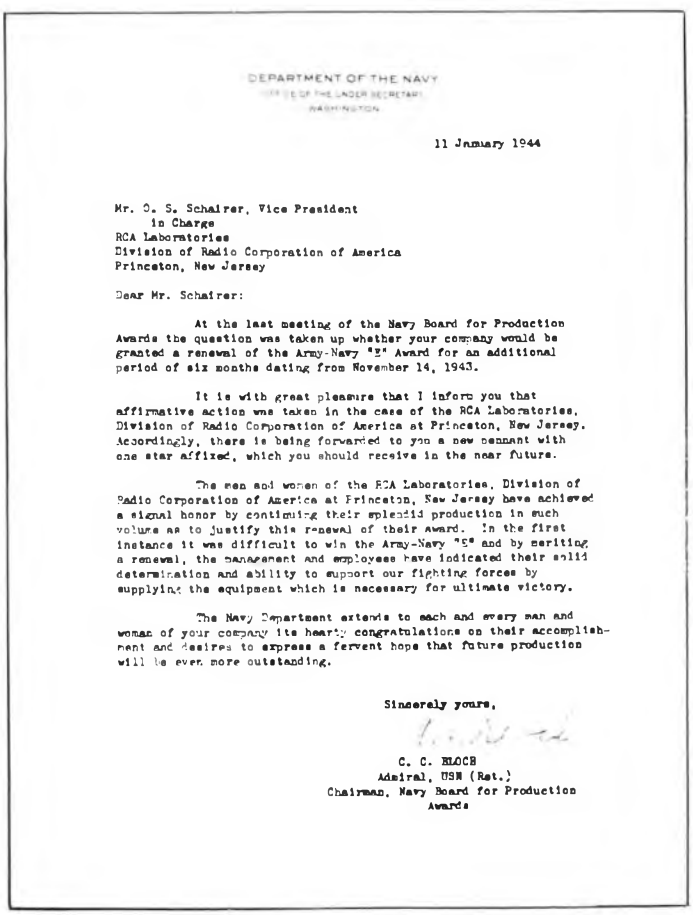
VOL. I. FEBRUARY 1944 NO. 2.

RCA LABORATORIES NEWS

ARMY-NAVY E AWARD

WE WIN RENEWAL WITH STAR



DEPARTMENT OF THE NAVY
OFFICE OF THE UNDER SECRETARY
WASHINGTON

11 January 1944

Mr. O. S. Schairer, Vice President
in Charge
RCA Laboratories
Division of Radio Corporation of America
Princeton, New Jersey

Dear Mr. Schairer:

At the last meeting of the Navy Board for Production Awards the question was taken up whether your company would be granted a renewal of the Army-Navy "E" Award for an additional period of six months dating from November 14, 1943.

It is with great pleasure that I inform you that affirmative action was taken in the case of the RCA Laboratories, Division of Radio Corporation of America at Princeton, New Jersey. Accordingly, there is being forwarded to you a new pennant with one star affixed, which you should receive in the near future.

The men and women of the RCA Laboratories, Division of Radio Corporation of America at Princeton, New Jersey have achieved a signal honor by continuing their splendid production in such volume as to justify this renewal of their Award. In the first instance it was difficult to win the Army-Navy "E" and by meriting a renewal, the management and employees have indicated their solid determination and ability to support our fighting forces by supplying the equipment which is necessary for ultimate victory.

The Navy Department extends to each and every man and woman of your company its hearty congratulations on their accomplishment and desires to express a fervent hope that future production will be ever more outstanding.

Sincerely yours,

C. C. BLOCH
Admiral, USN (Ret.)
Chairman, Navy Board for Production Awards

RADIO CORPORATION OF AMERICA
PRINCETON N.J.


RCA

RCA LABORATORIES NEWS

With this, our second issue of RCA Laboratories News, we welcome a new year and note the completion of our first full calendar year of work at Princeton. As we contemplate the accomplishments of our Laboratories during the past year, a feeling of satisfaction is certainly justified. We should not let this make us complacent toward the year to come, however. Instead, let us find in past performance a stimulation to greater accomplishments in future.

Your editor reports with pleasure the favorable reception accorded our first issue. We will endeavor to have our paper grow through the year in usefulness to its readers. We have decided upon a bimonthly publication interval for the News, with issues to come out in February, April, June, August, October and December. Suggestions on matters to be included and the submission of items for insertion in the paper are always most welcome.

Ed. Dickey - Editor

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RESEARCH DEVELOPMENT

THE DYNAMIC CORRECTION OF THE SPHERICAL ABERRATION OF ELECTRON LENSES

By

V.K. Zworykin, E.G. Ramberg, and J. Hillier

Collectively, research laboratories can be likened to an army advancing into unknown territory. There must be scouts - groups of individuals feeling out the barriers that prevent us from extending our uses of the forces of nature. From them come the fundamental ideas and intuitive guesses which are the beginning of almost any major scientific development. Then there must be the shock troops - that is, the groups who, seeing some of the barriers of nature giving way, take advantage of the situation to develop practical ideas and practical instruments which may give birth to entirely new sciences or new instruments. Following up behind these is a large group of laboratory workers and development engineers whose job it is to refine, polish, and simplify these ideas and instruments and thus to extend their value and use to large groups of individuals.

The electron microscope is a typical example of such a development. The large wavelength of light had imposed a well-recognized barrier which prevented us from seeing many of the small things of nature. As a result of accumulated information, the idea of breaking down this particular barrier by substituting short-wavelength electrons was conceived.

From this rather uncertain beginning, the electron microscope has progressed through the other stages of development and at present it can be considered as being in the final stage. Already a number of commercially produced electron microscopes are accomplishing spectacular results in the fields of chemistry, metallurgy and biology.

The laboratories that have these instruments feel that they have the last word in scientific equipment. However, in the laboratory here we are never satisfied with the performance of the electron microscope because we realize that, compared to the light microscope, it is still a very crude instrument. We are interested in removing one by one all those limiting factors which prevent the instrument from working at its theoretical limit. We have already removed practically all the limitations due to inaccuracies of machining and inhomogeneities of material. Further improvement will come only by removing the optical difficulties - the aberrations. The most important of these aberrations is the one that is often called spherical aberration or aperture defect. In electron optics this means that electrons going through the outer edges of the lens are focused at a different place than those going through the middle which, of course, causes a blurring of the image.

We cannot correct this by the techniques used in ordinary optics because there is no such thing as a diverging electron lens; a situation which has always presented the electron microscopists with something of a dilemma.

We have now, however, a method which, it is believed, will overcome this defect of electron lenses. The idea behind it is basically as follows: Electrons leaving the specimen must take a little longer to reach the outer edges of the lens than they do to reach the middle region, simply because they have farther to go. If, during this short interval of time between the arrival of the electrons at the middle and outer portions of the lens, we adjust the power of the lens slightly so that the focal length of each region of the lens is just right for the electrons when they arrive, then all the electrons should be focussed to the same place in the image. This has assumed, of course, that the electrons left the specimen only during a very short period, otherwise some electrons

would continue to go through the middle of the lens after its focal length has been changed, again blurring the picture.

Actually, the idea can be extended to take care of a steady stream of electrons coming through the specimen simply by applying an alternating potential of the right frequency and wave shape in such a way that it controls both the initial velocities of the electrons and the focal length of the lens. When we work out - mathematically - the frequency required, we find that it is in the neighborhood of 10,000 megacycles which is rather high but nevertheless is a frequency that is being developed rapidly for other reasons. This method can also be used for the chromatic aberration and if the lenses are properly designed, will correct both types of aberration simultaneously. Under ideal contions, a resolving power of 1 Å appears to be possible. This would correspond to a useful magnification of 2,000,000. It must be remembered that, before this optimum resolving power may be realized, it will be necessary to solve other problems which hinder attainment of the theoretical limits of present electron lenses.

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PERSONNEL INFORMATION

Movie Screens for Sale

For a limited period of time members of RCA Laboratories may purchase RCA 16mm Beaded Screens at attractive low prices. The screens are provided with a spring roller and are mounted in a wood case suitable for hanging from wall or ceiling. They are of the best quality of material and will provide unusually brilliant pictures when used with 16mm projectors.

The following sizes are available:

50" x 70" screen $10.00

30" x 40" screen $ 6.75

All orders should be placed through the Personnel Office, S-205

Bowling League

Competition is keen and interest high as the RCAL Bowling League nears the end of the first half schedule on January 19th. With the team standings being so closely bracketed, a neck and neck race is anticipated before the first half winner is decided.

Individual scoring honors to date go to Ted Tams (Office) with a high individual game of 256, and Joe Thompson (Model Shop #1) with a high three-game series of 615.

Team Standings as of January 4, 1944

	Won	Lost
Guards	20	13
Model Shop #1	20	13
Office	18	15
Engineers #2	17	16
Engineers #3	17	16
Maintenance	15	18
Model Shop #2	13	20
Engineers #1	12	21

Remainder of First Half Schedule

January 5th

Engineers #3 vs. Model Shop #2
Maintenance vs. Engineers #2
Guards vs. Office
Model Shop #1 vs. Engineers #1

January 12th

Office vs. Engineers #1
Guards vs. Model Shop #1
Model Shop #2 vs. Maintenance
Engineers #3 vs. Engineers #2

January 19th

Model Shop #2 vs. Engineers #2
Maintenance vs. Engineers #3
Guards vs. Engineers #1
Model Shop #1 vs. Office

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Selective Service

A Replacement Schedule for RCA Laboratories at Princeton was approved by the New Jersey State Director of Selective Service on December 11, 1943. Similar Schedules had previously been approved for the Communications groups at New York City, Rocky Point and Riverhead. This Schedule, which is for a six-month period, and must be renewed before the end of that time, lists approved replacement periods for all male employees under 38 who are not physically disqualified (4F or 1C). For the most part these periods are "more than six months", the longest permitted by the regulations. Mr. Engstrom and Mr. Burrill discussed the Replacement Schedule and Selective Service matters in general, with all the men concerned, in a recent series of meetings. As a result it is thought that everyone should be clear as to how he stands with regard to occupational deferment. If anyone wishes to discuss his individual case, Mr. Burrill will be glad to go over it with him.

It is important that everyone notify Mr. Burrill immediately of all communications received from the local boards, no matter how routine they may appear to be, so that his records may be complete and accurate, and so that he may be prepared to take appropriate action as necessary with the least possible delay. The sooner errors are discovered, either ours or the local

board's, the more easily they are corrected. "A stitch in time saves nine".

All employees concerned will be advised of any material change in our Selective Service situation in the future. Thus we need not be greatly concerned with the conflicting accounts of Selective Service policies which appear from time to time in the newspapers.

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TO THE ARMED FORCES

Below are given the names of members of our Laboratories who have left to go with the armed forces of the U.S.A. The groups in which they worked here are also indicated.

Collings, T. C.	Dec. 1942	Model Shop	Coast Guard
Schuessler, F. W.	Dec. 1942	Model Shop	Army
Ferrara, P.	Dec. 11, 1942	Porter	Army
Lewis, P. Jr.	Dec. 12, 1942	Porter	Army
Caponi, Olmstead	Dec. 1942	Porter	Army
Myers, Harry A.		Apprentice Machinist	Navy
Hall, James H.	Feb. 4, 1943	Plumber's Helper	Army
Bailey, E. F.	March 13, 1943	Laboratory Assistant	Army
Abry, Miss P.	March 18, 1943	Tube Assembler	Wacs
Seiler, Karl	April 7, 1943	Laboratory Assistant	Navy
Creager, E. F.	May 31, 1943	Junior Draftsman	Navy
Richmond, M. R.	June 26, 1943	Radio Research Engineer	Navy
Tyrell, J.	July 15, 1943	Model Maker	Army
Wargo, John Jr.	July 31, 1943	Guard	Army
Hall, Joseph W.	Aug. 4, 1943	Laborer	Navy
Tindall, Miss P.	Aug. 23, 1943	Telephone Operator	Waves
Dey, W. K.	Aug. 31, 1943	Wireman	Army Air Corps.
Solomon, F. K.	Aug. 1943	Junior Draftsman	Marines
Bathie, W. D.	Sept. 6, 1943	Landscaping & Grounds	Navy
Servis, Robert F.	Sept. 6, 1943	Chauffeur	Navy
Gendusi, B. R.	Oct. 6, 1943	Cabinet Maker	Army
Sprachman, M.	Oct. 7, 1943	Machinist	Navy
Boccanfuso, Vincent	Dec. 14, 1943	Janitor	Navy
Urbani, Paul	Jan. 19, 1944	Guard	Army
Lise, A.	Jan. 19, 1944	Janitor	Army

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LIBRARY INFORMATION

Recent Articles and New Books in the Library

Articles

Design of two-terminal balancing networks. K. G. VanWynen. Bell System Technical Journal, p. 278-292, Oct. 1943.

Effect of feedback on impedance. R. B. Blackman. Bell System Technical Journal, p. 269-277, Oct. 1943.

High-frequency heating for plastics; an explanation of its principles and uses. British Plastics, p. 322-326, Nov. 1943.

New statistical mechanics. K. K. Darrow. Bell System Technical Journal, p. 362-392, Oct. 1943.

Raw quartz, its imperfections and inspection. G. W. Willard. Bell System Technical Journal, p. 338-361, Oct. 1943.

The use of x-rays for determining the orientation of quartz crystals. Bond, W. L. and E. J. Armstrong. Bell System Technical Journal,' p. 293-337, Oct. 1943.

Books

Elasser, W. M. - Heat transfer by infrared radiation in the atmosphere. Milton, Mass. Harvard University, 1942.

Polk's Princeton Directory, 1942. Boston, Polk, 1942.

Bjerknes, V. - Physikalische Hydrodynamik. Berlin, Springer, 1933.

van Arkel, A. E. - Beine Metalle. Berlin, Springer, 1939.

The Library will make up bibliographies on any subject requested. At the present time over a hundred bibliographies on such subjects as PHOTO CELLS, INFRARED RAYS, and MERCURY ARC RECTIFIERS are available in the Library.

RCA Laboratories Christmas Party

The Laboratories Christmas party was held at the McCarter Theatre on the evening of December 29th. Members of RCA Laboratories, their families and friends (between 700 and 800) had a most enjoyable evening. The General Platoff Don Cossack Chorous, directed by Mr. Nicholas Kostrukoff provided the entertainment which was followed by refreshments served on the stage. Mr. Engstrom and Mr. Schairer made brief addresses in which they stressed the importance of the work being done by the laboratories and extended their best wishes for the New Year.

1944 I.R.E.

WINTER TECHNICAL MEETING

January 28 & 29, 1944

This meeting - held in New York City at the Hotel Commodore - will be reported in more detail in our next issue.

As part of the ceremony at the banquet on the evening of January 28 the following members of RCA laboratories received Fellowship Awards in the Institute:

M.G. Crosby D.O. North S.W. Seeley

Congratulations to these men on this recognition of their technical standing and ability.

The titles of papers our engineers presented at the meeting are given under "Lectures by RCA Laboratories Technical Staff."

Ad-Type Paper for Photograph Prints

Norman Newell, our photographer, has asked us to announce that he is now set up to make photograph prints on "Ad-Type" paper. This is a photographic paper giving the usual black and white image but is considerably more flexible than the standard "glossy" print paper.

Being quite flexible, this new paper is very useful for binding into reports along with typewritten or printed sheets of ordinary paper. The "Ad-Type" paper can be put in a typewriter and typed upon without danger of cracking the surface. 8-1/2" x 11" sheets are available which will fit well into a bound report since they are the same size as the text sheets. Where large numbers of photographic prints are required, we still recommend the use of "offset" printing. Where a moderate number, such as about a dozen, are needed for a report, however, we recommend consideration of the "Ad-Type" paper. Sample prints on "Ad-Type" paper are available for inspection in the Photographic Studio and in R. S. Holmes' office.

Newell also now has 8-1/2" x 11" sheets of glossy photographic paper for use where needed.

Lectures by RCA Laboratories Technical Staff

Before the Electron Microscope Society of America in New York City by R. F. Baker and J. Hillier on "Miscellaneous Research on Electron Microscope Perameters" - January 14, 1944.

Before the Electron Microscope Society of America by V. K. Zworykin, E. G. Ramberg and J. Hillier on "The Dynamic Correction of the Spherical Abberration of Electron Lenses" - January 14, 1944.

Before the Electron Microscope Society of America by J. Hillier on "Microanalysis by Electrons" - January 15, 1944.

Before the Society of Sigma Xi at Rutgers University by C. N. Hoyler on "Radio-Frequency Heating" - January 17, 1944.

Before the Princeton Chapter of the Society of the Sigma Xi by E. W. Engstrom on "RCA Laboratories" - January 10, 1944.

Before the 1944 Winter Technical Meeting of the I.R.E. in New York by C. M. Burrill on "Some Experiments Relating to the Statistical Theory of Fluctuation Noise" - January 28, 1944.

Before the 1944 Winter Technical Meeting of the I.R.E. in New York by D. O. North on "The Modification of Noise by Certain Non-Linear Devices" - January 28, 1944.

Before the 1944 Winter Technical Meeting of the I.R.E. in New York by L. P. Smith on "The Limitations Imposed by Quantum Theory on Resonator Control of Electrons" - January 28, 1944.

Personals

Miss Catherine McGuinness has enlisted in the U.S. Marine Corps, Women's Reserve, and will be stationed at Camp LeJeune, North Carolina. The Accounting Department loses a good conscientious worker. Our best wishes for good luck go with you, Kate.

Phyllis R. Tindall, of the Waves, formerly one of the efficient operators at RCAL switchboard, was home from Philadelphia Naval Hospital, where she is stationed. Miss Tindall was at home from December 15th through the 18th because of the death of her grandfather.

It was nice to see Bill Bathie, U.S.N., when he stopped in on December 18th. Bill is still stationed in Bainbridge, Md.

Mary DiDomenico left on December 15th to spend a few days in Topeka, Kansas visiting her brother Lt. John D. DiDomenico who was temporarily stationed at Topeka Army Air Base. He has now left for combat service as pilot of a B-24.

We learn with interest that Guard James R. Hogarty has been elected chief of the Princeton Fire Department for the year 1944. Congradulations to Mr. Hogarty.

What engineer in Dr. Wolff's group did not catch the "flu" because he exposes himself to a home-made sun lamp daily?

Paul Urbani, of our guards, left on January 19 for the U. S. Army. He will first be stationed at Fort Dix.

Vincent J. Boccanfuso, one of our cleaners, was inducted into the U. S. Navy on December 14th. We have since heard that he is well and is stationed at Bainbridge, Md.

Wendell Morrison (Television Research) was married on December 31, 1943, in DeKalb, Illinois, to Miss Charlotte Peterson

This is just an example of the tangle we got into when we attended a small skating party at the home of Chief Maher on Sunday, January 2nd. It certainly started the new year off with a bang. Those who were present enjoyed an afternoon of skating, topped off with some wonderful eats. The highlight of the afternoon was an exhibition by "Flash" Sampson, former New York skating champion of 1891 - 92 - 93. Judging from her picture, don't you think she's slipped a little since then?

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Births

Jess Epstein became the proud father of a daughter - Barbara Ann - on December 16, 1943.

Mrs. Shirley Collister - former employee of chemistry laboratory, room 318 - had a baby boy on December 1, 1943.

A baby boy is reported to have arrived on January 14 at the home of Charles O. Ringeisen.

Mr. and Mrs. H. W. Leverenz announce the birth of a daughter, Edith Humboldt Leverenz, alias "Ditty", on January 14, 1944. Weight: 8 lbs. 3 oz.

Deaths

We report with regret the death of Mr. Richard L. Allen on December 2, 1943. Mr. Allen had been one of our efficient corps of guards and was with us from the very first day the Laboratories opened. He was very well liked throughout the Laboratories and will be sadly missed.

For ten years Mr. Allen was head of the safety patrol of Morrisville schools, was a member of the Morrisville P.T.A. the Father's Association, Willet C. Stanford Post No. 433 of the American Legion, the Capitol View Fire Dept. and an active member of Grace Methodist Church. He was a veteran of World War 1 and was given a military funeral.

We learn with regret of the death of Mr. R. J. Schmit's father at Grafton, Wisconsin on December 27, 1943. The family has our sincere sympathy.

Mr. M. L. Snyder's father died on December 31, 1943 at Altoona, Pa. We are very sorry to hear this and our sympathy goes to the bereaved family.

Our sympathy is extended to Mr. Robert R. Bush, whose father died on Wednesday, January 5, 1944 at Charlotte, Michigan.

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Additions

J. D. Hopperton - Research

Transfers

T. S. (Ted) Hasle - RCAL Drafting to Camden Plant - M. A. Trainer's group.

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PATENT DEPARTMENT INFORMATION

Patent References

The Patent Department will order patent references upon requests from members of the technical staff. In making requests, set forth the patent number and name of inventors (if available). Address requests to Patent Department S-303, Att: L. J. Rieger.

Patent Disclosure Forms

New Patent Disclosure forms are now available for use in submitting disclosures of inventions. Attention is called to the space provided for noting Government contract information. When submitting disclosures the contract information should be furnished.

Patents Recently Issued to RCA

Nov. 2		
Hansell, C.W.	2,333,245	Communication System
Peterson, H. O.	2,333,335	Diversity Receiving System
Nov. 9		
Glans, J.	2,333,997	Cathode Forming Machine
Hapgood, J.C.	2,334,001	Stem Sealing Machine
Herold, E.W.	2,333,719	Two-way Radio Communication System
Herzog, C.	2,334,004	Wire Loader
Miller, H.J. et al	2,334,020	Glass-to-metal Seal
Shepard, F.H., Jr.	2,333,688	Distance Measuring System
Nov. 16		
Carlson, W.L.	2,334,473	Frequency-Modulation Tuning Indicator
Creager, F.L.	2,334,479	Telltale Device
Goldstine, H.E.	2,334,189	Relay system and Associated Circuits therefor
Neiman, M.S.	2,334,279	Antenna Construction
Owens, J.H.	2,334,351	Motion Picture Theater
Roberts, W. vanB.	2,334,510	Record Reproducing Control Circuit
Salzberg, B. et al	2,334,356	Vacuum Gauge
Vance, A.W., et al	2,334,519	Filament Transformer
Nov. 23		
Rankin, J.A.	2,334,726	Linear Modulator
Nov. 30		
Bierwirth, R.A.	2,335,575	Control Circuit for Sound Reproduction
Clark, T.H.	2,335,486	High-Frequency Measuring Circuit
Foster, D.E. et al	2,335,496	Band Width Control
Hansell, C.W.	2,335,591	Device for Fastening Insulating Spacers in Concentric Transmission Lines
Lincoln, R.B. et al	2,335,523	Radio Transmitter
Reiskind, H.I.	2,335,612	Sound Recording Apparatus
Roberts, W. van B.	2,335,540	Radio Program Sampler System
Schrader, H.J. et al	2,335,796	Modulation Limiter
Thompson, W.S. et al	2,335,621	Photometer
Trumbull, W.M. et al	2,335,818	Cathode Assembly
Dec. 7		
Goldstine, H.E.	2,335,934	Phase Modulation
Spencer, J.A.	2,336,197	Signal Storage in Telegraph Printer Systems
Dec. 14		
Crosby, M.G.	2,336,926	Frequency or Phase Deviation Changer Circuit
Selby, E.O.	2,337,005	Radio Receiver Muting Circuit
Dec. 21		
Carter, P.S.	2,337,184	Coupling Circuit
Eaton, T. T.	2,337,234	Television System
Hathaway, J.L.	2,337,328	Electrical Measuring Circuit
Hollingsworth, R.L.	2,337,196	Signal and Noise Control System
Hunt, S.	2,337,392	Frequency Modulated Carrier Wave Receiver Circuit
Roberts, W. vanB.	2,337,272	Modulation
Shaw, H. R.	2,337,132	Electronic Control
Tunick, H.	2,337,214	Ultra-Short-Wave Apparatus
Zottu, P.D.	2,337,219	Short-Wave Tuned Circuit Arrangement
Dec. 28		
Albin, F.G.	2,337,958	Sound Recording and Reproduction
Blodgett, E.D.	2,337,964	Direction Finder
Brown, G.H.	2,337,968	Determining Antenna Constants
Collins, M.E.	2,337,974	Noise-Reduction Measuring System
Cowan, E.J.	2,337,710	Antenna
Linder, E.G.	2,337,612	Indicator
Sharp, T.C.	2,338,014	Film Measuring Apparatus

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Gears and Gear Cutting

The Model Shop is prepared to cut gears of the following pitches:

16 - 24 - 32 - 48 - 96

In addition to these facilities, we are now carrying in the Finished Parts Stock Room a varied assortment of standard Boston Gears, both spur and bevel in various pitches and materials.

Fractional-Horse-Power Motor

The Finished Parts Stock Room in the Model Shop now carries in stock the following Synchronous Motors:

1 RPM 120V. 60 cycle Hansen
60 RPM 120V. 60 cycle Hansen
300 RPM 120V. 60 cycle Hansen
100 RPM 110V. 60 cycle General Electric

These are new motors available for immediate delivery upon receipt of a replacement order.

Extruded Plastic Tubing

In addition to sheet and bar plastics, there is now available in the Raw Stock Room, Extruded Plastic Tubing (Cellulose Acetate Butyrate) of the following sizes:

3/16 O.D. x 1/8 I.D.	1/4 O.D. x 3/16 I.D.
5/16 O.D. x 1/4 I.D.	3/8 O.D. x 1/4 I.D.
7/16 O.D. x 5/16 I.D.	1/2 O.D. x 3/8 I.D.
5/8 O.D. x 1/2 I.D.	3/4 O.D. x 5/8 I.D.
1 O.D. x 7/8 I.D.	1-1/2 O.D. x 1-3/8 I.D.
2 O.D. x 1-3/4 I.D.	

Ball Bearings

A small quantity of ball and needle bearings of assorted sizes are carried in the Finished Parts Stock Room.

Laminated Plywood Tubing

The Model Shop has available a source of supply for laminated plywood tubing fabricated from thin veneers and a thermosetting synthetic resin. It is quite strong for its weight, having a specific gravity considerably less than 1.0. The laboratory reports indicate it will carry a much heavier load, weight for weight, than steel tubing. It can be threaded with ordinary pipe dies or glue assembled. It has been developed for poles with high flexural strength, being as strong as heat-treated aluminum and 20% lighter for the same size. It is presently employed for aircraft wing spars, motor shafts, radio antenna masts up to 90-feet high, aircraft antennas, tent poles, tripods, signal masts, electrical conduits, etc.

It is available with inside diameters from 1/2" to 18" with wall thicknesses from .05" to .50" and any reasonable length; I.D. tolerances to minus 0" and plus .010"; and wall thickness to within plus or minus .005". Samples are available for inspection together with supplementary test data.

