	7.5	7.5
I_f —Fil. amp.	1.05	.25	.25	1.25	1.25	1.5	2.5	1.25	1.25
E_p —Plate volts	180	180	180	200	250	250	250	425	450
I_p —Plate ma.	6.2	7.6	20	18	26	34	60	18	55
E_g —Grid volts	-14.5	-13.5	-40.5	-29	-65	-50	-45	-39	-81
R_p —A.C. Plt. Res.	7300	5000	1850	3330	1500	1750	765	5000	1800
R_l —Load Res.	10500*	10800	5350	—	—	3900	2500	10200	4350
W—Out. Watts . . . . .	.13	.26	.7	—	—	1.6	3.5	1.6	4.6
G_m —Micro-mhos.	1150	1700	1620	1500	2000	2000	5500	1600	2100
μ —Amp. fact	8.3	8.5	3	5	3	3.5	4.2	8	3.8
R_c —Ohms	20	100	100	100	100	20	20	100	100
R_c —Ohms	2300	1800	2000	1600	2500	1500	725	2000	1500

*Approximate. †This scheme will be universal in these tube data sheets. ‡Sylvania tubes.

3— FULL WAVE FILAMENT RECTIFIERS

Mercury vapor types are recommended for class "B" circuits



	'80	82	83	523
E_f —Fil. volts	5	2.5	5	5
I_f —Fil. amp.	2	3	3	3
E_p —R.M.S. volts.. 350:400	500	500	500	500
D.C. Out. ma. 125:110	125	250	250	250
Gas content	High Vacuum	Mercury Vapor	Mercury Vapor	High Vacuum
Tube drop volts.	Variable	Variable	Variable	Variable
Allowable inverse peak volts.	—	15	15	—
		1400	1500	

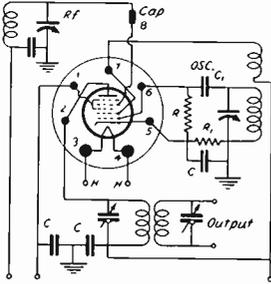
All of the circuits given represent typical arrangements and it must be recognized that many other arrangements or circuits may be used. Socket arrangements are given looking at the bottom of the socket or tube base. This will facilitate wiring and tracing circuits. R.C.A. Radiotron characteristics are given where possible. Characteristics of tubes will vary.

4—

PENTAGRID CONVERTERS

For Superheterodyne Circuits

These two pentagrid converters, the 2A7 and 6A7, have been designed to replace the first detector and oscillator in the usual superheterodyne circuit. Both functions are made possible by the multigrad construction of these tubes. The only difference between these two is in the filament characteristics.

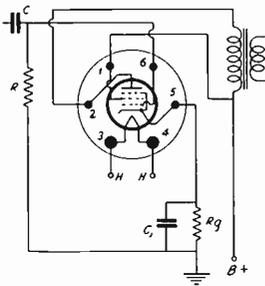


Tube	2A7	6A7	C — 0.2 mfd.
E_f —Fil. volts	2.5	6.3	C1 — 200 mmfd.
I_f —Fil. Amp. . . . .	.8	.3	R — 50,000 ohms
E_p —Plate volts	250	250	R1 — 250 ohms
I_p —Plate ma.	4	4	Cathode current 14 ma.
E_g —Grid volts	-3	-3	Screen current 2 ma.
E_{sg} —Screen volts . . .	100	100	Anode-grid (7) current 3.5 ma.
R_p —A.C. Plt. Res. . . .	.3 meg.	.3 meg.	1st control grid (6) current .5 ma.

5—

PENTODE HEATER A. F. AMPLIFIERS

All of the cathode type pentodes with the suppressor grid internally connected to the cathode are included in this list.

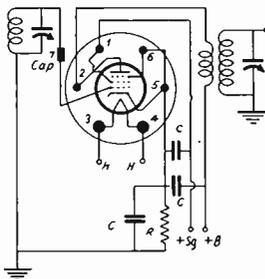


Tube	2A5	'41	'42	'43
E_f —Fil. volts	2.5	6.3	6.3	25
I_f —Fil. Amp.	1.75	.4	.7	.3
E_p —Plate volts	250	180	250	135
E_{sg} —Scr. volts	250	180	250	135
I_p —Plate ma.	34	18.5	34	34
I_{sg} —Screen ma.	6.5	3	6.5	7
E_g —Grid volts	-16.5	-13.5	-16.5	-20
R_p —A.C. Plt. Res. . . .	100000	81000	100000	35000
R_l —Load Res.	7000	9000	7000	4000
W—Out. Watts.	3	1.5	3	2
G_m —Micro-mhos.	2200	1850	2200	2300
μ —Amp. fact	220	150	220	80
R_g —Ohms	410	630	410	490

6—

PENTODE HEATER R. F. AMPLIFIERS

Types 58 and 78 are vario- μ types applicable to R.F. and I.F. amplification, whereas types 57 and 77 are used as detectors, as well. The circuit shows R.F. amplifier use.



