

Institute of Radio Engineers

(INCORPORATED)

Organized 1912



YEAR BOOK 1930

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of the

Institute of Radio Engineers

1930

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Alfred N. Goldsmith	1928		1918-27					1928
A. H. Grebe						1913-28		1924-26; 28
J. H. Hammond, Jr.					1914			
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Guy Hill								1914-16; 18-20
J. V. L. Hogan	1920	1916-19						1913-15; 21-29
Warren Hubley						1915-16; 1918-27		
Lewis M. Hull								1920
C. M. Jansky, Jr.	1916							1920
A. E. Kennelly								
L. R. Krumm	1923				1917			1921
Irving Langmuir								
R. H. Langley				1914				
George H. Lewis	1926	1925						1915-19; 26
Donald McNicol								1919-24
R. H. Manson	1912	1913						1927-29
R. H. Marriott								1914-16; 20-22; 26-29
Alexander Meissner		1920						
George R. Metcalfe	1924	1923					1926-27	1922
J. H. Morecroft								1924-25
H. W. Nichols	1913							
G. W. Pickard	1918-19	1915						
G. W. Pierce								
C. J. Porter	1917					1928		
M. I. Pupin								1918-19
A. E. Reoch								1925-27
D. Sarnoff								1918-20
E. J. Simon								1915
G. O. Squier								1918-22
John Stone Stone	1915	1914						1916-19
A. Hoyt Taylor	1929							
Thomas T. Trapnell						1914		
R. A. Weagant								1914-17
H. P. Westman						1929		
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GENERAL INFORMATION

Institute History

Prior to the formation of the Institute of Radio Engineers, two other organized groups of radio enthusiasts held meetings in New York and Boston. These were the Wireless Institute and the Society of Wireless Telegraph Engineers.

On May 13, 1912, these two organizations were merged, taking the new name of the Institute of Radio Engineers. Headquarters were established in New York.

The Society of Wireless Telegraph Engineers had a membership of eleven on January 1, 1907, and forty-three on January 1, 1912. The Wireless Institute had fourteen members on January 1, 1909, and twenty-seven members on January 1, 1912. The Institute of Radio Engineers, at the time of its foundation, had less than fifty paid-up members.

Prominent in the early work of the Society of Wireless Telegraph Engineers were John Stone Stone, Lee de Forest, and Fritz Lowenstein. Those identified with the initial work of the Wireless Institute included: John S. Murphy, R. A. Somerville, Joseph D. Fountain, R. B. Respress, R. A. Cleva, John Gregg, E. Barnwell, Philip Farnsworth, Sidney L. Williams, R. H. Marriott, G. W. Pickard, Harry Shoemaker, and Eugene Thurston. The consolidation of these two societies and the initial work of organizing the Institute of Radio Engineers were done by J. V. L. Hogan, A. N. Goldsmith, and R. H. Marriott.

Aims of the Institute

The Institute of Radio Engineers functions solely to advance the art and science of radio communication. It numbers among its members nearly all of the men who have been prominent in the development of radio in the United States, as well as many noted radio engineers and scientists in other countries.

The membership of the Institute consists of those persons who are qualified for any of its several grades of membership, either through their interest in radio communication, or by practice of some phase of radio engineering as a profession. The eligibility of an applicant to membership in any grade is finally determined by the Board of Direction of the Institute, in most cases on the recommendation of the Committee on Admissions.

Through the presentation and publication of original papers, by affording its members the opportunity of meeting to discuss radio problems, by awards of honors and prizes, and in other ways, the Institute fosters and encourages the development of this important means of communication, and particularly aids in the exchange of radio information of a technical and engineering nature.

Publications

The papers presented at the meetings of the Sections and of the Institute in New York, together with the discussions and other papers submitted by Institute members, are printed in the PROCEEDINGS of the Institute of Radio Engineers, published monthly. The PROCEEDINGS thus constitutes a continually growing store of information on all phases of radio engineering. Since the first issue in 1913, 678 papers have been printed. The PROCEEDINGS is sent free to all Institute members of all grades. The subscription price to non-members is \$10.00 per year.

Standardization Reports giving definitions of terms and standard graphical symbols used in radio communication were issued in 1913, 1915, 1922, and 1926. The Standardization Report for 1928 was published in the 1929 Year Book. These Standardization Reports have become an important reference authority on terminology and symbols in radio practice.

This Year Book is the seventh one the Institute has published; the first appearing in 1914, the second in 1916, the third in 1926, and subsequent issues each year.

Institute Awards for Meritorious Achievement in Radio

The Institute each year makes two awards to radio investigators in recognition of noteworthy inventions or other developments in radio technique.

One award, the Institute Medal of Honor, is a gold medal suitably engraved. The Medal of Honor is awarded to that person who has made public the greatest advance in the science or art of radio communication, regardless of the time of performance or publication of the work on which the award is based.

The advance may be an unpatented or patented invention which has been completely and adequately described in a scientific or engineering publication of recognized standing, and must be in actual operation. Preference will be given to widely used and widely useful inventions.

The advance may also be a scientific analysis or explanation of hitherto unexplained phenomena of distinct importance to the radio art, though the application thereof need not be immediate. Preference will be given analyses directly applicable in the art. Publication, in this case also, must be in full and approved form.

The advance may further be a new system of traffic regulation or control; a new system of administration of radio companies or of service of steamship, railroad, or other companies; a legislative program beneficial to the radio art, or any portion of the operating or regulating features of the art. It must be publicly described in clear and approved form and must, in general, be actually adopted in practice.

This medal has been awarded to the following:

E. H. Armstrong.....1918	John Stone Stone.....1923
E. F. W. Alexanderson.....1919	M. I. Pupin.....1924
G. Marconi.....1920	G. W. Pickard.....1926
R. A. Fessenden.....1921	L. W. Austin.....1927
Lee de Forest.....1922	Jonathan Zenneck.....1928
G. W. Pierce.....1929	

The other award is known as the Morris Liebmann Memorial Prize. This award was made possible through the generosity of Emil J. Simon, a Fellow of the Institute. It is given to perpetuate the memory of the late Colonel Morris N. Liebmann. The award consists of the sum of five hundred dollars which is the annual income derived from the principal of the gift of ten thousand dollars.

The award is made by a special committee, appointed annually by the Board of Direction, to that member of the Institute who, in the opinion of this committee, shall have made the most important contribution to the radio art during the preceding calendar year.

The Morris Liebmann Memorial Prize has been awarded to the following:

L. F. Fuller.....1919	J. R. Carson.....1924
R. A. Weagant.....1920	Frank Conrad.....1925
R. A. Heising.....1921	Ralph Bown.....1926
C. S. Franklin.....1922	A. Hoyt Taylor.....1927
H. H. Beverage.....1923	Walter G. Cady.....1928
E. V. Appleton.....1929	

All members of the Institute are eligible as candidates for these highly valued prizes. Each year's developments are carefully reviewed and examined by the Committees appointed, and by the Board of

Direction, the awards being made by vote of the Board in the case of the Institute Medal of Honor, and by vote of the committee appointed by the Board in the case of the Liebmann Memorial Prize.

The names of the engineers who have already been granted awards clearly show that the younger men as well as the pioneers, and the design, development and factory engineers as well as research engineers, have been given due recognition in the making of awards.

Grades of and Qualifications for Membership

The several grades of membership in the Institute of Radio Engineers as well as the qualifications required for each, dues, fees, etc., are tabulated on page 13. Full details will be found in the Constitution under Articles II and III. All the benefits of membership are available at once to all new members of any grade, except that Juniors are not eligible to vote. Membership means, also, that one is enrolled with others having a similar interest in radio, and that one is on record as being among those who are interested and active in the development of this new and useful branch of the electrical engineering industry.

The grades of Fellow and Member require a much higher degree of technical training and experience than the grade of Associate. In order to maintain a high standard of membership, the Board of Direction in each case very carefully scrutinizes the applications for Fellow and Member grades.

Before applying for membership in any grade the applicant should carefully read the Constitution of the Institute to ascertain for which of the several grades he is eligible. An extract from the Constitution dealing with admissions, eligibility, fees, etc., is printed on the back of the application form obtainable from Institute Headquarters.

When filling in the application form, the applicant should submit the names of those persons who have knowledge of his professional experience, rather than those who have a high professional standing, but cannot vouch for him. The personal signatures of references are not required.

Institute Badges



The authorized Institute badge is of 14-karat gold, finished in enamel and gold lettering. The Fellow's badge is of blue lettering on a gold background, Member's badge of gold lettering on a blue background, Associate's badge of gold lettering on a maroon background, and Junior's badge

MEMBERSHIP REQUIREMENTS, FEES, ETC.

Grade	Minimum Age	Years Active in Radio Engineering	References Required	Entrance Fee	Transfer Fee to Next Grade	Annual Dues
Fellow	30	7	Five Fellows	\$10	—	\$15
Member	25	4	Five Fellows or Members	\$5	\$5	\$10
Associate	21	A Person Who is Interested in or Connected with the Radio Arts.	†Five Fellows, Members or Associates	\$3	\$4	\$6
Junior	16*	A Person Interested in the study of Radio.	†Five Fellows, Members or Associates	\$1	\$2	\$4

* The maximum age of a Junior member is 20 years. Upon attaining the age of 21, the Junior member is transferred to the grade of Associate.

† In the case of the Junior or Associate applicant who is unable to supply the names of five members of the required grade, it is sufficient, usually, if the names of five business associates or friends are given. These should preferably be persons engaged in engineering or scientific work.

of gold lettering on a white background. The badge is made in three different forms: a screw-back lapel button, a lapel pin, and watch charm. The lapel button is approximately one-half the size of the emblem shown here, and sells for \$2.75 (any grade). The lapel pin and watch charm are approximately of the size of the illustration. The charm is finished on both sides and is provided with a ring for suspending the charm from a watch chain or fob. The lapel pin is priced at \$3.00 (any grade) and the watch charm is supplied at \$5.00 (any grade). Any of these may be ordered through the office of the Secretary.

Members of the Institute of Radio Engineers are authorized to indicate their grade of membership in the Institute only in the following manner:

Fellow I. R. E.
Member I. R. E.
Associate I. R. E.

Certificates of Membership

Upon application to the Secretary's office membership cards are sent to all members each year, and diplomas are supplied to Members and Fellows. The membership cards are signed by the Secretary and the diplomas are signed by the President and the Secretary.

Meetings

New York meetings of the Institute of Radio Engineers are held on the first Wednesday of each month (except during July and August) at the Engineering Societies Building, 33 West 39th Street, New York City. On these occasions engineering papers are presented. These papers describe recent developments in radio, and are the subject of general discussion on the part of those in attendance.

Sections

The following Sections of the Institute, which in most cases meet once a month, have been organized in localities where there is a sufficient number of Institute members:

ATLANTA—H. P. Thornton, chairman; Philip C. Bangs, secretary, 23 Kensington Road, Avondale Estates, Georgia.

BOSTON—George W. Pierce, chairman; Melville Eastham, secretary, General Radio Co., 30 State Street, Cambridge, Mass.

BUFFALO-NIAGARA—L. Grant Hector, chairman; E. C. Waud, secretary, 235 Huntington Ave., Buffalo, N. Y.

CHICAGO—H. E. Kranz, chairman; J. H. Miller, secretary, Jewell Electrical Instrument Co., 1650 Walnut St., Chicago, Ill.

CINCINNATI—R. H. Langley, chairman; W. W. Boes, secretary, 622 Broadway, Cincinnati, Ohio.

CLEVELAND—D. Schregardus, chairman; C. H. Shipman, secretary, 14805 Ardenall Ave., East Cleveland, Ohio.

CONNECTICUT VALLEY—Q. A. Brackett, chairman; F. C. Beekley, secretary, 96 S. Main St., West Hartford, Conn.

DETROIT—A. B. Buchanan, chairman; W. R. Hoffman, secretary, 615 West Lafayette Blvd., Detroit, Mich.

LOS ANGELES—T. C. Bowles, chairman; Charles S. Breeding, secretary, Aero Radio Corp., 5927 Franklin Ave., Hollywood, Calif.

NEW ORLEANS—Pendleton E. Lehde, chairman; Anton A. Schiele, secretary, 1812 Masonic Temple, New Orleans, La.

PHILADELPHIA—J. C. Van Horn, chairman; E. T. Darlington, acting secretary, 2848 Idaho Road, Camden, N. J.

PITTSBURGH—L. A. Terven, chairman; J. G. Allen, secretary, Duquesne Light Co., Pittsburgh, Pa.

ROCHESTER—E. C. Karker, chairman; A. R. Barfield, secretary, Valley Appliances, Inc., Rochester, N. Y.

SAN FRANCISCO—Donald K. Lippincott, chairman; Paul R. Fenner, secretary, Custom House, San Francisco, Calif.

SEATTLE—Austin V. Eastman, chairman; Abner R. Willson, secretary, 8055—14th Ave. N. E., Seattle, Wash.

TORONTO—V. G. Smith, chairman; G. E. Pipe, secretary, Standard Radio Co., 90 Chestnut St., Toronto, Canada.

WASHINGTON—C. B. Jolliffe, chairman; J. B. Brady, secretary, Ouray Bldg., Washington, D. C.

Procedure to be Followed in Forming a Section

In forming a Section of the Institute, the following is the approved procedure:

a. Carefully read the "By-Laws Governing Sections" found on page 41 of this book.

b. Make a tentative canvass of the members residing within the territorial limits of the proposed Section. If at least fifty-five (preferably sixty-five) Associates, Members, or Fellows favor and will support a Section, if established, obtain from Institute Headquarters a petition form. In making this tentative canvass effort should be made to obtain applications from desirable and eligible non-members. Wherever there are less than twenty-five

members of the Institute but it is felt that applications can be obtained from the necessary number of eligible non-members, this tentative canvass may be made and the membership applications forwarded to the Institute's Offices. In making this tentative canvass consideration should be given to the probable permanent Chairman and other officers of the Section, if formed. Much of the success of a Section depends on the calibre of the Chairman and the interest taken by him in the affairs of the Section. Institute Headquarters, therefore, would like information as to the probable candidates at the time the request is made for the petition forms.

c. On receipt of the petition forms and list of members residing within the territorial limits, an organization meeting should be called for the purpose of obtaining signatures to the petition, and to form a temporary organization.

d. The petition form, properly signed by the required number of members and accompanied by the minutes of the temporary organization meeting, should then be forwarded to the Institute Headquarters for presentation to the Board of Direction.

e. Upon receipt of the approval of the Board of Direction of the Institute, a meeting should be called for the purpose of forming the permanent organization. At this meeting the officers of the Section should be elected and the several standing Committees organized.

f. Thereafter not less than five meetings shall be held annually.

g. A full report of each meeting must be made to the Headquarters of the Institute on the form supplied by the Institute.

American Standards Association

The American Standards Association serves as a national clearing house for engineering and industrial standardization and acts as the official channel of cooperation in international standardization. It conducts its work through the activity of Sectional Committees, the responsibility for each of the several hundred standardization projects being in the hands of one or more cooperating agencies known as "sponsors."

The Institute of Radio Engineers and the American Institute of Electrical Engineers are joint sponsors for the Sectional Committee on Radio. The Institute of Radio Engineers is also cooperating in the formulation of standards on five other subjects, its representatives on all of these Sectional Committees being given on page 8.

The Sectional Committee on Radio is composed of representatives from sixteen cooperating organizations. The Executive Committee of the Sectional Committee on Radio consists of the following officers and Chairmen of Technical Committees:

ALFRED N. GOLDSMITH, *Chairman*
C. H. SHARP, *Vice-Chairman*
H. P. WESTMAN, *Secretary*

Chairmen of Technical Committees:

Radio Receivers and Parts	W. A. MACDONALD
Radio Transmitters and Parts	HARADEN PRATT
Vacuum Tubes	J. C. WARNER
Electro-Acoustic Devices	IRVING WOLFF

REPORT OF THE SECRETARY
INSTITUTE OF RADIO ENGINEERS
1929

DURING the past several years it has been the custom for the Secretary to prepare a very brief summary of the major activities of the Institute for the fiscal year for publication in the YEAR BOOK as information to the membership.

The following report is based, in part, upon reports of the various committee chairmen. It is hoped that the report will be of some interest and value to the membership in indicating the progress of the Institute.

General

At the end of 1929 the paid membership of the Institute had reached the gratifying figure of five thousand six hundred, a net increase of seven hundred and fifty members during the year. One new section was organized. All sections held meetings regularly with slightly better attendance, in most cases, than during 1928. The annual three-day convention was held in Washington, D. C., in May with excellent attendance. Two new types of general meetings were instituted; a "district" convention, sponsored by four sections, in Rochester in November, and a sectional meeting with the A. A. S. in Des Moines in December. There was an increase of twenty-two per cent in the number of speakers of national reputation who visited sections on tours. The number of editorial pages published in the PROCEEDINGS for the year was increased from 1,800 to 2,318. Due to the careful selection of the Committee on Meetings and Papers and the Board of Editors it is thought that the quality of papers published has been improved. The report of the 1928 Committee on Standardization was completed and published in the YEAR BOOK. Seven thousand copies of this book and fifteen hundred copies of reprints of the 110-page report were distributed to the Institute membership and others interested in radio standardization. The standardization projects in which the Institute is interested were inaugurated with renewed vigor. An Assistant Secretary of the Institute was secured to devote the major portion of his time to standardization work. The Committee on Broadcasting submitted six reports which were approved by the Board of Direction. The policy of the Institute with respect to Institute activities was modified, in view of the growing interest of engineers

in telegraph and telephone engineering methods as applied to radio problems, to allow the inclusion of papers on telephone and telegraph engineering and to admit engineers working in those fields to the higher grades of membership in the Institute. New committees were appointed to carry out policies established by the Board. The office staff at headquarters was enlarged to carry on the additional duties assigned to it.

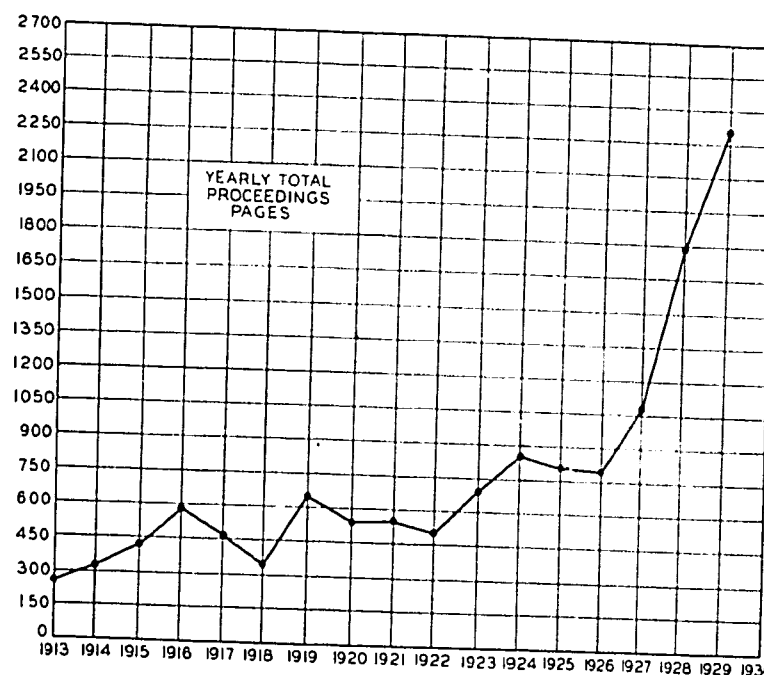


Fig. 1

Directors' Meetings

The affairs of the Institute are managed by the Board of Direction. The Board establishes general policies and supervises the entire operation of the Institute. Nine regular meetings and two special meetings of the Board were held, the average attendance being 8.8 members. President Taylor presided at five meetings of the Board. The two special meetings were held on January 25, 1929, and June 26, 1929, to consider reports of the Committee on Broadcasting which it was not desirable to defer to regular meetings. The business transacted at all meetings of the Board has been duly recorded in the minutes thereof. Matters of special interest to the membership were published in the Institute Notes section of the PROCEEDINGS each month. The

Board elected and transferred 1729 members of all grades during the year upon the favorable recommendations of the Committee on Admissions. To carry out more effectively the activities, new committees were appointed during the year as follows: Bibliography, New York Program, Code for Meetings and Papers, Sectional Meeting with the A. A. A. S., Use of Kilocycle Terminology, 1930 Convention, 1930 Convention Technical Program, Expansion of Institute's Scope and Activities, and Tellers. Most of these are not standing committees.