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A.S.A. Standard Tap Drill Sizes

Size of Screw	Body Dia.	Dia. of Tap Drill	Size of Screw	Body Dia.	Dia. of Tap Drill	Size of Screw	Body Dia.	Dia of Tap Drill
0-80	.0600	.0469	7-36	.1510	.1250	1/4-28	.250	.2130
1-56	.0730	.0550	8-30	.1640	.1285	1/4-32	.250	.2187
1-64	.0730	.0610	8-32	.1640	.1360	5/16-18	.312	.2570
1-72	.0730	.0610	8-36	.1640	.1360	5/16-20	.312	.2656
2-56	.0860	.0700	8-40	.1640	.1406	5/16-24	.312	.2720
2-64	.0860	.0700	9-24	.1770	.1360	5/16-27	.312	.2770
3-48	.0990	.0781	9-30	.1770	.1360	5/16-32	.312	.2812
3-56	.0990	.0827	9-32	.1770	.1470	3/8-16	.375	.3125
4-32	.1120	.0827	10-24	.1900	.1520	3/8-20	.375	.3281
4-36	.1120	.0860	10-28	.1900	.1562	3/8-24	.375	.3320
4-40	.1120	.0890	10-30	.1900	.1562	3/8-27	.375	.3390
4-48	.1120	.0937	10-32	.1900	.1610	7/16-14	.437	.3680
5-36	.1250	.0995	12-24	.2160	.1770	7/16-20	.437	.3906
5-40	.1250	.1024	12-28	.2160	.1850	7/16-24	.437	.3970
5-44	.1250	.1040	12-32	.2160	.1850	7/16-27	.437	.4062
6-32	.1380	.1065	14-20	.2420	.1935	1/2-12	.500	.4219
6-36	.1380	.1130	14-24	.2420	.2031	1/2-13	.500	.4219
6-40	.1380	.1130	1/4-20	.250	.2031	1/2-20	.500	.4531
7-30	.1510	.1200	1/4-24	.250	.2090	1/2-24	.500	.4531
7-32	.1510	.1200	1/4-27	.250	.2130	1/2-27	.500	.4687

ASA STANDARD TWIST DRILL SIZES

FRACTIONAL, MM SIZES, NUMBER & LETTER SYMBOLS MUST NOT BE USED ON DRAWINGS - DRILL SIZES SELECTED MUST BE SPECIFIED BY DEC. DIAM. ONLY

DEC. DIAM.	DRILL No	MM.	INCH	DEC. DIAM.	DRILL No	MM.	INCH	DEC. DIAM.	DRILL No	MM.	INCH	DEC. DIAM.	DRILL No	MM.	INCH
.0135	80			.0700	50			.1562			5/32	.2812			9/32
.0145	79			.0730	49			.1610	20			.2854			
.0156			1/64	.0760	48			.1660	19			.2913		7.4	
.0180	77			.0781			5/64	.1695	18			.2969			19/64
.0200	76			.0810	46			.1719			11/64	.3020	N		
.0225	74			.0827		2.1		.1730	17			.3071		7.8	
.0240	73			.0860	44			.1770	16			.3125			5/16
.0260	71			.0890	43			.1800	15			.3160	O		
.0280	70			.0906				.1850	13	4.7		.3230	P		
.0295		.75		.0937			3/32	.1875			3/16	.3281			21/64
.0312			1/32	.0960	41			.1910	11			.3320	Q		
.0330	66			.0995	39			.1935	10			.3390	R		
.0350	65			.1024		2.6		.1960	9			.3437			11/32
.0370	63			.1040	37			.1990	8			.3480	S		
.0390	61			.1065	36			.2031			13/64	.3543		9.0	
.0410	59			.1094			7/64	.2090	4			.3594			23/64
.0430	57			.1130	33			.2130	3			.3680	U		
.0453				.1160	32			.2187			7/32	.3750			3/8
.0469			3/64	.1200	31			.2244		5.7		.3860	W		
.0492		1.25		.1220		3.1		.2280	1			.3906			25/64
.0512		1.3		.1250			1/8	.2344			15/64	.3970	X		
.0531				.1285	30			.2402				.4062			13/32
.0550	54			.1299		3.3		.2460	D			.4219			27/64
.0571				.1339		3.4		.2500	E		1/4	.4375			7/16
.0591		1.5		.1360	29			.2520		6.4		.4531			29/64
.0610				.1378		3.5		.2570	F			.4687			15/32
.0625			1/16	.1406			9/64	.2610	G			.4844			31/64
.0629		1.6		.1440	27			.2656			17/64	.5000			1/2
.0650				.1470	26			.2720	I						
.0670	51			.1520	24			.2770	J						

ISSUED NOV 11 1942

Calculating Pulleys for Step-Cone Drives

By Paul Grodzinski

CORRECT belt tension when using any step of a cone-pulley drive depends on accurate determination of the pulley diameters to give the same theoretical belt length. While the equation

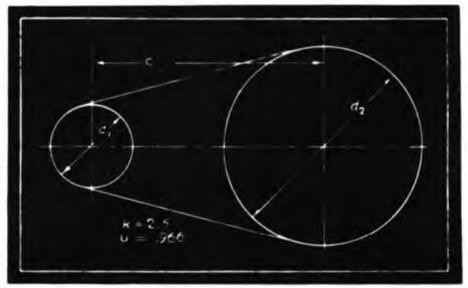
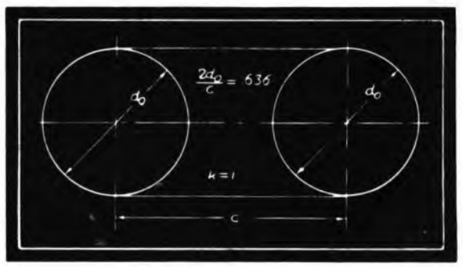


Fig. 1—Open belt drive layout for determining theoretical belt length

Fig. 2—Pulley sizes for one-to-one speed ratio are used in calculating diameters for other ratios



for belt length is relatively simple to use, the inverse problem of finding pulley diameters when given center distance, belt length and speed ratio is more involved. The accompanying chart, Page 138, enables this calculation to be made with ease and accuracy.

Basis of the chart is the well-known approximate equation for belt length on an open drive (see *Fig.* 1), which is sufficiently accurate for all practical purposes:

$$l = 2c + \frac{\pi(d_2+d_1)}{2} + \frac{(d_2-d_1)^2}{4c} \quad \ldots\ldots (1)$$

where l = belt length, inches; c = center distance, inches; d_1 = small pulley diameter, inches; and d_2 = large pulley diameter, inches. When greater accuracy is desired d_1 and d_2 may be replaced by (d_1+t) and (d_2+t), where t is belt thickness.

Introducing the speed ratio, k, which is equal to the diameter ratio d_2/d_1 and eliminating one of the pulley diameters:

$$l = 2c + \frac{\pi d_1}{2}(k+1) + \frac{d_1^2}{4c}(k-1)^2 \quad \ldots\ldots (2)$$

For the simple case of equal pulleys, *Fig.* 2, $d_1 = d_2 = d_0$ say, this equation becomes:

$$l = 2c + \pi d_0 \quad \ldots\ldots (3)$$

Equating the values of l in Equations 2 and 3:

$$\pi d_0 = \frac{\pi d_1}{2}(k+1) + \frac{d_1^2}{4c}(k-1)^2 \quad \ldots\ldots (4)$$

For any desired value of d_2/d_1 this quadratic equation may be solved in the usual manner. However, the resulting expression is clumsy and a quicker solution results from the following approach. As a first approximation the last term in Equation 4 may be ignored temporarily, giving as a solution:

$$d_1 = \frac{2d_0}{k+1} \quad \ldots\ldots (5)$$

Introduction of a correction factor u makes this a more exact relation:

$$d_1 = \frac{2d_0 u}{k+1} \quad \ldots\ldots (6)$$

The correct value of u is given by substituting the value of d_1 from Equation 6 into Equation 4 which becomes, after simplification:

$$\pi = \pi u + \left(\frac{d_0}{c}\right)\frac{(k-1)^2}{(k+1)^2}u^2 \quad \ldots\ldots (7)$$

Solution of this equation is most easily accomplished with the aid of the chart, *Fig.* 3, which gives values of the correction factor u as a function of the speed ratio k for usual values of d_0/c. The basic equations for solving all problems with the aid of the diagram are summarized for convenience as follows:

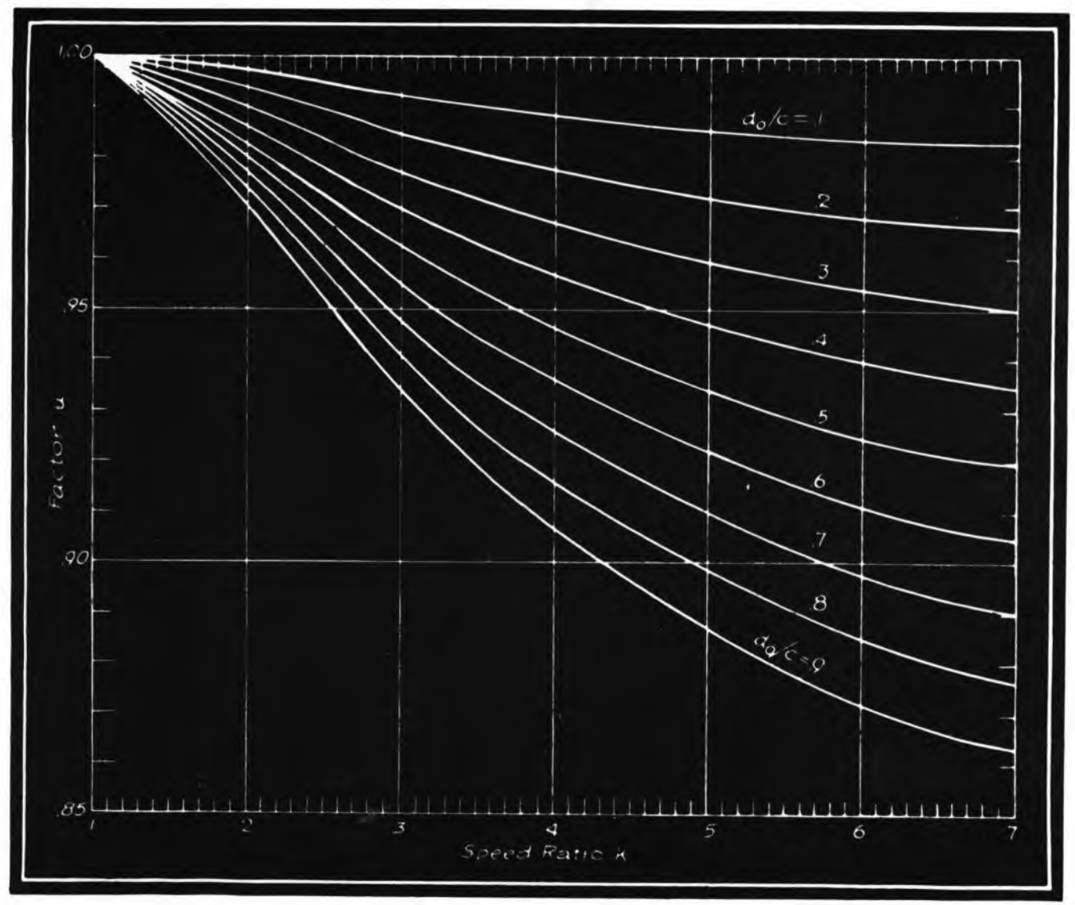
$$l = 2c + \pi d_0$$

$$d_0 = \frac{l-2c}{\pi}$$

$$d_1 = \frac{2d_0 u}{(k+1)}$$

$$d_2 = kd_1$$

Fig. 3—Chart shows correction factors for calculating pulley sizes at any step of a cone-pulley drive



It is worth noting that the value of u on the chart also indicates directly the accuracy of the common assumption that step-cone pulleys are correct if the sum of the diameters is constant. The percent error in this assumption is therefore $100(1-u)$.

How To Use the Chart

EXAMPLE: A belt 60 inches long is to connect two shafts with a center distance of 15 inches, the speed ratio being 2.5. It is required to find the proper pulley diameters.

From Equation 3 the pulley diameter for a speed ratio of 1 may be found: $d_0 = (l-2c)/\pi = (60-30)/\pi = 9.55$. Then the ratio $d_0/c = 9.55/15 = .636$. With this value of d_0/c, and k equal to 2.5, the value of the correction factor u is found from the chart, *Fig.* 3, to be .966.

Diameter of the smaller pulley, from Equation 6, is therefore $d_1 = 2d_0 u/(k+1) = (2)\ (9.55)\ (.966)/(2.5+1) = 5.26$ inches, and the larger pulley diameter is $d_2 = kd_1 = (2.5)\ (5.26) = 13.15$ inches.

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MACHINE DESIGN—July, 1943.

TUBES ON ORDER

1E5-GP
1H4
2A5
2A6
3BP1
3FP7
3S4
5R4-GY
6AB5/6N5
6AK6
6A3
6A6
6B4G
6B8
6F5
6H6
6H6GT
6J5
6J6
6J7GT
6L6G
6SL7
6SL7GT
6SN7
6X5GT/G
6Y6
12A7
12A8GT
12B8
12H6
12J5GT
12L8GT
12SK7
12SL7
12SN7
12SN7GT
31
32
35Z5
37
41
42
50Y6
53
77
83
83V
85
117L7/M7GT
210
211
224A
230
304TH(Eimac)
522
574
707B
723A
810
826
827R
829A
833A
834
872
872A/872
878
880
884
888
905
907
913
929
931A
934
1603
1629
1632
1851
2052
A4361 6AK6
G10
VR90/30
6C7
0Z4
6AE7GT
1G6GT
1Q5GT
1T5GT
6AC5
6AD7G
6AD6
6AE6G
6K8
6L7G
6N6G
6Q7G
6SK7GT
7V7
12N6
32L7GT
5OZ7
79
117M7
117Z6GT
117Z6
829B
889
906
1608
8005
464
9C21
316A (W.E.)
723A (W.E.)
6J4
715B (W.E.)
3EP1
2511A5
5PJ1/2529A5
101A
F.I.C. 1055A
Sylvania
Ballast Lamp #2

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VOL. I. APRIL 1944 NO. 3

RCA LABORATORIES NEWS

1944 RED CROSS CONTRIBUTION BY MEMBERS OF THE LABORATORIES

$1434.25

THIS EXCEEDS LAST YEARS CONTRIBUTION BY $400.00

IN ADDITION TO THE ABOVE CONTRIBUTIONS THE RADIO CORPORATION OF AMERICA HAS ALLOCATED A PORTION OF ITS NATIONAL CONTRIBUTION TO THE PRINCETON DISTRICT.

RADIO CORPORATION OF AMERICA
PRINCETON N.J.

RCA LABORATORIES NEWS

1944 I.R.E.

WINTER TECHNICAL MEETING

January 28 and 29, 1944

Of the papers presented at this meeting, several were of interest to our technical staff. Summaries of these have been kindly provided by those attending the lectures. We acknowledge with thanks the contributions of Messrs. R. R. Bush, G. L. Fernsler, A. Rose, and G. C. Sziklai which are reproduced below.

On the morning of January 28, Mr. H. R. Lubcke, of the Don Lee Broadcasting System, presented a paper on: "Orthicon Cameras in Television Studio Work".

The above paper described operating studio experience obtained at the Don Lee studios with RCA portable orthicon equipment. Considerable emphasis was placed on the artistic effects achieved by being able to maintain a uniform black level. A number of slides of the original studio scenes were shown but no pictures taken from kinescope screens were presented. Studio illumination for the orthicon was reported to be about one fifth that used for the iconoscope. Mr. Lubcke pointed out that satisfactory pictures were obtained by a reflected light of seventy foot candles. This additional sensitivity permitted the use of smaller lens stops on the camera thus providing greater depth of field which contributed much to operating convenience. The definition in transmitted pictures, as judged both from a resolution pattern and from studio shots, was reported about the same for the orthicon as for the iconoscope. Excellent resolution was claimed for both orthicon cameras which were made by RCA. It was stated that special care had to be taken in pre-setting the orthicon camera to get good pictures.

In the afternoon of January 28 a paper was presented by Mr. A. B. Bronwell, of Northwestern University, on the subject "Transmission Line Analogies of Plane Electromagnetic Waves".

The reflection of a plane wave propagated through one medium to another was shown to be analogous to joining two transmission lines of different impedances. The terminating impedance was considered to be an infinite line. For a normally incident wave the input impedance of the line is shown to be equivalent to the impedance presented to the plane wave condition where the impedance is considered to be equal to

$$z = \frac{E_z}{H_y}$$

An analogy is also evaluated for a plane of oblique incidence.*

Also an analogy was given for a plane wave of normal incidence to three different media of permeability μ_1, μ_2, μ_3 and dielectric constant $\epsilon_1, \epsilon_2, \epsilon_3$. This is shown to be equivalent to the case of three transmission lines of impedances Z_{o1}, Z_{o2}, and Z_{o3}. The propagation constants are given by γ_{o1}, γ_{o2}, and γ_{o3}. The input impedance Z of the line is then given by

$$Z = Z_{o2} \left[\frac{Z_{o3} + Z_{o2} \tanh \gamma_{o2} l_2}{Z_{o2} + Z_{o3} \tanh \gamma_{o2} l_2} \right]$$

The length of line l_2 may be used as a $\lambda/4$ matching transformer.

This paper was followed by a series of three presented by Mr. J. F. McAllister, Jr., of the General Electric Company. These were: "Equivalent Circuit of the Field Equations of Maxwell", by G. Kron; "A New Approach to the Solution of High Frequency Field Problems" by J. Winning and J. Ramo; and "Symmetrical Network Analyzer Studies of Electromagnetic Cavity Resonators" by J. Winning, C. Concordia, W. Ridgway, and G. Kron. These three were given as one paper and are so reported.

The Maxwell Curl equations were first presented for the three coordinate systems x, y, and z. Only an orthogonal curvilinear system is considered. It was assumed that the y coordinate was equal to zero, and further that the direction of propagation was in the z direction. The relationships of the TE and TM waves were given.

The difference approximation was then introduced by assuming z to be small but finite. Then the differential equations

$$\frac{\partial H_x}{\partial Z}(X,Z) = \frac{H_x\left(X, Z + \frac{\Delta Z}{2}\right) - H_x\left(X, Z - \frac{\Delta Z}{2}\right)}{\Delta Z}, \text{ etc.}$$

are obtained. These are substituted in the curl equations.

The equivalent circuit used normally in the solution of transmission line problems was shown. This was initially suggested by G. Kron as a means of setting up Maxwell's field equations by means of lumped circuit constants.

A point on the mesh shown may be represented as x,z. Other points will be given by

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* See "Micro Wave Transmission". Slater pages 100--108 & pages 173-183.

$x,z + \frac{\Delta z}{2}$; $x,z - \frac{\Delta z}{2}$ etc. Kirchoff's laws around a closed loop will then satisfy the electric field equations. The boundary conditions may be set up in the network as by connecting the condensers to ground on the outer meshes would represent a TM wave. A similar arrangement may be set up for guides of circular symmetry.

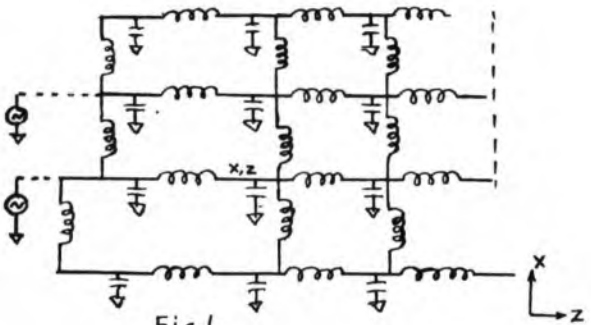

Fig.1.

Two cases were tested experimentally on the bridge network, namely a shorted resonant rectangular guide and a shorted resonant cylindrical guide. The results of these agreed with theoretical values.

A more complicated guide termination was then considered, namely, a right-angle bend in a rectangular guide shorted at its far end. The bridge used in simulating this condition was one normally used by the General Electric Company for setting up power-line transmission problems. Consequently, this part of the equipment was available having a total of 49 capacitors which limited the number of meshes. A recommended value was to use a system having 100 condensers. The generators are introduced to the system as shown in figure 1. Attenuation in the guide or dielectric may be introduced by resistances in the network.

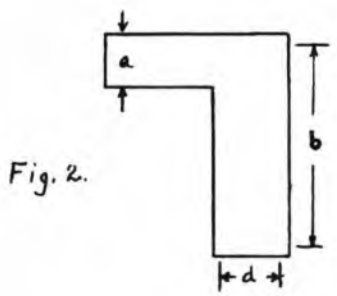

Fig. 2.

A typical result obtained from measurements made on the resonator shown in figure 2 is given below.

$\Delta Z/\lambda = .0195$, $b/\lambda = 0.175$, $d/b = 3/9$

$a/b = 5/9$, Input admittance $H_y/E_x = - j\ 0.488$ measured. Input admittance calculated = - j 0.512. Percentage Error = 4.9%.

Other values were also tabulated for different cavity dimensions. A maximum error of 13+ % was recorded. The error factor would be reduced presumably if the number of meshes were increased.

For those wishing to study these three papers in more detail, they contain basically the same material as is in the following General Electric Company reports: D.F. 46262, D.F. 63052 and D.F. 63060. Copies of these reports are available in Mr. B. J. Thompson's office.

Before a second group meeting at the same time that the above afternoon session took place, a paper was presented by W. A. Edson of Bell Telephone Laboratories on "Intermittent Behavior in Oscillators". The author showed that the gain and phase relations of the oscillator may be easily observed by opening the loop, as shown in Figure 3. By controlling the gain of the amplifier from the rectifying stage, and setting the gain and phase of the system properly, a modulated oscillation may be obtained if the loop is closed.

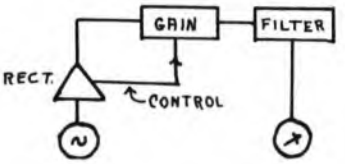

Fig. 3.

On the morning of January 29, Mr. A. Stringer, of the National Association of Broadcasters, presented some interesting statistics on the American listening habits.

In a wide canvass, according to Mr. Stringer, 70% of the people were willing to give up the movies if it were a choice between the movies and the radio. The author considered that the public was well served by the broadcasters, the manufacturing industry and the engineering profession, but he felt that it was let down by the servicing facilities. He proposed a planned training for the returning service man who specialized in the radio field, to provide an adequate and competent service personnel after the war.

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MEASUREMENTS COMMITTEE

NEW MEASUREMENT FACILITIES AVAILABLE

Frequency Standards

A rack of frequency standard equipment is now in operation in room W-223. It includes two standards, one a crystal and the other a tuning fork, each one connected through divider circuits to a 60 cycle clock for monitoring purposes. Observations with the clocks, and comparisons with WWV, indicate that the frequencies of both standards are correct to within approximately one part in a million.

The available frequency divider circuits make it possible to supply, at low level, standard frequencies of 100 kc, 10 kc, 1 kc, 100 cycles, and 60 cycles. Where the work justifies it, arrangements can be made to run wires so that any of these frequencies can be made available in other laboratories.

The installation also includes a facsimile recorder arranged for use as a chronograph and driven at 60 rpm from the frequency standard. By supplying an unknown

signal to the printer bar its frequency can be determined with an accuracy of one part in a million in about 20 minutes, providing, however, that its frequency is an integral number of cycles plus or minus one-tenth of one per cent, and not higher than 400 cycles.

Plans are being made for additional frequency measuring equipment, and these facilities will be reported as they become available for general use.

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WRITING REPORTS

(The following discussion was written by Dr. S. A. Goudsmit of the Radiation Laboratory at M.I.T. It seemed so directly applicable to our work - particularly with respect to reports we prepare for government groups - that we are reprinting it here.)

So you're going to write a REPORT. How many reports have you read lately? None, or perhaps just a part of one or two, because you were too busy. Well, your Report won't be read either unless you do it just right!

Nobody has time to read reports and those who do anyway hardly ever read further than the ABSTRACT. This abstract must therefore contain all the pertinent results. It is definitely not meant to arouse the curiosity of the reader and to tantalize him into reading all your fifty pages. It just doesn't work.

The FIRST FEW PAGES must contain the purpose of the work, the methods used to obtain the results and a more detailed description of the results themselves. Next should come experimental details and perhaps a more general discussion including eventual theoretical derivations. As only some of your friends will read beyond page 3, you probably know best how to convince them that you are right.

The FIGURES are often consulted even before the title. Tabloid type reports, just like magazines, are most popular. Diagrams, figures and photographs are usually far easier to understand than a lot of text, provided that they have clear and complete captions. Title, abstract and figures ought to give almost complete information. The remainder of the text is meant only for those working on the same problem.

The report should contain only one single SUBJECT. Often important information is entirely lost because it is hidden in a report on a different subject. After you have once noticed it, you have an awful time finding it again later. Several short reports are therefore far more useful than a long report covering a variety of subjects. An obvious exception to this recommendation is, of course, progress reports on systems and the like. In such cases, the division into many short chapters with clear titles is very helpful.

The DISTRIBUTION of the report should always be kept in mind when writing it. You are not writing for the Physical Review, I.R.E. or your college paper. Remember especially that your report is meant for persons in the armed forces and for research workers in England, Australia, Canada. These individuals are not half as familiar with the subject as you are. They know very little about our Laboratory. They are, however, very anxious to get the information you have to offer, but they have little time and less patience. Think of them when you write your report.

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PERSONNEL INFORMATION

Red Cross

Members of the Laboratories contributed $1,434.25 in the 1944 Red Cross War Fund and Membership drive. This compares favorably with last year's contribution of $1,070.

In addition to the contributions by members of the Laboratories, the Radio Corporation of America has allocated a portion of its National Red Cross contribution to the Princeton Chapter.

The following individuals made up the Red Cross Drive Committee for the Laboratories:

A. C. Dornfeld	C. A. Mueller
R. K. Edwards	J. Stonaker
D. W. Epstein	R. R. Thalner
F. Howarth	C. A. Vose
C. N. Hoyler	C. A. Hurford
P. C. Lockard	Mrs. B. Sloan
T. Maher	

RED CROSS BLOOD DONOR SERVICE

The Princeton Chapter of the Red Cross have informed us that the Red Cross Mobile Blood Bank is scheduled to visit the Princeton area again during the last week of April as follows:

Princeton - April 25, 26, 27
Hightstown - April 28

Arrangements will be made for those desiring to make a blood donation from our Laboratories to participate as a group, while the Unit is in Princeton, as we did last year. Transportation will be provided between the Laboratories and the blood donation point.

All those interested in making a donation may leave their names with Miss Terp who is collecting the list of blood donors from RCA Laboratories.

Rationing Information

We have been notified by the Office of Price Administration that revised retail Community Food Ceiling Prices are now effective in this area. Consumer knowledge and observance of ceiling prices are indispensable if a balanced economy is to be retained. Posted on the various bulletin boards are the new ceiling prices for food and these maximum prices are effective for three months beginning March 6, 1944.

Let's all make this pledge: "I pay no more than top legal prices. I accept no rationed foods without giving up ration stamps."

Ration Board Hours (Princeton)

	Day	Evening
Monday	10 A.M. - 4 P.M.	8 - 9 P.M. (Gas)
Tuesday	10 A.M. - 4 P.M.	
Wednesday	11 A.M. - 3 P.M.	8 - 9 P.M. (Gas)
Thursday	10 A.M. - 4 P.M.	
Friday	10 A.M. - 4 P.M.	8 - 9 P.M. (Gas)
Saturday	10 A.M. - 12 N.	

Movies

Movies are shown in the Television Studio from 12:10 to 12:40 every Friday noon. The Personnel Office will welcome any suggestions from members of the Laboratories as to suitable and available movie subjects.

Victory Gardens

Registration is now taking place at the Personnel Office for 1944 Victory Gardens, and indications point to an increased number of gardens this year. The plots are 25' x 25' and are located in the same area as last year. Plowing, harrowing and fertilizing will be done again this year by the Laboratories, as soon as the weather permits. Gardeners will be notified by the Personnel Office as soon as their plots are ready for planting.

Bowling League

The second half of the Men's Bowling League season ended March 8th with the Guards and Office teams tied for first place. A roll-off of three games was held on March 15th with Office winning the second half championship. Since the Guards won the first half title, a 5-game roll-off was held on March 22 to decide the League championship. This was won by the Office taking three out of the first four games.

The Bowling League operated for the past 21 weeks and proved a popular activity for the 8 Laboratories' teams that participated. All Bowling was on a handicap basis and as a result the competition was keen between the various teams. George Lewis of the Model Shop was Chairman of the League and contributed a good measure to its success.

Gymnasium Night

The Grade School gymnasium, located on Nassau Street, is available every Thursday night from 7:30 to 9:30 for Laboratories' men who care to indulge in light physical recreation. Basketball and volley ball are the principal sports offered, and a sizeable group of men have been attending this activity for the past several weeks. Any additional men interested in an activity of this nature are welcome to attend.

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The Basket Ball Game

by

Walter Howarth

On the evening of February 25, a basket ball game was held at St. Paul's Gymnasium between a team composed of Chief Maher's highly spirited guards, and another team composed of members of the research group and Model Shop. The result was a victory for the research and Model Shop (hereafter referred to as the "all-star" group). The final score was 17 to 8. The contest became so hot at times that it approached the proportions of a riot.

Field goals were at a premium due to close guarding by both temas, but injuries were numerous. In fact, the casualty list the following

morning included practically everyone who played.

Chief Maher showed great agility and clever ball handling ability, and was truly the spark-plug of his team. It is generally agreed that he might have been a wow in his younger days. Other members of his team played equally well. The "all star" group was led by A. Friel and Carl Meneley and showed fine form despite their lack of practice.

It is hoped that interest will continue in future basket ball activities, and that RCA Laboratories may be able to place a team in some local league next season.

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LIBRARY INFORMATION

Recent Articles Available in the Library

Control equipments for induction heating, F. E. Ackley. General Electric Review, March, 1944.

Postwar uses for luminescent pigments. V. A. Belcher. Modern Plastics, Feb. 1944.

A discussion of the sensitivity of a method for measuring impedance by means of transmission lines. D. Rogen. Proceeding of Physical Society, Jan. 1, 1944.

A new method for the measurement of impedance at ultra-high frequencies using a system of Lecher wires. G. W. Williams. Proceeding of Physical Society, Jan. 1, 1944.

Basic electronic circuits and tubes. C. B. Stadum. Product Engineering, Jan. Feb. 1944.