Tube	57	58	77	78
E_f —Fil. volts	2.5	2.5	6.3	6.3
I_f —Fil. Amps.	1	1	.3	.3
E_p —Plate volts	250	250	250	250
E_{sg} —Scr. volts	100	100	100	100
I_p —Plate ma.	2	8.2	2.3	10.5
I_{sg} —Screen ma. . . . .	.5	2	.6	3
E_g —Grid volts	-3	-3 min.	-3	-3 min.
R_p —A.C. Plt. Res. . . .	1.5 meg.	.8 meg.	1.5 meg.	.6 meg.
G_m —Micro-mhos.	1225	1600	1250	1650
μ —Amp. fact	1500	1280	1500	990
R—Ohms	1000	270 min.	1030	220 min.



ALUMNI *News*

PITTSBURGH LOCAL OFF TO GOOD START

By Thomas Deschantz,
Associate Editor, National
Radio News
Chairman, Pittsburgh
Chapter



BUFFALO CHAPTER REPORTS FINE PROGRESS

By T. E. Telaak, Chairman
Buffalo Chapter, Associate
Editor, National Radio
News



es

The "Local Chapter" plan is taking hold very well in the Pittsburgh area. Of course, we realize that when National Headquarters in Washington showed its confidence in us and issued us a Local Charter we had just made a start. From that point we must climb on our own initiative. This we plan to do.

Our original Local membership included

- | | |
|-----------------|--------------------|
| T. A. Deschantz | T. W. Edwards, Jr. |
| W. H. Gallowich | E. L. Cipra |
| M. P. Frank | J. N. Paulus |
| F. M. Baker | Leo B. Seng |
| S. E. Haas | W. R. Pippen |
| C. R. Brown | Albert Morrone |
| J. W. Spiker | |

Since the organization of our Local we have added the following members to our roll:

- | | |
|---------------|--------------|
| G. A. Warneke | Leroy Puliam |
| Fred Newell | |

We are holding our regular meetings in the Ball Room of the Penn-Lincoln Hotel. It is remarkable how many things of interest to Radio men we find to discuss at these meetings. One resolution passed unanimously by our membership will be of interest to every Radiotrician, because it has as its basic idea the improvement of ethics:

(Page 20, please)

The Buffalo Chapter of the National Radio Institute, which was organized in January, through the able cooperation of the National Alumni Secretary, Phil Murray, has been making steady progress toward the acquisition of a clubroom, which will be used by the Buffalo Chapter periodically for regular business and technical meetings and also for social meetings at all times.

To this end we have arranged a mammoth card party and entertainment, to be held at the Knights of Columbus Auditorium on Delaware Avenue in Buffalo. An elaborate program has been planned; we are publishing a nice printed program in which we will sell advertising space for additional revenue. Already several of the more prominent dealers in Buffalo and vicinity have taken full page ads, so that it's success is assured.

Mr. George Clohessy, one of the members of our Finance Committee, has been appointed to head the card party committee, and under his leadership and with the cooperation of the majority of the Buffalo local members, the project will be a huge success. Frederic Perau, the other Finance Committeeman, is in charge of the Program Committee, and through his untiring efforts we expect to have a program that will far surpass similar issues published by other local Radio service organizations.

(Page 20, please)

PITTSBURGH LOCAL

(Continued from page 19)

"The Pittsburgh Local has unanimously resolved to stimulate a greater demand for preferred Radio service by N. R. I. men—

"To give honest service for honest pay—

"To make replacements, when needed, with the best materials possible—

"To accept no compensation if customer is not perfectly satisfied (we have no record at present of any dissatisfied customers)—

"To strive to please, as this is the bedrock of our success—

"To expose incompetent Radio tinkerers by educating Radio set owners—

"To refer prospective new set buyers to N. R. I. men who are in the Radio sales business—

"To be in perfect harmony with the entire Radio Industry, of which we are a part—

"To be loyal in word and deed to our ALMA MATER."