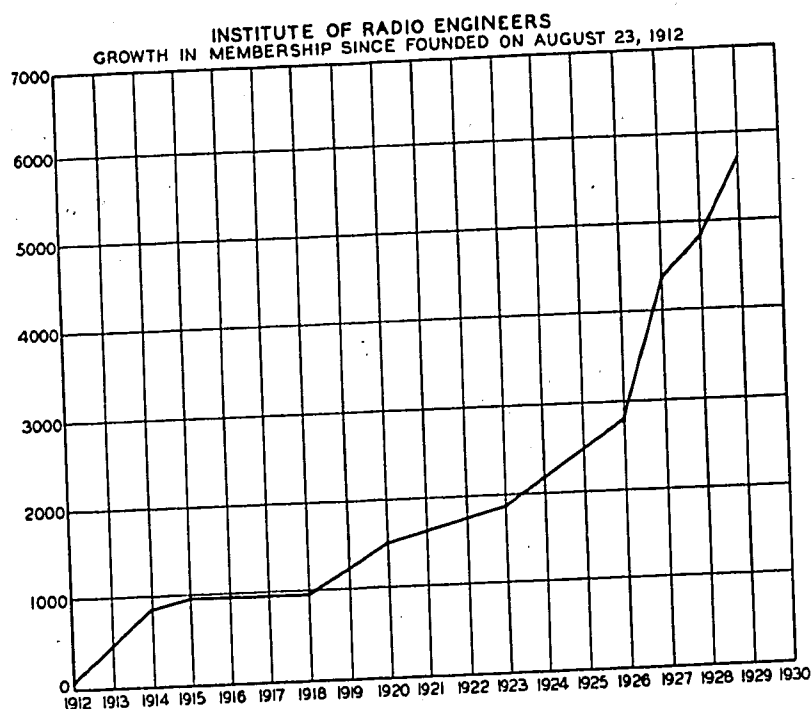


Fig. 2

As representatives of the Institute on the committees of other organizations, or as delegates to special meetings, the Board made the following appointments:

C. W. Latimer and F. B. Jewett, delegates to World Engineering Congress, Tokyo, October, 1929.

C. B. Jolliffe and T. McL. Davis, delegates to 50th Anniversary Celebration, American Society of Mechanical Engineers, Washington, D. C., April, 1930.

Alexander Meissner, delegate to 50th Anniversary Celebration of the Electrotechnical Association, Inc., Berlin, January, 1930.

J. C. Jensen, delegate to Annual Meeting, American Association for the Advancement of Science, Des Moines, December, 1929.

W. Wilson, delegate to International Technical Consulting Committee, The Hague, September, 1929.

J. V. L. Hogan, L. E. Whittemore, and L. M. Hull, representatives on Sectional Committee on Radio, American Standards Association.

Melville Eastham, representative on Radio Broadcasting Committee, American Engineering Council.

Haraden Pratt, representative on Sectional Committee on Definitions of Technical Terms, American Standards Association.

Addresses of the President

In addition to presiding at five New York meetings of the Institute, President Taylor served in his official capacity at two other meetings—at the Eastern Great Lakes Convention in Rochester, where he also presented a technical paper, and at a meeting of the Atlanta Section of the Institute.

Annual Convention

The fourth annual convention of the Institute was held in Washington, D. C., on May 13-16, 1929, under the chairmanship of C. B. Jolliffe. The program included three inspection trips, three special trips for the ladies, four technical sessions (including a joint meeting with the American Section of the International Scientific Radio Union), the presentation of thirty-eight technical papers, and a banquet on the last evening at which the annual Institute awards were made. The Institute was particularly honored in having present Vice-President and Mrs. Meissner of Berlin. Several other members from abroad also attended. The registration was five hundred and fifty-five, the larger portion of which consisted of members outside of the Washington Section. At a concluding session of the convention it was announced that the 1930 convention is to be held in Toronto in August.

Eastern Great Lakes District Convention

On November 18th two hundred and fifty members assembled in Rochester, N. Y., to take part in the first district convention of the Institute. A very interesting two-day program was provided by committees from four sections of the Institute—Rochester, Toronto, Buffalo-Niagara, and Cleveland. The program included two technical sessions at which eight papers were read, three inspection trips, special

trips and theater parties for the ladies, a banquet, and an exhibition of products by manufacturers of radio parts and accessories. V. M. Graham, of the Rochester Section, was the convention chairman.

Meeting with the American Association for the Advancement of Science

A committee composed of J. C. Jensen (chairman), C. A. Culver, H. M. Crothers, John H. Miller, and S. T. Hutchinson was appointed

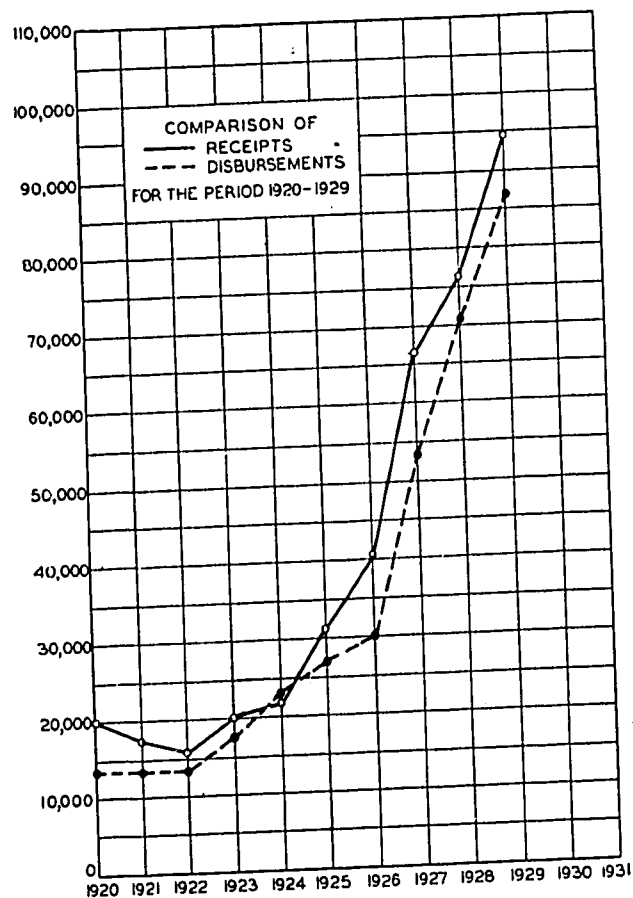


Fig. 3

in October to arrange the program of a sectional meeting of the Institute with the American Association for the Advancement of Science in Des Moines on December 28, 1929. The Institute had two sessions on the program; a noon luncheon and a technical session. At the latter twelve papers were presented.

New York Meetings

Ten technical meetings of the Institute were held in New York City, in the Engineering Societies Building, during the year. All of the papers presented at these meetings have been or will be published in the PROCEEDINGS. The average attendance for each meeting was slightly over three hundred and seventy-five.

Headquarters

During the last three years the headquarters staff has been increased from five to fifteen persons. This increased staff has been required partly through a one hundred per cent increase in the membership of the Institute, a two hundred per cent increase in the pages of PROCEEDINGS published, and an increase of two hundred per cent in the number of standing committees in operation. The staff is so organized now that practically all of the routine and detail work involved in the entire operation of the Institute is carried on at headquarters.

It is appropriate for the Secretary to acknowledge publicly the loyal and unfailing support of all members of the headquarters organization, lacking which the progress of the Institute would have been retarded considerably.

Committees

Under the direction and supervision of the Board of Direction the major activities of the Institute were carried on by twelve committees and eleven subcommittees. It is unfortunate that members of the Institute cannot be afforded an opportunity to acknowledge their debt of appreciation to these important bodies without whose continuous assistance their Institute could not conduct any of its work. These gentlemen, during 1929, have given unsparingly of their time and counsel to the variegated problems, both routine and constructive, which are involved in every phase of the carrying out of policies handed down by the Board of Direction. Members serving on any of the Institute committees are making a very direct and distinct contribution to the radio art.

ADMISSIONS

The Committee on Admissions, R. A. Heising, chairman, met eleven times during the year, the average attendance being 4.5 members. The recommendations of the committee to the Board of Direction were based upon the following number of applications considered and approved:

	<i>Acted Upon</i>	<i>Approved</i>
Transfer to Fellow grade.....	7	4
Recommended by Membership Committee for transfer to Fellow grade.....	12	10
Election to Fellow grade.....	4	3
Transfer to Member grade.....	59	37
Recommended by Membership Committee for transfer to Member grade.....	105	85
Election to Member grade.....	119	63
Election to Associate grade.....	1379	1375
Election to Junior grade.....	151	151
	<hr/>	<hr/>
	1836	1728

The committee undertook the revision of the memorandum originally prepared by the 1928 Committee on Admissions which has been used as a guide to the present committee's endeavor to interpret correctly the various clauses of the Constitution which define the qualifications for advanced grades of membership. This revision was particularly necessary in view of the change in policy, instituted by the Board of Direction, to include general communication activities in the Institute. Because of its effort to assist in the maintenance of a high standard of membership in the Institute, the committee has been called upon to assume much responsibility.

AWARDS

The Committee on Institute Awards, of which Melville Eastham was chairman, conducted its business through correspondence and one meeting. The committee prepared nominations for recipients of the two 1929 awards, the Institute Medal of Honor and the Morris Liebmann Memorial Prize. The awards were presented at the fourth annual convention in Washington in May, G. W. Pierce receiving the Medal of Honor and E. V. Appleton, the Liebmann prize.

BROADCASTING

The Committee on Broadcasting, L. M. Hull, chairman, was established in 1928 to be of assistance to the Federal Radio Commission and the Institute membership in the solution of some of the technical problems involved in radio development. The committee held eight meetings during the year with an average attendance of seven members out of a total membership of eight. In addition, the members of the committee prepared initial drafts and final revisions of all the reports in their own time outside of the regular meetings, and much of the committee's work was handled through correspondence. During

1929 the following reports were prepared by the committee and approved by the Board of Direction:

- No. 3. Synchronization—Preliminary Requirements for the Conduct of Tests.
- No. 4. Permissible Deviation of Carrier Frequency from Licensed Frequency.
- No. 5. Allowable Ratio of Day to Night Power.
- No. 6. Permissible Intensity of Harmonics and other Spurious Radiation.
- No. 7. Modulation Capability.
- No. 9. Effective Methods of Power Rating and Measurement.

These reports, together with two others completed in 1928, were published in the January, 1930, issue of the PROCEEDINGS.

BIBLIOGRAPHY

At the April 5, 1929, meeting of the Board of Direction it was decided that a preliminary committee should be appointed to investigate the desirability and possibility of the Institute's undertaking the compilation and publication of a complete bibliography of the radio literature. In June a committee under the chairmanship of B. E. Shackelford was appointed. At the June 5, 1929, Board meeting it was decided to include within the scope of the activities of the Committee on Bibliography a study of the possibility of the Institute's furnishing a monthly abstract service to its members. A meeting of the committee was held on June 26, 1929. Since that date the committee has gone forward with its work through correspondence and personal contact between certain of its members and engineers in foreign countries. It is thought that the committee's report to the Board of Direction will be available early in 1930.

BOARD OF EDITORS

The Board of Editors of the PROCEEDINGS, W. G. Cady, chairman, has examined one hundred and eighty-five papers submitted for publication. One hundred and twenty-six of these were accepted for publication. The Board is responsible for the technical editing of all papers published and is the final authority in the disposition of manuscripts submitted. Most of the Board's work was done through correspondence. Two meetings, however, were held during the year. The first meeting was held jointly with the Committee on Meetings and Papers. At the second meeting the Board completed its study of certain typographical and "make-up" changes in the PROCEEDINGS, and adopted a number of policies with respect to publication activities.

INSTITUTE SECTIONS

The Committee on Institute Sections, E. R. Shute, chairman, held six meetings during the year. The average attendance per

meeting was eight. Four petitions for the formation of new sections were considered by the committee. The committee was unable to approve three of these, since it was not thought that organization of sections in these territories would be compatible with the interests of the Institute. The petition from members residing in the territory of Cincinnati was approved, and the section was organized. The principal work of the committee during the year was: general supervision of the activities of the sections; revision of the Manual for Section Guidance and Operation; study of monthly reports submitted to the Institute office by sections; arrangements for and conduct of a meeting of section delegates at the annual convention at which eighteen section representatives were present; preparation of a memorandum to the Board of Direction suggesting policies to be followed respecting, (a) new sections, and (b) affiliation of sections with local engineering societies. During the year the Institute office arranged for speakers for thirty-three section meetings, an increase of seven over last year. Approximately twenty-five per cent of the total number of section meetings for the year were arranged in this manner.

The following tabulation indicates the activities and condition of sections of the Institute on December 10, 1929:

Section	Membership Dec. 1929	Number of Meetings			Average Attendance 1929	Percentage of Average Attendance to Total Membership
		1927	1928	1929		
Atlanta	33	6	7	7	23	69
Boston	227	1	3	2	128	56
Buffalo-Niag.	57	7	10	10	30	54
Chicago	360	5	6	6	183	50
Cincinnati	62	—	—	4*	44	70
Cleveland	131	6	10	10	62	47
Conn. Valley	130	5	5	4	33	25
Detroit	126	10	10	9	72	57
Los Angeles	183	6	8	8	120	65
New Orleans	36	—	3	5	39	108
Philadelphia	257	10	8	7	82	32
Pittsburgh	78	—	6	8	141	180
Rochester	65	6	8	7	137	210
San Francisco	138	1	6	10	145	105
Seattle	51	8	8	9	79	154
Toronto	131	9	8	8	90	68
Washington	172	6	8	9	84	48
	2,237	86	114	123	av. 88	av. 82

* The Cincinnati Section was not organized until the middle of the year.

NEW YORK PROGRAM

At the suggestion of the Committee on Meetings and Papers a subcommittee of that committee, known as the New York Program Committee, was created in April, 1929. Since that time the committee, of which W. Wilson was chairman, has arranged the programs of all meetings of the Institute held in New York City. The committee has met monthly.

NOMINATIONS

The Committee on Nominations, Melville Eastham, chairman, conducted its business through correspondence. The committee prepared a list of suggested candidates for the offices of President, Vice-President, and elective Board members for 1930. The recommendations of the committee were used by the Board of Direction as the basis of its choice of candidates for these offices.

MEMBERSHIP

The Committee on Membership held seven meetings in 1929, with an average attendance of five members. The major activity of the committee was a thorough, though not exhaustive, canvass of the larger firms and other employers of radio engineering talent. The committee rewrote the Aims and Activities booklet, prepared an application form suitable for publication each month in the PROCEEDINGS, prepared a bulletin-board membership solicitation form, recommended a list of Associates and Members to the Committee on Admissions for transfer to higher grades, arranged for the solicitation of membership applications from lists supplied by the American Radio Relay League, and prepared an extensive agenda of work to be done in 1930. In a large measure the gain in membership this year has been made possible through the personal interest of members of the Institute in the growth of their society, as was evident by the effective use made of membership material placed in their hands. Through their efforts the Institute enjoyed a fifteen per cent increase in membership.

DISTRIBUTION OF INSTITUTE MEMBERSHIP

Continental United States	4754
Africa	23
Alaska	5
Canal Zone	3
Philippine Islands	9
Australia	30
Belgium	2
Bermuda	2
British West Indies	2

Canada.....	215
Central America.....	1
China.....	30
Colombia.....	1
Costa Rica.....	1
Cuba.....	5
Czechoslovakia.....	4
Denmark.....	13
Dutch East Indies.....	1
Egypt.....	1
England.....	316
Federated Malay States.....	6
France.....	20
Friendly Islands.....	1
Germany.....	15
Gibraltar.....	1
Holland.....	10
Hungary.....	11
India.....	14
Ireland.....	7
Italy.....	6
Japan.....	82
Mexico.....	7
Malta.....	1
New Zealand.....	17
Palestine.....	2
Poland.....	3
Porto Rico.....	4
Portugal.....	1
U. S. S. R. (Russia).....	4
Samoa.....	1
Scotland.....	13
South America.....	25
Spain.....	8
Straits Settlements.....	2
Sweden.....	3
Switzerland.....	1
Wales.....	1
Republic of Panama.....	1
Virgin Islands.....	1
Territory Hawaii.....	9
	<hr/>
	5,695

MEETINGS AND PAPERS

The Meetings and Papers Committee, K. S. Van Dyke, chairman, was responsible for securing papers for publication in the PROCEEDINGS and for making a preliminary examination of all papers submitted with

a view to verifying their technical accuracy. Several committee members undertook extensive editorial work on manuscripts read. One meeting of the committee was held during the year; its activities outside of this organization meeting were confined to correspondence and reading of manuscripts, and to a revision of the "Report of Reader" form upon which the committee indicates its recommendations on papers read. A Subcommittee on Code of Meetings and Papers Committee, W. C. White, chairman, was appointed in April, 1929, to broaden the scope of the material prepared by previous committees on the work of the committee and its relation to the Board of Editors. This subcommittee completed the Code which was adopted by the Board of Direction and which has been of material assistance to the Committee on Meetings and Papers in its work. The table below indicates the extent of the committee's work for the year:

Papers secured for publication.....	185
Papers published in 1929.....	126
Papers rejected by the Committee and Editors.....	20
Papers returned to authors for revision.....	38
Book Reviews prepared and published.....	8
Discussions to papers published.....	11

PUBLICITY

The Committee on Publicity, W. G. H. Finch, chairman, provided publicity for all of the New York meetings as well as an extensive series of releases covering the annual convention. Convention releases were distributed to over two thousand papers in the United States. The monthly releases on New York meetings were sent to one hundred and twenty-five papers and secured national distribution, in addition, through three press associations. The committee cooperated with the Publicity Committee of the Eastern Great Lakes District Convention in securing desirable publicity on that meeting.

STANDARDIZATION

The 1928 Committee on Standardization, L. E. Whittemore, chairman, carried over into 1929 until its report had been completed. This report was published in the 1929 Year Book of the Institute, of which seven thousand copies were printed and distributed to Institute members and others. Fifteen hundred reprints of the 110-page standardization report were printed and were circulated among persons interested in radio standardization.

The 1929 committee, J. H. Dellinger, chairman, inaugurated its activities at a meeting of technical committee chairmen held on September 5, 1929. The set-up of main technical committees for 1929

was: No. 1, Radio Receivers, E. T. Dickey, chairman; No. 2, Radio Transmitters and Antennas, Haraden Pratt, chairman; No. 3, Vacuum Tubes, C. B. Jolliffe, chairman; No. 4, Electro-Acoustic Devices, H. A. Frederick, chairman. Three informal subcommittees of the Technical Committees on Radio Receivers and Radio Transmitters were organized. These were, under Technical Committee on Radio Receivers: marine and direction-finding receivers; aircraft receivers; high-frequency receivers; and, under Technical Committee on Radio Transmitters: nomenclature, symbols and definitions; methods of testing apparatus, equipment, devices, and materials; establishment of provisions for safety of operating and other personnel. The Standardization Committee is making a special point of working in close collaboration with other organizations in similar fields. There are included on the committee's membership officially designated representatives of the A. I. E. E., R. M. A., and N. E. M. A. The latter two associations have representatives on each of the technical committees. Through frequent meetings, and the preparation and circulation of drafts, all of the technical committees were active in reviewing previously published material and in instituting material for standardization in new fields.

SECTIONAL COMMITTEE ON RADIO OF THE AMERICAN STANDARDS ASSOCIATION

The Institute of Radio Engineers and the American Institute of Electrical Engineers are joint sponsors of the Sectional Committee on Radio of the American Standards Association. In July, 1929, the tentative American Standard for specifications for vacuum-tube bases was formally adopted by the A. S. A. This standard was prepared by the 1928 Technical Committee on Vacuum Tubes. During the middle of the year the Sectional Committee was completely reorganized. Officers of the committee were elected as follows: Alfred N. Goldsmith, chairman; C. H. Sharp, vice-chairman, H. P. Westman, secretary. In the reorganization of the technical committees, whose functions roughly correspond to those of the technical committees of the I. R. E. Standardization Committee, the following technical committees were constituted: No. 1, Radio Receivers, W. A. MacDonald, chairman; No. 2, Radio Transmitters, Haraden Pratt, chairman; No. 3, Vacuum Tubes, J. C. Warner, chairman; No. 4, Electro-Acoustic Devices, Irving Wolff, chairman. Although no standards were proposed by the Sectional Committee during 1929, much work was accomplished indicating that several standards should be completed in 1930.