Crystals of quartz. W. P. Mason. Bell Laboratories Record, Feb. 1944.

Laminated wood as an insulator. A. E. L. Jervis. Electronic Engineering, Feb. 1944.

Photomicrography. K. Cornell. American Photography, Mar. 1944.

The impedance of a transverse wire in a rectangular wave guide. S. A. Schelkunoff. Quarterly of Applied Mathematics. Jan. 1944.

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BIMONTHLY NEWS

LECTURES BY RCA LABORATORIES TECHNICAL STAFF

Before the Women's College Club of Princeton by J. Hillier on "The Electron Microscope" - March 6, 1944.

Before the Physics Club of Chicago by J. Hillier on "Electron Microscopy" - March 14, 1944.

Before the Dayton Section of the I.R.E. at Wright Field by V. K. Zworykin on "Electron Optics" - March 22, 1944.

Before the American Ceramic Society of Buffalo by J. Hillier on "Electron Microscopy" - March 24, 1944.

Before the Electro-Chemical Society in New York City by C. N. Hoyler on "R-F Heating" - March 31, 1944.

Before the Rotary Club of Princeton by J. Hillier on "Electron Microscopy" - April 4, 1944.

Before the A.I.E.E. at Bethleham by C. N. Hoyler on "R-F Heating" - May 12, 1944.

RCA TUBE ASSEMBLY PLANT TO BE OPENED IN SAUGERTIES

Will Employ About 400, Beginning Early March

The opening of a new plant in Saugerties, New York, for the manufacture of mount assemblies for radio and electron metal tubes was announced by H. F. Randolph, Manager of our Harrison, New Jersey, tube manufacturing plant.

The new plant, which will be located in the Knaust Building on East Bridge Street, is expected to be in full operation by summer. Mr. Charles T. Miller will supervise the operation of the Saugerties plant.

Personals

H. W. Hutchison, of our Model Shop, left for the Navy on February 25th - is now stationed at Sampson, New York.

C. W. Fell of our Model Shop, left March 18th to join the Army - will first be stationed at Fort Dix.

A birthday party was held on March first for Miss Ruth McCall. She is said to have received a crisp $10.00 bill from her friends. After this she was taken to Peacock Inn and was left holding the check. The guests were: Mrs. A. Honore, Mrs. R. McGuire, Mrs. Harry Sampson, Mrs. M. Urbani, Miss D. Frohling, Mrs. A. Cole, and Mrs. N. Robbins.

On Friday, February 18, the Guard's Bowling Team played a match game with the Walker Gordon Team at Princeton Bowling Alleys. The Guards' winning total by pins was:
Guards 2301 - Walker Gordon 2223

Announcement has been made recently of the engagement of Miss Juanita Patterson, of the Tube Assembly Room, to Private L. C. Glass.

Herbert A. Finke was married to Miss Rosalie Coblens on March 2nd in New York City.

E. T. Dickey was married to Miss Gertrude E. Kolb on February 12 in Lawrenceville, N. J.

Miss Sara E. McCafferty, of the Purchasing Department, was a very excited girl when she became engaged to Pfc. Robert C. Hoffman of Princeton, New Jersey. Pfc. Hoffman is now stationed at Camp Van Dorn, Mississippi. No date has been set for the wedding.

Miss May Simonsen, of the Purchasing Department, changed her name to Mrs. V. N. Sassman on January 8, 1944. The ceremony took place in the Second Presbyterian Church. Pfc. Sassman is now stationed at Page Field, Florida.

(Anybody want to work in this department?!)

Births

Mr. and Mrs. Kenneth Marple are the proud parents of a daughter - Marie Arlene - born on January 23, 1944.

It's a girl at the Benjamin Kulley's - Marion Kulley - born January 26, 1944.

Mr. and Mrs. George Lewis announce the birth of a daughter - Nancy Marie - on February 7, 1944.

Mr. and Mrs. Emil Wunderle are the proud parents of twins - Barbara Margaret and Emil Erhardt Jr. - born February 21, 1944.

Joseph Luther is the proud father of a daughter - Virginia Louise - born March 4, 1944.

Mr. and Mrs. Charles Busanovich announce the birth of a daughter - Carol - on March 7, 1944 at 6 p.m. Weight: 8 lbs.

John T. Van Pelt became the proud father of a daughter - Gale Louise - on March 11, 1944.

It's a girl at the home of H. L. Oehme - born March 16, 1944. Weight: 9 1/2 lbs.

Deaths

We learn with regret of the death on January 25 of Mrs. Mary Elizabeth Sullivan, grandmother of William, Charles and Frank Sullivan. Mrs. Sullivan would have been 104 years old on February 5 of this year. She lived with her grandson William and was working on some crocheting up until the night of January 22.

Mr. George Lewis' mother - Mrs. Fanny Lewis - died on March 10, 1944 at Westville, New Jersey. Our sympathy goes to the bereaved family.

Additions

Leon Kohlenberger - Bldg. & Grounds
Francesco Cuomo - Bldg. & Grounds
A. Robert Gordon - Bldg. & Grounds
Katherine Tindall - Tube Assembly
F. S. Osborn - Guard
J. E. Rodweller - Guard
Mrs. A. Cole - Accounting
R. L. Burtner - Research
L. L. Poli - Drafting
J. Bakay - Model Shop
A. P. Appelson - Model Shop
J. T. Van Pelt - Model Shop
Wm. E. Carpenter - Model Shop

--ooOoo--

PATENT DEPARTMENT INFORMATION

Patent Disclosure Forms

New Patent Disclosure forms are now available for use in submitting disclosures of inventions. Attention is called to the space provided for noting Government contract information. When submitting disclosures the contract information should be furnished.

PATENTS RECENTLY ISSUED TO RCA

Jan. 4

Dimmick, G.L.	2,338,233	Reduction in reflection from transparent material
Goldsmith, A.N.	2,338,239	Electrical energy generating system
Sands, W.F. et al	2,338,134	Variable tuning system
Stanko, E.	2,338,551	Automatic volume control

Jan. 11

Artzt, M.	2,339,133	Facsimile apparatus

Jan. 18

Cox, J.W.	2,339,682	Electron switching device
Crosby, M.G.	2,339,620	Signaling
Garner, L.P.	2,339,392	Cathode
Herzog, C.	2,339,402	Electron discharge device
Wendt, K.R.	2,339,536	Television system

Jan. 25

Bedford, A.V.	2,339,833	Television pickup tube
Hansell, C.W.	2,339,851	Automatic tuning control
Holmes, R.S.	2,339,856	Television receiver
Holmes, R.S.	2,339,857	Noise Limiter

Feb. 1

Bedford, A.V.	2,340,364	Audio transmission circuit
Burdick, R.H.	2,340,791	Electric power control circuit

Deal, H.B.	2,340,798	Remote control system
Harvey, R.L.	2,340,749	Variable permeability tuning system
Rankin, J.A.	2,340,429	Amplitude modulation limiter circuit
Sanford, R.C.	2,340,617	Phase-inverter circuit
Schock, R.E.	2,340,432	Phase modulation receiver
Van Ingen Schenau	2,340,443	Controlled degenerative feedback circuits

Feb. 8

Hathaway, J.L.	2,341,040	Frequency modulator
Koch, W.R.	2,341,047	Frequency modulation signal detector
Lindenblad, N.E.	2,341,408	Antenna feed system
McDonald, J.F.et al	2,341,224	Two-way radio telephone system
Norton, L.E.	2,341,232	Ninety degree phase shifter
Peterson, H.O.	2,341,238	Auxiliary power supply
Reid, J.D.	2,341,240	Frequency discriminator network
Schock, R.E.	2,341,243	Wave length modulation
Singer, K.	2,341,336	Compressor and variable equalizer system
Stone, F.B.	2.341,484	Frequency modulation signal detector system
Wolfe, W.V.	2,341,303	Sound re-cording system

Feb. 15

Fields, J.L.	2,341,706	Monitoring system for sound recording
Peterson, H.O.	2,341,649	Frequency control
Roberts, W. van B.	2,341,655	Variable reactance

Feb. 22

Finch, J.L.	2,342,335	Tone signal keyer
Rankin, J.A.	2,342,491	Tunable loop antenna circuit
Rankin, J.A. et al	2,342,492	Ultra-high-frequency amplifier

Feb. 29

Goldstine, H.E.	2,342,897	Electron discharge device system
Kell, R.D.	2,342,943	Television transmitting system
Luck, D.G.C.	2,343,196	Radio range
Salzberg, B.	2,342,896	Electron discharge device and circuit
Schrader, H.J. et al	2,343,207	Wave translation device
Usselman, G.L.	2,342,708	Wave length modulation circuit
Usselman, G.L.	2,343,099	Frequency modulation system

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CHART FOR TRANSPOSING FILAMENT OPERATING CONDITIONS

By
L.S. Nergaard

In the design of filaments for vacuum tubes, questions such as the following frequently arise:

1) What increase in filament current of a given tube is required to raise the filament temperature from 1000° K to 1050° K?

2) If the filament of a certain tube is run 5 percent above rated voltage what will the filament current be?

Questions of a similar nature arise in circuit design, for example:

The filaments of a number of tubes are to be operated in series. As the line voltage varies, will the filement power for each tube stay within the prescribed limits?

Frequently it is impractical to obtain the answers to these questions experimentally. In fact, the tube designer may have to know the answers before the first tube is built. He can answer them by recourse to his filament design charts, but the process is laborious, particularly because of the difficulty of handling end corrections.

To overcome these difficulties, Mr. Cecil Haller of the Power Tube Development Section at Lancaster has computed the accompanying chart for transposing filament operating conditions and has checked it against experimental data on a large variety of tubes. These have included:

1) Tubes with tungsten filaments
2) Tubes with thoriated-tungsten filaments
3) Tubes with nickel filaments
4) Tubes with oxide-coated cathodes and all conventional heaters
5) Incandescent lamps
6) Miniature tubes
7) Large transmitting tubes

In all cases, the curves have agreed with the experimental results within 4 percent over a voltage range of ± 25 percent.

The chart shows the percentage variation in filament power, current and temperature as a function of percentage change in filament voltage. It is therefore assumed that the quantities in question are known at some one operating condition of the tube. These known quantities are called the basic quantities, and the change in one of them as the result of a change in the other may readily be determined from the chart.

In a paper to be published in Electronics, Mr. Haller cites the following examples of the use of the chart:

1) The RCA-826 is designed to operate at

$$V_F = 7.5 \text{ volts}$$
$$I_F = 4.0 \text{ amperes}$$

If the filament voltage is reduced to

$$V_F = 5.62 \text{ volts},$$

what will the filament current be?

The new voltage is

$$\frac{5.62}{7.5} \times 100\% = 75\%$$

of the rated or basic voltage. From the chart the new current will be 83.8% of the rated current or

$$I_F = 0.838 \times 4.00 = 3.35 \text{ amperes.}$$

The measured value is

$$I_F = 3.34 \text{ amperes}$$

2) An oxide-coated cathode operates at a temperature of 1000° K with 5 volts on the heater. What heater voltage is required to raise the temperature to 1060° K?

The new temperature is

$$\frac{1060}{1000} \times 100\% = 106\%$$

of the basic temperature. From the chart, the corresponding voltage is 119% of the basic voltage or

$$V_F = 1.19 \times 5.00 = 5.95 \text{ volts}$$

The measured value is

$$V_F = 6.00 \text{ volts}$$

3) The heater of example 2) is to be operated at 7.00 volts. What will be the cathode temperature?

The new voltage is

$$7/5 \times 100\% = 140\%$$

of the basic voltage. From the chart, the corresponding temperature is

$$T = 1.118 \times 1000 = 1118° \text{ K.}$$

The measured value is

$$T = 1135° \text{ K.}$$

This is an example in which the chart is used well beyond the prescribed ± 25 percent range in variation in voltage. The accuracy in this case is probably fortuitous and the example should not be construed to indicate that the chart may be used with impunity over as great a range as ± 40 percent.

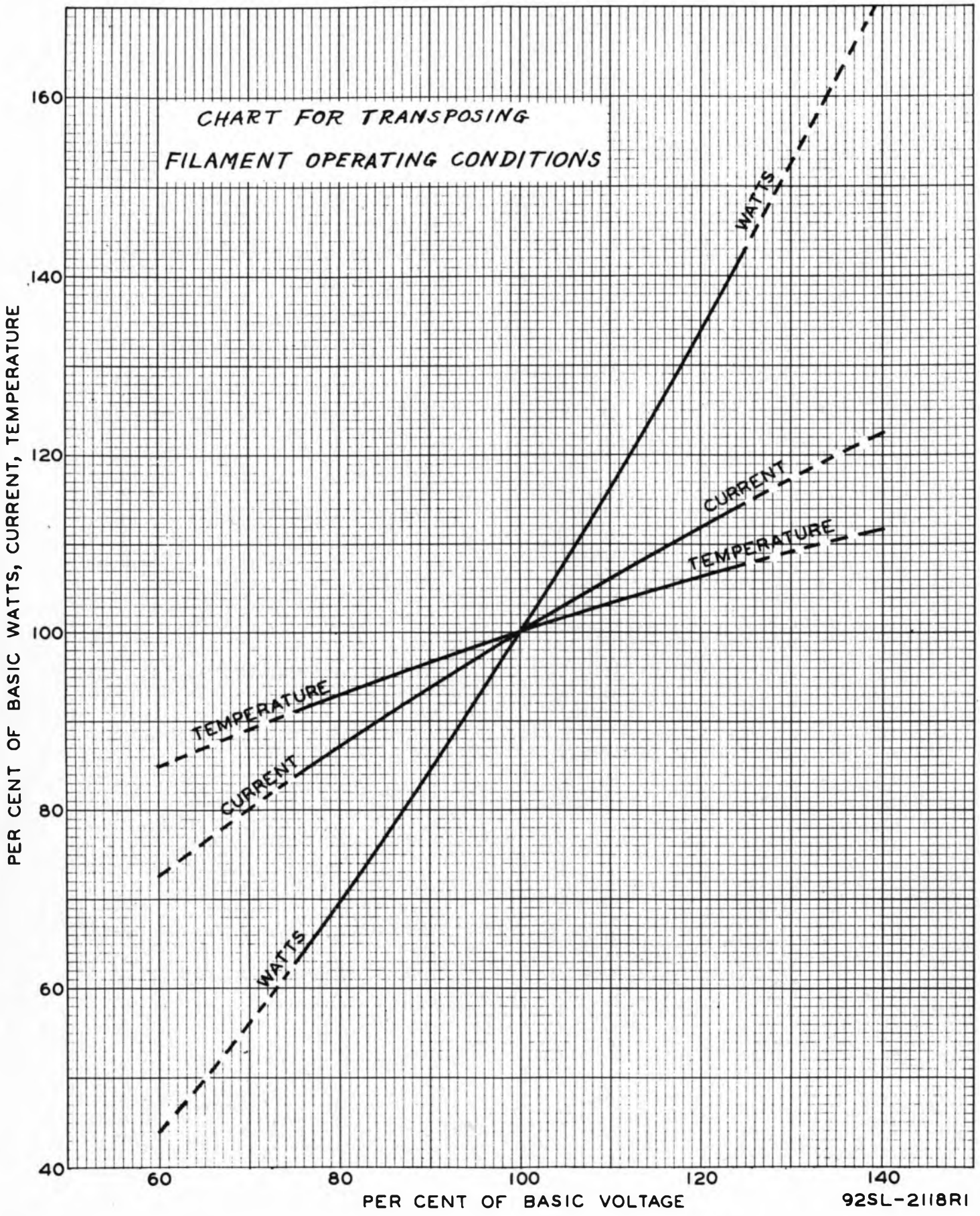


CHART FOR TRANSPOSING
FILAMENT OPERATING CONDITIONS
PER CENT OF BASIC WATTS, CURRENT, TEMPERATURE
160
140
120
100
80
60
40
WATTS
CURRENT
TEMPERATURE
TEMPERATURE
CURRENT
WATTS
60
80
100
120
140
PER CENT OF BASIC VOLTAGE
92SL-2118RI

MODEL SHOP SERVICE INFORMATION

Nickel Sheet

We now have available a source of pure nickel sheet from .0005" thick to approximately .005" thick and in widths up to 18". This material will shortly be available in 40" widths and virtually any length.

Enameled Wire Data

With the present popularity of "Heavy Formex" enameled wire for coils and transformers, considerable embarrassment is encountered in their construction when the old enameled wire tables have been used in figuring turns per inch, etc.

Listed below is a table of nominal wire sizes together with actual diameters over the enamel and also the practical turns per inch which may be obtained. All coil construction should be based on these figures rather than the older tables on enameled wire which do not have the same amount of insulation "build up" as Formex. Additional data on this kind of wire are available in the Model Shop.

Gauge No.	Bare Dia.	Heavy Formex Dia.	Turns per inch
12	80.8	84.0	11
13	72.0	75.1	--
14	64.1	67.1	14
15	57.1	60.0	--
16	50.8	53.7	18
17	45.3	48.1	--
18	40.3	43.0	22
19	35.9	38.5	--
20	32.0	34.5	29
21	28.5	30.9	--
22	25.3	27.6	35
23	22.6	24.8	39
24	20.1	22.2	44
25	17.9	19.9	48
26	15.9	17.8	54
27	14.2	16.0	60
28	12.6	14.3	68
29	11.3	12.9	74
30	10.0	11.5	83
31	8.9	10.4	92
32	8.0	9.4	101
33	7.1	8.4	112
34	6.3	7.4	128
35	5.6	6.6	145
36	5.0	5.9	162
37	4.5	5.4	177
38	4.0	4.8	199
39	3.5	4.2	228
40	3.1	3.8	250

RADIO TUBES IN STOCK

Occasionally in the past there have been cases of orders being placed by some one for tubes which were already available in the Stock Room. With the thought that the needless delay and duplication of effort that this entails could be avoided by publicizing the types in stock, we are giving below the tubes now available together with a list of those on order but not yet received.

TUBES IN STOCK

1A3
1A7GT
1B4P
1C21
1D8GT
1F7GV
1G4GT/G
1H4G
1J6G
1L4
1N5GT
1N21 Sylvania Crystals
1R5
1S4
1S5
2H2E4
1T4
1V
2AP1
2A3
2C22
2C44
2V3G
2X2/879
3AP1/906P1
3A4
3A5
3A8GT
3B-24
3DP1
3E29
4A1
3Q4
3Q5GT
5BP1/1802P1
5CP1
5CP7
5FP7/1812P7
5T4
5U4G
5V4G
5W4
5X4G
5Y3G
5Y3GT/G
5Y4G
5Z3
5Z4
6AB7/1853
6AC7/1852
6AG5
6AG7
6AK5
6A7
6A8
6B8G
6C4
6C5
6C6
6C8G
6D6
6E5
6F6
6F6G
6F7
6F8G
6G6G
6J5G
6J7
6K6GT/G
6K7
6K7G
6L5G
6L6
6L7
6N7
6N7GT/G
6Q7
6R7
6SA7
6SC7
6SF5
6SF7
6SG7
6SH7
6SJ7
6SK7
6SN7GT
6SQ7
6SR7
6SS7
6ST7
6S7
6U5/6G5
6V6
6V6GT
6X5
6X5GT/G
6Y6G
6ZY5G
7BP7/1813P7
7F7
12A6
12AH7GT
12C8
12SA7
12SC7
12SF5
12SG7
12SH7
12SJ7
12SL7GT
12SQ7
12SR7
25L6
25L6GT/G
25Z5
25Z6GT/G
30
35L6GT/G
35Z5GT/G
45
45Z3
50L6GT
53A(Eimac)
56
57
59
75
76
80
81
84/6Z4
89
112A
117N7GT
446A
559
631/P1
802
807
809
811
812
813
816
829
832
857B
866A/866
868
874
885
914
917
921
922
954
955
956
957
958
959
991
1614
1616
446B
836
1628
1631
1635
1636
2C21/1642
1644
2050
2051
(R6193)1654
(R6200)2D21
8012
8013
8013A
8016
8025
9001
9002
9003
9004
9005
9006
FG-67
0A4G
VR75/30
1960
1612
3EP1/1806P1
6N7G
3FP1
6L5
1A5GT
7H-11
VR105/30
VR150/30
4E29/8001
117Z6GT/G
GL8020


RCA

VOL. I. JUNE 1944 NO. 4

RCA LABORATORIES NEWS

REDUCTION OF PENICILLIN SOLUTION by THE RCA HIGH-FREQUENCY METHOD

In the production of penicillin, it is necessary to reduce great quantities of weak solution down to a dry solid state in which it can be preserved during shipment and storage. This is because penicillin solution loses potency rapidly if it is permitted to stand for any length of time in the liquid state at room temperature or above. Reduction or evaporation of the water by present commercial methods is accomplished while the solution is maintained in a frozen state in a high vacuum (100 microns). The combination of a long evaporation time cycle and the high-vacuum requirements makes the equipment setup for the conventional method both bulky and expensive.

The twenty penicillin producing companies are completing installation of additional reducing facilities of the conventional type to increase their output several-fold over that at the beginning of the year. Based on this expansion, WPB has already announced that sufficient penicillin will be available for civilian needs "in the near future".

Dr. G. H. Brown, Mr. C. N. Hoyler and Mr. R. A. Bierwirth have successfully reduced penicillin solutions at RCA Laboratories, by employing high-frequency power to evaporate the water. In this high-frequency method, the evaporation is accomplished while the solution is in a liquid state in a partial vacuum. This permits boiling at a temperature of approximately 50°F. This low evaporation temperature, coupled with the speed with which the water is evaporated, prevents loss in potency.

Although vacuum equipment is required for the high-frequency r-f reduction method, the degree of vacuum needed (2 to 3 cm of mercury) can be easily obtained with vacuum equipment which is quite inexpensive by comparison with the high-vacuum apparatus required for the conventional reduction method.

Complete reduction from the weak solution to the final dry solid state by the high-frequency method, as employed experimentally to date, requires a two-stage process.

In the first stage (which is called bulk-reduction) a reduction of approximately 10:1 in volume is made to obtain a concentrated solution. This part of our process is sufficiently well developed for commercial application.

In the second or final stage, a few cubic centimeters of the concen-

RADIO CORPORATION OF AMERICA
PRINCETON N.J.

RCA LABORATORIES NEWS

ED. DICKEY-EDITOR

trate from the bulk reducer are further reduced until only the penicillin in a dry solid state remains. This final reduction is accomplished directly in the bottles in which the product is to be shipped and stored.

A complete high-frequency bulk-reduction setup requires a 2 kilowatt r-f generator operating at approximately 30 megacycles and an associated unit consisting of a special cabinet housing a vacuum pump, condenser, and accessory equipment and having provision for supporting an evaporating flask and the high-frequency applicator electrodes. Our standard model 2-B Generator with a slight modification can be used as the source of r-f power.

--ooOoo--

THE ACTION OF A DIRECT RADIATOR LOUD SPEAKER WITH A NONLINEAR CONE SUSPENSION SYSTEM*

by Harry F. Olson

Introduction

During the past few years a number of investigators have directed their efforts toward the solution of differential equations with variable coefficients. These analysis are useful in explaining some of the phenomena which occur in electroacoustic vibrating systems with nonlinear elements. In particular, this mathematics may be used to explain the various phenomena exhibited by a direct radiator loud speaker with a nonlinear cone suspension system.

The general trend in all types of radio receivers and phonographs is more output without a corresponding increase in the size of the loud speaker. As a result, the maximum amplitude of the loud speaker is also increased. Many apparently peculiar activities are manifested by the loud speaker at the lower frequencies when the amplitude or excursion of the cone is large. Most of the unusual phenomena exhibited by the direct radiator loud speaker at the lower frequencies are due to the nonlinear characteristics of the suspension system. One of the effects of a nonlinear cone suspension system is a jump phenomena in the response characteristic. Another effect is the production of harmonics and subharmonics due to the nonlinear cone suspension system. It is the purpose of this paper to demonstrate theoretically and experimentally the effect of a nonlinear cone suspension system.

Direct Radiator Loud Speaker

The simple direct radiator loud speaker consists of a cone driven by a voice coil located in a magnetic field. The essential mechanical elements and the mechanical circuit of this loud speaker for the low-frequency range are shown in Fig. 1. The compliance or spring element in this system is the outside cone suspension and the voice coil centering suspension. In general, the compliance of the outside cone suspension is small compared to the compliance of the voice coil suspension and the cone suspension is therefore the controlling compliance. In any event, at the low frequencies the two compliances may be lumped as a single compliance as shown in the mechanical circuit of Fig. 1.

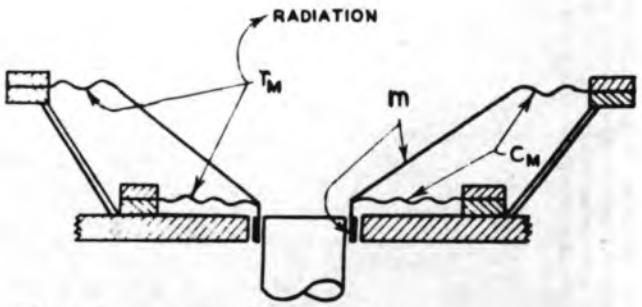
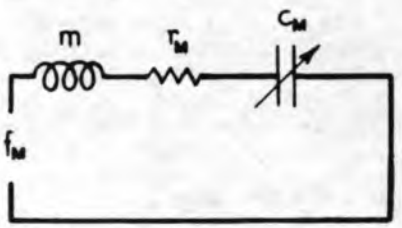


FIG. 1. CROSS SECTIONAL VIEW



MECHANICAL CIRCUIT

Equations Depicting the Action of a Direct Radiator Loud Speaker with a Nonlinear Suspension System

The force-displacement characteristic of a typical direct radiator loud speaker cone suspension system is shown in Fig. 2. It will be seen that for small amplitudes the suspension system is linear. However, for large amplitudes the suspension system is nonlinear.

The force-deflection characteristic of the loud speaker cone suspension of Fig. 2

* This paper was delivered before the Acoustical Society of America at New York on May 15, 1944. It will be published later in the Journal of that society.

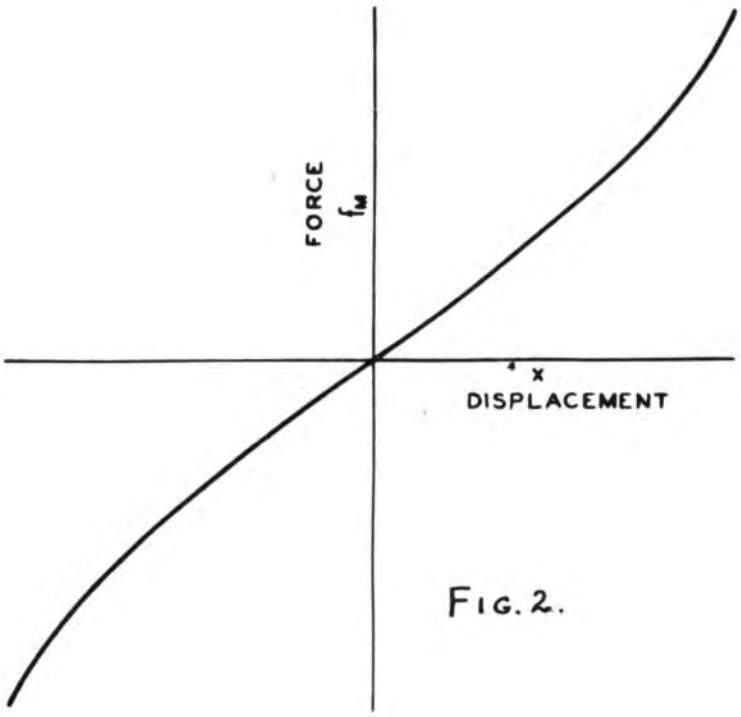


FIG. 2.

system may be approximately represented by the expression

$$f_M = f(x) = \alpha x + \beta x^3 \qquad (1)$$

where α = constant > 0,

β = constant > 0, and

f_M = applied force which produces the displacement x

The compliance of the suspension system of Fig. 2 may be obtained from equation 1 as follows:

$$C_M = \frac{x}{f_M} = \frac{1}{\alpha - \beta x^2} \qquad (2)$$

The differential equation of the vibrating system in Fig. 1 is

$$m\ddot{x} + r_M\dot{x} + \frac{x}{C_M} = F\cos\omega t \qquad (3)$$

where x = displacement,

$\dot{x}$ = velocity,

$\ddot{x}$ = acceleration,

m = mass of the cone and coil,

r_M = mechanical resistance due to dissipation in the air load,

C_M = compliance of the suspension system,

$F = Bli$,

B = magnetic flux density in the air gap,

l = length of the voice coil conductor,

i = amplitude of the current in the voice coil,

$\omega = 2\pi f$,

f = frequency, and

t = time

Substituting the expression for C_M of equation 2 in equation 3, the differential equation becomes

$$m\ddot{x} + r_M\dot{x} + \alpha x + \beta x^3 = F\cos\omega t \qquad (4)$$

Since the mechanical resistance, r_M, is quite small compared to the mechanical reactance, save over a very narrow frequency range near the resonance frequency, we can write equation 4 as follows,

$$m\ddot{x} + \alpha x + \beta x^3 = F\cos\omega t \qquad (5)$$

A number of investigators have obtained an approximate solution of this differential equation.