We have decided upon group advertising as a means of stimulating business and publicizing our Local organization. We have already received some very favorable free publicity in one of the local newspapers.

The Radio library we are building up is one of our proudest possessions, and special plans are being worked out to facilitate circulation of our Radio literature among our members.

Some time shortly we're going to appoint a "Ways and Means" committee to plan a Radiotricians outing—the dual purpose being recreation and a drive for new members.

I hope all Alumni Members in Pittsburgh and vicinity will get in touch with me immediately so they can be affiliated with this Local. They can reach me at 1216 Coal Street, Wilkensburg, Pittsburgh, Pa.

(The Survey continued from page 10)

CHARLES E. LOWERS, MARIETTA, OHIO.

Your stationery is fine, Mr. Lowers. The only suggestion is that your letterhead has too much type grouped together. If "Radio Sets Installed" were set in small type in the upper left hand corner of the page and "Sets Adjusted and Repaired" placed in the upper right corner—it would relieve the congestion of type in the letterhead and give you an ideal job.

(Page 21, please)

BUFFALO LOCAL

(Continued from page 19)

We can not help but mention at this time the splendid cooperation we are receiving from National Headquarters of our Association in Washington, D. C., due to the unceasing efforts of the officers of the National Association.

At the present time the Buffalo Chapter consists of twenty-seven members, most of whom are charter members. We have a potential of over ninety in this area, and the number of potential members is gradually increasing. After the card party we are planning a real honest to goodness membership drive. Any Alumni members residing in or near Buffalo and who would be interested in joining our organization are requested to get in touch with Theodore J. Telaak, 657 Broadway, Buffalo, N. Y.

We are particularly anxious to hear from men in the vicinity of Hamburg, Lackawanna, Blasdell, Williamsville, and Snyder.

The May meeting of the Buffalo N. R. I. A. A. will be held on the twenty-ninth of that month, and we have been fortunate in securing the services of Mr. Walter R. Jones, Commercial Engineer of the Sylvania Tube Corporation, who will address the meeting and will demonstrate the application of the new tubes to modern and, also, old-style circuits. Incidentally, this meeting is open to all members of the Radio profession, and each member is urged to bring along as many fellow Radio men as possible. Blanket invitations have been issued the other Radio organizations in this territory, so that an attendance of several hundred is anticipated.

The officers of the Buffalo Local Chapter are as follows:

T. E. Telaak, Chairman; Fred L. Cutler, Secretary; George W. Clohessy, Frederic H. Perau, Finance Committee; Lewis M. Weber, Librarian.

Our Alumni brothers in the other cities having Local Chapters, Pittsburgh and Cleveland, will have to move fast if they intend to keep up with the Buffalo Chapter in size and accomplishments—because we are going places and doing things up here in Buffalo.

This is a friendly challenge to the boys in Pittsburgh and Cleveland—but at the same time, we want to extend to them a cordial invitation to drop in to see us any time they happen to be in Buffalo.

George T. Case, N. R. I. graduate and member of the N. R. I. Alumni Association, who was recently named as Greater Cincinnati's most popular announcer, has moved from Chief Announcer of WCKY, Covington, Kentucky, to the announcing staff of WFBE, Cincinnati, Ohio. Good luck on your new job, George.

The Miles Reproducer Company, Inc., manufacturers of sound amplification systems, will be pleased to forward to any reader of National Radio News a copy of their vest pocket edition 1933 catalog. Address them direct at 244 West 23rd Street, New York City.

National Headquarters of the N. R. I. Alumni Association regrets to report to its members the death of our Alumni Brother, John Chibro, of Nanticoke, Pa.

After a lingering illness from July, 1932, until March of this year, he passed away. He is survived by his wife and two children, one five and the other three years old.

Theodore Roosevelt said:
"Every man owes some of his time to the upbuilding of the profession to which he belongs."

(The Survey continued from page 20)

F. W. AND W. I. TRANTHAM, WEST ASHEVILLE, N. C.

Your "Auto Radio" card circular is very good. The one entitled "Modernize your Radio" could be improved by using a less fancy—and more modern border around the title—or by eliminating the border altogether. The only suggestion on your letter is that the large ornament be removed and the address set a little more to the right.

WILLIAM MOSTELLER, WILLIAMSPORT, PA.

Your letter head is one of the best we've seen in the survey so far. The little stickers should serve a very useful purpose. Don't you think the type on your business card is a little large?