REPORT OF SECRETARY FOR 1929

Institute of Radio Engineers, Inc. COMPARATIVE BALANCE SHEET December 31, 1928 and 1929

	Dec. 31, 1929	Dec. 31, 1928	Increase Decrease
CASH			
General Fund—Corn Exchange Bank	\$15,603.90	14,208.82	1,395.08
General Fund—National State Bank, Newark	7.29	7.29	
Special Fund—Corn Exchange Bank	222.75	417.18	194.43
Savings Account—National State Bank, Newark	5,559.62	5,342.77	216.85
Petty Cash Fund	175.00	175.00	
TOTAL CASH	21,568.56	20,151.06	1,417.50
ACCOUNTS RECEIVABLE			
Juniors			
Associates	73.00	133.00	60.00
Members	1,181.31	1,073.65	107.66
Entrance Fees	25.00	88.00	63.00
Advertising	803.00		803.00
Transfer Fees	2,645.79	1,501.67	1,144.12
	52.20	30.00	22.20
TOTAL ACCOUNTS RECEIVABLE	4,780.30	2,826.32	1,953.98
NOTES RECEIVABLE			
		26.67	26.67
INVENTORY			
Proceedings on Hand	3,688.88	5,141.20	1,452.32
Bound Volumes on Hand	191.36	374.28	179.92
Paper Stock on Hand		1,519.96	1,519.96
Binders on Hand	181.70	36.75	144.95
TOTAL INVENTORY	4,064.94	7,072.19	3,007.25
INVESTMENTS (SCHEDULE "D")			
FURNITURE AND FIXTURES	\$6,760.03		
Less—Reserve for Depreciation	2,279.89		
	4,480.14	3,876.54	603.60
ACCRUED INTEREST ON INVESTMENTS	739.18	618.33	120.85
PREPAID EXPENSES			
Unexpired Insurance Premiums	43.68	54.54	10.86
Stationery Inventory	300.00	300.00	
TOTAL ASSETS	\$73,214.80	66,118.15	7,096.65
LIABILITIES AND SURPLUS			
ACCOUNTS PAYABLE			
SUSPENSE	\$ 3,912.29	4,687.40	775.11
DUES, ETC. PAID IN ADVANCE	120.32	111.28	9.04
Juniors			
Associates	9.70	24.00	14.30
Members	732.73	478.07	254.76
Fellows	75.15	116.70	41.55
	2.00	75.00	73.00
Subscriptions to PROCEEDINGS	2,722.07	2,723.70	1.63
TOTAL LIABILITIES	7,574.26	8,217.05	642.79
MORRIS LIEBMAN MEMORIAL FUND			
Principal			
Unexpended Income	10,000.00	10,000.00	
	77.87	77.87	
TOTAL MORRIS LIEBMAN FUND	10,077.87	10,077.87	
SURPLUS			
Balance, January 1st	47,823.23	40,916.34	6,906.89
Operating Profit for Year (See Exhibit "B")	7,739.44	6,906.89	832.55
SURPLUS, DECEMBER 31st	55,562.67	47,823.23	7,739.44
TOTAL LIABILITIES AND SURPLUS	\$73,214.80	66,118.15	7,096.65

Patterson and Ridgway, Certified Public Accountants,
74 Trinity Place, New York City.

CONSTITUTION

ADOPTED AT THE FIRST MEETING OF THE INSTITUTE OF RADIO ENGINEERS, MAY 13, 1912; AMENDED NOVEMBER 2, 1914, AND DECEMBER 5, 1915

ARTICLE I

NAME AND OBJECT

SEC. 1—The name of this organization shall be the Institute of Radio Engineers.

SEC. 2—Its object shall be the advancement of the theory and practice of radio engineering and of the allied arts and sciences, and the maintenance of a high professional standing among its members. Among the means to this end shall be the holding of meetings for the reading and discussion of professional papers and the publication of such papers, discussions and communications as may seem expedient.

ARTICLE II

MEMBERSHIP

SEC. 1—The membership of the Institute shall consist of:

- a. Honorary Members, who shall be entitled to all rights and privileges of the Institute except the right to nominate, vote and hold office.
- b. Fellows, who shall be entitled to all rights and privileges of the Institute.
- c. Members, who shall be entitled to all rights and privileges of the Institute except the right to hold the office of President and Vice-President.
- d. Associates, who shall be entitled to all rights and privileges of the Institute except the right to hold the office of President, Vice-President, and Editor.
- e. Juniors, who shall be entitled to attend all meetings and to receive copies of all Institute publications.

SEC. 2—Honorary members may be chosen from among those who have rendered acknowledged eminent service to radio science, or the radio arts.

SEC. 3—A Fellow shall be not less than thirty years of age and shall be either:

- a. A radio engineer by profession. As such he shall be qualified to design and take responsible charge of important radio work; he shall have been in the active practice of his profession for at least seven years, and shall have had responsible charge of important radio work for at least three years.

When the applicant holds in a principal national society of an allied branch of engineering, membership in a grade for which the qualifications indicate a standing equal to that required for the grade of Fellow herein, such membership shall be considered equivalent to three of the required seven years of active practice of the radio profession.

CONSTITUTION

- b. A professor of physical science or of electrical engineering. As such he shall have attained special distinction as an expounder of the principles of radio science and of radio engineering; he shall have had at least seven years experience as a teacher of physical or electrical subjects and shall have had responsible charge, for three years, in a radio course of a principal school of science and engineering. Any years of experience as defined in paragraph "a" that the applicant may have had as a radio engineer shall be considered the equivalent of the same number of years of experience as a "teacher of radio subjects."

- c. A person who has done notable original work in radio science of a character to give him a recognized standing at least equivalent to that required for the Fellows under paragraphs "a" and "b."

- d. A person regularly engaged in radio work for at least seven years, who, by inventions or special proficiency in contributions to the radio science or the radio arts or radio literature, has attained a standing at least equivalent to that required for Fellows under paragraphs "a" and "b."

SEC. 4—A Member shall be not less than twenty-five years of age and shall be either:

- a. A radio engineer by profession. As such, under general direction he shall have designed and taken responsibility for important radio engineering work; he shall have been in the active practice of his profession for at least four years.

When the applicant holds in a principal national society of an allied branch of engineering, membership of a grade for which the qualifications indicate a standing equal to that required for the grade of Member herein, such membership shall be considered equivalent to two years of the requisite four years of active practice of the radio profession.

- b. A teacher of physical science or of electrical engineering. He shall have had at least four years experience as a teacher of radio subjects in a school of recognized standing. Any years of experience the applicant may have had as a radio engineer shall be considered the equivalent of the same number of years of experience as a "teacher of radio science or of radio engineering."

- c. A person regularly employed in radio or closely allied work for at least four years, who, by invention or by proficiency in radio science, the radio arts, or radio literature, or as an executive of any radio enterprise of large scope, has attained a standing equivalent to that required for Members under paragraphs "a" and "b." In the case of such an executive the applicant must be qualified to take responsible charge of the broader features of radio engineering involved in the work under his direction.

- d. A commissioned officer of the Army or Navy of the United States Government or of any foreign government, who has been regularly engaged in radio work for a period of at least three years, who shall have had responsible charge of important government radio work for at least one year and who shall have attained the rank of Captain in the Army or Lieutenant in the Navy.

SEC. 5—An Associate shall be not less than twenty-one years of age and shall be:

- a. A radio engineer by profession.
- b. A teacher of radio subjects.
- c. A person who is interested in and connected with the study or application of radio science or the radio arts.

SEC. 6—A Junior shall be not less than sixteen years of age nor over twenty-one years of age, and shall be a person who is interested in the study or application of radio science or the radio arts.

On attaining the age of twenty-one years, Juniors shall be transferred to the grade of Associate.

SEC. 7—In all cases, graduation from the radio course or electrical course of a school of science or of engineering of recognized standing shall be considered the equivalent of one year's radio experience.

SEC. 8—Any person who is a Member at the time this group of amendments is adopted, shall not be barred from eligibility to the grade of Fellow because of the age limitation, provided he shall otherwise be eligible as herein defined.

Any person who is an Associate at the time this group of amendments is adopted, shall not be barred from eligibility to the grade of Member because of age limitations, provided he shall otherwise be eligible as herein defined.

ARTICLE III

ADMISSIONS AND EXPULSIONS

SEC. 1—Honorary Members shall be recommended by at least ten members of the Board of Direction, and upon unanimous vote of the Board shall be proposed to the membership for election. A person elected an Honorary Member shall be promptly notified thereof by letter. The election shall be cancelled if an acceptance is not received within six months after the mailing of notice.

SEC. 2—Applications may be made for admission or transfer to any grade of membership. Applicants shall give references to members of the Institute as follows:

For the grade of Fellow, to five Fellows.

For the grade of Member, to five Fellows, or Members.

For the grade of Associate, to five Fellows, Members or Associates.

For the grade of Junior, to five Fellows, Members or Associates.

Each application for admission or for transfer from one grade to another shall embody a concise statement, with dates, of the candidate's training and experience, and shall be in such form and such detail as may be prescribed by the Board of Direction. It shall be signed by the applicant and shall contain a promise to conform to the requirements of that grade of membership to which he may be elected.

Each of the members referred to by the applicant shall be requested by the Secretary to address a letter to the Board of Direction stating the extent of the writer's personal knowledge of the applicant and his training and experience. If at least a majority of the corporate members named as references do not furnish the requisite endorsement, the Secretary shall call upon the applicant for additional names, and not until written communications have been received from at least three members shall the application be considered by the Board of Direction.

The requirements of the foregoing paragraph may be waived in whole or in part where the applicant is well-known, either personally or by reputation, to the Board of Direction, or where the application is for Junior or Associate grade.

An applicant who is so situated as not to be personally known to the required number of members of any grade may give the names, occupations and addresses of responsible non-members to complete the required number of references.

SEC. 3—A list comprising the names, ages, addresses and occupations of all new applicants for admission or transfer shall be sent by the Secretary to each member of the Board of Direction.

The Board of Direction may consider applications for admission or transfer to the grade of Member at any regular meeting held at least two weeks after the list containing the applicants' names has been sent to each member of the Board of Direction.

The Board of Direction may consider applications for admission or transfer to the grade of Fellow at any regular meeting held at least four weeks after the list containing the applicants' names has been sent to each member of the Board of Direction.

A record affirmative vote, oral or written, of at least two-thirds of the Board members voting at any regular meeting, shall elect or transfer an applicant for any grade. A vote on any application shall stand, unless withdrawn by the Board member voting, until the application is finally acted upon.

SEC. 4—A rejected applicant may renew his application for membership at any time after the expiration of one year from the date of the ballot rejecting his previous application.

SEC. 5—All elected candidates shall be duly notified and shall subscribe to the Constitution and Rules of the Institute. Forms for this purpose shall be prescribed by the Board of Direction. If these provisions are not complied with within six months from the notification of election, such election shall be considered void, unless for special reasons the time shall be extended by the Board of Direction. Membership of any person shall date from the date of his election.

SEC. 6—Fellows, Members, Associates or Juniors, if found delinquent in their duties may be tried by the Board of Direction, and upon decision of the Board their names shall be submitted to the Institute to determine their suspension or expulsion. A three-quarters vote of the Institute shall be necessary to ratify such action of the Board.

SEC. 7—A member may resign his membership by a written communication to the Secretary, who shall present the same to the Board of Direction; when, if all his dues have been paid, his resignation shall be accepted.

ARTICLE IV

DUES

SEC. 1—The entrance fee, payable on admission to the Institute, shall be as follows:

Admission to the grade of Fellow, ten (\$10) dollars.

Admission to the grade of Member, five (\$5) dollars.

Admission to the grade of Associate, three (\$3) dollars.

Admission to the grade of Junior, one (\$1) dollar.

The transfer fee from one grade of membership to another shall be the difference between the corresponding admission fees.

The entrance fees shall be waived until January 1, 1927.

SEC. 2—The annual dues payable by members, whether resident or non-resident, shall be as follows:

- a. By Fellows, ten (\$10) dollars.
By Members, seven dollars and fifty cents (\$7.50).
By Associates, four (\$4) dollars.
By Juniors, three dollars and fifty cents (\$3.50).
- b. Honorary Members shall be exempt from all payments.

SEC. 3—The annual dues shall be payable on the first day of January, in advance of the ensuing year. It shall be the duty of the Secretary to notify each member of the amount due at the time of giving notice of the annual meeting.

SEC. 4—Persons elected after July 1st of any year shall pay only one-half of the dues for that year.

SEC. 5—Any person whose dues are more than three months in arrears shall be notified by the Secretary. Should his dues not be paid when they become six months in arrears, he shall lose the right to vote or to receive the publications of the Institute. Should his dues become nine months in arrears, he shall be again notified in form prescribed by the Board of Direction, and if such dues become one year in arrears, he shall forfeit his connection with the Institute. The Board of Direction may, however, for cause deemed by it sufficient, extend the time for payment and for the application of these penalties.

SEC. 6—The Board of Direction may, for sufficient cause, temporarily excuse from payment of annual dues any member; and the Board may remit the whole or part of dues in arrears, or accept in lieu thereof desirable additions to the library or collections.

SEC. 7—Every person admitted to the Institute shall be considered as belonging thereto and liable for the payment of all dues until he shall have resigned, been expelled, or have been relieved therefrom by the Board of Direction.

ARTICLE V

OFFICERS

SEC. 1—The governing body of the Institute shall be a President, a Vice-President, a Secretary, a Treasurer, and an Editor of Publications, six elected Managers, and three appointed Managers who shall together constitute the Board of Direction.

SEC. 2—The terms of all officers, except the six elected Managers, shall be one year each, and shall begin at the close of the annual meeting at which election is made. The terms of all officers shall continue until successors are duly elected. The President and the Vice-President shall not be eligible for immediate re-nomination to the same office.

CONSTITUTION

SEC. 3—Two Managers shall be elected each year and serve for three years.

For the year 1915 six elected Managers were voted upon as follows: The two candidates receiving the highest number of votes to serve three years; the two candidates receiving the next highest number of votes, two years; the two candidates receiving the next highest number of votes, one year.

SEC. 4—The three appointed Managers shall be chosen by the Board of Direction to serve for terms of one year. These appointed Managers shall have no vote in the election of their successors.

ARTICLE VI

MANAGEMENT

SEC. 1—The President shall have general supervision of the affairs of the Institute. He shall preside at meetings of the Institute and of the Board of Direction at which he may be present and shall be an ex-officio member of all committees. He shall deliver an address at the annual meeting.

SEC. 2—The Board of Direction shall manage the affairs of the Institute in conformity to the laws under which the Institute is organized and the provisions of the Constitution. It shall direct the investment and care of the funds of the Institute; make appropriations for specific purposes; act upon applications for membership as heretofore provided; take measures to advance the interests of the Institute; appoint all its employees, and generally direct its business. The Board of Direction shall make an annual report at the annual meeting, transmitting the report of the Treasurer and of the other officers and of committees. Five members of the Board of Direction shall constitute a quorum.

SEC. 3—The Treasurer shall receive all moneys and deposit same in the name of the Institute. He shall invest all funds not needed for current disbursements, as shall be ordered by the Board of Direction. He shall pay all bills, when certified and audited, as provided by this Constitution and by the rules to be prescribed by the Board of Direction. He shall make an annual report and such other reports as may be prescribed by the Board of Direction.

The Board of Direction shall secure a satisfactory surety for the faithful performance of his duties by the Treasurer, and shall renew the same during the month of January of each year.

SEC. 4—The Secretary will be expected to attend all meetings of the Institute and of the Board of Direction; prepare the business thereof, and duly record the proceedings thereof. He shall see that all moneys due the Institute are carefully collected, and without loss transferred to the custody of the Treasurer. He shall carefully scrutinize all expenditures and use his best endeavor to secure economy in the administration of the Institute. He shall personally certify the accuracy of all bills or vouchers on which money is paid, and shall countersign the checks drawn by the Treasurer against the funds of the Institute when such drafts are known to him to be proper, and duly authorized by the Finance Committee. He shall have charge of the books of account of the Institute, and shall furnish, when required by the Board of Direction, a statement of receipts and expenses under their several headings, and also a statement of monthly

balances. He shall present annually, to the Board of Direction, a balance sheet of his books as of December 31st and shall furnish from time to time such other statements as may be required of him. He shall conduct the correspondence of the Institute and keep full records of the same. He shall perform all other duties which may from time to time be assigned to him by the Board of Direction.

SEC. 5—The Board of Direction may also, if they deem it necessary, appoint an Assistant Secretary, who shall aid the Secretary and be under his immediate direction in all matters.

SEC. 6—The President, as soon as expedient after the annual meeting, shall appoint from the membership, with the advice and consent of the Board of Direction, the following standing committees:

- Committee on Papers.
- Committee on Standardization.
- Committee on Publicity.

Members appointed shall serve until their successors are appointed or the Committees dissolved.

ARTICLE VII

NOMINATION AND ELECTION OF OFFICERS

SEC. 1—Two months before the annual meeting, nominations for the offices of President, Vice-President, Secretary, Treasurer, and two Managers, shall be called for from the membership qualified by this Constitution. Before nominees' names are submitted to the membership for final vote, each nominee shall be consulted and if he so requests, his name shall be withdrawn and the next ranking name substituted.

For the year 1915, nominations for six Managers were called for.

One month before the annual meeting, the Board of Direction shall submit to the entire membership excepting Honorary Members and Juniors, a list of all nominees, which list shall consist of the pairs of names receiving the largest number of nominations for each office. In the event of ties in nominations the Board of Direction shall select the name of the man in its opinion best fitted for that office. The membership shall then submit written ballots in plain sealed envelopes enclosed within mailing envelopes marked "Ballot," and bearing the member's signature, voting for officers from the list of nominees. A majority vote received up to the time of the closing of the polls (twenty-four hours before the opening of the annual meeting) shall elect, and no votes by proxy shall be counted. The method of balloting herein described shall be used for nominating as well as for voting, except the outer envelope shall be marked "Nomination" in the former case. In nominating, as in voting, no proxies or ballots within unsigned outer envelopes shall be opened for counting. Ballots, whether for nomination or voting, shall be checked, opened and counted by a quorum of the Board of Direction, at a regular meeting of the Board. At the time of call for nominations, the Board of Direction shall submit to qualified voters a list of suggested nominations containing at least two names for each office.

SEC. 2—The Editor of Publications shall be elected by vote of the Board of Direction as soon as possible after May 1st.

CONSTITUTION

ARTICLE VIII

MEETINGS

SEC. 1—There shall be an Annual Meeting, at which the annual reports for the year ending December 31st previous shall be presented, and the Ballot for officers reported. At this meeting fifteen (15) members shall constitute a quorum.

SEC. 2—Business meetings shall be held as prescribed by the by-laws.

SEC. 3—In addition to the Annual Meeting, meetings for the reading and discussion of papers shall be held as ordered by the Board of Direction.

SEC. 4—Special meetings may be called by the Board of Direction, and shall be so called upon request of ten members, which request shall state the purpose of such meeting. The call for such meeting shall be issued ten days in advance, and shall state the purpose thereof, and no other business shall be taken up at such meeting. At these meetings ten members shall constitute a quorum.

SEC. 5—The Institute may adopt, from time to time, rules for the order of business at its meetings.

SEC. 6—Meetings of the Board of Direction shall be held at the time of the annual meeting and at such other times as the Board may determine, but only on notice to all members of the Board by the Secretary. Notices of time and place of meeting are to be mailed in New York at least two days in advance.

ARTICLE IX

AMENDMENTS

SEC. 1—Proposed amendments to this Constitution must be reduced to writing and signed by not less than twenty Fellows, Members or Associates, and be submitted to the entire membership, except Honorary Members and Juniors, who shall vote by letter ballot. The amendment shall be adopted if seventy-five per cent of the votes received are in favor of such action, the polls having been open for at least one month after mailing to the qualified membership, notices of the proposed amendments. Votes upon the adoption of proposed amendments shall be checked, opened and counted by a quorum of the Board of Direction at a regular meeting of the Board.

AMENDMENTS

INCREASE OF MEMBERSHIP DUES

In October, 1919, in accordance with the provision of Section 1, above, the membership approved adoption of an amendment to the Constitution authorizing increasing the dues as follows:

	Per Year
Fellows.....	\$15.00
Members.....	10.00
Associates.....	7.50
Juniors.....	5.00

At the Board meeting held in January, 1920, it was decided to defer advancing the dues to the full amount authorized until a later date. The dues adopted were:

	Per Year
Fellows.....	\$12.00
Members.....	9.00
Associates.....	5.00
Juniors.....	4.00

On January 1, 1926, the dues were advanced as follows:

	Per Year
Fellows.....	\$15.00
Members.....	10.00
Associates.....	6.00
Juniors.....	4.00

This leaves the annual dues for Associates and Juniors below the amount authorized by the membership in October, 1919.