If β is considered to be small, the relation

$$\omega^2 = \frac{\alpha}{m} + \frac{3/4\beta A^2}{m} - \frac{F}{Am} \qquad (6)$$

between the arbitrary amplitude A and ω may be obtained.

An approximate solution of the differential equation is

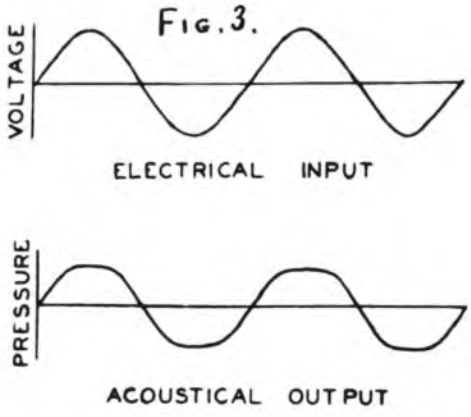
$$x = A\cos\omega t + \frac{1}{32}\,\frac{\beta A^3}{\alpha + 3/4\beta A^2 - \frac{F}{A}}\cos 3\omega t \qquad (7)$$

The sections which follow will show that these equations predict the performance of a loud speaker with a nonlinear cone suspension system.

Nonlinear Distortion Characteristics

The well-known experimental result of a nonlinear cone suspension system is the production of odd-order harmonics when a sinuoidal input is applied to the loud speaker. The wave shape under these conditions is shown in Fig. 3. The third harmonic is the preponderent distortion component. Equation 7 shows that a third harmonic term is introduced due to the suspension system. In the case of a direct

FIG. 3.



radiator loud speaker, the amplitude is inversely proportional to the square of the frequency for constant sound power output in the frequency region below the frequency of ultimate resistance. Consequently, the greatest distortion will occur at the low-frequency end of the frequency range as shown by a typical experimental nonlinear distortion-frequency characteristic of Fig. 4.

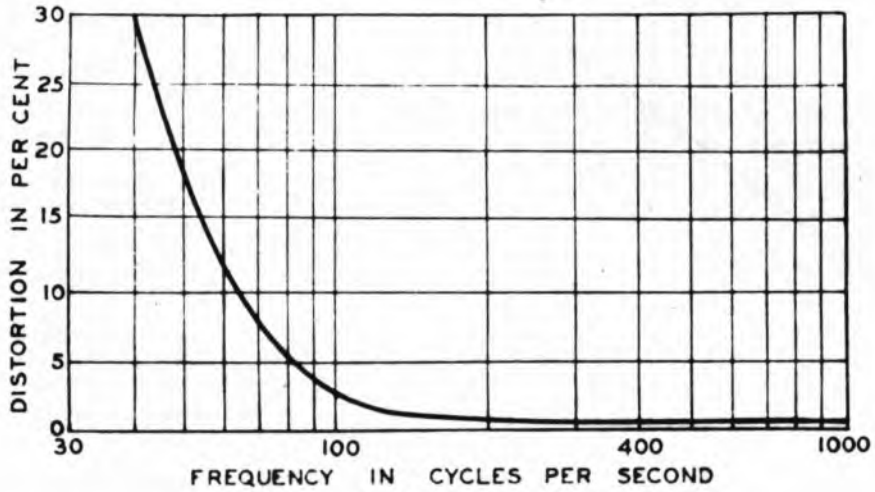
The manifestation and effect of this type of distortion upon the reproduction of sound is well known. It occurs in all amplifiers as well as loud speakers. As a matter of fact, it is more troublesome in amplifiers because the distortion occurs over the entire audio-frequency range whereas the distortion is confined to the low-frequency range in loud speakers.

tect. Careful experimental investigations have shown the existence of subharmonics due to a nonlinear cone suspension system as predicted theoretically.

Response-Frequency Characteristics

The velocity-frequency characteristic of a loud speaker with a nonlinear suspension system

Fig. 4.



In the above considerations, the distortion produced by the nonlinear element comprises harmonics of the fundamental. Distortion components with frequencies of 1/2, 1/3, 1/4--1/n of the frequency of the applied force occur in nonlinear systems. Those familiar with the performance of loud speakers have noticed the production of subharmonics. In general, these are more pronounced in the mid-frequency range. In the mid-frequency range the subharmonics are due to the nonlinear properties of the cone. Particular solutions of equation 3 have been obtained which show that subharmonics are possible in a loud speaker with a nonlinear cone suspension system. As pointed out above, the amplitude of the cone of a direct radiator loud speaker is inversely proportional to the frequency for constant sound output. The large amplitudes are confined to the low-frequency range. Therefore, the subharmonics will be of a very low frequency and difficult to de-

may be obtained rrom the equations 3 and 4. A typical theoretical velocity characteristic is shown in Fig. 5. In this analysis the mechanical resistance has been assumed to be zero. By analogy with the response curve in the linear case with damping, one would expect the curve to be rounded off at the peak as shown in Fig. 6.

Fig. 5.

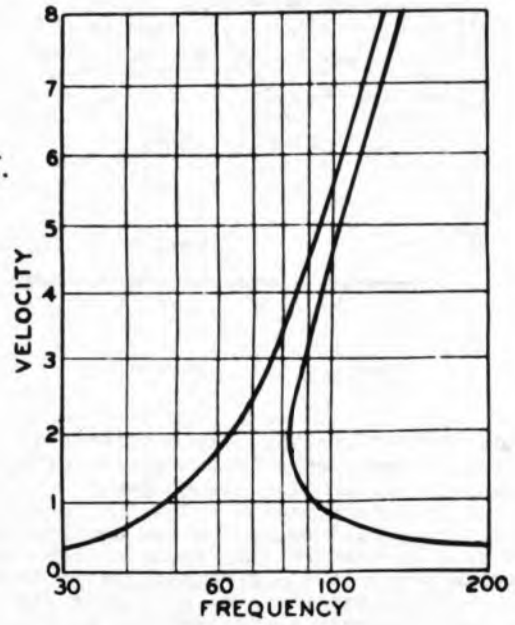
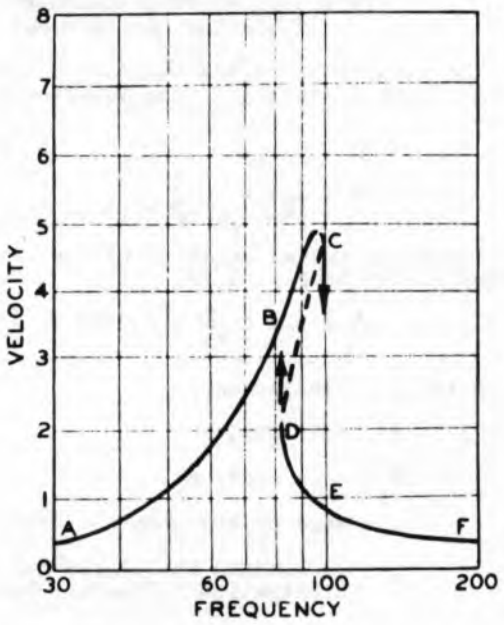
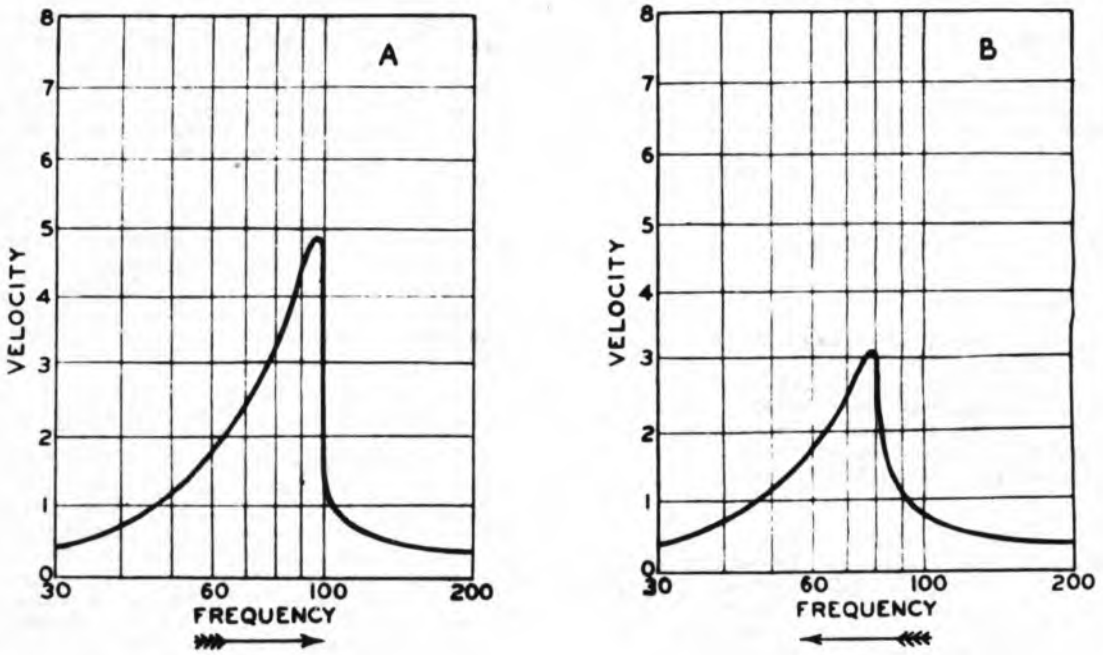


Fig. 6.



Suppose that we apply constant current to the voice coil of the loud speaker and start at a low frequency A-Fig. 6. Then as we increase the frequency, the velocity increases steadily to the point C. At this point the velocity drops suddenly in a jump to point E. From point E on, the velocity steadily decreases. Suppose that we now start at F and decrease the frequency. The velocity steadily increases to the point D. At point D the velocity suddenly jumps to the point B. From point B on the velocity steadily decreases.

Fig. 7. Experimental response-frequency characteristics of a direct radiator loud speaker with a nonlinear suspension system having a force-displacement characteristic as depicted in Fig. 2. A. The response for an applied alternating voltage which continously increases in frequency. B. The response for an applied alternating voltage which continuously decreases in frequency.



Typical experimental velocity-frequency characteristics are shown in Fig. 7. The velocity-frequency characteristic for an increase in frequency is shown in Fig. 7A. The velocity-frequency characteristic for a decrease in frequency is shown in Fig. 7B. These characteristics are quite similar to the theoretical characteristic of Fig. 6.

Subjective Aspects of Sound Reproduction by a Loud Speaker with a Nonlinear Cone Suspension System

The principle source of distortion due to a nonlinear suspension system occurs in small table model and personal receivers, because in these receivers a relatively small cone is driven through relatively large amplitudes. Furthermore, to prevent damage to the cone and voice coil assembly, the suspension is designed so that the amplitude of the cone is limited. When these systems reproduce speech and music at high levels, nonlinear distortion of the ordinary overload type is produced. There is, in addition, a peculiar type of distortion due to instability of the vibrating system. When a signal of varying frequency, which includes the unstable frequency region, is applied to the loud speaker, extraneous frequoncies are produced. The extraneous frequencies are manifested as grunting sounds. The loud speaker jumps from one stable characteristic to the other with the production of the extraneous sound or distortion during the transition period.

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N O T I C E

All Men Subject To

SELECTIVE SERVICE

Selective Service regulations and procedures have been subject to rapid change during the past several months; there are likely to be further changes in the near future. It is important, therefore, that you keep Mr. Hurford fully advised of any notification or reclassification which you may receive from your Local Board.

RED CROSS BLOOD BANK

In the last issue of the News the call went out for members of the Laboratories to serve as blood donors during a visit of the Red Cross Mobile Blood Bank in Princeton on April 25-26-27. We are pleased to announce that the Laboratories quota of sixty donors was quickly filled by the following individuals:

Allen, H.C.	Grosdoff, I.E.	Parfian, W.
Anderson, A.E.	Harvey, R.L.	Patterson, J.M.
Arleth, G.A.	Hershberger, W.D.	Peyton, P.B.Jr.
Ballard, R.C.	Howarth, W.J.	Ringeisen, C.O.
Benson, C.J.	Hurford, C.A.	Rodweller, J.E.
Burtner, R.L.	Kaufmann, K.G.B.	Rudnick, P.
Cole, B.R.	Kawalek, F.D.	Rzesutek, A.S.
Cope, D.A.	Kraus, L.F.	Scharf, P.B.
Cutinelle, R.J.	Kurshan, J.	Smith, B.M.
DeVore, H.B.	Law, H.B.	Smith, P.T.
Dukelow, R.A.	Legrum, R.B.	Solomon, L.E.
Epstein, D.W.	Lewis, G.S. Jr.	Sprachman, H.
Ferrara, L.	Luck, D.G.C.	Thalner, R.R.
Ferris, W.R.	Madden, R.C.	Vanderbilt, W.E.
Fisher, H.G.	McGarry, B.	Wentworth, C.
Flauss, H.C.	Martinelli, C.C.	Werner, G.F.
Gordon, A.R.	Meneely, A.	Wilkinson, W.C.
Gottier, T.L.	Metz, E.N.	Woodward, J.G.
Greenough, L.M.	Mueller, C.W.	Wright, R.R.
Greig, H.G.	O'Neill, J.J.	Zoda, W.J.

RATIONING INFORMATION

Even though periodic tire examinations are no longer required, we have been advised by the Office of Price Administration that it is still necessary to carry the Tire Inspection Record, and to present it in connection with applications for gasoline and tires.

The Tire Inspection Record will continue to be utilized in connection with the following:

1. It must accompany applications for supplemental (B and C passenger car rations), fleet, special or official rations. The Board will inscribe on the Record the class, serial number and date of issuance of the ration.

2. When application is made for replacement of tires, the applicant must first have his tires inspected by an official OPA Tire Inspection Station and the inspection certified on the Tire Inspection Record. The applicant must then submit the Tire Inspection Record to the rationing board together with the application.

3. When "A" books are renewed, the Tire Inspection Record must accompany the application for renewal.

SOFTBALL

"Take Me Out to the Ball Game" became the popular cry when play started on the new softball diamond. Thus far most of the ball playing has been during the noon hour, but it is planned to organize after-hours games as the season progresses. Needless to say, major league scouts were "conspicuous by their absence" at the first few work-outs of the local sluggers.

The Laboratories have been invited to enter a team in the Princeton Softball League and this will be done if enough interested players can be found to field a team. League play will probably be every Wednesday night and interested players are requested to contact the Personnel Office.

MODEL SHOP VICTORS IN SOFTBALL OPENER

The lid was lifted on the Softball Season with the Guards playing the Model Shop on May 18th. After seven innings of bruising action the Model Shop emerged the victor by a 10 to 2 count. Slugging honors for the Model Shop went to Carpenter with 3 singles and Zoda, Bernath, Zimmer, and Jones with two hits apiece. Chief Maher carried the brunt of the Guard's attack at bat by garnering 2 of the 5 hits the Guards collected off opposing hurler Bud Morris. Corio of the Model Shop played a stellar defensive game at shortstop, and Thompson (Model Shop) and Rodweller (Guards) made sensational catches in the field. Rumor has it that Rodweller was using glue in his glove at the time of his breath-taking catch.

The Chief had few alibis in losing except to say that the sun was bad - he dropped 3 fly balls (but caught 5)- his men were not in condition, the Shop wouldn't allow them sufficient practice time, the field was slippery (fell twice fielding flies) and the umpiring was bad. (The umpire was Mr. Hurford).

QUOITS

The quoit and horseshoe courts are receiving heavy play this year during the noon hour. As the season progresses and the players reach their peak of skill, it is planned to have singles and doubles tournaments. Last year team matches were arranged with Walker-Gordon and it is hoped that similar matches may be held this year. Chief Maher deserves a vote of thanks for developing this sport and keeping it active.

VICTORY GARDENS

The Victory Gardeners are off to a good start and will soon be reaping the benefits of their labors. This year two hundred plots twenty-five feet square were assigned to gardeners. A few plots have not been planted as yet and as a result are becoming infested with weeds. If you have a plot, but do not plan to use it, please notify the Personnel Office immediately.

The success of your garden and other gardens near you, will depend largely on how well you FIGHT THE BUGS!

If there are holes in your bean leaves, the Mexican Bean Beetle is getting busy. Mature beetles resemble lady bugs but are

slightly larger and are a dull yellowish orange color with eight black dots on each wing. To destroy, dust underside of leaves thoroughly with a ROTENONE preparation. This is not poisonous to man or pets.

Tomatoes, peppers, eggplant, turnips and cabbage are sometime attacked by flea beetles (small, black and jumping). Dust with Rotenone or with Bordeaux.

Cabbages are usually attacked by smooth dark green worms which chew large holes in the leaves. Sometimes soapy water destroys them, or they may be picked off by hand and stepped on. Rotenone, arsenate of lead or cryolite are the recommended remedies. (The lead and cryolite are poisonous to man).

MOVIES

Due to warm weather the Friday noon movies will be discontinued following the May 26th showing. Over a hundred individuals have been attending the showings each week, and it is planned to resume the activity with the advent of cooler weather.

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LIBRARY INFORMATION

RECENT BOOKS IN LIBRARY

Infrared Spectroscopy. R. B. Barnes, New York, Reinhold, 1944.

Materials Handbook. G. Brady, 5th Edition, New York, McGraw, 1944.

The Theory of Emulsions and Their Technical Treatment. W. Clayton, Philadelphia, Blakiston, 1943.

Modern Aspects of Inorganic Chemistry. H. J. Emeleus, New York, Van Nostrand, 1943.

A Course in Inorganic Preparations, W. E. Henderson, New York, McGraw, 1935.

Mathematical Tables Project. Table of the Bessel Functions J_0Z and J_1Z for Complex Arguments. New York, Columbia, 1943.

Our library recently added the JOURNAL OF THE BRITISH INSTITUTE OF RADIO ENGINEERS to the current periodical subscription list.

Another addition is a Recordak microfilm reader with an 18 x 18-inch translucent screen for reading the 16-mm. and 35-mm. films of books, periodicals and notebooks which the library has on file.

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BIMONTHLY NEWS.

LECTURES BY RCA LABORATORIES TECHNICAL STAFF

Before the I.R.E. in Philadelphia by J. Hillier on "Electronics in the Microscopic World" - May 4, 1944.

Before the American Bacteriological Society by V. K. Zworykin and J. Hillier, a joint paper with Perry C. Smith of Camden, on "Electron Microscopy in the Field of Bacteriology" - May 5, 1944.

Before the American Chemical Society at New Brunswick by G. H. Brown on "Accelerated Heat Treatment of Metals and Dielectrics by R-F Currents" - May 10, 1944.

Before the two-day meeting of the Acoustical Society of America in New York by H. F. Olson on "The Action of a Direct Radiator Loud Speaker with a Nonlinear Cone Suspension System" - May 13, 1944.

Before the Canadian Chemical Conference and Exhibition at Toronto by J. Hillier on "Electron Microscopy" - June 6, 1944.

RCA TUBE PLANT AT LANCASTER, PA. RECEIVES ARMY-NAVY "E" FLAG FOR OUTSTANDING WAR PRODUCTION

Under Secretary of War Robert P. Patterson notified the Radio Corporation of America that the RCA Victor Division plant at Lancaster, Penn., was awarded an Army-Navy "E" Flag for "great accomplishment in the production of war equipment." Presentation ceremonies were held on April 24 at the Lancaster plant, which has been in operation only a year and four months, manufacturing electron tubes.

RCA RADIO STATION IN ITALY SPEEDS WAR NEWS TO AMERICA

Difficulties in transmitting war news - ofttimes a plague to press correspondents - have been overcome on the Italian front by the first American wholly-owned commercial radio station on the continent of Europe.

Reports reaching offices of RCA Communications, Inc., in New York, tell of a remarkable feat in which engineers of the company installed the station from scratch in less than one month and now are flashing on-the-spot news accounts at a rate as high as 240 words a minute. Transmission of news copy to the United States has mounted steadily since the station opened on February 1. The daily capacity of the station exceeds 75,000 words.

During its first month of operation, the RCA station transmitted more than 800,000 words to the United States and received some 150,000 words. Included in the two-way file were Expeditionary Force Messages -- "EFM's" -- the messages carried for military and naval per-

sonnel and their families in prepared texts at a cost of only 60 cents each.

In addition, the RCA station, which was installed and placed in operation at the request and with the cooperation of the U. S. War Department to relieve military communication channels, handles news broadcasts by correspondents of American radio networks and programs of the Armed Forces.

The radio-beamed news copy travels directly across 4,300 miles of land and water to the RCAC receiving central at Riverhead, Long Island, and goes automatically by land lines to the company offices at 66 Broad Street, New York. This service, in the opinion of new authorities, is superior to that in any other theater of operations.

SHOP PRACTICE COMMITTEE

The RCA Victor Shop Practice Committee met at these Laboratories April 25th and 26th for their monthly conference. This meeting happened to be the first anniversary of the establishment of this Committee. The following members attended the meeting:

CAMDEN

M. S. Gokhale.....Standardizing
L. H. Davis.....Instruments and Standard Parts Eng.
A. Blain.....Assembly Process
E. Kerbaugh.....Component Parts Process
R. Schmicker.....Parts Process
C. H. Roth.....Parts Fabrication Process
F. C. Blancha.....Communication and Instrument Eng.
J. H. Thaidigsman.....Inspection

INDIANAPOLIS

E. Williams.....Standardizing
J. Hoehn.....Sound Engineering
B. Phillips.....Parts Process
L. Schock.....Inspection
G. T. Butzke.....Assembly Process

IMPROVED TERMINALS AVAILABLE

Considerable difficulty has been experienced with the use of terminal K844396 in that the prongs break off during soldering. These terminals will no longer be available and are being replaced by K884148 and 884624. See display in Model Shop Stock Room.

Personals

The new picnic tables in the orchard were put to very good use at noon on Monday, May 15th when the girls of RCA Laboratories held a picnic in honor of Mary V. DiDomenico who is returning to Camden. During the lunch Mary was presented with a token of esteem by her friends. We will all miss her. Good luck to you in your new job, Mary.

On May 4th, RCA Laboratories lost their most accomplished cartoonist - "Sugar" Dornfeld. However, we lost him for a good cause. He is now a member of the United States Maritime Service. He'd be very happy to receive mail from the friends he left behind. For their benefit we print his address:

A. C. Dornfeld
U. S. Maritime Service Training Station,
Sheepshead Bay
Brooklyn 29, New York
Section 175

Mr. Dornfeld, also noted for his culinary ability, spent one of his first days in training doing (of all things) K.P! He'll make somebody a good husband!!

While we were sorry to lose Karl Kaufmann - another budding young draftsman - we have lost him to a good cause, namely the U. S. Navy. Karl was inducted on May 18th after passing a test qualifying him to enter radio technician's school. We do not have his address yet, but it will appear in our next issue of RCA Laboratories News.

How come the girls in the Laboratories permitted these two eligibles to leave without a "promise"?

Pvt. Ruth D. Tams, wife of Mr. T. T. Tams of our Purchasing Department, became a member of the Women's Army Corps on April 19, 1944. She is at present stationed at Ft. Oglethorpe, Georgia for her basic training.

On May 18th we were very glad to have a visit from Eddie Creager (remember him from the Drafting Room). Ed, who is a Navy Flying Cadet, has been stationed at U. S. Navy Pre-Flight School, Chapel Hill, North Carolina and is now enroute to Naval Air Station, Glenview, Ill. for further training.

We were surprised on the 20th of May by another visitor from those in the service. Remember Jimmie Chamberlain who used to work in our cafeteria? He is now serving with the Merchant Marine and is in training at Sheepshead Bay. From his appearance, we'd say that the life agrees with him. And speaking of coincidence, he served "Sugar" Dornfeld his first meal in the Service!

Kay McGuinness, formerly of Accounting, came back on May 20th to spend the morning with her former co-workers. She looked very well in the smart green summer uniform of the Marine Corps. Kay says she is having a wonderful time and while she visited with us, she did her best to gather some new recruits for her organization. In her spare time she has been working hard helping the farmers of Virginia with the crops. Will someone tell us how such a small person can accomplish so much?

Friends who are interested in writing to Kay may wish to have her address:

Pfc. Katherine McGuinness
U. S. M. C. Co. E.
Barracks 3
Henderson Hall
Arlington, Virginia

The Model Shop has a mascot for their "crack" baseball team - Miss Corio. She is their official bat girl and substitute player.

Miss Madeline Murphy, Secretary to Mr. Seeley of the Industry Service Division in New York, has recently become the recipient of a beautiful diamond ring. No date has been set for her wedding to Mr. James Wakeman of Old Greenwich, Connecticut.

Additions

A. J. Neumann - Research
Gertrude M. Ellsworth - Photo Studio
Mildred J. Ellsworth - Model Shop
James B. Ellis - Model Shop
Dorothy L. Rosenberg - Research
Mrs. Florence R. Moran - Research
Michael J. Fichera - Model Shop
Arthur E. Hollander - Drafting

H. A. Calladine is transferring from our Model Shop to the Industrial Engineering Department at the Camden plant.

Birthdays

Rose Stazitian - May 5
Adell Rzesutek - May 8

Some of the girls had a surprise birthday cake for Rose at lunch.

Adell wasn't as fortunate - she had to make her own cake, but it sure did taste good!

Births

Dr. and Mrs. Albert Rose announce the birth of a daughter - Jane Susan - on April 29, 1944.

Mrs. Winogene Kaser, previously a member of our laboratory staff, had a baby girl on April 28th. The baby's name is Sharon Lynne Kaser.

From the Industry Service Division comes the news that the Earl Schoenfelds, of Mamaroneck, New York, have announced the birth of an 8 pound son, Eric Thurston, on April 12, 1944, at 6:30 a.m.

Deaths

We learn with deep regret of the death of Mrs. Elizabeth Greswold, wife of Forrest Greswold, (Drafting) on May 6. Our sympathy goes to the bereaved family.

Our sympathy is extended to Mr. J. R. Hogarty of our guards, whose mother passed away on Wednesday, May 3. She lived in Princeton, N.J.

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PATENT DEPARTMENT INFORMATION

Patent Disclosure Forms

New Patent Disclosure forms are now available for use in submitting disclosures of inventions. Attention is called to the space provided for noting Government contract information. When submitting disclosures the contract information should be furnished.