(Next column please)

DEVELOPMENTS IN AUTO RADIO

Automobile Radio receiving sets with dynamic speaker, all contained in a single metal case no longer than the average automobile heater, which can be attached to a car with but one bolt, is the latest development. These sets have a remote control box that can be clamped in any position to the steering post or on the instrument panel of the car.

Ignition interference has been completely obviated, due to complete shielding of the entire apparatus and the use of a tone control which makes it possible to reduce noises met with in some locations.

The set is mounted on a single stud and necessitates boring only one 1/2-inch hole in the bulkhead of the car.

When servicing is required, the entire set is easily removed from the mounting plate by loosening six accessible nuts.

LIONEL GALIPEAU, SOUTHBRIDGE, MASS.

No criticism on your stationery. It's good. That job record card should be a big help to you.

H. VERNON, WINNIPEG, CANADA.

Your letter head is neat and has all the essentials necessary to make it good. The service contract you use is also O.K., as is your business card. Your sales circular letter is that good that we intend to publish it in a future issue of National Radio News.

RALPH MELLON, POTTSTOWN, PA.

We like your letter head. It is simple and covers just what is necessary. We might suggest that you use a goldenrod colored stationery to match your envelope—when this letter head is re-run and also have your telephone number placed on the letter head. It might be well also to make the statement that you are a graduate of the National Radio Institute. The corner card on your envelope is printed with

(Page 22 please)

PHOTOELECTRIC PROTECTIVE ALARM SIGNAL SYSTEMS

(Continued from page 5)

a non-inductive circuit of 6 amperes at 110 volts A.C. This relay, locking after a single interruption of the light beam, continues to operate the signal until an authorized person with a key to the lock switch opens the circuit.

In addition to having the Foto-Switch operate an alarm, it can be used to turn on the store lights and leave them on until the key is turned in the lock. Burglars can not work well in bright illumination.

The value of an alarm system is fully as great from the standpoint of prevention as from the standpoint of apprehending burglars or frightening them away. A small sign in the window stating a burglar alarm system is used in this store does more good in keeping the average burglar away than in sounding an alarm, for it is much better to prevent burglaries than take a chance of catching the thieves.

Air lines of the United States flew 48,000,000 miles in 1932, and air passenger traffic totaled 145,000,000 miles. The latter figure, equivalent to moving the entire population of Schenectady, N. Y., or Little Rock, Ark, on a round trip from their home towns to Chicago and back, is an increase of 21 per cent over the previous year's record. Aviation's advance means Radio's advance.

(The Survey continued from page 21)

your name in "cameo" type. We would prefer using a "gothic" similar to the one used on your letter head, only smaller. Your business card is very good.

R. A. SWAN, WICHITA, KANSAS.

Your letter heads and envelopes are unusual but show ability in designing and are good. Your file card is O.K. and the telephone card quite novel. A good idea.

This survey is not closed by any means. Send in your forms and printed matter. Let us comment on them. There's no charge . . . this is just an added service by National Radio News.

NATIONAL RADIO NEWS



Vol. 5—No. 8 June-July, 1933

Published bi-monthly in the interest of the students and Alumni Association of the
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P. J. Murray, Washington, D. C., Managing Editor
 Thos. A. Deschantz, Pittsburgh, Pa., Associate Editor
 T. E. Telaak, Buffalo, N. Y., Associate Editor

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THE MAILBAG



H. S. Gets An Argument

In the April-May issue of National Radio News Student H. S., of Columbus, suggested cutting out the Mail Bag. What's the matter, H. S.? Did you get out on the wrong side of the bed? In my opinion some mighty fine tips and advice are given in our Mail Bag column, and I believe that my fellow National Radio News readers will agree with me. I want the Mail Bag continued—made larger, if possible—but not cut out.

W. J. Beswick, Ont., Canada.

Hutton

A year ago I was waiting for my first assignment of text books from N. R. I. Today I have a well-equipped shop, plenty of work to do, and many friends.

I owe it all to the National Radio Institute and I wish to thank you for the fine foundation you have given me for this work.

Although not yet many years of age, I have worked up a good service business in town and the surrounding district. It is very seldom that I do not have some work in my shop for service and repairs—sometimes I have as many as seven sets at once.

I started my business by talking to all the Radio dealers in town and having them give me a trial. Now I work regularly for three of them, and do occasional jobs for several of the smaller ones.

Donald A. Hutton,
Richmond, Que., Canada.