On January 1, 1927, the entrance fees were reinstated. These are:

Fellow.....	\$10.00
Member.....	5.00
Associate.....	3.00
Junior.....	1.00

NOMINATION AND ELECTION OF OFFICERS

In January, 1921, the membership by letter vote approved change in Article VII of the Constitution to read as follows:
Article VII, Section 1 of the Constitution to read:

"SEC. 1—Six weeks before the annual meeting, the Board of Direction shall submit to the entire membership, excepting Honorary Members and Juniors, a list of candidates (nominees) for the offices of President, Vice-President, (Secretary, Treasurer) and two Managers. This list shall comprise at least one name and not more than three names for each office, the names being proposed either by Petition as hereinafter provided, or by (a quorum of) the Board of Direction, at one of these stated meetings. The list shall contain no indication as to whether the candidate has been proposed by Petition or by the Board of Direction.

"Nomination by Petition shall be made by letter, addressed to the Board of Direction, setting forth the name of the proposed candidate and the office for which it is desired he be nominated. For acceptance, a letter of Petition must reach the Board of Direction on or before October 15th of any year, and shall be signed by at least thirty-five Fellows, Members or Associates.

"The list of nominees shall contain the names of all candidates proposed by formal Petition or by the Board of Direction, but before this list is submitted to the membership for final vote, each candidate should be consulted and if he so requests, the fact that he has withdrawn from election shall be stated after his name.

"The entire membership, excepting Honorary Members and Juniors, shall vote by written ballots in plain sealed envelopes, enclosed within mailing

envelopes marked "Ballot" and bearing the member's signature, for the officers whose names appear on the list of candidates. A majority vote received up to the time of the closing of the polls (twenty-four hours before the opening of the annual meeting, the date of which shall be stated in the election notice) shall elect, and no votes by proxy shall be counted. No proxies or ballots within unsigned outer envelopes shall be opened for counting. Ballots shall be checked, opened and counted by a quorum of the Board of Direction at a regular meeting of the Board.

"SEC. 2—The Treasurer, Secretary, and Editor of Publications shall be appointed by majority vote of the Board of Direction as soon as practicable after January 15th of each year, for a term of one year or until their successors be appointed."

BY-LAWS GOVERNING SECTIONS

(The purpose of the Institute in furthering the establishment of Sections is to afford opportunity for members situated in various parts of the United States and other countries to meet in organized groups for the discussions of radio engineering topics.)

1—A petition for the formation of a Section shall be signed by not less than twenty-five members (any grade except Juniors) residing within the territorial limits hereinafter prescribed. The Board of Direction may decline to authorize the formation of a Section when, in its judgment, such an organization would not be compatible with the interests of the Institute.

2—A Section shall be known as: The (name of place or geographical district) Section of the Institute of Radio Engineers.

3—The principal activity of a Section shall be the holding of periodical meetings (monthly or bi-monthly, but not less than five regular meetings annually) for the presentation of original papers already presented at New York meetings of the Institute, or at other Sections.

4—The territory of a Section shall be the territory naturally tributary thereto, but shall not include territory so remote or inaccessible that members cannot readily attend meetings. For the purpose of determining the maximum amount of money to which a Section is entitled under these by-laws, points more than sixty miles from the regular meeting place of the Section shall not be considered a part of the Section, except when special conditions warrant such action, territory within a reasonable distance may be authorized by the Board of Direction. If adjacent Sections should be so situated that the sixty-mile limit embraces common territory, the question as to which Section shall claim such members as reside within this common territory shall, if possible, be decided by agreement between the Sections concerned; otherwise by the Board of Direction. (Sections may carry on their mailing list for meeting announcements the names of members located outside of the prescribed Section territory.)

5—The Chairman, Vice-Chairman, Secretary, and any other officers of each Section must be Fellows, Members or Associates of the Institute, and shall be elected for the term of one year beginning January 1, or May 1, and until their successors are elected.

6—The Board of Direction may at any time terminate the existence of any Section when in its judgment the interests of the Institute make such action desirable.

7—Papers and discussions presented before a Section and published in the PROCEEDINGS shall not be republished except with due acknowledgment of the original source.

8—Original papers presented before a Section, suitable for publication in the PROCEEDINGS may be presented to the Meetings and Papers Committee for consideration, which, in judging suitability, will be governed by the same considerations applied to similar matter offered from other sources.

9—The Secretary of the Institute will forward to the Secretary of each Section copies of all printed announcements of the regular meetings in New York, and shall forward also to the Secretary of each Section, three complete sets of proofs, or three pamphlet form copies of each technical paper intended for presentation at New York or for publication in the PROCEEDINGS. This latter is for the purpose of supplying Sections with advance copies for Section discussion.

10—Each Section shall have a Meetings and Papers Committee and a Membership Committee, appointed by the Chairman.

11—Each Section shall conduct its affairs in such manner that no indebtedness shall accrue in excess of the amount due annually as per-member rebate, specified in paragraph 12.

12—The appropriation of Institute funds during any fiscal year for aid in Section maintenance shall be the sum determined as follows: one dollar for each Fellow, Member, and Associate residing within the territory of the Section at the beginning of the administrative year, namely, January 1. Each year, beginning in 1926, the Treasurer will place to the credit of each Section the accrued rebate calculated from members' dues paid in the Section as of March 1 and September 1. Section Treasurers may draw upon this account quarterly; that is, January 1st, April 1st, July 1st and October 1st.

13—Section Secretaries shall forward to the Secretary of the Institute a report of each meeting held by the Section for the presentation or discussion of papers, and on January 1 of each year a statement of the past year's accounts.

STANDARDS RELATING TO RADIO ENGINEERING

The 1929 Year Book of the Institute (pages 144-147) contained a list of standards, closely related to radio engineering, as prepared by other engineering organizations.

Through the courtesy of the organizations responsible for the preparation of these standards, the Institute is permitted to reprint certain numbers from this list. It is thought that the application of the following authoritative and nationally recognized standards to radio engineering and the work of radio engineers is so direct that members of the Institute and others interested in standardization work should be encouraged to make full use of them whenever possible.

MATHEMATICAL SYMBOLS*

(Adopted by the Board of Directors, American Institute of Electrical Engineers, June 23, 1927)

A.S.A. Z 10f 1928

Arithmetic and Algebra

1. $= \neq + - \pm \mp < > \leq \geq () [] \% \infty \approx$ (for approximately equal to)
2. $a \times b = a \cdot b = ab$; $a \div b = a/b = \frac{a}{b}$ (Influence extends to next $+$ or $-$). Thus, $a - b/c - d$ should not be used for $(a - b)/(c - d)$.
Note that $\frac{a}{b}$ is difficult to print in running text.
3. $a/b = c/d$ for proportion. Discourage $a:b::c:d$.
4. Notation by powers of 10 for very large or very small numbers is recommended; as 3.140×10^9 and 3.140×10^{-6} . The notation 0.0^5314 is useful in tables, to indicate that there are five zeros after the decimal point.
5. In writing numbers having a large number of digits, half-spaces may well be used instead of commas to separate groups of digits. In writing decimals, the 0 before the decimal point should not be omitted (except in tables).
6. $|x|$ = absolute value of x . $x! = 1 \cdot 2 \cdot 3 \cdots x$. Discourage $\lfloor x$.
7. $\sqrt{x} = +\sqrt{x}$, not $\pm\sqrt{x}$ (x being real and positive). $a^{1/n} = \sqrt[n]{a}$. $a^{-n} = 1/a^n$. $\exp x = e^x$ is useful when x is a complicated expression. Note that the bar or vinculum after the \sqrt is very expensive to print.
8. When $\log x$ is ambiguous, use $\log_{10} x$ or $\log_e x$. The notation $\ln x$ may be mentioned as an alternative for $\log_e x$.
9. $P(n, r) = n(n-1)(n-2) \cdots (n-r+1)$
 $C(n, r) = [n(n-1)(n-2) \cdots (n-r+1)]/[1 \cdot 2 \cdot 3 \cdots r]$ = binomial coefficients.
A common alternative for $C(n, r)$ is $\binom{n}{r}$; this, however, is difficult to print in running text.
10. $a \propto b$ (meaning a varies directly as b).

* Approved as American Standard by the American Standards Association, January, 1928. Sponsors: American Association for the Advancement of Science, American Institute of Electrical Engineers, American Society of Civil Engineers, The American Society of Mechanical Engineers, and Society for the Promotion of Engineering Education.

Elementary Geometry

11. $\angle \triangle \parallel \perp \odot \square \therefore$

Analytic Geometry

12. $x, y, z; \xi, \eta, \zeta$; rectangular coordinates. Right-handed system preferred.
13. ρ, s =intrinsic coordinates. ρ =radius of curvature, s =length of arc.
14. $l = \cos \alpha, m = \cos \beta, n = \cos \gamma$, direction cosines.
15. r, θ =polar coordinates. ψ =angle from radius vector to tangent.
16. r, θ, ϕ =spherical coordinates. θ =co-latitude, ϕ =longitude. (Usage general in mathematical physics; other notations are used in astronomy.)
17. r, θ, z =cylindrical coordinates. (Usage diverse.)
18. Conics: e =eccentricity. p =semi-latus rectum (usage general in U.S.).
19. Straight line: $y = mx + b$.

Trigonometric and Hyperbolic Functions

20. $^{\circ} \sin x, \cos x, \tan x, \cot x, \sec x, \csc x$.
21. $\sin^{-1}x$ =the principal value of the angle whose sine is x (when x is real). Thus, $-\pi/2 \leq \sin^{-1}x \leq \pi/2, 0 \leq \cos^{-1}x \leq \pi, -\pi/2 \leq \tan^{-1}x \leq \pi/2$. (Discourage arc $\sin x$).
22. $\sin^2 x$ for $(\sin x)^2$ is an exceptional notation, justified by usage. Similarly for $\cos^2 x$, etc.
23. $\sinh x, \cosh x, \tanh x, \coth x, \operatorname{sech} x, \operatorname{csch} x$.
24. $\cosh^{-1}x$ =the principal value (when x is real). (Discourage arc $\sinh x$).
25. $\sinh^2 x$ for $(\sinh x)^2$ is an exceptional notation, justified by usage. Similarly, $\cosh^2 x$, etc.
26. In general f^{-1} means the inverse of the function f ; and f^2 denotes iteration of the functional operation. But in exceptional cases, f^2 may denote the square of the function f (as in $\sin^2 x$ and $\sinh^2 x$). In general, $[f(x)]^{-1} = 1/f(x)$.

Calculus, etc.

27. If $y = f(x)$, derivative $= y' = f'(x) = \frac{dy}{dx} = D_x y$.

Second derivative $= y'' = f''(x) = \frac{d(y')}{dx} = D_x^2 y = \frac{d^2 y}{dx^2}$. Note: $\frac{d^2 y}{dx^2}$

cannot be regarded as a fraction, except when x is the independent variable; in general, $\frac{d^2}{dx^2} = D_x^2$ is a symbol of operation on y .

28. If $u = f(x, y)$, partial derivative $= u_x = f_x(x, y) = D_x u = \frac{\partial u}{\partial x}$.

Similarly, $u_{xy} = f_{xy}(x, y) = D_y(D_x u) = \frac{\partial^2 u}{\partial y \partial x}$. Note: $\frac{\partial^2 u}{\partial y \partial x}$ and $\frac{\partial u}{\partial x}$ are

not fractions; $\frac{\partial}{\partial x} = D_x$ and $\frac{\partial^2}{\partial y \partial x} = D_y D_x$ are symbols of operation.

29. Δy =increment, dy =differential. δy =variation. $\sum_{i=a}^b$ =summation.

30. $\dot{x} = dx/dt = v$; $\ddot{x} = dv/dt$ (used only for differentiation with respect to the time t , and difficult to print).

31. $\lim_{x \rightarrow a}(y) = b$; $y \rightarrow b$ as $x \rightarrow a$. (Discourage \doteq .)

32. $\int_a^b f(x) dx$. $F(x) \Big|_a^b = F(b) - F(a)$. $\iiint f(x, y) dx dy = \int \{ \int f(x, y) dx \} dy$.

33. $\pi = 3.1416 \dots e = 2.718 \dots i$ (or j) $= \sqrt{-1}$.

34. If $z = x + iy$, then $|z|$ =absolute value, or magnitude, $\angle z$ =angle, $R(z)$ and $I(z)$ =real and imaginary parts. \bar{z} =conjugate of z . (Where \bar{z} is difficult to print, use $\operatorname{conj} z$.)

Special Functions

35. Bessel Functions. The notation used in G. N. Watson's Treatise, 1922, as endorsed by E. P. Adams in the Smithsonian Tables, 1922, is recommended.
36. Bernoulli numbers. Of the five or six different notations in use, the notation B_1, B_3, B_5, \dots has historical priority and many practical advantages, but the notation B_1, B_2, B_3, \dots is the one most used in recent years. To indicate what usage is being followed, authors will do well to state explicitly the value of the first few numbers, as $B_1 = 1/6, B_2 = 1/30, B_3 = 1/42, \dots$
37. $\gamma = 0.5772 \dots$ (Euler's constant.)

Vector Analysis¹

38. Vectors to be indicated in printed matter by letters in bold-face type, and in written manuscript by letters modified by a bar above

¹ NOTE: As to further questions of notation in Vector Analysis (including Tensor Analysis), the desirability of a thorough-going attempt to bring uniformity out of the present diversity of usage is recognized, and the appointment of a special committee to take up this subject has been recommended.

(or by the doubling of some part of the character). The magnitude of a vector to be indicated in print by the corresponding italic letter, and in manuscript (when necessary) by the use of the absolute value signs, $| |$.

39. The scalar product, or dot product, = $a \cdot b$, the dot being centered. (Other notations are Sab , or (ab) in round parentheses.)
40. The vector product, or cross product, = $a \times b$, the cross being small. (Other notations are Vab , or $[ab]$ in square brackets.)
41. i, j, k = unit vectors along the axes (right-handed system).

Abbreviations

42. It is desirable to distinguish between (1) a "symbol," that is, a single letter or a single letter affected with subscripts, etc., which is to be used to represent a numerical value in a formula; and (2) an "abbreviation," which may consist of several letters, but is not intended to be substituted for a numerical quantity in a formula.
43. Abbreviations such as ft/sec², ft-lb/min, etc., should not be further condensed, lest clearness be sacrificed to brevity.

NOTE: The recommendations concerning terms and symbols in elementary mathematics contained in Chapter 8 of the report on the Re-organization of Mathematics in Secondary Education, made in 1923 by the National Committee on Mathematical Requirements (under the auspices of the Mathematical Association of America and reprinted by Houghton Mifflin Company in 1927), are, with one or two unimportant exceptions, endorsed.

LETTER SYMBOLS FOR ELECTRICAL QUANTITIES*

(Adopted by the Board of Directors, American Institute of Electrical Engineers, October 18, 1928)

A.S.A. Z 10g1 1929

Name of Quantity	Symbol	Name of Quantity	Symbol
1. Admittance.....	Y, y	23. Frequency.....	f
2. Angular frequency.....	ω	24. Impedance.....	Z, z
3. Angular velocity.....		25. Inductance.....	L
4. Capacitance.....	C	26. Magnetic intensity.....	H
5. Capacity, electrostatic (see capacitance)		27. Magnetic flux.....	Φ
6. Conductance.....	G, g	28. Magnetic flux density..	B
7. Conductivity.....	γ	29. Magnetomotive force...	\mathcal{F}
8. Current.....	I, i	30. Mutual inductance.....	M
9. Difference of potential, electric (see note 4)...	E, e	31. Number of conductors or turns.....	N
10. Dielectric constant.....	K or ϵ	32. Permeability.....	μ
11. Dielectric flux.....	Ψ	33. Permeance.....	\mathcal{P}
12. Dielectric flux density..	D	34. Permittance (see capaci- tance)	
13. Efficiency.....	η	35. Period.....	T
14. Electric potential (see note 4).....	E, e	36. Permittivity (see di- electric constant)	
15. Electrical tension (see voltage)		37. Phase displacement....	θ or ϕ
16. Electromotive force....	E, e	38. Power.....	P, p
17. Electrostatic capacity (see capacitance)		39. Quantity, electric.....	Q, q
18. Electrostatic flux (see dielectric flux)		40. Quantity of electricity..	
19. Electrostatic flux density (see dielectric flux density)		41. Reactance.....	X, x
20. Energy.....	W	42. Resistance.....	R, r
21. Flux density, electro- static (see dielectric flux density)		43. Resistivity.....	ρ
22. Flux density, magnetic (see magnetic flux density)		44. Reluctance.....	\mathcal{R}
		45. Reluctivity.....	ν
		46. Self-inductance.....	L
		47. Susceptance.....	b
		48. Speed of rotation.....	n
		49. Voltage.....	E, e
		50. Work.....	W

* Approved as American Standard by the American Standards Association, February 5, 1929. Sponsors: American Association for the Advancement of Science, American Institute of Electrical Engineers, American Society of Civil Engineers, The American Society of Mechanical Engineers, Society for the Promotion of Engineering Education.

NOTES:

1. Where distinctions between maximum, instantaneous, effective (root-mean-square), and average values are necessary, E_m, I_m, P_m are recommended for maximum values; e, i, p for instantaneous values, E, I for effective (r. m. s.) values, and P for average value.

2. In accordance with the practise in other branches of engineering, it is recommended that quantities per unit volume, area, length, etc., be represented as far as practicable by lower-case letters corresponding to the capitals which represent the total quantities.

3. In print, vector or complex quantities should be represented by bold-face letters. In typing, overscoring may be used to indicate bold-face letters, (vectors).

4. Where a distinction between electromotive force and difference of electric potential is desirable, the symbols E_e , and V_v , respectively, may be used.

Table of Preferred Numbers

Informally approved by the American Standards Association and recommended to industry for a period of trial in practice.

A.S.A.
Z17-1927

.001 to .01				.01 to .1				.1 to 1.0				1 to 10				Values to 5 Figures	Term No.
5 Series	10 Series	20 Series	40 Series	5 Series	10 Series	20 Series	40 Series	5 Series	10 Series	20 Series	40 Series	5 Series	10 Series	20 Series	40 Series		
.0010	.0010	.0010		.010	.010	.010	.010	.10	.10	.10	.10	1	1	1	1		
		.0011				.011	.0105			.11	.105			1.05	1.05	10592	1
	.0012	.0012				.012	.011			.12	.11			1.12	1.12	11220	2
		.0014				.0125	.012			.125	.12			1.18	1.18	11885	3
						.014	.0125			.14	.125		1.25	1.25	1.25	12589	4
	.0016	.0016				.014	.013			.14	.13			1.32	1.32	13335	5
						.015	.014			.15	.14			1.4	1.4	14125	6
						.016	.015			.16	.15			1.5	1.5	14962	7
							.016				.16	1.6	1.6	1.6	1.6	15849	8
		.0018					.017				.17			1.7	1.7	16788	9
		.0020					.018				.18			1.8	1.8	17783	10
							.019				.19			1.9	1.9	18837	11
		.0022					.020				.20		2.0	2.0	2.0	19953	12
							.021				.21			2.1	2.1	21135	13
	.0025	.0025					.022				.22			2.25	2.25	22387	14
							.024				.24			2.35	2.35	23714	15
							.025				.25	2.5	2.5	2.5	2.5	25119	16
		.0028					.026				.26			2.65	2.65	26608	17
							.028				.28			2.8	2.8	28184	18
		.0030					.030				.30			3.0	3.0	29854	19
							.032				.32		3.2	3.2	3.2	31623	20
		.0035					.034				.34			3.4	3.4	33497	21
							.036				.36			3.6	3.6	35482	22
	.0040	.0040					.038				.38			3.8	3.8	37584	23
							.040				.40	4.0	4.0	4.0	4.0	39811	24
		.0045					.042				.42			4.25	4.25	42170	25
							.045				.45			4.5	4.5	44668	26
		.0050					.048				.48			4.75	4.75	47315	27
							.050				.50		5.0	5.0	5.0	50119	28
		.0055					.052				.52			5.3	5.3	53089	29
							.056				.56			5.6	5.6	56234	30
	.0060	.0060					.060				.60			6.0	6.0	59566	31
							.064				.64	6.4	6.4	6.4	6.4	63095	32
		.0070					.068				.68			6.8	6.8	66834	33
							.072				.72			7.2	7.2	70795	34
		.0080					.075				.75			7.6	7.6	74990	35
							.080				.80		8.0	8.0	8.0	79433	36
		.0090					.085				.85			8.5	8.5	84140	37
							.090				.90			9.0	9.0	89125	38
							.095				.95			9.5	9.5	94405	39
	.0100	.0100					.100				1.00	10.0	10.0	10.0	10.0	100000	40

Preferred Numbers are the rounded geometric series with the ratios

$\sqrt[5]{10}$ (5 series)

$\sqrt[10]{10}$ (10 series)

$\sqrt[20]{10}$ (20 series)

$\sqrt[40]{10}$ (40 series)

The exponents thus give the number of terms in one order of magnitude, (that is between 1 and 10, 10 and 100, etc.)