PATENTS RECENTLY ISSUED TO RCA

March 7

Gillespie, H.C.	2,343,453	Electrical heating apparatus
Herzog, C.	2,343,457	Metal envelope radio tube
Kellogg, E.W.	2,343,674	Sound recording
Nixon, G.M.	2,343,471	Binaural translating system

March 14

Del Valle, G.A.	2,343,961	Film take-up
Finch, J.L.	2,344,238	Compressed fluid condenser
Finch, J.L.	2,344,239	Electric Condenser

March 21

Crosby, M.G.	2,344,678	Frequency divider network
Crosby, M.G.	2,344,679	Beam phase detector
Elliott, C.I.	2,344,857	Tube carton
Fredendall, G.L.) Schroeder, A.C.)	2,344,810	Synchronization of deflecting circuits
Goldstine, H.E.	2,344,813	Radio repeater
Hollingsworth, R.L.	2,344,697	Noise reduction system
Hunt, S.	2,344,699	Amplitude modulation limiter circuit
Koch, W.R.	2,344,618	Radio air raid warning system
Preisman, A.	2,344,727	Amplifying system
Rankin, J.A.	2,344,731	Detected frequency modulated wave amplifier
Roberts, W.V.B.	2,344,734	Neutralizing circuit
Rosencrans, C.A.	2,344,641	Radio frequency wattmeter
Schade, O.H.	2,344,736	Television transmitting system
Sherman, J.B.	2,344,741	Tunable high frequency circuits
Somers, F.J.	2,344,745	Electrical circuit
Swanson, H.T.	2,344,906	Carbonizing metals

March 28

Crosby, M.G.	2,345,101	Frequency modulator
Goldsmith, A.N.	2,345,472	Remote control system
Monack, A.J.	2,345,278	Sealing glass to iron
Morton, G.A.) Flory, L.E.)	2,345,282	Television pickup tube
Thomas, H.E.	2,345,511	Regenerative detector circuit

April 4

Anderson, L.J.	2,345,996	Signal translating apparatus

Gillespie, C.N.	2,346,020	Modulation amplifier and modulator
Guedon, E.C.	2,346,071	Phonographic apparatus
Martinelli, C.C.	2,345,762	Noise limiter circuit
Smith, J.E.	2,345,951	Radio relay control system
Tolson, W.A.	2,346,093	Sonic depth indicator

April 11

Conklin, J.W.	2,346,557	Direct current restoring apparatus
Rettinger, M.E.	2,346,394	Sound pickup apparatus
Rettinger, M.E.	2,346,395	Sound pickup device
Rider, J.F.	2,346,396	Oscillator for sine waves and square waves
Roberts, W.V.B.	2,346,311	Combined oscillator and reactance tube

April 18

Cooney, J.R.	2,347,084	Noiseless sound system
Usselman, G.L.	2,346,800	Wave length modulator
Vance, A.W.	2,347,008	Electrical circuits

April 25

Crosby, M.G.	2,347,398	Modulation system
Linder, E.G.	2,347,577	Resonant cavity oscillator
Marton, L.	2,347,328	Electron microscope
Young, C.J.	2,347,348	Electron microscope object chamber

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RCA

VOL. I. AUGUST 1944 NO. 5

RCA LABORATORIES NEWS

ARMY-NAVY E AWARD

WE WIN SECOND RENEWAL WITH *TWO STARS*

DEPARTMENT OF THE NAVY
OFFICE OF THE UNDER SECRETARY
WASHINGTON

14 June 1944

Mr. O. S. Schairer, Vice President
in Charge
RCA Laboratories
Division of Radio Corporation of America
Princeton, New Jersey

Dear Mr. Schairer:

It is a pleasure to inform you that the Navy Board for Production Awards has granted the RCA Laboratories, Division of Radio Corporation of America at Princeton, New Jersey a second renewal of the Army-Navy "E" Award for meritorious service on the production front.

The men and women of your plant have continued to maintain the high standards they set for themselves when they were originally awarded the Army-Navy "E". They may well be proud of their achievement.

There is being forwarded to you a new pennant with two stars affixed, which should be received in the near future.

The additional white star, which the renewal adds to your Army-Navy "E" flag, is the symbol of appreciation from our Armed Forces for your continued untiring effort and support so necessary for victory.

Sincerely yours,

C. C. BLOCH
Admiral, USN (Ret.)
Chairman, Navy Board for Production Awards

RADIO CORPORATION OF AMERICA
PRINCETON N.J.

RCA LABORATORIES NEWS

ED. DICKEY - EDITOR

AN ELECTRONIC METHOD FOR AUTOMATIC CONTROL OF STILLS*

By

R.E. Shrader and E.J. Wood

Some of the vital materials used in the field of electronics such as phosphors, photosensitive and electron emitting materials are of the impurity-sensitive type; that is, the presence of one part in a million of a given impurity may alter some specific property of the bulk material by several orders of magnitude. It follows that any chemical research concerned with such materials will require reagents of the highest purity. Since water is used in large quantities for almost all chemical manipulations, it is essential that a sufficient supply of very pure water be available. Generally, three distillations, the last two being made in all-Pyrex stills, will serve to produce water suitable for most uses. Our requirement of approximately ten gallons per day of double-distilled water and five gallons per day of triple-distilled water makes it desirable that some sort of continous system be employed which will operate with very little attention.

In the system being described, the primary distillation takes place in a conventional commercial still which feeds its product into a large glass-lined storage tank. From there the water is fed by gravity to the second stage of distillation. The second and third distillations are carried out in all-Pyrex stills, completely protected against air-borne dust. The stills are connected in series, the first being run at a rate approximately twice that of the second. Thus, the first Pyrex still may deliver water directly to the boiling flask of the second, and the excess beyond that required to maintain a constant level passes through an overflow to double-distilled water storage. The second Pyrex still delivers directly to triple-distilled water storage. Two such combinations are in use with a fifth still arranged to augment the double-distilled water production whenever it becomes necessary.

The problem of automatic control comprises two phases: control of the heater current, and control of the water level in the boiling flasks. As the heater power never exceeds seven kilowatts at 110 volts, an ordinary magnetic switch is capable of controlling the current. Control of the water level, however, is a more difficult matter. To meet the requirements of an all-Pyrex system well protected against air-borne contaminants, a special type of valve and level indicator is required.

An electromagnetic valve# constructed as shown in Fig. 1 proved completely satisfactory. The valve is of the vertical-lift type utilizing a spherical, ground-glass joint as seat and plunger. A soft-iron, laminated core is sealed inside the glass stem which extends into the center of the surrounding solenoid. Energization of the solenoid lifts the plunger permitting water to flow; when no current is flowing through the solenoid the weight of the core and stem is sufficient to close the valve.

An attempt to use a glass float and mechanically operated level control proved very unsatisfactory. This method was unreliable and made it difficult to provide suitable enclosure. Various electronic methods of control were considered - photoelectric cells, radio-frequency devices, and conductivity circuits. The latter seemed to offer the simplest approach. Although the Pyrex stills are fed with single-distilled water, which has a very low conductivity, it was felt that a sensitive relay might be employed which would operate under these conditions. A commercially available relay of the hard-tube type was tried and although it could be made to operate on the low currents available, it was not suitable for reliable, continuous operation because of the need for constant readjustment. It was felt that a more positive relay making use of a gas tube could be constructed.

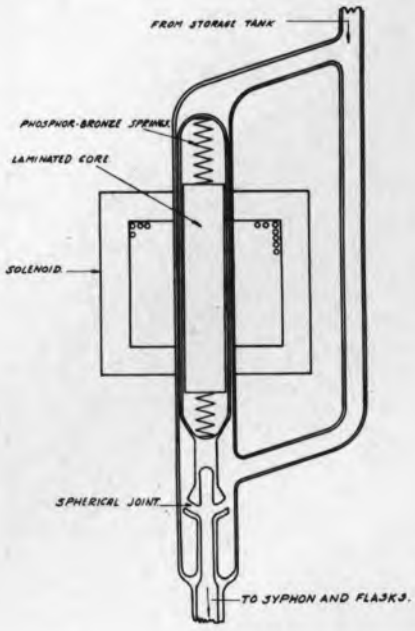

Fig. 1.

The action of the relay finally put in use (Fig. 2) is quite simple. The gas tetrode is maintained non-conducting during the positive swing of the plate by applying to the grid the negative swing from the filament supply winding of the transformer. The phase is advanced slightly by the capacity coupling to the potentiometer in order to compensate for the lag introduced by the

*This article is planned to appear in "Electronics" in an early issue.

#The electromagnetic valve, control cell, and reservoir feed system were designed by Mr. Ralph H. Plumlee.

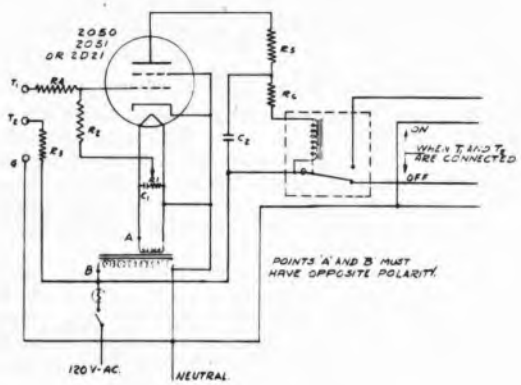

Fig. 2.

transformer. The exact amount of phase advance required will be determined by the individual transformer characteristics.

Tripping of the relay is accomplished by imposing on the grid a sufficiently large voltage in phase with the line (or plate) voltage. This occurs when T_1 and T_2 are connected together. The resistance of this connection may be as high as 60 megohms. The protective resistors R_3 and R_4 may be increased up to twice the values indicated in Fig. 2. The optimum value is determined by the current requirements of the controlling element, and its maximum resistance. In any event, the sensitivity is influenced by the potentiometer (R_1, Fig. 2) setting. With the potentiometer set for maximum bias, the control element is closed; should the gas tetrode fail to conduct, the bias is reduced until conduction does take place. In the event that the tetrode conducts with the control circuit open and with the potentiometer set for maximum bias, the value of C_1 should be increased. The shield for the lead connecting the grid and the control element has been found necessary in applications where considerable sensitivity is required.

The circuit described has the usual advantage over similar hard-tube circuits in that the gas tetrode will close the relay with no uncertainty if it closes it at all, regardless of some abnormal behavior of the control element. The relay circuit described has been in operation without a single failure for nearly one year. No adjustments beyond those made during the original installation have been required.

In any particular application, better performance may be obtained by connecting the grid lead to one side of the control element rather than to the other. The control element used in the present application (Fig. 3) consists of a tubular cell with two platinum electrodes extending down to the level which determines the minimum level of the water in the boiling flasks. It has been found advantageous to set the electrodes at slightly different levels with the grid connected to the higher one. Electrolysis in the control cell has produced no difficulties, probably due to the use of AC in the control circuit and the exceedingly small currents flowing.

A schematic diagram of the complete system is shown in Fig. 3. The solenoid valve is placed in the water line leading from the single-distilled water storage tank to the reservoir and control cell. The reservoir was added in order to lengthen the period between successive operations of the system; since it is the minimum level that requires control rather than the maximum level it is preferable that water be added in relatively large amounts at infrequent intervals rather than in small amounts at frequent intervals. The amount added is controlled by the self-starting siphon in the reservoir and by the rate of flow from the reservoir to the control cell. By partially filling the connecting tube with glass wool the rate of flow may be adjusted to the point where the reservoir fills just as the water level in the control cell reaches the electrodes and closes the valve. The glass wool restriction also serves to damp out level fluctuations due to the boiling action as the water level approaches the operating point.

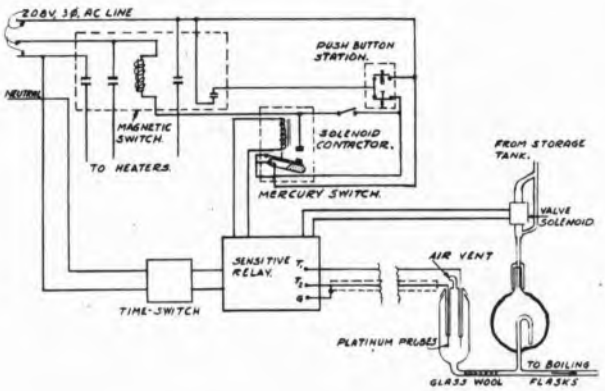

Fig. 3.

The sensitive relay controls simultaneously the valve and heater circuits, opening the valve and turning off the heaters whenever the system calls for water. Thus, in the event that the single-distilled water tank becomes empty, or the valve fails to open, or any other condition prevents the normal supply of water, the still heaters are shut off. Similarly, most failures in the sensitive relay itself will result in opening both the heater and the valve circuits, thus effectively turning off the stills. By inserting a time-clock switch in the line side of the sensitive relay circuit the system may be set to operate automatically for a predetermined time.

The heater system as installed originally was provided with a three-phase magnetic switch operated from the usual "off-on" push-button station. To give the sensitive relay control of the magnetic switch with a minimum amount of rewiring, and to retain the original push-button station, a simulated push-button station, relay operated, was devised. This consists of a solenoid contactor in combination with a mercury switch. The mercury switch is fixed to the armature in such a position that the closing of the contactor causes the mercury to flow toward the end of the tube into which the contacts are sealed; however, the closed position of the contactor is such that the globule of mercury does not remain across the contacts; closing of the circuit is dependent upon the inertia of the moving globule carrying it past the equilibrium position to make momentary contact before returning to the position of rest. This action simulates the pushing of the "on" button. Release of the armature on signal from the sensitive relay is equivalent to pushing the "off" button.

In addition to its use in the still system, the sensitive relay described has been found ideal for use with sensitive thermo-regulators whose precision depends upon the maintainance of clean contactors. The exceedingly small currents drawn by the sensitive relay enable its use for long periods of time with mercury thermoregulators.

PERSONNEL INFORMATION

GASOLINE RATIONING

Immediate review of all outstanding "B" supplemental gasoline rations in the seven-county Trenton Office of Price Administration districts has been ordered by E. M. Reidmiller, rationing executive for the district. Local Boards have been directed to deny renewals unless applicants prove they are participating in a ride sharing plan or have at least three riders. Applications of those who have access to public transportation will also be closely investigated before supplemental gasoline is issued.

In view of this recent tightening of gasoline restrictions, the Transportation Committee requests that all members of the Laboratories make every possible effort to work out a car sharing plan or to obtain riders before applying for supplemental gasoline. The Personnel Office has complete transportation files and is available to give assistance in working out transportation problems.

GENERAL

On June 29 and July 7 special Fifth War Loan films were shown in the Television Studio during the noon hour. The pictures depicted invasion landings and preparations for such landings.

VICTORY GARDENS

A number of employees of the Laboratories have requested that hose be provided for the victory gardens. Now that the water situation has improved, the hose have been made available to the victory gardeners. The issuing of the hose was delayed due to difficulties encountered in maintaining an adequate water supply. Victory gardeners are requested to water their gardens in the evening rather than during the noon hour. This is important because peak period for the use of water is between the hours of 1:00 and 3:00 P.M.

Work is nearing completion on the new pre-fabricated house erected adjacent to the present victory garden tool house. This house will be equipped with wash room facilities, and the same facilities are also being added to the present tool house. An announcement will be made at a later date as to when the houses will be completed and ready for use.

ATHLETICS AND RECREATIONAL ACTIVITIES

A number of soft-ball games were played by Laboratories teams during the past month. On June 7, RCA played the Heyden Chemical Company with Heyden emerging the victor by a 5-4 score. On June 24 the Model Shop played the Office-Engineering team with the Model Shop winning 10-9 The Model Shop played the Walker-Gordon Farms on July 5, and Walker-Gordon was the victor by a 10-3 score. It is planned to continue the soft-ball games on Wednesday and Friday evenings throughout the summer months.

A croquet set has been purchased and is available for individuals who are interested in this sport. The set is presently being kept at the gate house and is available for any group wishing to play croquet during the noon hour.

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LIBRARY INFORMATION

Some Recent Articles in the Library

Cross-prism Investigation of Fluorescence. F.E. Germann and R. Woodriff, Review of Scientific Instruments, June, 1944.

Planning Tomorrow's Electronic Highways. W.R.G. Baker, General Electric Review, June, 1944.

Knowledge of Shrinkage Aids in Design of Plastic Parts. C.R. Simmons, Product Engineering, June, 1944.

U.H.F. and Post-war Broadcasting. K.I. Jones and D.A. Bell. Journal of the Television Society, V. 4, No. 1, 1944.

Mutual and Self-impedance for Coupled Antennas. R. King and C.W. Harrison, Journal of Applied Physics, June, 1944.

Quartz Crystals-development and Application. S.A. Bokovay, Electrical Communication, V. 21, No. 4, 1944.

Some Phase Effects with Coincidence Proportional Counters. C.L. Meaker and A. Roberts, Review of Scientific Instruments, June, 1944.

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CERTIFICATE OF APPRECIATION AWARDED TO DR. H. H. BEVERAGE BY CHIEF SIGNAL OFFICER OF U. S. ARMY

Early in June it was announced publicly by Major General Harry C. Ingles that the Army Certificate of Appreciation had been awarded to Dr. H. H. Beverage, Associate Research Director of RCA Laboratories, by the Chief Signal Officer of the U.S. Army.

This award was made because of the work of Dr. Beverage and his organization when they assisted the Signal Corps in the Construction of a transatlantic radio teletype system for the Air Forces, over the Arctic Circle route.

At the time Dr. Beverage's assistance was solicited, great difficulties were being encountered by the Army Air Forces in getting airplanes to England because of frequent failures of the essential communications system. Because of his long communications experience Dr. Beverage was able to solve the difficulties by suggesting an entirely different range of frequencies, to meet the peculiar characteristics of radio circuits in that part of the world. He and his associates were also able to suggest, and to help set up and place in service, specific types of equipment, particularly antennas, to meet the rigorous conditions in the Arctic and to provide improved results.

The fundamental knowledge used in this instance had resulted from work done during and soon after the first World War. It was knowledge which had been almost lost from the radio art, and of a type that comes only with experience.

The great superiority of Allied Air Forces in Europe is in no small measure made possible by this contribution which has just received official recognition.

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FIFTH WAR LOAN DRIVE

During the period of the drive - June 12 to July 8 - the purchases by RCA Laboratories employees in the Princeton area were as follows:

Through regular payroll deduction plan $12,187.50

Through this plan there were:

172 bond purchases on June 15
181 bond purchases on June 30

During the drive there were 25 additional purchases of bonds amounting to a total purchase price of $2,100.00

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AMERICAN EXPRESS COMPANY MONEY ORDERS

The Accounting and Treasury Department has announced that arrangements have been made whereby American Express Company Money Orders may now be purchased from the Cashier at rates as follows-

From $0.01 to	$ 5.00	- 10 cents
From 5.01 to	25.00	- 15 cents
From 25.01 to	50.00	- 20 cents
From 50.01 to	100.00	-.25 cents

LECTURES BY RCA LABORATORIES TECHNICAL STAFF

As one of a series of lectures on Television jointly sponsored by the I.R.E. and A.I.E.E. in New York City, G. A. Morton lectured on "Electron Optics" - April 27, 1944. (Our apologies to Dr. Morton for omitting this previously).

Before a Physics Seminar at the Carnegie Institute of Technology in Pittsburgh by R. F. Baker on "Recent Developments in Electron Optics" - May 24, 1944.

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WAR PROBLEMS

In addition to the problems we are working on, the armed forces have many others in a number of different fields. Some idea of the scope of such problems may be gained from the list, which was recently issued by the National Inventors Countil, and released by the War Department. The list is reproduced below for the general interest of our readers.

1. A relatively simple gauge to measure the impulse of explosion blast, positive and negative phases to be determined separately but concurrently. It would be desirable if the duration of each phase could be determined in some simple manner.

2. A waterproofing compound for field application to nets. The compound must be susceptible of aqueous application. It must be colorless and not affect the flame-proofing or infrared reflectance of the nets. It should add as little weight as possible to the fabric, should not seriously affect the "handle" (tackiness, flexibility, etc.) of the net fabrics and should not adversely affect the tensile strength of the nets.

3. A lightweight material, other than Neoprene, Buna S or other similar rubber substitute now commonly used, which will hold air and CO_2. The material to be of noncritical materials and inexpensive.

4. A light detachable rock-drill-bit grinder for resharpening detachable bits. Capacity approximately twenty bits per hour and weighing 200 to 250 pounds.

5. Removal of dissolved mineral matter from sea water and brackish water by ionic exchange process.

6. Means of controlling fires in fighting tanks for a sufficient period of time to evacuate personnel. The process should not be injurious to personnel and should be manually controlled and operated.

7. Waterproof compound for treatment of duck used in fabrication of canvas drinking water storage tanks.

8. For field use, a simple practical and accurate method of determining moisture content of aviator's breathing oxygen.

9. A means for unloading ships by use of quickly erected tramway.

10. Means for increasing life of standard automotive or stationary engines when operated

on 91-octane fuel.

11. The use of anti-stripping agents with cut back asphalts to permit effective coating of wet aggregates.

12. Additional methods for the chemical stabilization of soil.

13. A means for removing asphalt from drums and melting to pumpable temperature on a quantity production basis.

14. A quick and effective nonbituminous dust palliative for all climates.

15. Device to maintain or indicate, within five minutes, the relation of an aerial camera to the vertical.

16. Reduction of glare from glass surfaces by durable coatings suitable for field application.

17. Optical method for determining the difference between an artificial green and a natural green.

18. Destruction and removal of obstacles to landing operations. Obstacles may be visible or concealed and may be off or on shore.

19. Short-base, wide-angle range finder readily portable and capable of being mounted on a vehicle.

20. Location and destruction of concealed enemy emplacement, pillboxes and similar strong points.

21. Methods of protecting our vehicles from the effects of enemy land mines.

22. Improvements in tank vision devices and control instruments. There is special interest in reducing space requirements and improving performance of gyroscopic compasses.

23. Ingenious and simple decoy devices for purpose of confusing and misleading enemy.

24. Technical data to strategic enemy targets such as chemical plants, explosive plants, power plants, etc.

25. A voice-transmitting gas mask which would permit the wearer's voice to be heard with clarity.

26. Clothing giving protection against falling pieces of white prosphorus.

27. Colored smokes using readily available pigments for obtaining the desired color.

28. Protective ointments to counteract vesicants.

29. Methods of generating stable artificial fogs, and methods of dispersing artificial and natural fogs.

30. Protection against flame throwers.

31. Odorless toxic agents.

32. Design of life vest which automatically inflates and turns the man on his back when he is thrown overboard by concussion and is unconscious.

32. Design of life vest which automatically inflates and turns the man on his back when he is thrown overboard by concussion and is unconscious.

33. Noiseless hand generator combined with a lightweight flashlight. The generator should be pumped at a rate of forty revolutions per minute and the light should be continuously brilliant and start on the first pump.

34. Plumb-bob type of generator to operate a light six-volt radio. Generator probably operated by a reel winding up and letting out the plumb-bob.

35. Methods of insuring CO_2 inflation of life rafts within thirty seconds' time at temperatures of minus 20 Faherenheit to minus 40 Fahrenheit.

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PERSONALS

It gives us great pleasure to report that Harwick Johnson of our laboratories staff received the degree of Ph.D. (major - Electrical Engineering; minor - Mathematics) from the University of Wisconsin in June of this year. Because of circumstances due to the war, he was unable to complete the requirements for the degree before joining RCA. By subsequent diligent effort he completed the thesis and took his examinations during his vacation this year.

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Mr. S. W. Seeley, Acting Manager of the Industry Service Division of RCA Laboratories, is conducting a course for the non-engineering members of his staff to acquaint them with the fundamental principles of radio. This course is held one night a week and those attending find it very interesting and of considerable value to them in their work.

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We take pleasure in announcing that Dr. R. E. Shrader of our laboratory staff won the Bourne cup at the Annual Handicap Tournament at the Springfield Golf Club on July 9, 1944. It is estimated that about 48 contestants took part in the elimination contests.

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Fourth of July went over with a bang for those who attended the party at the home of T. L. Maher on that date. All enjoyed swimming during the afternoon, (except perhaps the part where "Tarzan" Stonaker kept throwing the girls orf the raft and ducking them). Aside from that it was a quiet afternoon.

About five p.m. all adjourned to the house for a delicious spagetti dinner. Credit goes to Colleen - "Flash" Sampson and her committeemen (or should we say women) for the wonderful meal.

The climax of the evening came when two very polite gentlemen invited a young lady (all dressed up) for a row boat ride. Of course they waited until they reached the middle of the lake before turning the boat over. It certainly provided the perfect ending of a perfect day (for those on shore). The thanks of all present go to Mr. and Mrs. Maher for their hospitality.

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"Sugar" Dornfeld, formerly of our Drafting Department, called recently via long distance telephone and we were sorry to say "good-bye"

to him for an indefinite period. At last report he was in San Francisco, California waiting for a ship to take him on a jaunt into the Pacific. We all wish him luck and hope that we will be seeing him again soon.

Friends who are interested in writing to him may wish to have his latest address:

A. C. Dornfeld,
S-S Texas
Texas Oil Co. Marine Division
Wilmington, California

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The Navy life seems to agree with Karl Kaufmann, formerly of our Drafting Department, who visited the laboratories on June 30th. His appearance is certainly a credit to the USN. Karl seems to be thoroughly enjoying his training, now that the first hard weeks are past. His latest address is:

S 1/c, Co. 1148
U.S.N.T.C.
Great Lakes, Ill.

Pvt. Ruth D. Tams, wife of Mr. T. T. Tams of our Purchasing Department has completed her basic training at Ft. Ogelthorpe, Ga. as an Air WAC, and is now assigned to Army Air Base, New Castle, Delaware in Technical Photography Work.

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While working on the 11 p.m. - 7 a.m. shift, Guard James Hogarty of RCA, who is also Chief of the Princeton Borough Fire Department, was called by one of the guards at the Boiler House who told him that there was a fire in Princeton. Hogarty called Princeton Police several times but the line was always busy. He finally called up his wife and asked where the fire was. She informed him that it was in his back yard. He said "Stop the kidding; where is the fire?" She said "It's in your own back yard and many of the people in Princeton are here". It turned out that it was the children's play house in his back yard. The damage was not great.

Another recent fire was that in the barn of H. H. Golden of our Purchasing Department on July 4th.

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Dr. Jan A. Rajchman was married to Miss Ruth Vi Teitrick on Friday, June 30, 1944 in Philadelphia, Pa.

Ralph H. Plumlee, previously a member of our laboratories staff, was married on June first to Miss Lynnette Birdsall, formerly of California, at her residence at Westcott Road in Princeton. Mr. Plumlee is now at Ohio State University. The couple plan to make their home in Columbus, Ohio.

Ensign M. R. Richmond, formerly of our laboratories staff, was married on July 2nd to Miss Miriam Wiedman at the Ocean Parkway Jewish Center in Brooklyn, New York.

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Mr. Russell Post of the Accounting Department enjoyed a vacation trip from New York to Montreal by plane. He then took a cruise on the St. Lawrence and Saguenay Rivers.

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Mr. and Mrs. P. C. Lockard celebrated their wedding anniversary on July 6, 1944 and it was quite a happy occasion. They weren't the only ones who profited by it, so to speak, because Mrs. Lockard very generously brought in a lovely cake which she had baked herself and all the girls in the Tube Assembly Room enjoyed it very much.

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We seem to have hit a new high in war-time birthday cakes. On July 7, Miss Miriam Kurkjian (Model Shop) celebrated her birthday. She was greeted in the morning with a lovely birthday cake, consisting of one "store" doughnut with a candle in the middle. Oh well, it's the thought that counts, they always say. Congratulations, Miriam!

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ADDITIONS

Elizabeth G. Taylor - Research
S. M. Thomsen - Research
Mrs. V. B. Klockner - Technical Services
E. J. Middleton - Drafting
J. P. Valentine - Model Shop
A. S. Lewallen - Model Shop
E. Annette Hornyak - Research
G. W. Brown - Research
Mrs. Ethel G. Moonan - Research
J. E. Benbenek - Model Shop
S. Boccanfuso - Building and Grounds
F. G. Fechter - Model Shop

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BIRTHS

Dr. and Mrs. George A. Morton announce the birth of a son - Lewis Hunt - on Saturday, July 8, 1944. Weight - 7 1/2 lbs.

Mr. and Mrs. G. W. Leck announce the birth of a son, Charles Frederick Leck on June 20, 1944 at 11:58 a.m. Weight 6 lbs. 15 oz.

Mr. H. W. Hutchison, formerly of our Model Shop and now serving in the U.S. Navy, became a proud father on July 4th. It's a boy named Thomas Harold. Congratulations Mr. and Mrs. Hutchison.

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DEATHS

Our sympathy is extended to Miss Ruth McCall of our Personnel Department whose father passed away on Thursday, July 6, 1944. He lived in Hightstown, New Jersey.

We extend our sympathy to Mr. Gardner Krieger on the death of his father in Natchitoches, La. on May 19, 1944.

We were very sorry to learn of the death of Mr. Albert Stehle's father who died on June 29th at Irvington, New Jersey. Our sympathy is extended to the bereaved family.

We learn with deep regret of the death on June 9th of Mr. Christian M. Terp, of Maplewood, New Jersey, brother of Miss J. Terp of our Dispensery. Our sympathy goes to the bereaved family.

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PATENT DEPARTMENT INFORMATION

Patent Disclosure Forms

New Patent Disclosure forms are now available for use in submitting disclosures of inventions. Attention is called to the space provided for noting Government contract information. When submitting disclosures the contract information should be furnished.

PATENTS RECENTLY ISSUED TO RCA

May 2

Dimmick, G.L.	2,347,938	Sound film printer
Ramberg, E.G.	2,347,965	Art of electron microscopy
Snyder, R.L.Jr.	2,348,030	Electron microscope
Rajchman, J.A.	2,348,031	Method of focusing electron microscopes

May 9

Haynes, R.L.	2,348,296	Alternating current exciter lamp for sound reproducers
Brown, G.H.	2,348,325	Electrical transformer
Gillespie, H.C.	2,348,338	Electrical heating apparatus
Olson, H.F.	2,348,356	Microphones

May 16

Linder, E.G.	2,348,986	Resonant cavity magnetron
Smith, R.M.	2,349,011	Frequency controls for ultra-high frequency devices

May 30

Luck, D.G.C.	2,350,284	Radio ranges

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Taps and Dies

Listed below are taps and dies available in the Model Shop. Unless otherwise indicated all threads are right hand. Those sizes starred should be employed if at all possible since they are commercial standards and consequently screws, nuts, washers etc., are available to fit them.