HAMS

Robert Altomare, New York City, operates amateur station W2EWW.

Bill Meyer, Hobart, Indiana, operates W9KQV.

Earl Mayo, Glendale, Calif., operates stations W6ABZ and W6DBD.

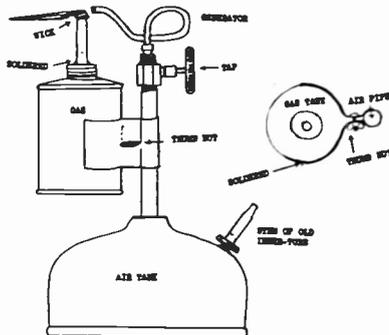
Another Letter to H.S. of Columbus

I think the Mail Bag fills a great service for N. R. I. students and graduates. It is a very appropriate medium through which the fellows can pass along helpful service hints to others in the field. Student "H. S., of Columbus," is very selfish, in my estimation, in his attitude. His reason for desiring the discontinuance of the Mail Bag is a very poor one. All of National Radio News is good. And the Mail Bag is the first thing I read when I receive my copy of National Radio News. If I find I do not have need for the information right at the moment, I file it away for future reference. More power to the Mail Bag. Come on, you other fellows, to the rescue of this fine page.

Henry I. Davis,
Detroit, Mich.

A Blow Torch Made From Scrap Material

Here's a rough sketch of a handy blow torch made from an old gasoline lamp. First remove all the top part. The generator may be an old one as long as it is not plugged up and the needle hole in the small end nut is in good shape. The gas tank is an old screw-top can filled with cotton batting. The wick holder is made of tin and should be soldered at the seam and then soldered into the screw top of the can. Use a 1-inch lamp wick. The air tank may be pumped up with a gas lamp pump, or a valve stem off of an old inner tube may be soldered to the cap and pumped up with a tire pump. Ten or twelve strokes is enough—any more may blow the tank up. With this information and the accompanying sketch you can build a handy blow torch—at least, it was mighty handy for me.



By Archie H. Lackey, Creelman, Sask., Canada.

Archie H. Lackey,
Creelman, Sask., Canada.

Former Piano Tuner

As a piano tuner—with work getting scarce—I realized I must turn to a new field; learn something new or lose my job. I took the N. E. I. Radio Course and it was my salvation. I haven't lost a day's work; was advanced to head service man and my income is roughly around two thousand dollars a year.

Fred H. Ziegler,
West New York, N. J.

Build Yourself a Valuable Radio Library with these Helpful FREE MANUFACTURERS' BOOKLETS AND CATALOGS

A FREE SERVICE DESIGNED TO SAVE YOU TIME AND MONEY

The cooperation of the manufacturers whose catalogs, literature and booklets are listed on this page, and the courtesy of the Calcatera Catalog Service has made it possible for the N. R. I. Alumni Association to offer to readers of National Radio News a unique and money-saving service in obtaining Radio manufacturers' literature.

All that is necessary for you to obtain the catalogs or other literature listed on this page is to

write the numbers of the items in which you are interested on the coupon, fill in the information asked for and MAIL IT TO THE CALCATERA CATALOG SERVICE. DO NOT MAIL COUPONS TO THE NATIONAL RADIO INSTITUTE, AS THAT WILL DELAY THE FILLING OF YOUR ORDER.

Stocks of the publications listed are kept on hand and they will be sent to you promptly, as long as the supply lasts.

1. **WHOLESALE RADIO SERVICE CO. 1933 CATALOG NO. 54.** A 152-page book of illustrations, descriptions and specifications with list and net prices of radio parts, replacement items, receivers and radio and electrical supplies carried by this old, reliable mail order house.

2. **HAMMARLUND 1933 PARTS CATALOG.** 8 pages. Variable and adjustable condensers, sockets, coils, intermediate frequency transformers, chokes, etc., for broadcast and short wave work.

4. **HAMMARLUND-ROBERTS 15 to 200 METER COMET "PRO" SUPERHETERODYNE.** Details of a receiver designed especially for laboratory, newspaper, police, airport and steamship use.

5. **ELECTRAD 1933 CATALOG.** 12 pages. Standard and replacement volume controls, Truvolt adjustable resistors, vitreous enamel fixed resistors, voltage dividers, public address systems, etc.

6. **AMPERITE REAL LINE VOLTAGE CONTROL.** Characteristics, uses and chart showing correct Amperite recommended by set manufacturers for their sets. Tells how to improve customers' sets and make a profit besides.

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