In all length measurements, the numbers apply to the inch as the unit of length. With all other dimensions than lengths, the numbers apply to the unit forming the basis of the standardization.

Preferred Numbers above 10 inches are formed by multiplying the numbers between 1 and 10 in. by 10, 100, etc. Preferred Numbers below .001 in. are formed correspondingly by division of the numbers between .001 in. and .01 in. by 10, 100, etc. Between .001 and .01 in. the 20 series will probably serve as the finest gradation; the 40 series is therefore not given.

So far as possible the numbers of the 5 series are to be used in preference to those of the 10 series, these again in preference to those of the 20 series, and these finally to those of the 40 series. It is permissible to pass over from one series of Preferred Numbers to an adjacent series.

ELECTRICAL MEASURING INSTRUMENTS

(Adopted by the Board of Directors, American Institute of Electrical Engineers, December 10, 1926)
(Effective April 1, 1927)

A.I.E.E.

No. 33; January, 1927

SCOPE

The standards in this section apply to the following kinds of indicating electrical instruments for direct current and for alternating current:

- (1). Ammeters
- (2). Voltmeters
- (3). Wattmeters
- (4). Reactive Volt-Ampere Meters
- (5). Frequency Meters
- (6). Power-Factor, Reactive-Factor and Phase-Angle Meters
- (7). Synchrosopes

These standards are not intended to apply to indicating instruments provided with arrangements for curve drawing, contact making, etc. They do not apply to the following kinds of instruments:

- (a) Small instruments of types and sizes which are used where low cost is essential; for example, small polarized-vane ammeters used on automobiles, battery-charging outfits, etc.
- (b) Instruments constructed for very special requirements.

DEFINITIONS

Definitions given herein apply specifically to the instruments treated in this section. They are included with all other standard definitions in a separate section.

Instruments and Their Parts

33-1 Instrument.—An instrument is a measuring device which measures the present value of the quantity under observation. The term "instrument" is used in two different senses: (a) instrument proper as described below, and (b) to include not only the instrument proper but, in addition, any necessary apparatus, such as shunts, shunt leads, resistors, reactors, condensers, or instrument transformers.

- 33-2 Mechanism.**—The mechanism is the arrangement for producing and controlling the motion of the pointer. It includes all the essential parts necessary to produce this result, but does not include the base, cover, scale, or any parts, such as series resistors or shunts, whose function is to make the indicated value of the measured quantity agree with the actual value.
- 33-3 Moving Element.**—The moving element includes the pointer and the parts which move with it.
- 33-4 Instrument Proper.**—The instrument proper is the mechanism and the scale, built into the case, including all devices (resistors, shunts, etc.) which are built into the case or non-removably attached to it. Examples: An instrument (ammeter) for 500 amperes direct current consists of the instrument proper (which may be thought of as essentially a millivoltmeter) together with a 500-ampere shunt and a pair of shunt leads. Another instrument (wattmeter) consists of the instrument proper (which is essentially a 5-ampere 110-volt wattmeter) together with a current transformer and a potential (voltage) transformer.
- 33-5 Self-Contained Instrument.**—An instrument is said to be self-contained when all the necessary equipment is built into the case or non-removably attached to it.
- 33-6 Current Circuit of an Instrument.**—The current circuit of an instrument is that winding of the instrument proper which carries the current to be measured, or a definite fraction of it, or a current dependent upon it.
- 33-7 Voltage Circuit of an Instrument.**—The voltage circuit of an instrument is that winding of the instrument proper to which is applied the voltage to be measured, or a definite fraction of it, or a voltage dependent upon it.
- 33-8 Series Resistor.**—A series resistor is a resistor in series with a circuit of an instrument. It usually refers to a resistor forming part of the voltage circuit.
- 33-9 Multiplier.**—A multiplier is a particular type of series resistor which is used to extend the voltage range of an instrument beyond some particular value for which the instrument is already complete.
- 33-10 Shunt.**—A shunt is a resistor connected in the circuit to be measured and in parallel with a current circuit of an instrument.

- 33-11 Reactor.**—A reactor is a device used for the purpose of introducing reactance, and usually has a high time-constant.
- 33-12 Shunt Leads.**—Shunt leads are leads which connect the current circuit of an instrument to the shunt.
- 33-13 Crest Voltmeter.**—A crest voltmeter is a voltmeter depending for its indications upon the crest, or maximum value of the voltage of the system to which it is connected. Crest voltmeters should be clearly marked on the instrument proper whether readings are in r. m. s. values or in true crest volts. It is preferred that the marking should be r. m. s. values of the sinusoidal wave having the same crest value.
- 33-14 Synchroscope.**—A synchroscope is a device which indicates synchronism between two machines, and in addition shows whether the incoming machine is fast or slow.
- 33-15 Line-Drop Voltmeter Compensator.**—A line-drop voltmeter compensator is a device used in connection with a voltmeter which causes the latter to indicate the voltage at some distant point of the circuit.

Scales

- 33-16 Indication Range.**—The indication range is the range within which the electrical quantity (current, voltage, power, etc.) is to be indicated without reference to accuracy.
- 33-17 Measurement Range.**—The measurement range is that part of the indication range within which the requirements for accuracy are to be met.
- 33-18 Scale Length.**—The scale length is the length of the arc described by the end of the pointer in moving from the zero position to the end of the scale.

Influences of Operating Conditions

- 33-19 Temperature Influence.***—The temperature influence is defined as the percentage change in the indication which is caused solely by a difference in room temperature of ± 10 deg. cent. from the reference temperature (20 deg. cent.).

* If the influences (referred to in 19, 20, and 21) above and below the normal conditions are not equal the greater value should be given.

33-20 Frequency Influence.*—The frequency influence (in other than frequency meters) is defined as the percentage change in the indication which is caused solely by a change of ± 10 per cent from the rated frequency.

33-21 Voltage Influence.*—The voltage influence (in other than voltmeters and wattmeters) is defined as the percentage change in the indication which is caused solely by a change of ± 10 per cent from the rated voltage.

33-22 External-Field Influence.—The external-field influence is defined as the percentage change in the indication which is caused solely by an external field of an intensity of 5 gauss produced by a current of the same kind and frequency as that on which the instrument operates, with the most unfavorable phase and position of the external field.

33-23 Power-Factor Influence.—The power-factor influence in wattmeters is defined as the percentage change of the indication which is caused solely by the lowering of the power-factor from unity to 0.50, current lagging, at the rated voltage and frequency.

33-24 Position Influence.—The position influence, in other than gravity-controlled instruments, is defined as the maximum displacement of the pointer which is caused solely by an inclination of 30 deg. in any direction under the most unfavorable conditions as to position. It is to be expressed as a percentage of the scale length.

Miscellaneous Definitions

33-25 Period of an Instrument.—The period of an instrument, sometimes called the "periodic time," is the time taken for the pointer to make one complete oscillation (two consecutive swings). A swing is a completed movement in either direction.

33-26 Damping.—This is a term applied to instrument performance to denote the manner in which the pointer settles to its steady indication after a sudden change in the value of the measured quantity. Two general classes of damped motion are distinguished; namely, (a) periodic, in which the pointer oscillates about the final position before coming to rest; (b) aperiodic, in which the pointer comes to rest without overshooting the rest position. The point of change between periodic and aperiodic damping is called critical damping.

* If the influences (referred to in 19, 20, and 21) above and below the normal conditions are not equal the greater value should be given.

33-27 Damping Factor.—Damping factor is the ratio of the angular deviations of the pointer in two successive swings from the position of equilibrium.

33-28 Responsiveness.—This term denotes the rapidity with which the pointer of an instrument comes to rest after a change in the value of the measured quantity. It may be measured by the reciprocal of the time in seconds for the pointer to come to rest after a change in the value of the measured quantity.

33-29 Torque.—The torque of an instrument is the turning moment produced by the electrical quantity to be measured acting through the mechanism. This is better termed the "deflecting torque," and in instruments having control systems is opposed by the controlling torque, which is the turning moment produced by the mechanism of the instrument tending to return the moving element to a fixed position. Torque is expressed in millimeter-grams. The particular value of the torque for the condition of full scale deflection should be designated "full scale torque" and should be accompanied by a statement of the angle corresponding to this deflection.

In instruments where the controlling torque is proportional to the deflection it is also convenient to state the torque in millimeter-grams per degree deflection computed from the torque at full scale. When the controlling torque is not proportional to the deflection it is desirable to state also the torque at points other than full scale.

33-30 Restoring Torque.—The restoring torque is the resultant of the electrical or electrical and mechanical torques tending to restore the moving element to any position of equilibrium when displaced from that position. It should be expressed as the rate of change in resultant turning moment in millimeter-grams per degree at that position.

The principle of restoring torque as here defined applies to any type of instrument and to any method of control such as spring or gravity control, or no mechanical control, as in power factor meters and this term is preferable to the use of the term torque as defined above since it is of universal application which is not the case with torque.

33-31 Weight.—The weight of a moving element includes one-half the weight of the springs, if any. It is to be expressed in grams.

33-32 Error and Correction.—The error of indication is the difference between the indication and the true value of the quantity being measured. It is the quantity which must be algebraically subtracted from the indication to get the true value. A positive error denotes that the indication of the instrument is greater than the true value.

The correction has the same numerical value as the error of indication, but the opposite sign. It is the quantity which must be algebraically added to the indication to get the true value. If T , I , E and C represent respectively the true value, the indicated value, the error, and the correction, the following equations hold:

$$E = I - T$$

$$C = T - I$$

Example: A voltmeter reads 112 volts when the voltage applied to its terminals is actually 110 volts.

Then,

$$\text{Error} = 112 - 110 = +2 \text{ volts}$$

$$\text{Correction} = 110 - 112 = -2 \text{ volts}$$

33-33 Accuracy of Indicating Instruments.—In specifying the accuracy of an indicating instrument the limits of error at any point on the scale shall be expressed as a percentage of the full scale reading.

Classification

33-34 Electrical instruments may be classified as follows:

A. As to Use:

- (a) Portable instruments
- (b) Switchboard instruments

B. As to Principle of Operation

- (a) Electrodynamical (dynamometer)
- (b) Permanent-magnet moving coil*
- (c) Moving-iron
 - (1) Plunger
 - (2) Vane
 - (3) Repulsion
- (d) Induction

* Instead of "permanent-magnet moving coil" the following terms were suggested: "d'Arsonval"; "fixed-field."

- (e) Electrothermic
 - (1) Expansion
 - (2) Thermocouple
- (f) Electrostatic

C. As to Kind of Protection:

- (a) Dust-proof
- (b) Moisture-proof
- (c) Rust-resisting
- (d) Water-tight (submersible).

The terms "portable" and "switchboard" are self-defining. A third classification as to use is suggested, namely, "laboratory-standard."

33-35 In electrodynamic (dynamometer) instruments one or more coils move within the field produced by a fixed coil or coils.

33-36 In permanent-magnet moving-coil instruments a coil moves within the field of a permanent magnet.

33-37 In moving-iron instruments one or several pieces of soft iron are caused to move by the magnetic field of a fixed coil or coil system. Various forms of this instrument (plunger, vane, repulsion) are distinguished chiefly by mechanical features of construction.

33-38 In induction instruments the torque is produced by fixed coils acting upon moving conducting parts (disks, drums, etc.) in which currents are produced by electromagnetic induction.

33-39 Electrothermic instruments depend for their operation on the heating effect of a current. Two distinct types are (a) the expansion type, including the "hot-wire" and "hot-strip" instruments; (b) the thermocouple type, where one or more thermocouples which are heated directly or indirectly by the passage of a current supply a direct current which flows through the coil of a suitable direct-current mechanism, such as one of the permanent-magnet moving-coil type.

33-40 Electrostatic instruments depend for their operation on the forces of attraction and repulsion between bodies charged with electricity.

33-41 A dust-proof instrument is provided with a case which excludes dust from the mechanism.

33-42 A moisture-proof instrument is one in which moisture is excluded from the mechanism, or which is so constructed that moisture will not damage the mechanism.

- 33-43 A rust-resisting instrument** is one whose case and parts are made of rust-resisting materials, or are specially finished to resist the corrosive effects of moist air.
- 33-44 A water-tight (submersible) case** withstands for one hour complete immersion in a tank containing sufficient water to cover all parts to a depth of at least three feet, without any visible trace of penetration of water into the interior.

RATING

- 33-100 Rating of an Instrument.**—The rating of an instrument is a designation assigned by the manufacturer to indicate its operating limitations. The full-scale marking of an instrument does not necessarily correspond to its rating.
- 33-101 Rating of the Circuits of an Instrument.**—The rating of the circuits of an instrument shall be equal to, or less than, the maximum current or voltage to which they may be continuously subjected without exceeding the permissible temperature rises.

HEATING

Temperature Limitations

- 33-150 Limiting Temperature Rise of Instrument Windings.**—The temperature rises of the windings of instruments shall not exceed the values given in the following table for the class of insulation and the method of temperature determination employed.

TABLE I

Method of Temperature Determination to be Employed	Limit of Observable Temperature Rise in Deg. Cent.		
	Class O Insulation See par. 33-152	Class A Insulation See par. 33-153	Class B Insulation See par. 33-154
Thermometer	35	50	70
Resistance	40	55	75

- 33-151 Limiting Temperature Rise of Shunts.***—The temperature rise of shunts shall not exceed 80 deg. cent. determined by the Thermometer Method.

* The temperature rise of a shunt is largely dependent upon the bus bars connected to it and provision should be made to eliminate excessive temperature rise from this source.

Exception: This rule shall not apply to shunts having no soldered joints and made of material which is not permanently changed in resistivity if continuously subjected to a higher temperature.

- 33-152 Class O Insulation Defined.**—Class O insulation consists of cotton, silk, paper and similar organic materials when neither impregnated* nor immersed in oil.
- 33-153 Class A Insulation Defined.**—Class A insulation consists of cotton, silk, paper and similar organic materials when impregnated* or immersed in oil; also enamel as applied to conductors.
- 33-154 Class B Insulation Defined.**—Class B insulation consists of inorganic materials such as mica and asbestos in built-up form combined with binding substances. If Class A material is used in small quantities in conjunction for structural purposes only, the combined material may be considered as Class B, provided the electrical and mechanical properties of the insulated winding are not impaired by the application of the temperature permitted for Class B material. (The word "impair" is here used in the sense of causing any change which could disqualify the insulating material for continuous service.)
- 33-155 Thermometer Method of Temperature Determination Defined.**—This method consists in the determination of the temperature, by mercury or alcohol thermometers, by resistance thermometers or by thermocouples, any of these instruments being applied to the hottest part of the instrument accessible to mercury or alcohol thermometers.
- 33-156 Resistance Method of Temperature Determination Defined.**—This method consists in the determination of temperature by comparison of the resistance of the winding at the temperature to be determined with the resistance at a known temperature.

* Impregnated Cotton, Paper or Silk—An insulation is considered to be "impregnated" when a suitable substance replaces the air between its fibers, even if this substance does not completely fill the spaces between the insulated conductors. The impregnating substance, in order to be considered suitable, must have good insulating properties; must entirely cover the fibers and render them adherent to each other and to the conductor; must not produce interstices within itself as a consequence of evaporation of the solvent or through any other cause; must not flow during the operation of the machine at full working load or at the temperature limit specified; must not deteriorate under prolonged action of heat.

33-157 Determination of the Mean Temperature of a Copper Winding by Measurement of its Electrical Resistance when there is known the Resistance at some Reference Temperature.

Let t be the reference temperature
 r be the resistance at the reference temperature
 R be the observed resistance

Then T (the temperature sought*)

$$= \frac{R}{r}(234.5+t) - 234.5$$

CHARACTERISTICS

33-200 Reference Temperature.—The standard temperature of reference for instrument characteristics shall be 20 deg. cent.

Influences of Operating Conditions

In determining the influences of operating conditions (except position influence), ammeters and voltmeters should be tested with rated current or voltage respectively. Wattmeters should be tested with rated voltage and such a current (not exceeding the rated current) as will give a suitable deflection, preferably not less than that corresponding to one-half of the maximum reading. Frequency meters (except in the test for voltage influence) should be tested at rated voltage. Power-factor meters and reactive-factor meters should be tested with rated voltage and rated current at unity power factor.

33-201 Instrument Calibrations by the Manufacturer and Acceptance Tests by the Purchaser should be based on the legalized international electrical units.

DIELECTRIC TEST

33-250 Standard Test Voltage.—The standard test voltage for instruments having a voltage circuit not exceeding 750 volts without external resistors shall be twice the rated voltage of the combination, plus 1000 volts. The standard test voltage for in-

* This formula is derived from the experimentally determined relation between temperature and resistance of copper:

$$\frac{R}{r} = \frac{234.5+T}{234.5+t}$$

The temperature rise is the difference between the calculated temperature T and the temperature of the cooling medium at time of test.

struments without voltage circuits shall be 1000 volts. Test shall be made with alternating current as described in 33-254.

The test between current circuit and voltage circuit (where both exist) of an instrument shall be taken care of under the test prescribed for insulation resistance. (See paragraph 33-300.)

33-251 Duration of Application of Test Voltage.—The test voltage shall be applied continuously for a period of 60 seconds.

33-252 Condition of Instrument to be Tested.—Dielectric tests shall be made on finished instruments.

33-253 Points of Application of Test Voltage.—The test voltage shall be applied between all electrical circuits connected together and other metal parts grounded.

33-254 Frequency and Wave Shape of Test Voltage.—The frequency of the test voltage shall be not less than 15 cycles nor more than 65 cycles. A sine wave shape is recommended. The voltage wave shall have a crest value equal to $\sqrt{2}$ times the specified test voltage.

INSULATION RESISTANCE

33-300 Insulation Resistance.—The insulation resistance between all the electrical circuits of the instrument connected together and the case shall not be less than 20 megohms. The insulation resistance between the current circuit and the voltage circuit of an instrument (where both exist) shall be not less than 5 megohms. These tests shall be made with 500 volts direct current.

When instruments are specified to have one or more of the circuits internally connected to the case, the necessary exceptions to these requirements are allowed.

CONSTRUCTION

33-350 General.—The construction of electrical instruments shall be mechanically sound, suitable to their class and purpose and shall be such as to give assurance of permanence in the accuracy of the indications. All materials must be suitable for the purpose for which they are used.

33-351 Scale and Pointer.—The preferred value of each scale division should be either 1, 2 or 5 of the units measured or any decimal multiple or submultiple of these numbers. In the case of multiple-range instruments exceptions to this rule may be necessary, but should be avoided where reasonably possible.

The angle subtended by a scale division shall preferably not be less than 0.5 degree in portable instruments, or 1 degree in switch-board instruments. When smaller angles are used the legibility is decreased.

The numbers marked on the scale, except in the lower part of non-uniform scales, shall preferably be by steps of 1, 2 or 5, or a decimal multiple or submultiple of any of these numbers. The figures shall be of such shape as to minimize the risk of different figures being confused with one another and shall be so spaced as to render individual numbers clearly distinguishable from adjacent numbers.

33-352 External Shunts.—The main terminals of the shunt shall be so constructed that slight variations in the manner of connecting it in the circuit (such as might occur in an average workmanlike installation) shall not alter the indication of the instrument by more than 0.25 per cent.

The thermal electromotive force produced by continuous operation of the shunt at rated current shall not exceed the value which would cause a change in the reading (at rated current) of 0.25 per cent. The connections to the circuit should be made so that the opportunity for the escape of heat will be the same at both terminals.

33-353 Marking.—The instrument shall be distinctly marked with the following particulars in such a way that they will be visible from the front of the case: Name (or symbol) of manufacturer; serial number; designation of the quantity measured; the words "direct-current" or "alternating-current" or their abbreviations; the rated current, voltage or frequency (or the ranges of these quantities) or such of these as apply; the maximum current and voltage, in the case of wattmeters, power-factor meters, and reactive-volt-ampere meters. Of these, only the scale marking itself and the designation of the quantity measured shall be conspicuous.

In the case of alternating-current instruments the following additional items are required: Ratio of the appropriate current transformer expressed thus: 1200:5 or 1200/5; ratio of the appropriate potential (voltage) transformer expressed thus: 6600:110 or 6600/110.

Instruments having separate shunts shall also be marked with the millivolt drop of the shunt with which they are to be used, corresponding to full-scale deflection.