TAPS AND DIES IN MODEL SHOP

	TAPS			DIES		
	Dia.		Pitch	Dia.		Pitch
	.0148	-	320			
	.0168	-	260			
	.0208	-	220			
	.0288	-	220			
	.028	-	200	.028	-	200
	.032	-	130	.032	-	130
	.036	-	130	.036	-	130
	.039	-	130	.039	-	130
				.042	-	130
	.044	-	130	.044	-	130
	.047	-	112			
	.047	-	110			
	.048	-	110	.048	-	110
	.056	-	100	.056	-	100
	.0572	-	100			
*	00	-	112	00	-	112
*	0	-	80	0	-	80
	1	-	56	1	-	56
	1	-	64	1	-	64
*	1	-	72	1	-	72
*	2	-	56	2	-	56
	3	-	48	3	-	48
	4	-	32	4	-	32
	4	-	36	4	-	36
*	4	-	40	4	-	40
	4	-	40 L.H.	4	-	40 L.H.
	4	-	48	4	-	48
	4	-	48 L.H.	4	-	48 L.H.
	5	-	40	5	-	40
*	6	-	32	6	-	32
	6	-	32 L.H.	6	-	32 L.H.
	6	-	36	6	-	36
	6	-	40	6	-	40
	7	-	50			
*	8	-	32	8	-	32
	8	-	32 L.H.	8	-	32 L.H.
				8	-	36
				8	-	36 L.H.
	8	-	50			
	10	-	24	10	-	24
*	10	-	32	10	-	32
	10	-	32 L.H.	10	-	32 L.H.
	10	-	40			
	10	-	56	10	-	56
*	12	-	24	12	-	24
	12	-	28			
	12	-	32	12	-	32
	14	-	20			
	14	-	24	14	-	24
	14	-	24 L.H.			

L.H. Indicates "Left Hand". Otherwise all are "Right Hand".

* Indicates preferred sizes.

	TAPS			DIES		
	Dia.		Pitch	Dia.		Pitch
*	1/4	-	20	1/4	-	20
	1/4	-	20 L.H.	1/4	-	20 L.H.
	1/4	-	28	1/4	-	28
	1/4	-	28 L.H.	1/4	-	28 L.H.
	1/4	-	32	1/4	-	32
	1/4	-	40	1/4	-	40
	1/4	-	64	1/4	-	64
	5/16	-	16			
*	5/16	-	18	5/16	-	18
	5/16	-	18 L.H.	5/16	-	18 L.H.
	5/16	-	20			
	5/16	-	24	5/16	-	24
	5/16	-	32	5/16	-	32
	5/16	-	40	5/16	-	40
	10 mm.	-	1.0 mm.			
*	3/8	-	16	3/8	-	16
	3/8	-	16 L.H.	3/8	-	16 L.H.
	3/8	-	20			
	3/8	-	24	3/8	-	24
	3/8	-	24 L.H.			
	3/8	-	27			
	3/8	-	32	3/8	-	32
	3/8	-	40	3/8	-	40
				13/32	-	32
	7/16	-	14	7/16	-	14
	7/16	-	24	7/16	-	24
	7/16	-	32	7/16	-	32
	15/32	-	32	15/32	-	32
	1/2	-	12			
*	1/2	-	13	1/2	-	13
	1/2	-	20	1/2	-	20
	1/2	-	20 L.H.	1/2	-	20 L.H.
	1/2	-	24	1/2	-	24
	1/2	-	28	1/2	-	28
	1/2	-	32	1/2	-	32
	14 mm.					
	9/16	-	12	9/16	-	12
	9/16	-	24	9/16	-	24
	9/16	-	32	9/16	-	32
*	5/8	-	11	5/8	-	11
	5/8	-	18	5/8	-	18
	5/8	-	24	5/8	-	24
	5/8	-	27	5/8	-	27
	5/8	-	32	5/8	-	32
*	3/4	-	10	3/4	-	10
	3/4	-	16	3/4	-	16
	3/4	-	20	3/4	-	20
	3/4	-	32	3/4	-	32
				7/8	-	9
*	7/8	-	14	7/8	-	14
	7/8	-	20	7/8	-	20
				7/8	-	32
	1	-	14	1	-	14
*	1	-	8	1	-	8
	1-1/8	-	12	1-1/8	-	12

IRON PIPE TAPS AND DIES IN MODEL SHOP

TAPS			DIES		
Dia.		Pitch	Dia.		Pitch
1/8	-	27	1/8	-	27
1/4	-	18	1/4	-	18
3/8	-	18	3/8	-	18

TAPS			DIES		
Dia.		Pitch	Dia.		Pitch
1/2	-	14	1/2	-	14
3/4	-	14			
1	-	11-1/2			
1-1/4	-	11-1/2			


RCA

VOL. I. OCTOBER 1944 NO. 6

RCA LABORATORIES NEWS

RCA ELECTRONIC DEVICE MEASURES

MUZZLE VELOCITY OF PROJECTILES

Time-Interval Counter, in Use at Nation's Arsenals, Registers Speed of Flight of Ammunition with Greatest Accuracy

American Army and Navy guns of all sizes are blasting the enemy on every war front with more deadly effectiveness than ever before because of amazingly accurate muzzle velocity measurements, as precise as 1/100,000 of a second, made possible by a new electronic time-interval counter developed in our Laboratories at Princeton, New Jersey. Release of this information has recently been approved by the War Department Bureau of Information in Washington.

The instrument has been in use for more than a year at the Aberdeen Proving Ground in Maryland and at other Government arsenals and proving grounds throughout the country. It supplies instantaneously information upon which the performance of a given gun can be established and the uniformity of its ammunition checked. It is equally effective with all types of guns--from small hand weapons to the Army and Navy's most powerful 16-inch rifles.

Developed especially for the Aberdeen Proving Ground, the electronic time-interval counter is designed to measure, with great accuracy, a time interval in the order of one one-hundredth of a second. Extreme accuracy is obtained through the ability of the device to give this measurement to within a hundred-thousandth of a second. The research on this device was brought to fruition, and a very practical device made available to the military services through the work of Igor F. Grosdoff of our Laboratories.

On the ranges at Aberdeen and the other arsenals, means are being provided for making these measurements at the rate of hundreds of observations a day. Each range is equipped with two electrical coils, arranged so that a projectile will pass first through one and then through the other. By magnetizing the projectile, a small electrical signal is generated in each coil as the bullet passes through it. If the coils are 30 feet apart, and the time between the two signals is one one-hundredth of a second, the bullet is traveling 3,000 feet a second.

The counter consists of three essential parts: an oscillator, a gate, and the counter proper. The frequency of the oscillator is maintained, as in a radio transmitter, by a quartz crystal and is precisely 100,000 pulses per second. The gate, actually a vacuum-tube circuit, passes these pulses into the counter which counts them and finally, when the gate is closed, shows by indocator lamps the number of pulses that have passed through. In other words, it shows the number of hundred-thousandths of a second from the time the gate opened until it closed. This extraordinary speed and accuracy of operation is possible because there are no moving parts; the entire apparatus is electronic and can be started and stopped instantaneously.

In operation on the firing ranges, the counter's gate is opened by the electrical signal from the first coil as the bullet passes through it, and is closed again by the impulse from the second coil. The operator records the time of flight between coils and computes the velocity. It is noted down, along with the record of the particular gun and projectile being tested, for subsequent analysis by ballistic experts. The operator then touches the reset button and is ready for the next shot, all in a matter of a few seconds.

The importance of such fine measurements becomes apparent when it is remembered that if all shells from a gun leave the muzzle with the same velocity, and the position of the gun is not changed, then the shells will all fall in the same spot, and the effectiveness of the fire will depend only on the skill and aim of the gunner. To insure this consistent performance, our arsenals are constantly measuring muzzle velocities of all types of guns and with all kinds of powder loads and shells.

RADIO CORPORATION OF AMERICA
PRINCETON N.J.

RCA LABORATORIES NEWS

ED. DICKEY - EDITOR

RADIO RELAY SYSTEMS DEVELOPMENT BY THE RCA*

By
C. W. Hansell
RCA Laboratories, Rocky Point, N.Y.

INTRODUCTORY

If television and its auxiliary services are to expand rapidly, so as to provide a new American industry, and a source of large scale employment after the war, we must have the means to carry programs from city to city over nationwide distributing networks.

For years forward looking research, invention and development has been directed toward making it possible to provide these networks and the need to provide them is almost upon us.

Two lines of approach, one through development of coaxial cables and repeaters, and one through development of radio relays, have been followed. The present paper is intended to outline work done by one organization, the Radio Corporation of America, on the development of radio relay systems.

HISTORICAL

RCA has now been engaged in radio relay development for more than 20 years. In the course of that development the radio carrier frequencies used have increased from 182 kilocycles to 500 megacycles and the modulation bands have increased from 2000 cycles to 4 megacycles. The type of service has comprised relaying of telegraph signals, international broadcast programs, facsimile and television. It has included five years experience with an unattended radio relay system in commercial service between New York and Philadelphia.

1. 182 Kilocycle Relay for Transoceanic Telegraph Signals

In 1923 RCA began the development of a radio relay station at Belfast, Maine. Its purpose was to intercept long wave transoceanic telegraph signals at a location where directional reception would reduce interference from summer lightning storms and to relay the intercepted signals on another frequency to the Riverhead receiving station for transfer to New York. The relay transmitter was designed to handle several telegraph signals simultaneously. It used single side band modulation with a carrier at 182 kilocycles and provided peak power of a few kilowatts. This station was operated experimentally for about a year, until it was replaced with a commercial receiving station connected with New York through wire lines.

2. 3-Megacycle Relay for Transoceanic Broadcast Programs

In 1924 a supplementary relay transmitter was completed at Belfast to operate on frequencies near 3 megacycles, with a maximum power output of about 250 watts. This transmitter is of incidental historical interest because it is believed to be the second transmitter in the world equipped for piezo-electric quartz crystal frequency control, the first having been an assembly of units in the laboratory of Professor George H. Pierce at Harvard. It was the first crystal controlled transmitter put to any practical use. It is also of interest because it relayed the first broadcast programs brought from London to New York for rebroadcasting here. For RCA it marked the beginning of short-wave equipment development and propagation tests which, in combination with the work of others, resulted in the present world-wide networks for international radio communication.

3. 80-Megacycle New York to Camden Television Relay

In the meantime RCA and its associated companies carried forward a program of development designed to create a system of television. Eventually this program had made enough progress to justify the creation of an experimental television broadcasting station at the Empire State Building in New York City and it had become apparent that television networks for carrying programs from city to city would be required.

In 1932 RCA and NBC, in cooperation with General Electric and Westinghouse undertook the development of a relay station to carry experimental television from New York to Camden, New Jersey. It was demonstrated successfully in 1933. At that time television had reached the point where 120 lines per frame could be used, which required a modulation band of about 250,000 cycles.

The relay station was located at Arney's Mount, near Mount Holly, New Jersey. For reception of signals from the Empire State Building it used a broadside array of dipoles, with a reflector, mounted on a 165-foot steel tower and for transmission used a resistance-terminated V antenna on 70-ft. wooden poles. Most of the

*This paper will be presented at the National Electronics Conference in Chicago on October 5, 1944. Some portions of the article are reprinted here. The entire paper will appear in the Proceedings of the N.E.C. and in the Proceedings of the I.R.E.

amplification in the repeater was done at an intermediate radio frequency so that modulation frequency appeared at only one point in the transmitter.

The Arney's Mount repeater had only a short period of usefulness, for experimental purposes, because at about that time electronic methods of television were being field tested and the quality of the television images improved so rapidly with corresponding increases in band width that the repeater very soon was entirely inadequate. It was forseen that television relaying would have to be done at far higher frequencies than could be utilized at the time and that a long range program of vacuum tube and equipment development would be necessary.

4. 100-Megacycle Unattended Relay System Between New York and Philadelphia

A long range program of television relay development was begun but, in the meantime, an unattended automatic radio relay system for two-way multiplexed telegraph printer and facsimile communication between New York and Philadelphia was undertaken, starting in 1924. This relay system used two repeaters, in each direction, one at Arney's Mount and one at the RCA transoceanic station at New Brunswick, New Jersey. It operated in a range of frequencies near 100 megacycles and provided for a modulation range up to 20,000 or 30,000 cycles.

The system was placed in operation in 1936 and was a regular part of RCA facilities on the circuits from New York to Philadelphia, Baltimore and Washington until the FCC ordered it shut down soon after the beginning of the war. Its approximately 5 years of continuous unattended operation gave us some valuable experience and provided a service of greater reliability than had been obtained with cable pairs over the same circuit. It proved that radio relaying with fully automatic, unattended repeaters is practical.

5. 500-Megacycle Television Relay Demonstrations

By the end of 1939 enough progress had been made in the development of new vacuum tubes for use at very high frequencies, and in the development of radio repeaters and relay stations so that 450-500 megacycle experimental radio relay stations had been established on Long Island, at Hauppauge and at the Laboratory near the transoceanic transmitting station at Rocky Point. By means of these repeaters, television signals broadcast from the Empire State Building were picked up at Hauppauge and relayed automatically through Rocky Point to a terminal receiver in the Laboratory near the transoceanic receiving station at Riverhead. This relay system was designed to accomodate the full modulation band width permitted by the present television standards.

It employed frequency modulation of the radio carrier current as a result of which the technical problems were simplified. It became possible to use simple amplitude limiting to control power levels in the system and the inherently non-linear response characteristics of vacuum tubes were reduced to a smaller factor in the production of distortion.

Late in 1940 a third relay station was established at the former site of NBC broadcast station WEAF at Bellmore, Long Island and a terminal receiving station was set up at the RCA Building in New York. This made it possible to relay from Hauppauge back into New York and many demonstrations of relaying were made, in 1940 and 1941, including demonstrations for the FCC and NTSC.

These demonstrations should some day have much historic interest because they comprised all the elements of a complete television broadcasting service including studio programs, programs brought from a distance by radio relay, and by coaxial cable, broadcasting of programs to home receivers and showing of programs on a large screen in a theatre.

An important part of these tests was the demonstration of radio relaying with a repeater so designed and adjusted that the input and output carrier frequencies were equal.

PRESENT STATUS OF RADIO RELAY DEVELOPMENT

Before the development of radio relay systems suitable for television had been interrupted by the war, the initial and most difficult pioneering work had been accomplished and the technical basis laid for a great nation-wide system of radio relays capable of providing not only television networks but many other important services. Many detail problems, such as must be solved in establishing any new service, still remained but it could be stated with confidence that there were no insuperable technical obstacles remaining to prevent the establishment of a successful radio relay service.

The range of frequencies which will be used for relaying is so high that it has become possible to utilize each frequency channel over and over again not only over circuits which are spaced apart geographically but even, with some limitations, for a number of circuits in and out of the same city. It is this possibility of using the same frequency band over and over again which justifies the assignment of wide channel bands to television relay systems and which promises a great future for radio relays.

A striking characteristic of properly designed radio relay systems, operated on frequencies above 500 megacycles, is that they require much less amplification in a given distance than the concentric cable systems, when both are required to meet the present and future television modulation band width requirements.

As television broadcasting moves to the higher frequency portions of the spectrum and as it becomes possible to include color, it is natural that the band width required for transmission will be increased and it then seems probable that radio relaying will receive greater recognition as the most promising means, technically and economically, for the distribution of television programs.

A fortunate circumstance is that, in establishing a radio relay system, a major portion of the cost is represented by sites and towers and that no developments which can be forseen at present will destroy the value of these investments. Instead, it is anticipated, future developments will make it possible to utilize higher radio frequencies and to provide more perfect reproduction of modulations without requiring substantial alterations in sites and towers.

Before the war the development of vacuum tubes and repeaters had been carried far enough to make it practical to utilize frequencies for television relaying in the range of about 300 to 1000 megacycles. It is anticipated that, as soon as restraints due to the war are removed, the frequency range will be extended upward until, eventually, frequencies of 3000 megacycles or more may be used.

PHASE OR FREQUENCY MODULATION PREFERRED FOR RELAYING

At the present time phase or frequency modulation of the radio carrier current by the video modulation frequencies is considered preferable to amplitude modulation. In practice a hybrid, or compromise, between phase and frequency modulation, obtainable by means of suitable preemphasis of the modulation currents in either a phase modulated or a frequency modulated terminal transmitter is preferred.

By using this bybrid type of modulation it is possible to strike some sort of optimum balance between the width of frequency band required for modulation side frequencies and the relative magnitude and frequency distribution of noise in the output of the relay system. This optimum balance may vary according to the character of the material transmitted so that the means to attain it should not be standardized but should be left to the agency operating the system.

When phase or frequency modulation is used in a radio relay system it is possible to use simple amplitude limiting in each repeater as a means to overcome the effects of space circuit variations. It is expected that this will make it unnecessary to employ pilot current channels with automatic level controls such as would be required in amplitude modulated, or single side band modulated systems.

Amplitude limiting makes it possible to operate the high power portions of repeaters as class C amplifiers, or equivalent, which is a condition tending toward high power conversion efficiency.

PROBABLE FUTURE USES FOR RADIO RELAY SYSTEMS

Since the only justification for investing large sums of money in radio relay systems, and for getting involved in the toils of technical development, business promotion and government regulation, is the usefulness of the systems, it may be appropriate to consider what some of the uses may be.

Radio relays have such outstanding technical and economic advantages for the distribution of television that, eventually, they should be regarded as essential for this service. However, the costs for adequate radio relay systems are substantial and, unless the costs of relay station sites, towers and facilities can be spread over a number of channels and services they may be so burdensome as to delay the initial spread of television service.

In holding unit costs down it is essential that the relay stations be designed and utilized to provide several television channels, all utilizing the same towers. It is also essential that the investment and operating expenses be shared with as many secondary services as possible.

In general relay stations will occupy the highest points and provide the highest towers in each community. They are therefore the natural choice for location of radio broadcasting stations. By combining relaying and broadcasting, where this is possible, both can benefit.

High towers, occupying the highest points are natural gathering places for pleasure seekers and the curious. In many cases observation platforms at the top of the towers, television theatres, restaurants and other entertainment facilities may be provided to give a greater public service and to help in paying the costs.

One of the most natural secondary services, from a technical standpoint, will be that of facsimile communication, by which is meant the transmission of any sort of picture or message which is to be recorded at the receiving end as a copy of the original. An adequate television radio relay circuit has a potential speed of transmission of 108,000 pages per hour.

There are as many uses for facsimile service as there are for the existing telegraph and mail services. It is a means for giving the service with far greater speed and less effort. Soon, for example, it could provide a nationwide newspaper delivery faster than papers can now be printed. Newspaper publishers then will no longer be dependent upon the slow and inefficient type of delivery service which was already in use when printing was invented.

There is another probably important use for future radio relay systems which is closely related to the struggle, just beginning, to obtain the use of frequencies above 30 megacycles. It is that of providing radio services to airplanes.

As the number of airplanes in flight increases, the demands for radio service will increase to such a degree that it will be unreasonable to provide radio frequencies and facilities so that all of the airplanes flying over land may communicate by radio over long distances. Furthermore, as the speed and efficiency of airplanes has increased it has become more unreasonable to provide either large protruding antennas, or powerful equipment, needed to operate on the frequencies required to reach large distances.

Looking ahead it seems inevitable that much of the communication with aircraft must be limited to short distances and carried out on higher frequencies with smaller equipment and without protruding antennas. This will require a large number of ground stations, spread out along the air routes. Substantially these same routes will be followed by the radio relay systems and the radio relay stations are natural sites for airline radio ground stations.

The railroads, long distance bus and truck lines, and portions of the traveling public have communications needs similar in character to those of the airlines and radio relay systems might very well contribute to the fulfillment of these needs.

Radio relays may, of course, be used for long distance multiplex telephone communication, particularly for the distribution of sound broadcasting programs. Sound accompanying television obviously should pass over the radio relays so that its handling may be properly coordinated and so that vision and sound will be subject to equal time delays.

Finally there is a growing need for means to interconnect a variety of newly developed business machines so that manufacturing, transportation and merchandising organizations, and the public they serve, may benefit from the advantages of decentralized and widespread operations, with centralized management and control.

With all the pent-up new needs, and the apparent ability of radio relay systems to fill these needs, what is now needed most to make radio relaying a great new American industry is a more general understanding of its value; a well-defined and stable licensing policy; a relaxation of restraints which dampen the hope of expansion and profit and which discourage joint action by those in need of relay service; and a few good promoters who have caught the vision.

RED CROSS BLOOD DONOR SERVICE

The Mobile Unit of the American Red Cross Blood Bank was at Cranbury on September 7th and at Princeton on September 20th and 21st. The following members of the Laboratories served as blood donors at Cranbury:

W. R. Ferris	J. F. Stonaker
W. D. Hershberger	L. F. Kraus
R. D. Hughes	A. R. Gordon
E. N. Metz	J. E. Rodweller
D. O. North	Miss D. L. Rosenberg
P. B. Peyton, Jr.	J. A. McFadden

The following made blood donations at Princeton:

W. E. Vanderbilt	Miss B. Smith
A. Meneely	P. C. Lockard
R. R. Wright	Miss F. Kawalek
C. O. Ringeisen	Miss B. McGarry
R. B. Legrum	Miss L. Liniewicz
H. C. Flauss	R. C. Ballard
G. S. Lewis	J. J. O'Neill
R. K. Edwards	L. Ferrara
H. M. Ayres	G. F. Werner
H. B. Dougherty	A. E. Anderson
E. W. Watson	W. C. Wilkinson
S. M. Spangenberg	C. C. Martinelli
Miss C. J. Benson	B. R. Cole
H. G. Fisher	J. G. Woodward
C. W. Mueller	J. Kurshan
A. J. Neumann	R. L. Burtner
J. Hillier	P. Rudnick
H. W. Leverenz	T. L. Gottier
P. B. Scharf	M. L. Greenough
C. M. Burrill	I. E. Grosdoff
H. B. Law	D. W. Epstein
R. L. Harvey	J. Burnett
R. R. Thalner	Mrs. R. C. Madden
A. M. Wiggins	

Arrangements for the Cranbury donation were made through Dr. James Hillier and Miss Terp of the Dispensary arranged for the Princeton group.

RCA PICNIC

Thanks to the weather man, the RCA picnic was held, as scheduled, on Saturday, September 16th, on the Laboratories' property. The program for the affair consisted of games, contests and prizes for the children, a novelty softball game between members of the Model Shop and the Engineers, horseshoes and quoits, four acts of entertainment, and outdoor dancing.

A vote of thanks is in order for the following members of the Laboratories who served as a Committee for the affair:

George Adams	Mrs. Alice McNamee
Richard Edwards	C. A. Mueller
C. A. Hurford	P. B. Peyton
Joseph Luther	John Stonaker
T. L. Maher	Miss E. Webster
Miss Sara McCafferty	C. Vose

BASEMENT RECREATIONAL FACILITIES

With the advent of cooler weather, members of the Laboratories are beginning to use the basement recreational facilities again. Ping Pong, Shuffle Board and Darts are available for use during the noon-hour. It is hoped that as many individuals as possible will take advantage of these recreational facilities furing the fall and winter months.

BOWLING LEAGUE

Plans are being completed at this time to have a Bowling League again this year. The bowling will be held on Wednesday nights at the Princeton Bowling Alleys and from all indications there will be about ten teams in the League. Any men or women who are interested in bowling and are not already affiliated with a team should contact the Personnel Office.

GAS AND TIRE RATIONING

The gasoline and tire situation is still acute in this area. Ration Boards have notified us that they cannot issue supplementary gasoline or tire certificates unless every possible effort is made to work out car-sharing arrangements. If you require supplemental gasoline, please make every effort to either pool your car or to obtain passangers. The Transportation Committee meets regularly each Monday afternoon at 2 p.m. and all applications for supplemental gasoline should be in the hands of the Committee prior to that time.

QUOITS

Maher and Warren Crowned 1944 Quoits Champions

The team of Maher and Warren captured the Elimination Doubles Quoit Championship on September 25th by defeating T. Tams and A. Friel. The winners reached the finals by defeating the brother team of F. Howarth and W. Howarth. In the final match Maher and Warren displayed the same steady game which brought them to the final eliminations. This same team also captured the Doubles Quoit Championship for 1943.

HORSESHOES

On September 28th J. Hillier and M. S. Cytowic captured the Doubles Horseshoe Championship for the second year in succession. The winners gained the Championship by defeating R. Kilgore and C. Shulman in the best of three games. The match was very close throughout, as the following scores will indicate:

Hillier & Cytowic 13 vs. Kilgore & Shulman 21
Hillier & Cytowic 21 vs. Kilgore & Shulman 11
Hillier & Cytowic 21 vs. Kilgore & Shulman 19

--ooOoo--

LIBRARY INFORMATION

Recent Articles in the Library

Determination of discontinuities in sheet metal by means of ultrasonics. Habil A. Trast, Engineers' Digest, August, 1944.

Welding thermoplastics with high frequency. H. P. Zade, Plastics, September, 1944.

Electronic light sources for photo-machines. B. W. Woodward, Electrical Manufacturing, September, 1944.

Theory of the influence of concentration on the fluorescence of solutions. S. I. Vavilov, Journal of Physics, (U.S.S.R.) V. 6, No. 4, 1943.

Closed cell for electron microscopy. I. M. Abrams and J. W. McBain, Journal of Applied Physics, August, 1944.

Supersonic transmission of oblique incidence through a solid plate in water. J. B. Smyth and R. B. Lindsay, Journal of the Acoustical Society of America, July, 1944.

The impulse response of electrical networks - with special reference to the use of artificial lines - in network design. M. Levy, Electrical Communication, V. 22, No. 1, 1944.

Join the Library Book Club and read the Best Sellers without paying a rental fee. Ask the Library how to join the club.

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BIMONTHLY NEWS

MEASUREMENTS COMMITTEE

Frequency Measuring Equipment

Under the sponsorship of the Measurements Committee, a frequency measuring apparatus has now been completed. It is now available for the use of those who are interested in exact frequency measurements.

In this equipment an Electronic Counter has been adapted to frequency measurement. The equipment actually counts the cycles of an unknown frequency over a predetermined interval, the unknown frequency being indicated as a number by means of neon indicating lamps.

The two component parts of the equipment are an electronic counter and a timer. The counter capacity is nine decimal places, five of which are electronic. The timer produces an accurate time interval of 1 or 10 seconds duration. In addition, the counter is provided with manual start-stop, thus extending the available time interval to any desired duration.

The cycles will be correctly counted whether they arrive at a uniform rate as in measuring the frequency of an oscillator, or irregularly, as from a random source.

Technical Summary

Range:	30 cycles to 100 kc.
Timer:	1 or 10 second interval
Input Voltage:	40 v. at 30 cycles, decreasing to 1.5 v. at 100 kc.
Input Impedance:	100,000 ohms
Power Supply:	115 Volts, 60 Cycles, 500 Watts

The equipment can also be used as a chronograph for measuring time intervals up to 9999.99999 seconds duration and correct to within ± 10 microseconds.

The equipment is mounted on an open rack with wheels and can be easily moved about. It is normally located in Room W-218.

STACKPOLE IRON CORES AVAILABLE

Iron cores in the following sizes are now available in the Finished Parts Stockroom:

SK-1 to SK-40 inclusive and SK-101 to 135 inclusive.

These are also covered by a graph showing recommended frequency ranges and approximate permeability of Iron Core grades.

LECTURES BY RCA LABORATORIES TECHNICAL STAFF

Before the Princeton Rotary Club by F. H. Nicoll on "Non-Reflecting Glass" - August 15, 1944.

Before the American Chemical Society in New York by H. W. Leverenz on "Cathode-Luminescence and Photo-Luminescence" - September 11, 1944.

Before the Rotary Club of Princeton by H. W. Leverenz on "Luminescent Materials" - September 19, 1944.

Before the National Electronics Conference in Chicago by D. W. Epstein as joint author with I. G. Maloff of RCAVD, on "Reflective Optics in Projection Television" - October 5, 1944.

Before the National Electronics Conference in Chicago by C. W. Hansell on "Radio Relay System" - October 5, 1944.

Before the Industrial Research Institute at Atlantic City by E. W. Engstrom on "RCA Laboratories" - October 6, 1944.

Before the American Chemical Society in Philadelphia by H. W. Leverenz on "Phosphor Crystals for Television and Illumination" - October 18, 1944.

Tube Assembly Section Enters New Quarters

During the week end of September 9 to 11 (a slightly longer week end than usual), the Maintenance Crew with John O'Neill in the driver's seat did everything possible excluding hand springs, in moving the equipment of the Tube Assembly Section from E-208 to W-204 - 208. Starting the move at noon on Saturday, we were back in working order again by 9 a.m. Monday. The delay from 8 a.m. until 9 a.m. was occasioned by a few boxes of tube parts and tools being misplaced. As many people had anticipated several days' delay in tube making operations, this was a fine job.

We have the same group of skilled tube assembly girls, rearranged slightly to facilitate the job.

We have also our usual supply of tube parts and raw materials such as nickel, nichrome, copper molybdenum tungsten and many other metals in strip and wire form. These improved quarters and the increased space will enable us to provide better service to our "customers".

S. W. Dodge

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AN OUTING - AND HOW!

We wish to express our thanks to Mr. Kraus of our guards for the swell time and good food enjoyed by the Model Shop and its co-workers on Thursday evening, July 14. A total of 40 swell fellows were there.

There were a few events that took the highest place of the evening's fun, beginning with a ball game which must be played over, due to the bad umpiring of Mr. Preston. And we had a legal quoit game which was played into the darkness of the morning, for no winners were determined. A group of singers (or whatever else you may call them) gave out with a few numbers; this was followed by a special act -- small finger plus large man -- by Mr. Donohue and Mr. Solomon. After this came a fair and bare bout between Georgian, Southern Snyder, Sally Rand Solomon and Gypsy Rose Lee Coria ending in a draw. Someone got his ear bitten, too.

A few complaints are in order, such as, (1) more outings, (2) a good man with a flash bulb, (3) a 35-cent refund, (4) better singers, (5) no horseburgers, (6) a good umpire, (7) an honest man to run the quoit games.

If we overcome these complaints, plus a few more, we will have a repeat in the near future.

"Uncle Willie"

---"---

Letter from an RCAL Man in the Armed Forces

The following letter has been received from H. W. Hutchison formerly in our Model Shop and now in the navy:

I'm now beginning some more training at my 4th base since I've been in the navy. During this time I have regularly been getting literature from RCAL and I've thoroughly enjoyed reading every bit of it. I want to inform you of my new address so that I may continue to receive any literature and news about RCA that you may desire to send me. I have been going to Q.M. school at Gulfport, Mississippi since last May. I graduated from there as the seventh highest man in our company of 125. Twelve of us received a petty officer rating of QM 3/c, and I was fortunate enough to be one of them. Quartermaster work in the navy consists of signalling, weather, navigation, use of instruments, and any other duty that may be necessary on the bridge of a ship. It's pretty nice work and I'm really enjoying every bit of it. I'm now assigned to a crew for training aboard a LSM (landing ship-medium). After ten weeks here I'll be transferred to some ship yard to pick up our new ship. There are 16 of us in the ship control group of our crew. Of these I am the only man with a petty officer rating, so you can easily see that there is plenty of room for advancement before we go to sea. This group consists of quartermasters, signalmen, radio men, and radar men. My new address is:

Herbert W. Hutchison QM 3/c
906-47-86 LSM Unit 907 - Div. 17
A.T.B. Little Creek, Va.

I hear news about the "Labs" from many of my friends there and it sure is fine to hear from them. I still have a great interest in RCA, and I sure hope it won't be long now before I can return there. RCA has gotten plenty of free advertising since I've been in the navy - as many a time it has been the subject of some of our frequent "gab fests".

Give my regards to all there at the "Labs" and the first time I have a leave, which should be before Christmas, I'll be in to see you all.

Thanks again for all the news you have sent to me.

Sincerely,

Herbert W. Hutchison

We will welcome letters from any other RCAL employees in the Armed Services and hope some of them - seeing this letter - will be prompted to write us.

Congratulations to "Hutch" for his rapid advancement and we'll be looking for that visit from him soon.

--ooOoo--

PERSONALS

On August 31, 1944 the members of the guard force at our Princeton Laboratories were sworn in as Special Deputies for the State of New Jersey by Sheriff Mark O. Kimberling.

We are proud to record that Miss Cora J. Benson and Miss Dorothy Rosenberg, members of the Nurses' Aides Corps in Princeton, were the first in their class to complete 150 hours of duty - the minimum required per year.

Pvt. Paul A. Urbani, one of our guards now serving in the Armed Forces, visited the labs on September 2 and again on September 30. He completed his training on August 4, at Provost Marshall General Military School at Fort Custer,

Michigan. He presently is stationed at Ft. Lewis, Washington for further training.

Mr. L. E. Solomon of our Model Shop received some Japanese trophies from his son Pfc. Erskine L. Solomon 2nd, who is serving in the Signal Corps in New Guinea. Among the trophies were a 15-inch knife, handle of teckwood inlaid with mother-of-pearl, a Japanese helmet, jacket, Japanese money and many other articles.

On Friday evening, August 25, Dr. and Mrs. Lloyd P. Smith gave a garden party and buffet supper at their home in Princeton for Dr. Smith's associates at the Laboratories.

Members of the Industry Service Division staff of RCA Laboratories said goodbye to two of their oldest friends several weeks ago -- Ben Ross of the Photostat Department and Garrard Mountjoy, Section Head Engineer. Both Mr. Ross and Mr. Mountjoy were honored at a luncheon at Tony's, at which time they were presented with gifts from their friends at RCA.

We can't help but feel that Messrs. Hinsdale, Anderson and Alexander look pretty funny in their technical observor uniforms which they are going to have to don for a stretch of overseas work with the armed forces.

Mr. Grosdoff has given evidence of talents along poetic as well as engineering lines by providing the following anent the electronic counter:

> The counters count accountably
> To measure the speed of a shell
> To help U. S. A. unaccountably
> By helping more Nazis to hell.

Miss Marion Lumley celebrated her birthday on September 9th. Her co-workers enjoyed a birthday cake which she baked in honor of the ocassion.

Canada seems to have had quite an attraction for people from the RCA Laboratories this year as will be evident from the following:

Dorothea Frohling of Purchasing, Rose McGuire of Accounting and her sister Josephine Rosso recently returned from what they describe as a "marvelous trip" to Canada. They were guests at the Chateau Frontenac in Quebec, and during their stay they took a cruise up the Saguenay River. The highlights of the trip were the wonderful steak dinners they enjoyed every night. Wonder why they didn't bring one home for us!!

Three more who visited Canada during their vacations were: Messrs. Greenough, Kurshan and Raab (the latter is here temporarily from the Indianapolis plant). They also enjoyed a cruise up the Saguenay River and according to their comments they had a "Swell time".

Among others from the Laboratories who visited Canada during vacations were: Miss Elsie Fowler and her parents, Miss Josephine Truska and Miss Evelyn Webster. While these girls did not all go together, each reports having had a fine trip.

---"---

Conversation seems to have taken a new turn in the Ladies Lounge during the noon hour. The only sounds you hear are "Knit one, Purl two. Bea, I dropped a stitch. Can you pick it up?"

The girls have taken up knitting in a big way! Let's hope they all have ambition enough to finish what they start -- and then, most important of all, courage enough to wear it when it's finished.

---"---

The bigger they are, the harder they fall! Our sympathy goes to Mr. S. DeMeritt (Superintendent of Buildings and Grounds) who fell on Sunday, September 24 from a ladder on his roof and suffered from bruises and bumps. We were glad he was able to get back on the job so soon.

FUN CLUB

We understand that some of the people at the RCA Labs. in Princeton are organizing a club to conduct parties from time to time for the benefit of their members. The temporary committee in charge of organization consists of H. Golden, C. H. Morris and J. Procaccino. Anyone interested in learning more about this organization may contact one of the committeemen for further information.

---"---

On August 12, Mrs. Richard B. Hardy left our employ to return with her husband, Rev. Hardy, to their home in Boston, where Rev. Hardy will continue his religious education at Newton Seminary. Our best wishes go to both for their future happiness.

Mrs. Ruth Ann Dukelow left our employ on August 11 to take up residence with her husband, Rev. Dukelow, in their home town of Hutchinson, Kansas. Good luck to both of you!

We were all sorry to see Mr. "Hank" Bomberger leave the Laboratories on August 24. Good luck Hank in your new position with the National Broadcasting Company!

---"---

Many things have been happening to Ensign R. S. Corby, U.S.N.R., lately:

> Engagement to Miss Jacqueline Elizabeth Mayo of Baltimore announced on August 27, 1944;
>
> Promoted to rank of Lt. (jg) on September 1, 1944;
>
> Will be transferred to duty in Florida in October.
>
> Our congratulations and best wishes to him.

---"---

Announcement has been made recently of the engagement of Miss Helen Kauczka of the Tube Assembly Room to L.A.C. William Mann, who is presently stationed at Debert, Nova Scotia, Canada. No date has been set for the wedding. By the way, who sent Helen the sweet roses on her first month's engagement anniversary?

---"---

We note by the third finger on her left hand that Miss Gertrude Ellsworth of the Photo Studio has an option on a future contract. Mr. A. Simpson of Trenton's General Electric is the lucky fellow.

---"---

We extend our best wishes to John J. O'Neill, Assistant Superintendent of our Buildings and Grounds Department who was married to Erma Finch on Thursday, September 14, 1944 in Princeton, New Jersey

---"---

ADDITIONS

Mrs. J. A. Fehrman - Research
John J. Allen - Model Shop
Miss Loretta J. Liniewicz - Research
Miss Ethel L. Moore - Tube Assembly
F. G. Fechter - Model Shop
Joseph Phillips - Model Shop
Solomon Lasof - Research
Miss Mary V. DiDomenico - Research
T. C. Collings - Model Shop
M. L. Fell - Guard
J. T. Pluswick - Model Shop

---"---

BIRTHS

Mr. and Mrs. E. O. Keizer announce the birth of a son - Alan Stanley - born on Saturday, July 29th. Weight 7 lbs. 11 1/2 oz.

Mr. and Mrs. M. H. Mesner are proud to announce the birth of a daughter, Barbara Sue, weight 7 lbs. 4 ozs., at Princeton Hospital on August 6th.

We received an announcement of the birth of a son - William James Wiseman, Jr. to Mr. and Mrs. William Wiseman at Philadelphia, Pa. on August 9, 1944. Mrs. Wiseman was formerly supervisor of our Mail Room.

Mr. and Mrs. R. R. Goodrich announce the birth of a son - Rhea Woolston - on Thursday, September 21, 1944.

Mr. and Mrs. C. Wentworth announce the birth of a daughter - Linda Joy - born on Monday, September 25, 1944. Weight - 6 lbs.

---"---

DEATHS

We are very sorry to learn of the death of Lieut. James J. Higgins, brother of Miss Katherine Higgins of our Accounting Department. Lieut. Higgins was killed in a plane crash in New Mexico. Our deepest sympathy goes to the bereaved family.

Our sympathy is extended to Mr. George F. Adams of our Accounting Department whose father, Mr. Peter King Adams, passed away on August 18, 1944. Mr. P. K. Adams lived in Philadelphia.

We learn with deep regret of the death on August 27th of Mr. Steven Liptak of Monaca, Pennsylvania, brother of Mr. V. H. Liptak of our Model Shop. Our sympathy goes to the bereaved family.

--ooOoo--

PATENT DEPARTMENT INFORMATION

Patent Disclosure Forms

New Patent Disclosure forms are available for use in submitting disclosures of inventions. If your office has not been furnished with a supply of these printed forms, they may be obtained from the Patent Department by calling Ext. 415.

Attention is called to the spaces provided for noting the dates of conception and reduction to practice of invention, also for noting the relationship of the invention to Government contracts. This information should be furnished with the disclosure.

PATENTS RECENTLY ISSUED TO RCA

June 6

Bliss, W. H.	2,350,869	Frequency demodulator
Collins, M. E.	2,350,727	Rehearsal system for sound motion pictures
George, R.H. etal	2,350,552	Absorption modulation
Hoehn, J. J. etal	2,350.682	Phonographic apparatus
Kallmann, H. E.	2,350,902	Television system
Kroger, F. H.	2,350,907	Ultra short wave apparatus
Rettinger, M.	2,350,820	Aircraft Altitude determining system
Schlesinger, K.	2,350,536	Synchronizing signal generator

June 13

Boterweg, D. etal	2,351,185	Wireless transmitting or receiving set
Crosby, M. G.	2,351,191	Heterodyne elimination circuit
Houghton, W. D.	2,351,212	Convertible demodulator circuit
Katzin, M. etal	2,351,520	Transmission lines
Mountjoy, G. etal	2,351,221	Superregenerative receiver circuit
Roberts, W. van B.	2,351,368	Reactance tube
Schade, O. H.	2,351,294	Television reviewing screen
Trevor, B.	2,351,240	Phase and frequency modulation receiver
Usselman, G. L.	2,351,463	Frequency modulator
Crosby, M. G.	2,351,192	Frequency modulation receiver

Crosby, M. G.	2,351,193	Frequency modulation detector circuit

June 20

Beers, G. L.	2,351,760	Color television system
Dimmick, G. L.	2,352,085	Reduction in reflection from glass
Grundmann, G. L.	2,351,759	Motor speed control

June 27

Anderson, L. J.	2,352,305	Microphone
Harper, E. E.	2,352,541	Electronic synchronization system
Young, L. L.	2,352,302	Pressure measuring device

July 4

Callahan, J. L.	2,352,688	Phasing device for synchronous telegraph systems
Douden, W. L.	2,352,777	Range finder
Duke, V. J.	2,353,018	Television apparatus
Hansell, C. W.	2,352,893	Cooling of vacuum devices
Smith, J. E.	2,352,918	Two-way telephone and telegraph system
Walker, W. E.	2,352,925	Tape perforating system

July 11

Andrews, E. F.	2,353,429	Vibrator power supply for radio receivers
Holst, P.F.G. etal	2,353,468	Frequency modulation receiver circuit
Kaltenbacher, D.M.	2,353,162	Frequency modulation
McLaughlin, K.	2,353,348	Electrical connector for tubes
Parkin, T. D.	2,353,493	Quenched electric oscillation generator
Purington, E.S.	2,353,499	Radio alarm system
Seeley, S. W.	2,353,204	Wave Length modulation
Usselman, G. L.	2,353,203	Frequency modulator
Warwick, J. C.	2,353,327	Error indicator for start-stop printers

July 18

Bliss, W. H.	2,353,631	Image reproducing apparatus
Caplin, F. etal	2,354,104	Band-spread tuning circuit for radio receivers
Keck, A. etal	2,353,672	Phase inverter
Purington, E. S.	2,354,141	Universal resistance capacitance filter
Shaw, H. R.	2,354,148	Push-button tuner for radio receivers
Young, C. J. etal	2,353,982	Material creasing and indenting apparatus

July 25

Albin, F. G.	2,354,295	Sound recording system
Blain, A.	2,354,571	Facsimile apparatus
Eddy, W. C.	2,354,583	Synchronizing system
Finch, J. L.	2,354,585	Low capacity filament transformer system
Goldsmith, A.N.	2,354,591	Television apparatus
Goodale, E. D.	2,354,592	Electrical network
Hershberger, W.D.	2,354,262	Electron tube oscillator circuit
Hillier, J.	2,354,263	Electron microscope
Miller, B. F.	2,354,329	Motor starting system
Schock, R. E.	2,354,483	Voltage variation compensator
Zworykin, V.K. etal	2,354,287	Dynamic method of correcting the spherical aberration of electron lens
Hershberger,W.D.	2,354,636	Electron tube oscillator circuit

August 1

Crosby, M. G.	2,354,799	Phase modulation
Deal, H. B.	2,354,800	Multiple frequency source
Goldstine, H.E.	2,354,809	Transmission line load for high frequencies
Peterson, H.O.	2,354,827	Frequency control

August 8

Barton, L. E.	2,355,502	Signal indicator and recorder
Bedford, A. V.	2,355,136	Camera device
Goldstine, H.E.	2,355,433	Wave length modulation circuit
Roberts, W. M.	2,355,560	Electrical coupling device
Shelby, R. E.	2,355,566	Television system
Shoup, F. F.	2,355,182	Noise reduction system
Vance, A. W.	2,355,191	Power supply for electron microscopes
Wiggins, A.M.	2,355,194	Mechanical impedance measuring device

August 22

Battermann,L.A.	2,356,199	Connection plug
Beers, G. L.	2,356,201	Frequency modulation signal receiving system
Cox, J. W.	2,356,221	Electron switching for speed control circuits
Crosby, M. G.	2,356,224	Frequency modulation tone keyer
Finch, J. L.	2,356,390	Wave length modulation system
Fredendall, G.L.	2,356,308	Wide band amplifier
Kentner, C. D.	2,356,230	High frequency apparatus
Linder, E. G.	2,356,414	Tunable resonant cavity device

August 29

Blancha, F. C.	2,356,914	Counting mechanism
Ketcham, L. G.	2,356,934	Mounting hollow structures
Koch, W. R.	2,356,935	Tuning mechanism
Young, C. J.	2,356,963	Electron microscope viewing chamber


RCA

VOL. 2 DECEMBER 1944 NO. 1

RCA LABORATORIES NEWS

RADIO CORPORATION OF AMERICA
PRINCETON N.J.

RCA LABORATORIES NEWS

ED. DICKEY - EDITOR

HIGHLIGHTS OF FCC ALLOCATIONS HEARING*

The FCC Allocations Hearing (September 28 - November 2, 1944) was called in order to consider the requests for frequencies by all radio services throughout the frequency range of from 10 kilocycles to 30,000,000 kilocycles looking forward to a complete reallocation of the spectrum based upon present-day needs and views. Obviously when you consider that the record of the Hearing consists of over 5000 pages of testimony, it is impractical in an article of this length to summarize the volumes of requests made or even to outline the major conflicts between various services which the FCC must resolve. The Hearing covered all services including Fixed Point-to-Point, Marine, Aeronautical, Amateur, Standard and International Broadcasting, Facsimile, Radio Relay; Emergency Services such as Fire, Police, Forestry and Special Emergency; Special Services such as Mobile and Relay Press, Geological and Geophysical and Motion Picture; Experimental Services and New Services such as Mobile Telephone Services and services to taxicabs, busses, trucks, railroads, etc. This discussion is confined primarily to the consideration of data presented relative to the position in the spectrum which FM and Television should occupy, as these were perhaps the most controversial issues in the entire Hearing.

Panel 2 of RTPB, recommended that FM Broadcasting be assigned 15 megacycles from 43 to 58 megacycles and that Television be assigned eighteen 6 Mc. channels from 60 to 218 Mc., as well as the space 460-956 Mc. for Experimental Television and Television Relay. The recommendations contemplated the use of fifteen of the eighteen channels below 218 Mc. shared with Government and non-Government miscellaneous and emergency services in those areas where a television station was not employing the specific channel. This sharing seems possible by virtue of the fact that Television is a wide-band, high-powered service whereas the miscellaneous Government and non-Government services are narrow-band, low-powered services and therefore certain of these latter communication services could be conducted in adjacent television channels in the same area as the television station.

Throughout the Hearing it was evident from the questions of the Commission that consideration was being given to the possibility of moving FM Broadcasting from its present portion of the spectrum to somewhere near 100 Mc., say 88 to 108 Mc. This was apparently predicated on the fear that as more and more stations were assigned throughout the world to frequencies in the 40-56 Mc. range, sporadic E and F2-layer long-range interference would be encountered and that, on a purely technical basis, such interference might be considerably reduced in the range about 100 Mc. Information was released by the military authorities which indicated that in certain areas of the world F2-layer interference could be anticipated up to 120 Mc. and sporadic E-layer interference up to about 88 Mc. - the amount of both types of interference gradually decreasing as the operating frequency increases. However, such interference would be expected to occur for short periods only and for a relatively small amount of time. To offset this, however, the industry was practically unanimous in recommending that FM be maintained in its present portion of the spectrum, first, because it had proven satisfactory in its present band and little was known about its possible performance in higher portions of the spectrum and second, because it would delay the establishment of a satisfactory commercial FM Broadcasting service. It should be mentioned in this connection that Commissioner Jett commented on the fact that there was no request for space for Experimental FM Broadcasting above 400 or 500 Mcs.

As regards Television, CBS, the Cowles Broadcasting Corporation and Zenith recommended that Television be moved to the higher frequencies above 450 Mc. in order to provide sufficient channels for a competitive service of wide band high definition and color. However, with these exceptions, the industry was unanimous in recommending that Television be continued in the present portion of the spectrum below 225 Mc. in order that commercial service could be started immediately. Many data were submitted by various witnesses to prove that television broadcasting, in the range of frequencies now authorized by the Commission for commercial television, should not be curtailed or abandoned because a satisfactory and practical television service can now be operated on frequencies below 300 Mc., because the period of time required to develop and demonstrate the practicality of a television system above 300 Mc. cannot be determined at this time and because the nation needs and expects television as an immediate post-war service and industry. It was pointed out that a shift of Television to frequencies above 400 Mc. would necessitate a complete redesign of transmitters and receivers involving many unknown factors, at least one or two years of field experimentation and the development of an entirely new system of standards, and further that there was no information available at the present time which could assure solution to the problems of Television on these superhigh frequencies. It was argued that it is possible to provide completely adequate and satisfactory television service now with present standards; that this service could be expanded into a much better service within these standards and that experimental work looking forward to the development of a new system of Television including color at frequencies above 450 Mc. should be initiated as an expansion rather than an obsolescence of the present system. It was generally estimated that it would take a minimum period of approximately five years before this experimental work would evolve into an adequate system suitable for release to the public.

Another point stressed by the industry

* This account has been prepared by Mr. Philip F. Siling of the RCA Frequency Bureau.

witnesses was that if Television is to be adapted to the desires of the public, complex receiving installations must be avoided and simple antennas should be provided at the receiving end. This means that in order to produce the desired signal-to-noise ratio, high transmission power must be used. In this connection, RCA witnesses pointed out that while theoretical curves showed that the field strength at receiver locations increased with frequency, this was true only for unobstructed paths and that tests and experiments had shown that for the practical case, due to the fact that the waves must pass through and around buildings, rooftops and trees, the attenuation increased with frequency, becoming really serious at 300 Mc., and for that reason the field strength at receiver locations was not increased, but actually decreased with a rise in frequency. Therefore, in order to maintain the same field strength, an increased rather than a decreased power of the transmitter is indicated. RCA witnesses testified that a 5 kw. television transmitter at 288 Mc. was not being used in conducting transmission tests at Princeton, New Jersey. It was estimated that within two years a transmitter of 40 or 50 kw. in power could be built for 300 Mc.

These are the two principal problems which the Commission must face in resolving the various conflicts for frequency space in the radio spectrum. It should be borne in mind, however, that there are many other serious problems presented to the Commission as a result of this Hearing, particularly in the finding of spectrum space for the New Services and for the expected tremendous expansion in the aviation industry, which in turn requires a similar increase in the number of radio channels which must be allocated to the Aviation Service for domestic as well as international air routes and for navigational aids. It is interesting to note that the recommendations of Panel 2 divide the portion of the spectrum from 1000 to 30000 Mc. into primarily four services - Relay, Navigation Aids, Government and Amateur. Portable and Mobile Relay are provided from 1225 to 1325 Mc. and wide-band, narrow-beam point-to-point systems for transmission of television, broadcasting and other communications has been provided from 1900 to 2300 Mc., 3900 to 4550 Mc., 5750 to 7200 Mc., 10500 to 13000 Mc., 16000 to 18000 Mc. and 26000 to 30000 Mc.

The Commission is reviewing the record carefully and it is expected that their decision in these matters will be rendered at an early date.

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TECHNICAL TEDIUM OR OTHERWISE*

By R. W. Crum**

At last your time has come; after hours of waiting through the enterminable and boring speeches of your fellow conferees the chairman is about to call upon you. He announces your paper; you rise and, accompanied by a scattering of perfunctory applause, walk briskly to the platform, only stumbling on the top step and getting your feet tangled in the wires strewn around the floor for the public address system.

"Mr. Chairman, ladies and gentlemen," you say and reach in your inside coat pocket for the paper. Consternation reigns for a moment when you find it isn't there, but you haven't quite lost all of your presence of mind yet and remember that you put it in your left-hand outside coat pocket. Fishing it out you are ready to go ahead after first disburdening yourself of the few ill-chosen introductory words that you[1] have been mulling over the last hour and a half.

Your labored joke doesn't get much of a laugh but you are too flustered to bother about that. Grasping your bulky manuscript firmly but shakily in both hands and carefully avoiding the "mike", if there be one, you start to read. After reading one page you are somewhat appalled by the magnitude of the remaining task. You wonder momentarily if you are going to be able to get through in the allotted twenty minutes. But you haven't time to worry about that now and anyway time alone will tell. Gluing your eyes to the page you proceed. About this time some ill-mannered person in the rear of the room calls "louder." Rather resentfully you raise your voice for a few lines but you can't think of that and keep your place at the same time so your voice soon fades down to your usual tone and thenceforward you pay no attention to such unwarrented distractions.

By this time you have recovered some of your self-confidence and most of the shakiness is gone and you are forging ahead full steam. But you don't dare glance at the audience or it will return and you will lose your place. On and on you go without thought of time. By and by you become aware that the chairman is trying to convey some sort of signal to you, but you can't take on his troubles too, and you keep on reading till you realize that you have come to that welcome period when you can show the pictures.

Saying, "I have some lantern slides that I would like to show if there is time," you start a search for the push button that will signal the operator, finding it, after some confusion, grasped formly in your right hand.

The first slide comes on and turning your back to the audience you rather confidentially tell the screen what the picture is about. This takes some time as it is a complicated table with lots of data. This part of the speech doesn't take over

*Reprinted with permission and in the interest of better technical meetings, from the Proceedings of the American Concrete Institute, vol. 37, April, 1941

1. Any resemblance of the characters to any persons living or dead is entirely coincidental. The striking likeness of the first one to appear to the author of this paper is purely imaginary.

**Director, Highway Research Board, Washington, D. C. Mechanical Engineering, 1941.

a half hour as there are only about a dozen of the slides crammed with tabulated data and intricate curves. In doing this you repeat practically everything you read before the picture came on.

As the lights return you notice that the chairman is about to have apoplexy and there is a red light shining on the reading desk in front of you, but the whole point will be lost unless you read your conclusions and so you struggle on manfully to the bitter end.

At last there is no more to read. You say "I thank you" and stagger from the platform with the beginning of a mild inner glow that says to you "well done." This feeling is heightened by the applause which is louder this time, indicating that the audience's feeling of relief that you are through is slightly greater than its courtesy in giving you a hand when you started. To tell the truth, no one has listened for the last 45 minutes.

The chairman is now saying, "I am sorry that on account of the fact that we are way behind our schedule it will be necessary to defer the discussion of this interesting paper and proceed to the next item on the program."

You think, resentfully, that if the speakers before you hadn't taken so much time there might have been some interesting discussion of your absorbing topic. But you are too overwhelmed with relief at having the thing done to cherish that feeling long and settle down on the end of your spine to enjoy the next paper in a rather comatose condition.

But instead of being soothed by a gentle flow or monotone as you expect, something seems to be happening; your lethargy is being dispelled; the man on the platform is talking in such a way that you are becoming interested in spite of yourself. He is reading from a manuscript but from the way he is holding it you can tell it isn't very long. And he seems to know what he is saying so well that he can look up and actually talk to the audience most of the time.

It doesn't take him very long to tell what the paper is about and why and then he jumps right over the tedious details of what he did which took so much time in your paper and goes on to tell what he found out. Soon he comes to a place where some illustration is indicated. Without pausing in his stride he signals the operator and a slide comes on the screen; just a simple little table that anyone can grasp at a glance but full of significance. Glancing over his shoulder to make sure the picture is the right one, the speaker describes it quickly and goes on to the next thought in his paper. Presently he comes to the next slide. This time it is a diagram; just a single curve, but illustrating a telling point forcefully and without loss of time.

Well, time has been getting on and the chairman even in this case signals the speaker that his time is about up. Strangely, this doesn't seem to disconcert him; he just goes for the last sheet of the manuscript, reads it quickly and makes a graceful exit. Too good to be true -- for a burst of appreciative applause wakes you up and you realize that at least part of this remarkable performance has been the figment of a dream, but the man has done a good job and got through almost on time. Maybe he took the secretary's letter of instruction seriously.

Musing on this while sticking out the rest of the program you think, "I wish I could present a paper like that" and later, being a person reasonably quick on the intake and still having plenty of self-confidence, you say to yourself, says you, "By heck, I can do a job like that." And so being a confirmed convention hound and a man of experience and ideas, besides having opportunities to write technical papers, you make yourself over into a forceful and interesting speaker by means of a few simple principles based upon your illuminating flash of insight while drowsing through a dreary session.