Instruments having separate shunts or series resistors should be marked to indicate this fact.

Separate shunts, if not interchangeable, shall be marked as follows: Name (or symbol) of manufacturer; serial number of the instrument with which it was calibrated; the line current corresponding to full-scale deflection of the instrument; the rated current, if this is less than the preceding, and the millivolt drop at rated current. When the shunts are designed to be used with devices taking sufficient current to be an appreciable proportion of the whole, this fact shall be indicated.

Interchangeable separate shunts shall bear the above markings, except that the serial number may be omitted.

If the rating of an instrument differs from the full-scale marking, the rating shall be marked on the instrument proper.

TELEPHONY AND TELEGRAPHY

(Adopted by the Board of Directors, American Institute of Electrical Engineers, June 29, 1922)

A. I. E. E.

No. 34; June, 1922

DEFINITIONS

34-1 General.—Many of the following definitions are tentative and not yet fully established. Some of the definitions are specific to telephony, and differ in detail from similar definitions appearing in other sections of the rules.

Line Circuits

34-2 Ground-Return Circuit.—A ground-return circuit is a circuit consisting of one or more metallic conductors in parallel, with the circuit completed through the earth.

34-3 Metallic Circuit.—A metallic circuit is a circuit of which the earth forms no part.

34-4 Two-Wire Circuit.—A two-wire circuit is a metallic circuit formed by two parallel conductors insulated from each other.

34-5 Superposed Circuit.—A superposed circuit is an additional circuit obtained from a circuit normally required for another service, and in such a manner that the two services can be given simultaneously without mutual interference.

34-6 Phantom Circuit.—A phantom circuit is a superposed circuit, each side of which consists of the two conductors of a two-wire circuit in parallel.

34-7 Side Circuit.—A side circuit is a two-wire circuit forming one side of a phantom circuit.

34-8 Non-Phantom Circuit.—A non-phantomed circuit is a two-wire circuit, which is not arranged for use as the side of a phantom circuit.

34-9 Simplexed Circuit.—A simplexed circuit is a two-wire telephone circuit, arranged for the superposition of a single ground-return signaling circuit operating over the wires in parallel.

34-10 Compositated Circuit.—A compositated circuit is a two-wire telephone circuit, arranged for the superposition on each of its component metallic conductors, of a single independent ground-return signaling circuit.

34-11 Quadded or Phantom Cable.—A quadded or phantom cable is a cable adapted for the use of phantom circuits.

34-12 Simplex Circuit.—A simplex circuit in telegraphy is one arranged for operation in one direction at one time.

34-13 Duplex Circuit.—A duplex circuit in telegraphy is one arranged for simultaneous operation in opposite directions.

34-14 Diplex Circuit.—A diplex circuit in telegraphy is one arranged for the simultaneous transmission of two messages in the same direction.

34-15 Quadruplex Circuit.—A quadruplex circuit in telegraphy is one arranged for the simultaneous transmission of two messages in each direction.

34-16 Multiplex Circuit.—A multiplex circuit in telegraphy is one arranged for the simultaneous transmission of one or more messages in both directions. Both duplex and quadruplex are examples of multiplex whereas diplex is not.

34-17 Linear Electrical Constants.—The linear electrical constants of a line are the electrical constants per unit length of the line, *e.g.* linear resistance, linear inductance, etc.

34-18 Smooth Line.—A smooth line is a line whose electric elements are all continuously and uniformly distributed throughout its length.

34-19* Periodic Line.—A periodic line is a line consisting of successive similar sections in each of which one or more electric elements are not distributed uniformly. As examples of periodic lines are (1) loaded lines and (2) artificial lines consisting of successive similar sections of lumped constants.

34-20 Equivalent Smooth Line.—An equivalent smooth line of a periodic line is a smooth line having the same electrical behavior as the periodic line, at a given single frequency, when measured at terminals or at corresponding section junctions.

34-21 Equivalent Periodic Line.—An equivalent periodic line of a smooth line is a periodic line having the same electrical behavior, for an assumed single frequency, as the smooth line, when measured at terminals or at corresponding section junctions. The terms conjugate smooth line and conjugate periodic line are also sometimes used.

* (19) The term periodic in this definition refers to the line constants and not to time relations.

- 34-22 Composite Line.**—A composite line is a line consisting of a plurality of successive sections having different linear electrical constants, as in the case where an underground cable section is joined to an overhead open-wire section.
- 34-23 Loaded Line.**—A loaded line is one in which the normal reactance of the circuit has been altered for the purpose of increasing its transmission efficiency.
- 34-24 Series Loaded Line.**—A series loaded line is one in which the normal reactance has been altered by reactance serially applied.
- 34-25 Shunt Loaded Line.**—A shunt loaded line is one in which the normal reactance of the circuit has been altered by reactance applied in shunt across the circuit.
- 34-26 Continuous Loading.**—A continuous loading is a series loading in which the added inductance is uniformly distributed along the conductors.
- 34-27* Coil Loading.**—A coil loading is one in which the normal inductance is altered by the insertion of lumped inductance in the circuit at intervals.

Circuit Constants and Characteristics

- 34-28 Damping of a Circuit.**—The damping at a given point in a circuit from which the source of energy has been withdrawn, is the progressive diminution in the effective value of electromotive force and current at that point resulting from the withdrawal of electrical energy.
- 34-29* Damping Constant.**—The damping constant of a circuit is a measure of the ratio of the dissipative to the reactive component of its admittance or impedance.

* (27) This lumped inductance may be applied either in series or in shunt.

As commonly understood, coil loading is a series loading, in which the lumped inductance is applied at uniformly spaced recurring intervals.

* (29) Applied to the admittance of a condenser or other simple circuit having capacity reactance, the damping constant for a harmonic electromotive force of given frequency is the ratio of the conductance G , of the condenser or simple circuit at that frequency to twice the capacitance, C , of the condenser at the same frequency, $(G/2C)$.

Applied to the reactance of a coil or other simple circuit having inductive reactance, the damping constant for a harmonic current of a given frequency is the ratio of the resistance, R , of the coil or circuit at that frequency to twice the inductance, L , at the same frequency, $(R/2L)$.

- 34-30* Mutual Impedance.**—The mutual impedance for single frequency alternating currents, between a pair of terminals and a second pair of terminals of a network, under any given condition, is the negative ratio of the electromotive force produced between either pair of terminals on open circuit to the current flowing between the other pair of terminals.
- 34-31* Self-Impedance.**—The self-impedance between a pair of terminals of a network, under any given condition, is the ratio of the electromotive force applied across the terminals to the entering current.
- 34-32* Characteristic Impedance.**—The characteristic impedance of a line is the ratio of the applied electromotive force to the resulting steady-state current upon a line of infinite length and uniform structure, or of periodic recurrent structure.
- 34-33* Sending-End Impedance.**—The sending-end impedance of a line is the ratio of the applied electromotive force to the resulting steady-state current at the point where the electromotive force is applied.
- 34-34* Propagation Constant.**—The propagation constant of a uniform line, or section of a line of periodic recurrent structure, is the natural logarithm of the ratio of the steady-state currents at various points separated by unit length in a uniform line of infinite length, or at successive corresponding points in a line of recurrent

* (30) A receiving-end impedance is an example of a mutual impedance.

Single frequency voltages and currents are here supposed to be represented by complex numbers. Their ratio is therefore a complex number.

* (31) Single frequency voltages and currents are here supposed to be represented by complex numbers. Their ratio is therefore a complex number.

* (32) In practise, the terms (1) line impedance, (2) surge impedance, (3) iterative impedance, (4) sending-end impedance, (5) initial sending-end impedance, (6) final sending-end impedance, (7) natural impedance and (8) free impedance, have apparently been more or less indefinitely and indiscriminately used as synonyms with what is here defined as "characteristic impedance."

Single frequency voltages and currents are here supposed to be represented by complex numbers. Their ratio is therefore a complex number.

* (33) See note under "Characteristic Impedance." In case the line is of infinite length of uniform structure or of periodic recurrent structure, the sending-end impedance and the characteristic impedance are the same.

Single frequency voltages and currents are here supposed to be represented by complex numbers. Their ratio is therefore a complex number.

* (34) Single frequency voltages and currents are here supposed to be represented by complex numbers. Their ratio is therefore a complex number.

structure of infinite length. The ratio is determined by dividing the value of the current at the point nearer the transmitting end by the value of the current at the point more remote.

34-35 Attenuation Constant.—The attenuation constant for a single frequency is the real part of the propagation constant taken at that frequency.

34-36 Wavelength Constant.—The wavelength constant is the imaginary part of the propagation constant.

34-37 Standard Cable.—A standard cable is an ideal uniform line in terms of which the attenuation of a line or network may be specified. It is characterized by the following constants: Linear resistance, 88 ohms per loop mile (54.7 ohms per loop km.). Linear capacitance between wires 0.054 microfarad per loop mile (0.03355 microfarad per loop km.). Linear inductance and linear leakage, 0.

Equivalent Circuits

34-38* Equivalent Circuit.—An equivalent circuit is a simple network of series and shunt impedances, which, at a given frequency, is the approximate electrical equivalent of a complex network.

34-39* "T" Equivalent Circuit.—A "T" equivalent circuit is a triple-star or "Y" connection of three impedances externally equivalent to a complex network. See Fig. 1 for symbol.

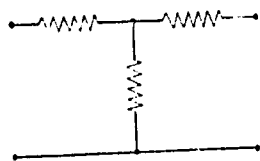


Fig. 1

34-40* "I" Equivalent Circuit.—An "I" equivalent circuit is a connection of five impedances in the form shown in Fig. 2, which is externally equivalent to a complex network. It differs from the

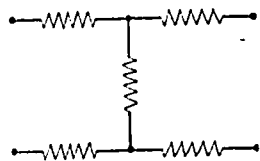


Fig. 2

* (38 to 40) As ordinarily considered, the simple networks as defined are the electrical equivalents of complex networks only with respect to definite pairs of terminals.

"T" equivalent circuit in that the impedances are arranged symmetrically on the two sides of the circuit, which is often desirable in connection with practical problems, as indicating that the circuit is balanced with respect to ground.

34-41* "II" Equivalent Circuit.—A "II" equivalent circuit is a delta connection of three impedances externally equivalent to a complex network. It is also called a "U" equivalent circuit. See Fig. 3 for symbol.

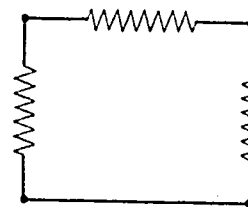


Fig. 3

34-42* "O" Equivalent Circuit.—An "O" equivalent circuit is a connection of four impedances in the form shown in Fig. 4, externally equivalent to a complex network. It differs from the II equivalent circuit in that the impedances are arranged symmetrically on the

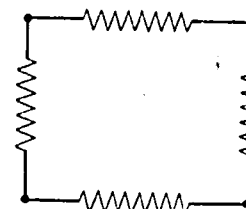


Fig. 4

two sides of the circuit, which is often desirable in connection with practical problems, as indicating that the circuit is balanced with respect to ground.

Telephony

34-43 Manual Telephone System.—A manual telephone system is one in which the calling party gives his order to an operator who completes the call directly by hand, either with or without the assistance of one or more additional operators.

* (41 to 42) As ordinarily considered, the simple networks as defined are the electrical equivalents of complex networks only with respect to definite pairs of terminals.

- 34-44 Automatic or Full Mechanical Telephone System.**—An automatic or full mechanical telephone system is one in which the calling party is enabled to complete a call by remote-control switches without the aid of an operator.
- 34-45 Semi-Automatic or Semi-Mechanical Telephone System.**—A semi-automatic or semi-mechanical telephone system is one in which the calling party gives his order to an operator who completes the call through remote-control switches.
- 34-46 Telephone Exchange.**—A telephone exchange consists of one or more central offices with associated plant, by means of which telephone service is rendered in a specified local community.
- 34-47 Telephone Exchange Area or District.**—A telephone exchange area or district is the area or district served by a telephone exchange.
- 34-48 Central Office (British "Exchange").**—A central office is a switching center for inter-connecting lines terminating therein.
- 34-49 Toll Central Office.**—A toll central office is one in which toll and long distance lines terminate.
- 34-50 Local Central Office.**—A local central office is one in which subscriber's lines terminate.
- 34-51 Private Branch Exchange (Generally Abbreviated "P. B. X.").**
—A private branch exchange is a telephone system generally installed on the premises of a subscriber, including a switchboard and extension sets, and connected to a central office, affording intercommunication between the extension sets and also between these sets and the central office.
- 34-52 Private Exchange.**—A private exchange is one which serves one business organization or individual, and is not connected to a central office.
- 34-53 Private Automatic Exchange.**—A private automatic exchange is an automatic exchange which serves one business organization or individual, and is not connected to a central office.
- 34-54 Subscriber Set (Often Abbreviated to "Subset").** A subscriber set is an assembly of apparatus for sending and receiving telephone calls.
- 34-55 Subscriber Station (Often Abbreviated to "Substation").**—A subscriber station is an installed subscriber set connected to a central office for the purpose of sending and receiving telephone calls.
- 34-56 Pay Station (British "Public Call Office").**—A pay station is a subscriber station available for the use of the public on the pay-

- ment of a fee. The fee may be either deposited in a coin box or paid to an attendant.
- 34-57 Toll Station.**—A toll station is a pay station located outside of a local service area and affording toll and long distance service only.
- 34-58 Subscriber Line or Subscriber Loop.**—A subscriber line or subscriber loop is the wire connection between a subscriber station and the central office.
- 34-59 Subscriber Line Circuit.**—A subscriber line circuit is a subscriber line with its associated individual central office apparatus.
- 34-60 Individual Line (British "Direct Line").**—An individual line is a subscriber line which connects one subscriber station to a central office, though it may have one or more extension sets.
- 34-61 Party Line.**—A party line is a subscriber line which connects two or more subscriber stations to a central office.
- 34-62 Tip Side or Tip Wire, Ring Side or Ring Wire.**—The tip side or wire, or the ring side or wire, is that conductor of a circuit which is associated with the corresponding member of a jack.
- 34-63 Negative Side or Negative Wire, Positive Side or Positive Wire.**
The negative side or wire, or the positive side or wire, is that conductor of a circuit which is normally connected to the corresponding pole of a battery.
- 34-64 Main Distributing Frame.**—A main distributing frame is a structure for terminating the permanent inside and outside wires of a central office and for effecting flexible junctions between them. It generally carries the central office protective devices and functions as a test point between line and office.
- 34-65 Intermediate Distributing Frame.**—An intermediate distributing frame is a structure for terminating permanent inside wires of a central office and for effecting flexible junctions between them.
- 34-66 Switchboard.**—A switchboard is an assemblage of apparatus in a coordinate structure for switching talking and signaling circuits.
- 34-67 Switchboard Section.**—A switchboard section is an element or unit one or more of which constitutes a complete manual switchboard.
- 34-68 Operating Room.**—An operating room is a room which contains a manual switchboard and associated apparatus.
- 34-69 Combination Current.**—A combination current consists of two or more currents of different characteristics in the same circuit. As ordinarily used the term refers to currents whose characteristics are steadily maintained, as for example, a combination of direct current and an alternating current.

- 34-70 Manual Ringing.**—Manual ringing is ringing which is affected by and continues with the operation of a key.
- 34-71 Machine Ringing.**—Machine ringing is intermittent and is caused to act periodically by the apparatus itself.
- 34-72 Superimposed Ringing Current.**—A superimposed ringing current is a combination current for ringing, consisting of a direct and an alternating current.
- 34-73 Pulsating Ringing Current.**—A pulsating ringing current is a current for ringing in which the succeeding impulses are separated by intervals approximately equal to those of the impulses themselves.
- 34-74 Harmonic Selective Signaling.**—Harmonic selective signaling employs devices tuned mechanically or electrically to the frequency of the ringing current, so that each device will not operate when receiving current intended to operate another device.
- 34-75 Multiple Harmonic Signaling.**—Multiple harmonic signaling employs frequencies which are integral multiples of the lowest frequency.
- 34-76 Non-Multiple Harmonic Signaling.**—Non-multiple harmonic signaling employs frequencies which are not integral multiples of the lowest frequency.
- 34-77 "To Call."**—"To call" is to originate a telephone call.
- 34-78 "To Dial."**—"To dial" a number is to use a dial type of calling device in order to control automatic switches.
- 34-79 "To Set Up."**—"To set up" a number is to use a key type or multiple lever type of calling device in order to control automatic switches.
- 34-80 Calling Device.**—A calling device is an apparatus by means of which automatic switches are controlled for the purpose of establishing a connection.
- 34-81 Calling Party.**—A calling party is a person who originates a telephone call.
- 34-82 Called Party.**—A called party is the person who answers when a station is called.
- 34-83 Reverting Call.**—A reverting call is one between two stations on the same subscriber line.

- 34-84 Telephone Traffic.**—Telephone traffic is the aggregate volume of communication handled in a given time.
- 34-85 "Busy."**—"Busy" is the condition of a line or an apparatus when it is in use.
- 34-86 Free.**—Free is the condition of a line or an apparatus when it is not in use. Free is the opposite of busy.
- 34-87 "To Make Busy."**—"To make busy" is to cause a line or an apparatus to appear to be busy.
- 34-88 "To Release" or "To Disconnect."**—"To release" or "to disconnect" is to terminate a telephone connection by disengaging the apparatus.
- 34-89 "To Clear."**—"To clear" is to restore a line or an apparatus to the free condition.
- 34-90 Trunk.**—A trunk is the wire connection between switching devices or central offices.
- 34-91 Trunk Circuit.**—A trunk circuit is a trunk with its associated individual apparatus.
- 34-92 Trunked Call.**—A trunked call is one which employs an inter-office trunk or a trunk between two switchboard positions.
- 34-93 Relay.**—A relay is a device by means of which contacts in one circuit are operated by a change in conditions in the same circuit or in one or more associated circuits.
- 34-94 Polar Relay.**—A polar relay is a relay which operates in response to a change in the direction of the current in the controlling circuit.
- 34-95 Quick Operating Relay.**—A quick operating relay is one which operates its contacts within a specified brief time limit.
- 34-96 Quick Release Relay.**—A quick release relay is one which releases its contacts within a specified brief time limit.
- 34-97 Quick Acting Relay.**—A quick acting relay is one which has the properties of both a quick operating and a quick release relay.
- 34-98 Slow Operating Relay.**—A slow operating relay is one which will not operate until after a specified delay.
- 34-99 Slow Release Relay.**—A slow release relay is one which when operated will not release until after a specified delay.
- 34-100 Slow Acting Relay.**—A slow acting relay is one which has the properties of both a slow operating and a slow release relay.

- 34-101 Line Relay.**—A line relay is one whose coil is normally in the line circuit.
- 34-102 Cut-Off Relay.**—A cut-off relay is one which when operated disconnects from a line apparatus normally connected to it.
- 34-103 Relay Coil Section.**—A relay coil section is one of two or more windings of a coil on one and the same core. The several sections may be concentric or placed side by side on the core.
- 34-104 Tension Spring.**—A tension spring is one which functions to exert mechanical pressure but does not carry an electrical current.
- 34-105 Contact Spring.**—A contact spring is one which takes an electrical part in switching a circuit.
- 34-106 Main Contact Spring.**—A main contact spring is one which may switch a circuit between two or more other contact springs.
- 34-107 Armature Spring.**—An armature spring is the first of a group to be moved by the armature. It may or may not be a main contact spring.
- 34-108 Plunger Spring.**—A plunger spring is the first of a group to be moved by the plunger.
- 34-109 Impulse Springs.**—Impulse springs are those which act to make or break a circuit for the purpose of sending impulses.
- 34-110 Make-Before-Break Contact Springs (Abbreviation "M. B. B.).**—Make-before-break contact springs are those in which the main spring touches the front contact before it breaks away from the back contact. Also called a continuity preserving contact.
- 34-111 Back Contact Spring.**—A back contact spring is one against which the main contact spring rests when in the normal position.
- 34-112 Front Contact Spring.**—A front contact spring is one against which the main contact spring rests when in the operated position.
- 34-113 Automatic Signaling.**—Automatic signaling is effected without the aid of an operator.
- 34-114 Automatic Switch.**—An automatic switch is a remote control device for controlling talking or signaling circuits.
- 34-115 Finder Switch.**—A finder switch is a switch connected to one of a smaller number of circuits and which finds automatically a circuit out of a larger number of circuits from whence the signal comes.

- 34-116 Line Switch.**—A line switch is a switch connected to one of a larger number of circuits from which a signal comes which finds automatically a circuit out of a smaller number of circuits.
- 34-117 Selector Switch.**—A selector switch is a switch whose duty is to select a particular group of trunks and one trunk of the group selected. In particular cases, one of these functions may be omitted.
- 34-118 Connector Switch or Final Selector.**—A connector switch or final selector is a switch whose duty is to establish a connection with the called line. It is usually operated by the last digit or digits of the call number.
- 34-119 Switch Frame.**—A switch frame is a structure for mounting an assembly of switching apparatus which may be integral therewith.
- 34-120 Section of Switches.**—A section of switches, considered from a trunking standpoint, is a group of adjacent switches whose banks are multiplied together.
- 34-121 Switchroom.**—A switchroom is a room which contains an assemblage of automatic switches and associated apparatus.
- 34-122 Bank Wires.**—Bank wires are those wires which multiple adjacent switch banks to each other.
- 34-123 Bank Cable.**—A bank cable is one which connects a switch bank to a terminal rack.
- 34-124 Multiple Cable.**—A multiple cable is one which multiples together two or more sections of switch banks by connecting together their terminals.
- 34-125 Impulse.**—An impulse is any sudden change of brief duration produced in the current of a circuit.
- 34-126 Make Impulse.**—A make impulse is an impulse due to a temporary flow of current.
- 34-127 Break Impulse.**—A break impulse is an impulse due to a temporary interruption of current.
- 34-128 Impulse Frequency.**—The impulse frequency is the number of impulses occurring per second. The reciprocal of this is the impulse period.
- 34-129 Impulse Period.**—The impulse period is the period of time included between the corresponding points in periodically recording impulses. It thus corresponds to the period of alternating current.

- 34-130 Impulse Ratio.**—Impulse ratio is the ratio of duration of an impulse to the impulse period.
- 34-131 Impulse Circuit.**—An impulse circuit is one through which impulses are transmitted.
- 34-132 Telephone Impulse Repeater.**—A telephone impulse repeater is a device for repeating impulses from one line circuit into another and for performing other duties.
- 34-133 Supervisory Signal.**—A supervisory signal is a device for attracting attention of an attendant to a duty in connection with switching apparatus or its accessories. This includes cord supervisory lamps on a manual switchboard and the supervisory lamps in an automatic exchange which indicate that a switch has been occupied but has not completed its function.
- 34-134 Tell-Tale Signal.**—A tell-tale signal is a device for locating the failure of some apparatus; for example, the blowing of a fuse, the continued drawing of heavy current by apparatus intended to receive only momentary current, etc.
- 34-135 Alarm Signal.**—An alarm signal is a sound producing device for attracting attention to either a supervisory or a tell-tale signal.
- 34-136 Telephone Repeater.**—A telephone repeater is a device for amplifying a voice current from one line circuit into another line circuit.
- 34-137 Telephone Receiver.**—A telephone receiver is an electrically operated device designed to produce sound waves or vibrations which correspond to the electromagnetic waves or vibrations actuating it.
- 34-138 Microphone.**—A contact device designed to have its electrical resistance directly and materially altered by slight differences in mechanical pressure.
- 34-139 Telephone Transmitter.**—A telephone transmitter is a sound-wave-operated or vibration-operated device designed to produce electromagnetic waves or vibrations which correspond to the sound waves or vibrations actuating it.
- 34-140* Coefficient of Coupling of a Transformer.**—The coefficient of coupling of a transformer at a given frequency is the ratio of the mutual impedance between the primary and secondary of the

* (140) Single frequency voltages and currents are here supposed to be represented by complex numbers. Their ratio is therefore a complex number.

- transformer, to the square root of the product of the self-impedances of the primary and of the secondary.
- 34-141 Repeating Coil.**—A term used in telephone practise meaning the same as transformer, and ordinarily a transformer of unity ratio.
- 34-142* Retardation Coil.**—A retardation coil is a reactor (reactance coil) used in a circuit for the purpose of selectively reacting on currents which vary at different rates.
- 34-143 Manual Switchboard.**—A manual switchboard is one in which the switching operations are performed by hand.
- 34-144 Multi Office Exchange (British "Multi Exchange System").**—A multi office exchange is one which is composed of more than one office.
- 34-145 Trunk Hunting.**—Trunk hunting is the operation of an automatic switch in moving its wipers or brushes to an idle set of terminals or contacts in a chosen group of terminals or contacts.
- 34-146 Wiper.**—A wiper is that portion of the moving member of a selector which engages with a bank contact.
- 34-147 Bank.**—A bank is an assembly of fixed contacts with which the moving members of a selector engage: Banks are usually multiplied.

Telegraphy

- 34-148 Relay.**—A relay is a device by means of which contacts in one circuit are operated by a change in conditions in the same circuit or in one or more associated circuits.
- 34-149 Polar Relay.**—A polar relay is a relay which operates in response to a change in the direction of the current in the controlling circuit.
- 34-150 Non-Polar Relay, or Neutral Relay.**—A non-polar relay is a relay which operates in response to a change in the strength of the current in the controlling circuit, irrespective of the direction of the current.
- 34-151 Neutral Relay.**—See non-polar relay.

* (142) In telephone and telegraph usage, the terms "impedance coil," "inductance coil," "choke coil" and "reactance coil" are sometimes used in place of the term "retardation coil."

- 34-152 Selector.**—A selector is a device which performs certain functions such as causing an electric lamp to light, or an electric bell to sound, in response to a definite signal or group of successive signals received over a controlling circuit.
- 34-153 Direct-Point Repeater.**—A direct-point repeater is a repeater in which the receiving relay controlled by the signals received over a line repeats these signals into another line or lines without the interposition of any other repeating or transmitting apparatus.
- 34-154 Concentrator.**—A concentrator is a traffic distributing device by means of which a number of telegraph or telephone lines, and connections to operating instruments are brought together at one point to facilitate their interconnection at such times as signals or messages are to be transmitted from one to the other.
- 34-155 Transmitter.**—A transmitter is a device for effecting electrical changes in a controlled circuit. The term transmitter is commonly applied principally to devices which in response to a controlling means effects in a main line telegraph circuit electrical changes necessary to send signals over the line.
- 34-156 Synchronous System.**—A synchronous system of telegraphy is one in which the proper transmission and reception of signals is dependent upon the synchronous operation of similar commutators or other devices located at the sending and receiving stations of a circuit.
- 34-157 Differential Duplex.**—A differential duplex is a duplex system in which at each station one of two portions of the receiving instrument are connected in series with the line wire and the other in series with an artificial line of such electrical characteristics that the effects upon the receiver of currents passing through the main and artificial lines, as a result of outgoing signals, are neutralized.
- 34-158 Bridge Duplex.**—A bridge duplex is a duplex system in which the receiving instruments at each station are connected across two impedances, one in series with the line wire and the other in series with the artificial line in such manner that no electrical change in the receiver circuit is effected by outgoing signals.
- 34-159 Half-Set Repeater.**—A half-set repeater is a repeater used for connecting together a simplex circuit and a duplexed circuit converting them into the equivalent of a single simplex circuit.

- 34-160 Intermediate Current Supply.**—An intermediate current supply is an ungrounded source of current connected in series with a line wire at a station other than a terminal on a ground return telegraph circuit.
- 34-161 Phantoplex Circuit.**—A phantoplex circuit is a superposed circuit operated by alternating current over a simplex, duplex or quadruplex circuit operated from direct-current sources.
- 34-162 Spark Condenser.**—A spark condenser is a condenser, with or without associated non-inductive resistance, connected with a pair of instrument contact points for the purpose of diminishing sparking at these points.
- 34-163 Current Margin.**—In a non-polar simplex system, the difference between the current flowing through a receiving instrument when operated to that flowing when not operated.
- 34-164 Margin Ratio.**—In a non-polar simplex system, the ratio of the current flowing through a receiving instrument when operated to that flowing when not operated.
- 34-165 Percentage Margin.**—In a non-polar simplex, the current margin expressed as a percentage of the current flowing through the relay when operated.
- 34-166 Main Circuit.**—A main circuit is a major electrical circuit of a telegraph system and includes both transmitting and receiving devices.
- 34-167 Local Circuit.**—A local circuit is a circuit, within the limits of the station, usually controlled by a receiving instrument in a main circuit or controlling a transmitter effecting changes in a main line circuit.

STORAGE BATTERIES*

(Revised Edition Adopted by the Board of Directors, American Institute of Electrical Engineers,
February 16, 1928)

A.S.A. C 40 1928

SCOPE

- 36-1** The standards in this section apply to storage batteries of the lead-acid type and of the nickel-iron alkaline type. They are suitable for large and small batteries in either stationary or portable service.
- 36-2** These standards conform to accepted usage.

CLASSIFICATION OF STORAGE BATTERIES

- 36-51** Storage batteries are classified as stationary or portable batteries on the basis of construction.
- 36-52 Stationary Batteries.**—Are those designed for service in a permanent location.
- 36-53 Portable Batteries.**—Are those designed for convenient transportation during service. Portable batteries may be used for service in a permanent location.

CONSTRUCTION

- 36-100 Storage Battery.**—A connected group of two or more electrochemical cells for the generation of electrical energy in which the cells after being discharged may be restored to a charged condition by an electric current flowing in a direction opposite to the flow of current when the battery discharges. Common usage permits this designation to be applied to a single cell used independently.
- 36-101 Storage Cell.**—The unit of the battery, consisting of positive and negative plates, separators, electrolyte and container, for the generation of electrical energy and capable of being recharged by an electric current.
- 36-102 Active Materials.**—Materials of plates reacting chemically to produce electrical energy during the discharge. The active materials of storage cells are restored to their original composition, in the charged condition, by oxidation or reduction processes

* Approved as American Standard by American Standards Association October 19, 1928. Sponsor: American Institute of Electrical Engineers.

STORAGE BATTERIES

produced by the charging current. In the charged condition the active materials are as follows:

<u>Plate</u>	<u>Lead-acid cells</u>	<u>Nickel-iron alkaline cells</u>
Positive	Lead peroxide	Oxides of nickel
Negative	Sponge lead	Iron

- 36-103 Grid.**—A metallic framework for conducting the electric current and supporting the active material.¹
- 36-104 Positive Plate.**—The grid and active material from which the current flows to the external circuit when the battery is discharging.
- 36-105 Negative Plate.**—The grid and active material to which the current flows from the external circuit when the battery is discharging.
- 36-106 Electrolyte.**—An aqueous solution of sulphuric acid used in lead cells and of certain hydroxides used in nickel-iron alkaline cells. The concentration of the solutions varies somewhat with the type of cell, its use and condition. The electrolyte of charged cells at 70 deg. Fahr. (21 deg. cent.) will ordinarily fall within the following limits of specific gravity.

	<u>Lead-acid cells</u>	<u>Nickel-iron alkaline cells</u>
Maximum.....	1.300	1.230
Minimum.....	1.200	1.160

- 36-107 Separator.**—A device for preventing metallic contact between the plates of opposite polarity within the cell.
- 36-108 Group.**—Assembly of a set of plates of the same polarity for one cell.
- 36-109 Element.**—The positive and negative groups with separators assembled for a cell.
- 36-110 Couple.**—The element of a cell containing two plates, one positive and one negative. This term is also applied to a positive and negative plate connected together as one unit for installation in adjacent cells.
- 36-111 Jar.**—The container for the element and electrolyte of a cell. Specifically a jar for lead-acid cells is usually of hard rubber composition or glass; but for nickel-iron alkaline cells is a nickel plated steel container frequently referred to as a "can."

¹ In certain types of batteries the active material is enclosed in containers which are held in place by the grid.

- 36-112 Tank.**—A lead container, supported by wood, for the element and electrolyte of a cell. This is restricted to some relatively large types of cells.
- 36-113 Case.**—A container for several cells. Specifically wood cases are containers for cells in individual jars; rubber or composition cases are provided with compartments for the cells.
- 36-114 Tray.**—A support or container for one or more cells.
- 36-115 Terminal Posts.**—The points of the cell or battery to which the external circuit is connected.
- 36-116 Cell Connector.**—A conductor used for carrying current between adjacent cells.
- 36-117 Counter Electromotive Force Cells.**—Cells of practically no capacity used to oppose the line voltage. Frequently called "Counter cells."
- 36-118 End Cells.**—The cells of a battery which may be cut in or out of the circuit for the purpose of adjusting the battery voltage.
- 36-119 Pilot Cell.**—A selected cell whose temperature, voltage and specific gravity of electrolyte are assumed to indicate the condition of the entire battery.

CAPACITY

- 36-150 Ampere-Hour Capacity.**—The number of ampere-hours which can be delivered by a cell or battery under specified conditions as to temperature, rate of discharge and final voltage.
- 36-151 Watt-Hour Capacity.**—The number of watt-hours which can be delivered by a cell or battery under specified conditions as to temperature, rate of discharge and final voltage.
- 36-152 Time-Rate.**—The rate in amperes at which a battery will be fully discharged in a specified time, under specified conditions of temperature and final voltage. Example, the eight-hour rate or the twenty-minute rate.

VOLTAGE

- 36-200 Open-Circuit Voltage.**—The voltage of a cell or battery at its terminals when no current is flowing. For the purpose of measurement, the small current required for the operation of a voltmeter is usually negligible.
- 36-201 Closed-Circuit Voltage.**—The voltage at the terminals of a cell or battery when current is flowing.

- 36-202 Average Voltage.**—The average value of the voltage during the period of charge or discharge. It is conveniently obtained from the time integral of the voltage curve.
- 36-203 Initial Voltage.**—The voltage of a cell or battery at the beginning of a charge or discharge. It is usually taken after the current has been flowing for a sufficient period of time for the rate of change of voltage to become practically constant.
- 36-204 Final Voltage.**—The prescribed voltage upon reaching which the discharge is considered complete. The final voltage is usually chosen so that the useful capacity of the cell is realized. Final voltages vary with the type of battery, the rate of the discharge, temperature, and the service in which the battery is used.
- 36-205 Polarity.**—An electrical condition determining the direction in which current tends to flow. By common usage the discharge current is said to flow from the positive or peroxide plate through the external circuit. In a nickel-iron alkaline battery the positive plate is that containing nickel peroxide.
- 36-206. Polarization.**—The change in voltage at the terminals of a storage cell, when a specified current is flowing, equal to the difference between the actual and the equilibrium (constant open-circuit condition) potentials of the plates, exclusive of the IR drop.

CHARGING AND DISCHARGING

- 36-250 Charge.**—The conversion of electrical energy into chemical energy within the cell or battery. This consists of the restoration of the active materials by passing a uni-directional current through the cell or battery in the opposite direction to that of the discharge. A cell or battery which is said to be "charged" is understood to be fully charged.
- 36-251 Charging Rate.**—The current expressed in amperes at which a battery is charged.
- 36-252 Constant-Current Charge.**—A charge in which the current is maintained at constant value. For some types of lead batteries this may involve two rates called the starting and the finishing rates.
- 36-253 Constant Voltage Charge.**—A charge in which the voltage at the terminals of the battery is held at a constant value. A modified constant voltage system is usually one in which the voltage of the charging circuit is held substantially constant, but a fixed

resistance is inserted in the battery circuit producing a rising voltage characteristic at the battery terminals as the charge progresses. This term is also applied to other methods for producing automatically a similar characteristic.

36-254 Boost Charge.—A partial charge, usually at a high rate for a short period.

36-255 Equalizing Charge.—An extended charge given to a battery to insure the complete restoration of the active materials in all the plates of all the cells.

36-256 Trickle Charge.—A continuous charge at low rate approximately equal to the internal losses and suitable to maintain the battery in a fully charged condition. This term is also applied to very low rates of charge suitable not only for compensating for internal losses but to restore intermittent discharges of small amount delivered from time to time to the load circuit.

36-257 Finishing Rate.—The rate of charge expressed in amperes to which the charging current for some types of lead batteries is reduced near the end of charge to prevent excessive gassing and temperature rise.

36-258 Discharge.—The conversion of the chemical energy of the battery into electrical energy.

36-259 Reversal.—Change in normal polarity of a storage cell.

36-260 Local Action or Self Discharge.—The internal loss of charge which goes on continuously within a cell regardless of connections to an external circuit.

36-261 Floating.—A method of operation in which a constant voltage is applied to the battery terminals sufficient to maintain an approximately constant state of charge.

36-262 Specific Gravity of Electrolyte.—The electrolyte of lead-acid batteries increases in concentration to a fixed maximum value during charge and decreases during discharge. The concentration is usually expressed as the specific gravity of the solution. This variation of specific gravity of the solution affords an approximate indication of the state of charge.

The specific gravity of the electrolyte in nickel-iron alkaline batteries does not change appreciably during charge or discharge and therefore does not indicate the state of charge. The specific gravities, however, are indication of the electrochemical usefulness of the electrolyte.

36-263 Gassing.—The evolution of oxygen or hydrogen, or both.

EFFICIENCY

36-300 Efficiency.—The ratio of the output of a cell or battery to the input required to restore the initial state of charge under specified conditions of temperature, current rate, and final voltage.

36-301 Ampere-Hour Efficiency.—(Electrochemical Efficiency.)—The ratio of the ampere-hours output to the ampere-hours of the recharge.

36-302 Volt Efficiency.—The ratio of the average voltage during the discharge to the average voltage during the recharge.

36-303 Watt-Hour Efficiency.—(Energy efficiency.)—The ratio of the watt-hours output to the watt-hours of the recharge.

TEMPERATURE

36-350 Reference Temperature.—The capacity obtained from a storage battery on discharge varies with the temperature of the electrolyte. The following standard reference temperatures are established.

(1) The temperature of electrolyte at beginning of discharge shall be 25 deg. cent. (77 deg. fahr.). No limit is placed on the temperature attained by the electrolyte during discharge.

(2) The ambient temperature on discharge shall be from 5 deg. cent. to 8 deg. cent. lower than the temperature of the electrolyte, on the beginning of discharge. The ambient temperature shall be kept constant throughout the discharge.

36-351 Temperature Coefficient of Voltage.—The change in open-circuit voltage per degree (cent.) change in temperature.²

36-352 Temperature Coefficient of Capacity.—The change in delivered capacity expressed as a percentage of the ampere-hour or watt-hour capacity per degree (cent.) change in temperature between specified limits.

36-353 Critical Temperature.—The temperature of the electrolyte at which an abrupt change in capacity occurs.

² This is but a few tenths of a millivolt and must not be confused with the effect of temperature on changes in voltages resulting from polarization and IR drop when charging or discharging.

RATING OF BATTERIES

36-400 General.—Batteries are usually rated in terms of the number of ampere-hours which they are capable of delivering when fully charged and under specified conditions as to temperature, rate of discharge and final voltage (See 36-150, 36-204 and 36-250). For different classes of service, different time-rates (See definition of time-rate, 36-152) are frequently used. For comparing the capacities of batteries of different size but of the same general design, it is customary to use the same time-rate, and a comparison based on the different lengths of time they will discharge at the same rate is not recommended as it is misleading.

36-401 Misrating.—A battery which fails to deliver its rated capacity on the third successive measured cycle of charge and discharge under specified current rates, temperature of electrolyte, specific gravity, and final voltage, shall be considered to be improperly rated.

NATIONAL ELECTRICAL CODE
 Regulations of the
 National Board of Fire Underwriters for
 Electrical Wiring and Apparatus
 as recommended by the
 National Fire Protection Association

A.S.A. CI 1930

ARTICLE 37. RADIO EQUIPMENT*

3701. General.

(a) The requirements of this article shall neither apply to equipment installed on shipboard, nor to antennas used for coupling carrier current to line conductors; but shall be deemed to be additional to, or amendatory of, those prescribed in Articles 1 to 19, inclusive, of this code.

(b) Transformers, voltage reducers, keys and other devices employed shall be of types expressly approved for radio reception or transmission.

(c) Methods of wiring from the source of power to and between devices, related to apparatus connected to interior wiring systems, shall be in accordance with the rules covering permanent or portable fixtures, devices and appliances.

It is recommended that the authority enforcing this code be freely consulted as to the specific methods to be followed in any case of doubt relative to installation of antenna and counter-poise conductors and that the National Electrical Safety Code, Part 5, be followed.

3702. For Receiving Stations Only.

(a) Antenna and counterpoise conductor sizes shall be not less than No. 14 if of copper or No. 17 if of bronze or copper-clad steel. Antenna and counterpoise conductors outside buildings shall be kept well away from all electric light or power wires of any circuit of more than 600 volts, and from railway, trolley or feeder wires, so as to avoid the possibility of contact between the antenna or counterpoise and such wires under accidental conditions.

* Approved as American Standard by the American Standards Association, July 19, 1929.