1. You realize that most technical papers have to be long enough to cover the subject thoroughly with supporting data to satisfy the studious reader who will ultimately use your material, but you also realize that there is no need to present all this orally and that no one would get it even if you did. No one can get the good out of a technical paper by reading it just once. Many passages must be read and reread, and reread and studied, so why should you expect anyone to grasp it all instantly while you read it to him. Better just read him the significant parts that he can assimilate as you go along.

2. It is apparent therefore that the first thing to do is to prepare a condensed version of the paper that can be read in the alloted time. Twenty minutes is about right, although some gifted persons can hold an audience with a dry subject for thirty.

In this version, tell what you did and why you did it and then jump right over the dreary details of how you did it and tell about what you found out that is new and interesting.

3. Having written the condensed version, read it aloud for timing. Then rewrite it so that the time will just be nicely filled. Then rehearse it -- to your wife, or secretary, or the mirror -- until you can deliver it with some degree of animation and direct appeal to the audience. (It sometimes helps to pick out some one who looks as if he agrees with you and aim many of your remarks at him. His nods will spur you on, or else pick out a dumb-looking one and see if you can wake him up.)

4. But let's not forget the slides. If well done they can add greatly to the quick comprehension of a technical talk. Just remember to express only one idea on a slide and make it so simple that about all you need to do is name it. It is best to use the slides to illustrate points as you go along. If left to be shown all together at the end there is a great tendency to waste time repeating what has already been said.

5. Sometimes you do miscalculate and the chairman calls time on you before you are quite through. Why not provide in advance for this contingency and if it arrives, just turn to the closing statement you have already prepared, read it, and stop.

6. After you have prepared and delivered a few papers in this way you will probably discover for yourself that there is an even better way. Go ahead and write the short version, then write an outline of it, then memorize the outline, and soak yourself in your subject till you don't need a manuscript. Just talk and follow the outline in the back of your head. Of course, it is a good idea to have a copy of the outline on small cards in your pocket in case of emergency. You are not likely to need it but if you do, it will save the day. Doing it this way it is also easy to talk too long and bring the chairman's warning down on you, so have that prepared closure all ready to grab and read it if you haven't had

time to memorize it.

7. This is not intended for a discourse on technical writing, but one principle should be mentioned that is of particular importance in preparing a short paper for oral presentation.

write simply, using short common-usage words and as few of them as possible.

For instance, to say: "When concrete is being placed during cold weather and the air temperature may be expected to drop below 35 degrees Fahrenheit, a sufficient supply of straw, hay, grass, or other suitable blanketing material shall be provided along the line of work and any time when the air temperature is expected to reach the freezing point during day or night, the material so provided shall be spread over the pavement to a sufficient depth to prevent freezing of the concrete before it has thoroughly hardened," may be perfectly good specification writing, but if you want to make the point in a speech why not say: "During freezing weather freshly laid concrete pavement should be protected by a suitable insulating layer."

On reading this thing over, it doesn't seem so difficult; I don't think one needs to be an expert to follow these rules. I think I will try it myself some day.

For those interested in further references on this subject, the following bibliography may be helpful:

B. Dudley, Proc. I.R.E., December, 1942 - "Preparation of Technical Articles".

S. Marion Tucker, Mining and Metallurgy, September, 1940 - "Are You Going to Present a Paper?"

P. E. Fitzgerald, Mining and Metallurgy, September, 1941 - "Preparing Illustrations For Technical Papers". (Particularly good for presentation of papers.)

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PERSONNEL INFORMATION

RED CROSS BLOOD DONOR BANK

The following members of the Laboratories served as Blood Donors when the Red Cross Blood Bank visited Cranbury on November 22nd:

G. M. Morley	W. Parfian
P. B. Peyton	E. O. Keizer
W. R. Ferris	J. E. Rodweller
A. R. Gordon	G. F. Werner
L. F. Kraus	H. Kihn
Miss C. Benson	

Also the following members of the Cafeteria staff:

Edith Snedeker
Mary Bleakney
Mary Shorten
Ethel Peresett

The arrangements for the blood donations were made by Dr. J. Hillier and Miss J. Terp. The next visit of the Blood Bank to Princeton has been tentatively set for the first week in May, 1945.

We regret very much that in our last issue we inadvertently omitted the names of those from our Cafeteria staff who donated blood in Cranbury on September 7. We are giving the names of these donors below:

Mrs. Edith Snedeker
Mrs. Ethel Peresett
Mrs. Mary Bleakney

BOWLING LEAGUE

The RCA Laboratories Bowling League swung into action on October 4, 1944, with Mr. G. D. Nelson officially ushering in the season by rolling the first ball. This year's league is comprised of twelve teams, two of which, the Tube Room and Nondescripts, have mixed rosters of men and women. The League will run for twenty-two weeks and the Championship will be decided by a roll-off at the end of the season between the first and second half winners. As this issue of the "News" goes to press the standings of the teams are as follows:

Model Shop Big Six	23 Points
Model Shop Gold	23 Points
Model Shop Green	22 Points
Tube Room	21 Points
Office	20 Points
Engineers I	19 Points
Model Shop Red	15 Points
Guards	14 Points
Wiremen	13 Points
Engineers II	12 Points
Nondescripts	6 Points
Maintenance	4 Points

Individual High Single Games to Date:

Masterson	247
Thompson	245
Morley	225

High Three-Game Series to Date:

Masterson	581

BASEMENT RECREATION

Now that the weather is becoming undesirable for outside noontime recreation, the interest in the basement recreational facilities is increasing. The number of shuffleboard courts has been increased to five this year and additional ping pong tables have been added. These facilities are available for men and women and as many of the Laboratories people as possible are urged to take advantage of them during the noon hour.

VICTORY GARDENS

We are pleased to announce that the Victory Gardeners of the RCA Laboratories have again been awarded the National Victory Garden Institute plaque in recognition of outstanding Victory Gardening during 1944. This plaque represents the highest award of the Institute and this is

the 2nd year in succession that we have won this recognition.

Since there are numerous gardens with root vegetables still in the ground, it has been decided not to plow the garden area this fall. Therefore, it is important that we do everything possible to improve the appearance of the garden area. With this in mind, it was requested a few weeks ago that gardeners pull up dead produce and weeds and pile them in the pathways for pick-up. Several of the gardeners responded immediately to this request but there are still a majority of gardens in need of cleaning up. Gardeners are, therefore, urged again to rid their plots of unsightly dead produce and weeds. It is important that this be done before the ground freezes. In most cases, a little work during the noon hour will do the trick. Your cooperation will be appreciated.

GYM NIGHT

The Grade School Gymnasium is available every Thursday night from 7:30 to 9:30 p.m. for men of the Laboratories who wish to play basketball and volley ball. Thus far the turnout has been far below the number of men who signed up for this activity, but it is expected that the number will increase as the weather becomes colder. All men interested in this activity are urged to come out every Thursday night so that there will be enough participants to form teams.

QUOITS AND HORSESHOES

The Quoit and Horseshoe activities have closed after a very successful season. About sixty men participated in these activities and it is planned to expand the facilities in 1945, if additional equipment is available. T. L. Maher is to be congratulated for the fine manner in which he organized and promoted these activities.

The last regular event of the season for the quoits pitchers was an interdepartmental championship contest which was won by the Model Shop. The final standings in this League were as follows:

	Won	Lost
Model Shop	39	15
Mixed Department	32	22
Buildings & Grounds	19	35
Office	18	36

Winners in other League tournaments were:

Class A - Singles	- A.S. Lewallen
Class B - Singles	- J. Luther
Class C - Singles	- J. Burnett
Class A - Doubles	- L.M. Warren and T.L. Maher
Classification Doubles	- T. L. Maher and G. Adams
Horseshoes - Doubles	- M.S. Cytowic and J. Hillier
Horseshoes - Singles	- J. Thompson

We wish to thank the following men who loaned quoits and horseshoes:

J. Luther	C. Sullivan
C. H. Morris	T. L. Maher
L. Ferrara	A. E. Anderson

A vote of thanks is also in order for the men who were responsible for keeping the courts in good condition throughout the season.

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LIBRARY INFORMATION

Recent Articles in the Library

Midget tubes for high frequencies. G. T. Ford, Bell Laboratories Record, November, 1944.

Foundations of electrical measurements. L. Hartshorn, Nature, October 28, 1944.

Diode detectors. A. Moore, Service, October, 1944.

Electrostatic properties of rubber and GR-S. R.S. Havenhill, H.C. O'Brien and J.J. Rankin, Journal of Applied Physics, November, 1944.

Rebuilding broadcast directional antenna systems. W. A. Wood, Communications, October, 1944.

Electronics sets standard for automatic control. W. H. Gille and R. J. Kutzler, Machine Design, November, 1944.

Color transmitted by wire. Science News Letter, November 11, 1944.

Attenuation of wave guides, J. M. Sowerby, Wireless World, November, 1944.

On electrical resonance. C. H. Collie, Physical Society Proceedings, July 1, 1944.

General coordinates for optical systems with central or axial symmetry. M. Herzberger, Quarterly of Applied Mathematics, October, 1944.

The signal converter and its application to television. P. Nagy, Journal of the Television Society, June, 1944.

Bibliography

A bibliography on the Magnetron, covering the period from 1912 to 1944 has been compiled. Copies may be obtained from the Library.

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RCA VICTOR READIES TELEVISION PROGRAM

To Feature Walt Disney OCIAA Films, Live Talent Shows With Victor Recording Artists, and Special Events

A new television program entitled "The World in your Home", sponsored by the RCA Victor Division of the Radio Corp. of America, started Friday, November 17 over NBC's New York television station WNBT. The new program series will bring to television set owners in the metropolitan New York area a well-rounded program of science, education, entertainment, sport news and special events.

The first offerings will introduce to television some of the unusual films produced by Walt Disney for the Office of the Coordinator of Inter-American Affairs. Originally, filmed for South American consumption, these Disney productions have attracted considerable attention whenever exhibited. Among the Disney subjects to be televised are "Defense Against Invasion" and "Grain That Built a Hemisphere". The program will also present Victor recording artists in a series of live talent entertainments. Other selected films dealing with electronics, chemistry and associated science topics will also be scheduled.

"The World in Your Home" will be telecast immediately preceding the Cavalcade of Sports programs now presenting boxing bouts from Madison Square Garden and St. Nicholas Arena, every Friday evening.

WHAT IS THE EXPLANATION?

Mr. V. D. Landon has discovered a number having unusual properties. The number is 76923. Let this number be multiplied by any number between 1 and 10.

(a) If the product has seven for one of its digits, cross out all digits to the left of the seven and transfer them to the other end of the number as a suffix. The result is 769230.

(b) If the product has no seven, multiply it by the same multiplier again. If a seven-place number is obtained, cross out the digit on the left and add it to the remainder by simple addition. Carry out operation A and the result is 769230.

Anyone who can explain this should send in his explanation to Mr. Landon or the editor. The best explanation will be published in our next issue.

LECTURES BY RCA LABORATORIES TECHNICAL STAFF

Before the S.M.P.E. in New York City by D. W. Epstein as joint author with I. G. Maloff of RCAVD on "Reflective Optics in Projection Television" - October 16, 1944.

Before the A.I.E.E. in New York City by H. F. Olson on "Dynamical Analogies" - October 24, 1944.

Before the American-European Friends in Princeton by E. W. Engstrom on "Research" - November 4, 1944.

Before the Rochester Fall Meeting by E. W. Engstrom on "The RCA Laboratories in Princeton" - November 13, 1944.

Before the National Industrial Chemical Conference in Chicago by G. H. Brown, R. A. Bierwirth and C. N. Hoyler on "The Radio-Frequency Dehydration of Materials Labile with Heat" - November 18, 1944.

Before the Electron Microscope Society by J. Hillier and R. F. Baker on "Progress Report on Electronic Analysis" - November 18, 1944.

Before the Electron Microscope Society by J. Hillier and A. Kurkjian "On the Artifacts Produced by the Use of Distilled Water as an Intermediate Medium in the Mounting of Bacterial Specimens for the Electron Microscope" - November 18, 1944.

Before the Television Broadcasters Association Convention by E. W. Engstrom on "New Horizons in Television" - December 11, 1944.

Before the Television Broadcasters Association Convention by D. W. Epstein on "Projection Television" - December 11, 1944.

At a meeting sponsored by the Communication Group of the New York Section of the A.I.E.E., held on the evening of November 6th at the Engineering Societies Building in New York City, lectures on high-frequency radio measurements were delivered by RCA Laboratories engineers. Mr. C. W. Hansell, head of the Rocky Point laboratory, spoke on transmitting measurements and Mr. A. M. Braaten of the Riverhead laboratory spoke on receiving measurements.

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Letters from RCAL Men in the Armed Services

The following letter was received by Mr. T. L. Maher from Harry Myers, formerly with our Model Shop, and now "Somewhere in the Pacific":

Just a few lines to let you know I have received a copy of RCA Laboratories News; also the other book put out by RCA.

The kindness and thoughtfulness behind your action is greatly appreciated. These books have supplied me with educational as well as interesting reading.

Out here, one has plenty of time to read - that is when he has caught up on his work and doesn't have a watch to stand. To date, I have read both books through several times without missing a sentence.

More than likely Dad has told you that I have been transferred. My new ship is a destroyer. She is really a honey too and well seasoned to battle.

We expect to hit port in the next day or so. Therefore, I am writing this letter now

in order for it to get mailed at that time.

There is no telling when we will be able to send mail once we leave there. It looks as though I'm really going to get in on something this time. It wouldn't surprise me if you folks back home are reading about us by the time this letter reaches you.

Well, I had better close now. I would like to write more, only the circumstances wont permit me.

Thanks again for sending me those copies and I hope you will forgive the penmanship. Writing a letter on here, is like trying to write in a rocking chair. Give my regards to the folks back in RCA Laboratories. Boy! I sure wish I were back there. Maybe I will be when this war is over. I am looking forward to it any way.

Harry Myers

Another letter was received by your editor from Lieut. M. R. Richmond, formerly of our technical staff. It is reproduced below for the information of Marty's friends at RCA Laboratories.

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Thank you very much for your letter and your congratulations. Yes, it is Lt. (jg) Marty Richmond as of 1 September.

I would be very glad to forward any interesting information to my former associates, but there are several well-known reasons why I cannot do so through personal correspondence. However, if items do arise, and are not of a classified nature I'll be sure to send them along.

My duties have revolved around air bombing, and have run from an instructory nature to maintenance and development. To date I have not been overseas, but I have toured the South and West fairly thoroughly.

The Airborne Coordinating Group, to which I am attached, is primarily a maintenance and training outfit, but some of our officers do manage to vary their routine a bit. One Ensign was ordered to erect a radar station atop a certain hill on Peleliu and had somewhat more than the usual installation difficulties....He had to clean out about forty Japs first. Although he was a pretty hot man with a soldering iron, he did have the assistance of several Marines with their associated hardware.

Other men of our group have been with landing and occupying forces wherever the U.S. Fleet has taken part and I expect that one of those assignments will fall my way soon. When that happens I'll forward a first-hand account.

Until then my very best regards to you and the Laboratories staff.

Marty

For the benefit of Marty's friends, his address is:

Airborne Coordinating Group
Naval Research Laboratories
Washington 20 D. C.

BIG GAME HUNTERS AT RCA LABORATORIES

The girls say it's a good thing they no longer have to depend on their men folks to go out and shoot the Thanksgiving turkey! If they did they believe there would be more people going without than are already doing so this year. At least that is the impression they get from talking to the hunters from RCA Laboratories. It's just like all the old fish stories about the ones that got away! Like the story "Pilgrim" John Stonaker tells about shooting a fox, but it got away from him before he could finish it off. However, after two tiresome days of tramping through the woods, he did come home with one rabbit. Oh, well, anything that doesn't take ration points is a big help these days!

Among the hunters from RCA Laboratories this year were:

H. Ayres	N. W. Newell
W. Carpenter	V. Sasso
G. Cortese	F. Schindler
M. Cuomo	W. Slayback
A. Lewallen	J. Stonaker
V. Liptak	J. Walentine

W. Zimmer

FUN CLUB

The Fun Club, mentioned in our last issue, held their first annual affair at the Knights of Columbus home, Prospect Avenue, Princeton, New Jersey, on Saturday evening, November 25, 1944. The affair was attended by 125 men and women.

Dancing to the music of a 10-piece orchestra was followed by a buffet supper especially prepared by a New York caterer. A special program of entertainment arranged by an artist from New York City was also enjoyed by all. The final curtain was drawn at 2:00 a.m. Judging from the comments, everyone present had a grand time.

The committee headed by H. H. Golden, A. C. Anderson, Joseph Proccacino and George Lewis are to be congratulated on their fine arrangements. Keep up the good work!

Leonard F. Kraus, President

The club now has 80 members (men only). The following have been recently elected as officers of the club:

Leonard F. Kraus - President
William Zimmer - Vice-President
Bud Morris - Secretary
Hugh H. Golden - Treasurer

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PERSONALS

We were much pleased recently by having a visit from Phyllis Tindall of the Waves, formerly of our switchboard operaters. Miss Tindall was recently promoted to Pharmacist

Mate 3rd Class. She is now attending school at the Philadelphia Navy Hospital for six months. learning the "ins and outs" of operating room duty.

Friends of Air Cadet Edwin F. Creager, formerly of our Drafting Room, will be interested in having his present address which is:

A/c Edwin F. Creager V-5-USNR
Class 10-B 44 P(c)
c/o Flight Brigade, Bldg. 679
NATB
Pensacola, Florida

Many of Kay McGuinness's friends will be happy to learn of her promotion from Private First Class to Corporal. Corporal McGuinness is a member of the Marine Corps Women's Reserve, and is still stationed at Arlington, Virginia. We were all glad to see her looking so well on her visit to the labs in October. Before entering the service, Corporal McGuinness worked in our Accounting Department.

Miss Dorothy Rosenberg of our labs joined the WACS on September 25, 1944 and is stationed at Ft. Oglethorpe, Ga. "breezing" through her basic training. After completing this training, she expects to enter the Medical Corps as a Medical Technician in Indiana.

Pvt. Paul Urbani, formerly a member of our guards, visited the labs on Monday, November 20, 1944. We were all glad to see him again. Pvt. Urbani is still stationed at Ft. Lewis, Washington.

It gives us great pleasure to report the promotion of Mr. Martin R. Richmond to the rank of Lieutenant (jg) as of September 1, 1944. A letter from Marty is reproduced elsewhere in this issue for the benefit of his many friends at RCA Laboratories.

On Saturday, November 18, 1944 Mr. Thomas Lyman left our laboratories to join the staff of the National Broadcasting Company. We extend to Tom our very best wishes for success in his new television job.

Miss Juanita Patterson and Mrs. Thelma Lockard of our Tube Assembly Room celebrated their birthdays together on Saturday, November 25, 1944 by having a big birthday cake which was enjoyed by everyone who had a piece.

Guard Whatley was operated on at the Post Graduate Hospital at East 20th Street, in New York City in October. He is reported to be coming along nicely.

Mrs. Sampson (our chief telephone operator) was among the crowds at the Army-Notre Dame game (if you can call it that) in New York on Saturday, November 11, 1944. She tells us it was a good game for the first ten minutes, but after that she got so she knew the plays by heart!

Parlez-vous francais? "Not yet, but I'm learning". That's the motto of Doris Schellenger who is deeply engrossed in the job of catching up on foreign languages. She is coming along very well with her French lessons according to the latest reports.

Of course, we know that there is a transportation shortage, but we didn't know it had come to this!

Several weeks ago, Bill Konietzko, Mike Cuomo, Tony Friel, Andy Anderson and Chief Maher took a little trip to New York to see the Rodeo at Madison Square Garden. The party was going very well until they came out as the show was over. They hopped into a cab (cosmopolitan fellows) and journed toward Pennsylvania Station. They dashed up what they thought were the station steps, only to find the building completely locked up! Suddenly they discovered that they were trying to get into the Post Office! Yes sir, we knew transportation was bad but not so bad that people had to mail themselves home!!

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We extend our congratulations to Miss R. Cutinelli of our Patent Department who was married to Mr. William K. Murphy on November 24, 1944.

Congratulations to Mr. Henry S. Huff of our Patent Department who was married to Miss Marjorie Dietz on Wednesday, November 1, 1944 in Princeton, New Jersey.

We extend our congratulations to Mr. Benjamin Cole of our labs. who was married to Miss Katherine Hamilton Coon of Poughkeepsie, New York on Saturday, November 18, 1944 at 4:30 p.m. at the Reformed Church in Poughkeepsie, New York.

On Saturday, November 18, 1944 Miss Frances Kawalek left the employ of our company to take a permanent job as housewife. Fran was married on Sunday, November 26, at Our Lady of Mt. Carmel Church in Bayonne, New Jersey, to Mr. Stanley Radomski. Mr. Radomski served as a sargeant in the army during the African-Sicilian campaigns. He was wounded and subsequently given his honorable discharge. He is now a Federal employee at La Guardia Field, New York. Although we will all miss Fran a great deal, we know she will be very happy. Our best wishes to both her and her husband.

Miss Evelyn Moorefield has been transferred to the Drafting Room from her duties as messenger.

ADDITIONS

Miss Eleanor V. Lawton - Tube Assembly
Mrs. Florence W. Bathie - Tube Assembly
Miss C. A. Snook - Tube Assembly
Miss Madeline Mihelyi - Research
Mrs. Beatrice A. Denton - Tube Assembly
Marcel D. Baloche - Model Shop
Mrs. Margaret S. Heagy - Research
Mrs. Edna S. Moist - Technical Services
Mrs. Florence Gertrude Taylor - Research
Mrs. Lucy A. Hartig - Research

BIRTHS

We extend our congratulations to Mr. and Mrs. George L. Fernsler who announce the birth of a son - Richard Frank Fernsler - on October 2, 1944.

Mr. and Mrs. A. Coria announce the birth of

a daughter - Mary - born on Saturday, October 14, 1944. Weight 6 3/4 lbs.

Mr. and Mrs. W. N. Moore are proud to announce the birth of a daughter - Nancy Jane - born on Tuesday, November 7, 1944.

We extend our congratulations to Mr. and Mrs. R. R. Thalner who announce the birth of a son - Thomas Robert - on November 15, 1944.

Mr. and Mrs. J. A. McFadden Jr. are proud to announce the birth of a daughter on Saturday, November 18, 1944 at Mercer Hospital, Trenton, New Jersey.

DEATHS

We extend our sympathy to Mr. L. Pensak of our technical staff whose father, Mr. Samuel Pensak, died on Monday, September 25, 1944. He lived in New York City.

Our sympathy is extended to Mr. R. R. Wright of our Model Shop whose grandfather Mr. Richard T. Ridgway died on November 2, 1944. Mr. Ridgway lived in Allentown, New Jersey and was 94 years of age.

Our sympathy is extended to Mr. A. Cuomo and Mr. M. A. Cuomo of Building and Grounds whose uncle, Mr. Anthony Cuomo died on November 5, 1944. He lived in Englishtown, New Jersey.

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MODEL SHOP SERVICE INFORMATION

Fixed Capacitors

Effective October 1, 1944 the Camden Component Parts Division will not accept orders for the following:

1. Toothpick Capacitors
2. Tubular Capacitors (Paper), which are not oil filled or hermetically sealed.
3. Capacitor packs, where the capacitors used inside of the capacitor pack are of a type or types which are not made by Component Parts.

In view of this situation, we will stock A.W.S. molded capacitors as replacement for Toothpick capacitors. Tubular capacitors formerly obtained from Camden will now be purchased from either Aerovox or Sprague, both approved sources.

Finished Parts Stock

To enable our Technical Staff to keep abreast of additionsto our Finished Parts Stockroom, a "New Items Panel" at the Stockroom door will display such additions. Currently there is being shown:

1. Fuse holder suitable for mounting upon panel-mounted meter terminals.
2. A new heavy-duty molded terminal board.
3. Cathode-Ray contact covers (rubber).
4. 90° Soldering ells for copper tubing.

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PATENTS RECENTLY ISSUED TO RCA

September 5

Albin, F. G.	2,357,623	Feedback System and Method
Carter, P. S.	2,357,313	High Frequency Resonator and Circuit Therefor
Hansell, C. W.	2,357,401	Protective Arrangement for Rectifiers
Haynes, R. L.	2,357,652	Rectifier Timing Circuit
Katzin, M.	2,357,405	Audio Frequency Limiter Network
Kellogg, E. W.	2,357,661	Control Amplifier
Kreuzer, B.	2,357,665	Photographic Sound Record System and Record
Latimer, C. W.	2,357,671	Phase Correction Circuit
Singer, K.	2,357,696	Sound Recording Compressor Method and System
Thompson, W. S.	2,357,704	Current Control System
Toepperwein, G.	2,357,706	Heating and Cooling System
Usselman, G. L.	2,357,439	Radio Communication by Means of Polarization Modulation

September 12

Appel, H. W.	2,357,925	Combined Reed and Relay Device
Crosby, M. G.	2,357,932	Phase Modulation and Amplitude Receiving System
Peterson, H. O.	2,358,028	Monitoring Receiver
Roberts, W. V.	2,357,975	Frequency Modulation System
Thompson, L. E.	2,357,983	Noise Limiter Circuit
Travis, C.	2,357,984	Automatic Frequency Control System

September 19

Bedford, A. V.	2,358,297	Blocking Oscillator
Carlson, W. L.	2,358,382	Frequency Modulation Signal
Ford, J. R.	2,358,391	Measuring Circuit
Goldstine, H. E.	2,358,454	Automatic Circuit Tuning
Landon, V. D.	2,358,520	Coupling Transformer
Thompson, H. C.	2,358,542	Currentless Grid Tube
Tolson, W. A.	2,358,544	Television Receiver
Wendt, K. R.	2,358,545	Television System
Young, C. J.	2,358,434	Gas or Liquid-Tight Plug

October 3

Carter, P. S.	2,359,620	Short Wave Antenna
Kahn, A. etal	2,359,649	Producing Synchronization and Regeneration of Electric Telegraph Signals
Roys, H. E.	2,359,585	Phonographic Apparatus
Sands, W. F.	2,359,684	Loop Input System for Radio Receivers
Seeley, S. W.	2,359,447	Electrical Circuit
Shelby, R. E.	2,359,449	Television System

October 10

Goddard, D. R.	2,360,219	Ultra High Frequency Switch
Haynes, R. L.	2,359,989	Noise Reduction Circuit
Reisking, H. I.	2,360,012	Lamp Modulated Recording

October 17

Carlson, W.L. etal	2,360,810	Self-Orienting Radio Direction Finder
Crosby, M. G.	2,360,764	Phase Modulated Carrier Receiver
Dimmick, G. L.	2,360,403	Optical System
Eddy, W. C.	2,360,662	Exhibiting Apparatus
Hillier, J.	2,360,677	Object Support for Electron Microscopes
Lincoln, R. B. etal	2,360,694	Voltage Supply Circuit
Rankin, J. A.	2,360,794	Regeneration Stabilization Circuit
Eddy, W. C.	2,360,663	Electrical Biasing Means

October 24

Eddy, W. C.	2,361,183	Recording Optical Images
Griswold, R.S.	2,360,871	Cassette
Hillier, J.	2,360,872	Electron Optical Instrument
Mathes, R. E.	2,361,115	Keyboard Operated Code Transmitter
Owens, J. H.	2,361,119	Stand for Motion picture Screens

October 31

Appel, H. W.	2,361,585	Radio Warning System
Baker, J. O.	2,361,447	Sensitometry
Blaney, A. C.	2,361,451	Variable Density Sound Recording Method and System
Clark, E. L.	2,361,602	Radio Receiver Tone Control Circuit
Crosby, M. G.	2,361,606	Frequency Modulation Divider

October 31

Everett, F. C.	2,361,616	Demodulator Circuits
Hansell, C. W.	2,361,625	Frequency and Phase Modulation Receiver
Koch, W. R.	2,361,634	Record Reproduction Circuit
Marzoli, A.etal	2,361,487	Water-cooled Amplifier
Mueller, W. A.	2,361,490	Sound Reproducing
Pare, V. T.	2,361,492	Diamond Saw and Making the Same
Pessel, L.	2,361,867	Soldering Flux
Roberts, W. V.	2,361,653	Radio Monitoring System
Schock, R. E.	2,361,657	Variable Condenser
Sinnett, C. M.	2,361,658	Sound Recording and Reproducing System
Stone, F. B.	2,361,664	Frequency Modulation Detector Circuit
Trevor, B.	2,361,437	Pulse Signaling System
Weagant, R. A.	2,361,669	Frequency Modulation Receiver

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