(b) Antenna and counterpoise where placed in proximity to electric light or power wires of less than 600 volts, or signal wires, shall be constructed and installed in a strong and durable manner, and shall be so located and provided with suitable clearances as to prevent accidental contact with such wires by sagging or swinging.

(c) Splices and joints in the antenna span shall be soldered unless made with approved splicing devices.

(d) The preceding paragraphs, (a), (b), and (c), shall not apply to light and power circuits used as receiving antenna, but the devices used to connect the light and power wires to radio receiving sets shall be of approved type.

(e) Lead-in conductors, that is, conductors from antennas to sets, shall be of copper, approved copper-clad steel or other metal which will not corrode excessively, and in no case shall they be smaller than No. 14, except that bronze or copper-clad steel not less than No. 17 may be used.

(f) Lead-in conductors from the antenna to the first building attachment shall conform to the requirements for antennas similarly located. Lead-in conductors from the first building attachment to the building entrance shall, except as specified in the following paragraph, be installed and maintained so that they cannot swing closer to open supply conductors than the following distances:

Supply wires 0 to 600 volts	2 feet
Supply wires exceeding 600 volts	10 feet

Where all conductors involved are supported so as to insure a permanent separation and the supply wires do not exceed 150 volts to ground, the clearance may be reduced to not less than 4 inches. Lead-in conductors on the outside of buildings shall not come nearer than the clearances specified above to electric light and power wires unless separated therefrom by a continuous and firmly fixed non-conductor which will maintain permanent separation. The non-conductor shall be in addition to any insulating covering on the wire.

(g) Each lead-in conductor shall enter the building through a non-combustible, non-absorptive, insulating bushing slanting upward toward the inside or by means of an approved device designed to give adequate insulation and protection. The lead-in conductor from the building entrance to the set shall have rubber insulation approved for voltages 0-600 (Type R).

(h) Each lead-in conductor shall be provided with an approved protective device (lightning arrester) which will operate at a voltage of 500 volts or less, properly connected and located either inside the building at some point between the entrance and the set which is convenient to a ground, or outside the building as near as practicable to the point of entrance. The protector shall not be placed in the immediate vicinity of easily ignitable stuff, or where exposed to inflammable gases or dust or flyings of combustible materials.

(i) If an antenna grounding switch is employed, it shall in its closed position form a shunt around the protective device. The switch should be placed in the most direct line between the lead-in conductor and the point where the grounding connection is made. Such a switch shall not be used as a substitute for the protective device.

(j) If fuses are used, they shall not be placed in the circuit from the antenna through the protective device to ground.

(k) The protective grounding conductor may be bare and shall be of copper, bronze or approved copper-clad steel. The protective grounding conductor shall be not smaller nor have less conductance per unit of length, than the lead-in conductor, and in no case shall be smaller than No. 14 if of copper nor smaller than No. 17 if of bronze or copper-clad steel. The protective grounding conductor shall be run in as straight a line as possible from the protective device to a good permanent ground. The ground connections shall be made to a cold-water pipe where such pipe is available and is in service and connected to the street mains. An outlet pipe from a water tank fed from a street main or a well may be used, provided such outlet pipe is adequately bonded to the inlet pipe connected to the street water main or well. If water pipes are not available, ground connections may be made to a grounded steel frame of a building or to an artificial ground such as a galvanized iron pipe or a rod driven into permanently damp earth or to a metal plate or other body of metal buried similarly. Gas piping shall not be used for the ground.

(l) The protective grounding conductor shall be guarded where exposed to mechanical injury. An approved ground clamp shall be used where the protective grounding conductor is connected to pipes or piping.

(m) The protective grounding conductor may be run either inside or outside the building. The protective grounding conductor and ground, installed as prescribed in the preceding paragraphs (k) and (l), may be used as the operating ground.

It is recommended that in this case the operating grounding conductor be connected to the ground terminal of the protective device.

If desired, a separate operating grounding connection and ground may be used, this operating grounding conductor being either bare or provided with an insulated covering.

(n) Wires inside buildings shall be securely fastened in a workmanlike manner and shall not come nearer than 2 inches to any electric light or power wire not in conduit unless separated therefrom by some continuous and firmly fixed non-conductor, such as porcelain tubes or approved flexible tubing, making a permanent separation. This non-conductor shall be in addition to any regular insulating covering on the wire.

(o) Storage-battery leads shall consist of conductors having approved rubber insulation. The circuit from a filament, "A," storage battery of more than 20 ampere-hours capacity, NEMA rating, shall be properly protected by a fuse or circuit-breaker rated at not more than 15 amperes. The circuit from a plate, "B," storage battery shall be properly protected by a fuse or circuit-breaker rated at not more than 1 ampere in the negative lead. Fuses or circuit-breakers shall be located not more than 18 inches along the wire from a battery terminal.

3703. For Transmitting Stations Only.

(a) Antenna and counterpoise conductors outside buildings shall be kept well away from all electric light or power wires of any circuit of more than 600 volts, and from railway trolley or feeder wires, so as to avoid the possibility of contact between the antenna or counterpoise and such wires under accidental conditions. Antenna and counterpoise conductors where placed in proximity to electric light or power wires of less than 600 volts, or signal wires, shall be constructed and installed in a strong and durable manner, and shall be so located and provided with suitable clearances as to prevent accidental contact with such wires by sagging or swinging.

(b) Antenna conductor sizes shall be not less than given in the following table:

Material	Stations to which power supplied is less than 100 watts and where voltage of power is less than 400 volts	Stations to which power supplied is more than 100 watts or voltage of power is more than 400 volts
Soft copper.....	14	7
Medium-drawn copper.....	14	8
Hard-drawn copper.....	14	10
Bronze or copper-clad steel.....	14	12

(c) Splices and joints in the antenna and counterpoise span shall be soldered unless made with approved splicing devices.

(d) Lead-in conductors shall be of copper, bronze, approved copper-clad steel or other metal which will not corrode excessively and in no case shall be smaller than No. 14.

(e) Antenna and counterpoise conductors and wires leading therefrom to ground switch, where attached to buildings, shall be firmly mounted 5 inches clear of the surface of the building, on non-absorptive insulating supports such as treated pins or brackets, equipped with insulators having not less than 5 inches creepage and air-gap distance to inflammable or conducting material, except that the creepage and air-gap distance for continuous-wave sets of 1000 watts and less input to the transmitter, shall be not less than 3 inches.

(f) In passing the antenna or counterpoise lead-in into the building a tube or bushing of non-absorptive, insulating material, slanting upward toward the inside, shall be used and shall be so insulated as to have a creepage and air-gap distance in the case of continuous-wave sets of 1000 watts and less input to the transmitter, not less than 3 inches, and in all other cases not less than 5 inches. If porcelain or other fragile material is used it shall be protected where exposed to mechanical injury. A drilled window pane may be used in place of a bushing provided creepage and air-gap distances as specified above are maintained.

(g) A double-throw knife switch having a break distance of at least 4 inches and a blade not less than 1/8 inch by 1/2 inch, or a flexible grounding lead and clamp in place of this switch, shall be used to join the antenna lead-in to the grounding conductor. The switch or flexible grounding lead may be located inside or outside the building. The base of the switch shall be of non-absorptive insulating material. The switch or flexible grounding lead shall be so mounted that its current-carrying parts will be at least 3 inches clear of the building wall or other conductors in the case of continuous-wave sets of 1000 watts and less, and in all other cases at least 5 inches. The conductor from grounding switch or flexible grounding lead to ground shall be securely supported. These provisions shall also apply to the connection of the counter poise lead-in to its grounding conductor.

It is recommended that the switch be located in the most direct line between the lead-in conductors and the point where grounding connection is made.

(h) Antenna and counterpoise conductors shall be effectively and permanently grounded at all times when station is not in actual operation and unattended, by a conductor at least as large as the lead-in and in no case smaller than No. 14 copper, bronze or approved copper-clad steel. This protective grounding conductor need not have an insulated covering or be mounted on insulating supports. The protective grounding conductor shall be run in as straight a line as possible to a good permanent ground. The ground connections shall be made to a cold-water pipe where such pipe is available and is in service and connected to the street mains. An outlet pipe from a water tank fed from a street main, or a well may be used, provided such outlet pipe is adequately bonded to the inlet pipe connected to the street water main or well. If water pipes are not available, ground connections may be made to a grounded steel frame of a building or to an artificial ground such as a galvanized iron pipe or a rod driven into permanently damp earth or to a metal plate or other body of metal buried similarly. The protective grounding conductor shall be protected where exposed to mechanical injury. A suitable approved ground clamp shall be used where the protective grounding conductor is connected to pipes or piping. Gas pipes shall not be used for the ground.

It is recommended that the protective grounding conductor be run outside the building.

(i) The operating grounding conductor shall be of copper strip not less than $3/8$ inch wide by $1/32$ inch thick, or of copper, bronze, or approved copper-clad steel having a periphery, or girth, of at least $3/4$ inch, such as a No. 2 wire, and shall be firmly secured in place throughout its length.

(j) The operating grounding conductor shall be connected to a good permanent ground. Preference shall be given to water piping. Other permissible grounds are grounded steel frames of buildings or other grounded metal work in the building, and artificial grounding devices such as driven pipes, rods, plates, cones, etc. Gas piping shall not be used for the ground.

(k) Where the current supply is obtained directly from lighting or power circuits, the conductors whether or not lead-covered shall be installed in approved metal conduit, armored cable or metal raceways.

(l) When necessary to protect the supply system from high-potential surges and kick-backs there shall be installed in the supply

line as near as possible to each radio transformer, rotary spark gap, motor and generator in motor-generator sets and other auxiliary apparatus one of the following:

(1) Two condensers (each of not less than $1/10$ microfarad capacity and capable of withstanding 600 volt test) in series across the line with mid-point between condensers grounded; across (in parallel with) each of these condensers shall be connected a shunting fixed spark-gap capable of not more than $1/32$ inch separation.

(2) Two vacuum-tube-type protectors in series across the line with the mid-point grounded.

(3) Lightning arresters, such as the aluminum-cell type.

NATIONAL ELECTRICAL SAFETY CODE*
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SECTION 50. SCOPE

500. Scope.

The rules of part 5 apply to radio transmitting and receiving installations, including antennas, counterpoise wires, lead-in conductors, grounding conductors, grounding connections, protective devices, and batteries. The rules do not apply to antennas used for coupling carrier-current equipment to line conductors.

In case the installation is covered by more than one rule, the superior requirement shall apply.

SECTION 51. CLASSIFICATION OF RADIO STATIONS

510. Classification of Radio Stations.

For the purpose of these rules radio stations are classified as follows:

A. Receiving stations.

B. Transmitting stations.

1. *Low-power*.—Transmitting stations to which the power supplied is less than 100 watts and where the voltage of the power supplied is less than 400 volts.

2. *Medium-power*.—Transmitting stations not classified as low-power or high-power.

3. *High-power*.—Transmitting stations to which the power supplied is greater than 1,000 watts or where the voltage of the power supplied is greater than 2,000 volts.

SECTION 52. ANTENNA AND COUNTERPOISE INSTALLATION

520. Application of Rules.

These rules apply to the following:

A. **Outdoor antennas of all classes of receiving and transmitting stations.** (There are no requirements for indoor antennas.)

B. **Counterpoise wires.**

* Approved as American Standard by the American Standards Association, November 15, 1927. The complete handbook can be purchased from the Government Printing Office, Washington, D. C. Price \$1.00.

521. General Requirements.

A. **Counterpoise wires.**—Counterpoise wires shall conform to the requirements for antennas similarly located.

B. **Antennas of receiving and low-power transmitting stations.**—Such antennas shall, in general, comply with the requirements for the construction of communication lines for public use in similar situations.

C. **Antennas of medium- and high-power transmitting stations.**—Such antennas shall, in general, comply with the requirements for the construction of supply lines in similar situations.

522. Locations to be Avoided.

The following situations should be avoided in erecting antennas and guy wires:

A. Attachments to supply or communication poles.

B. Crossings over railroad tracks or public highways.

C. Crossings over supply or communication conductors.

D. Crossings under supply or communication conductors.

E. Antenna conflicts with supply or communication conductors.

(See definition of "Antenna conflict.")

523. Ordinary Construction of Antennas.

Antennas shall be constructed according to the requirements of rule 523 when they do not cross over railroad tracks, supply conductors, or communication conductors and do not conflict with supply or communication conductors.

A. **Antenna conductors.**

1. *Material.*

(a) RECEIVING ANTENNAS.

No requirements.

(b) TRANSMITTING ANTENNAS.

Antennas shall be of copper, bronze, copper-covered steel, or other metal which will not corrode excessively under the prevailing conditions.

2. *Size.*—Antenna conductor sizes shall be not less than given in Table I.

3. *Strength.*

(a) ANTENNAS OF RECEIVING AND LOW-POWER TRANSMITTING STATIONS.

No requirements.

(b) ANTENNAS OF MEDIUM- AND HIGH-POWER TRANSMITTING STATIONS.

TABLE I
ANTENNA CONDUCTOR SIZES—ORDINARY CONSTRUCTION

Material	Receiving antennas		Transmitting antennas			
			Low-power		Medium- and high-power	
	Size A.W.G.	Diameter	Size A.W.G.	Diameter	Size A.W.G.	Diameter
Copper:						
Soft-drawn.....	14	<i>Inch</i> 0.064	14	<i>Inch</i> 0.064	7	<i>Inch</i> 0.143
Medium-drawn.....	14	0.064	14	0.064	8	0.128
Hard-drawn.....	14	0.064	14	0.064	10	0.102
Bronze or copper-covered steel....	17	0.045	14	0.064	12	0.081

The strength of the antenna conductor shall be not less than that of No. 10 A. W. G. (diameter 0.102 inch) hard-drawn copper.

B. Antenna insulators.

1. *Antennas of receiving and low-power transmitting stations.*—No requirements.

2. *Antennas of medium- and high-power transmitting stations.*—Insulators shall be of non-combustible material and shall have a creepage distance of not less than 10 inches.

C. Antenna supports.

1. *Strength of supports.*—Supports shall be of such initial size as to carry the vertical load and where necessary shall be guyed or braced so as to withstand the transverse and longitudinal loads to which they may be subjected.

2. *Roof supports.*—Antenna supports erected on roofs shall be of rigid construction, and where necessary shall be arranged to distribute the load over the roof. Such supports shall be erected so that they are not dependent in any way on the antenna for stability.

3. *Chimneys.*—The attachment of antennas to chimneys should be avoided.

4. *Grounding metal supports on roofs.*—Metal poles or masts extending more than 10 feet above the supporting building shall be permanently and effectively grounded.

5. *Trees.*—Where a tree is used as an antenna support, sufficient sag (or other means) shall be provided to keep the tension in the antenna safely below the breaking strength when the tree sways in the wind.

D. Attaching antennas to supports.

1. *Strength of attachment.*—The means used for attaching the antenna to the support shall be such as to withstand a greater load than that which will break the conductor itself.

2. *Attachment on small poles.*—If the pole is not strong enough to support a person, some arrangement shall be provided to draw up the antenna from the ground.

E. Minimum clearance above ground.

1. *Spans 150 feet or less in length.*—Antenna conductors shall have clearances above ground as given in Table II.

TABLE II
MINIMUM ANTENNA CLEARANCES ABOVE GROUND

Location	Receiving and low-power antennas	Medium- and high-power antennas
Above streets and other traveled roadways.....	<i>Feet</i> 18	<i>Feet</i> 28
Along road in rural districts.....	15	28
Above roadways to residence garages.....	10	—
Above spaces or ways accessible only to pedestrians.....	10	—

2. *Spans exceeding 150 feet in length.*—For such spans the above clearances shall be increased by 0.1 foot for each 10 feet in excess of 150 feet.

F. *Minimum clearances below supply and communication conductors.*—Antennas shall have the following clearances from conductors under which they cross:

TABLE III
MINIMUM ANTENNA CLEARANCES BELOW OTHER CONDUCTORS

Crossing under—	Receiving and low-power antennas	Medium- and high-power antennas
Communication conductors.....	<i>Feet</i> 2	<i>Feet</i> 10
Supply conductors, 0 to 750 volts.....	4	10
Supply conductors exceeding 750 volts.....	6	10

G. *Clearances from combustible material.*—Antennas of medium- and high-power transmitting stations shall be placed so that an air gap of at least 10 inches exists between the antenna and the nearest combustible material.

524. Special Construction of Antennas.

Antennas shall be specially constructed according to the following requirements when they cross over railroad tracks, supply conductors, or communication conductors, or are in conflict with supply or communication conductors.

A. *Recommendation against locating antennas in situations where special construction is required.*—It is strongly recommended

that the installation of antennas in these special situations be avoided. If such locations are employed, it must be recognized that special hazards are introduced and that great care is necessary in the construction and maintenance of antennas to avoid contact with supply or communication conductors or to avoid the reduction of clearance over railroad tracks.

B. Construction of antennas crossing over or conflicting with service loops 0 to 150 volts to ground.—Antennas constructed in these situations shall conform to the requirements for the ordinary construction of antennas (rule 523) and, in addition, with the requirements set forth below for splices (rule 524, C, 2) and for minimum clearances above communication and supply line conductors (rule 524, C, 4).

C. Construction of antennas crossing over or conflicting with communication conductors or supply conductors 0 to 750 volts.

1. *Antenna conductor strength.*—The strength of the antenna conductor shall be not less than that of hard-drawn copper to the following sizes:

Span length	Size of hard-drawn copper	
	Size A.W.G.	Diameter
0 to 150 feet.....	8	<i>Inch</i> 0.128
Exceeding 150 feet.....	6	0.162

2. *Splices.*—Splices in antenna spans shall be made with a suitable twisted-sleeve connector which will provide a strong unsoldered joint.

3. *Antenna supports.*

(a) MATERIAL.

The poles for supporting antennas shall be of steel, concrete, or wood. Wood poles shall be free from observable defects that would decrease their strength or durability.

(b) SIZE.

Wood poles shall have a top diameter of not less than 6 inches.

(c) SETTING.

Poles shall be set to such a depth and in such a manner that any applied load will break the pole before the butt is pulled loose from its setting.

4. *Minimum clearances above communication and supply conductors, 0 to 750 volts.*—Antennas crossing over such conductors shall have the following clearances:

Antennas of receiving and low-power transmitting stations.....	6
Antennas of medium- and high-power transmitting stations.....	10

D. Antennas crossing over railroads or crossing over or conflicting with supply lines exceeding 750 volts.

1. *Antennas of receiving and low-power transmitting stations.*—Such antennas shall conform to the requirements for communication lines for public use in similar situations as far as grades of construction and clearances from all other wires and from ground are concerned. (See part 2.)

2. *Antennas of medium- and high-power transmitting stations.*—Such antennas shall conform to the requirements for supply lines in similar situations as far as grades of construction and clearances from all other wires and from ground are concerned. (See part 2.)

525. Guarding of Antennas.

Antennas for transmitting stations shall be installed or protected so as to be inaccessible to unauthorized persons.

SECTION 53. LEAD-IN CONDUCTORS

530. Application of Rules.

The requirements of this section apply to lead-in conductors of receiving stations and transmitting stations of low and medium power. Lead-in conductors of high-power transmitting stations shall meet such requirements of part 1, "Supply stations," as apply.

531. Material.

Lead-in conductors shall be of copper, bronze, copper-covered steel, or other metal which will not corrode excessively under the prevailing conditions.

532. Size.

A. *Receiving stations.*—For receiving stations the size of lead-in conductor shall be not less than No. 14 A. W. G. (0.064 inch) if of copper, or less than No. 17 A. W. G. (0.045 inch) if of bronze or copper-covered steel.

B. *Low- and medium-power transmitting stations.*—For such transmitting stations the lead-in conductor shall be not less than No. 14 A. W. G. (0.064 inch).

533. Installation of Lead-in Conductor.

A. *From antenna to first building attachment.*—This section of the lead-in wire shall conform to the requirements for antennas similarly located.

B. From first building attachment to building entrance.—This section of the lead-in conductor shall be installed and maintained so that it cannot swing closer to open supply conductors than the following distances:

	Feet
Supply lines 0 to 750 volts.....	2
Supply lines exceeding 750 volts.....	10

Exception.—The 2-foot clearance may be reduced if the lead-in conductor is separated from supply conductors by a continuous and firmly fixed non-conductor which will maintain permanent separation. This non-conductor shall be in addition to any insulating covering on the wires.

C. From building entrance to set.

1. Receiving stations.

(a) Lead-in conductors shall be securely fastened in a workman-like manner.

(b) Clearance between lead-in conductor and any supply conductor not in conduit shall not be less than 2 inches.

Exception.—This 2-inch clearance does not apply if a firmly fixed non-conductor such as porcelain tube affords a permanent separation. This non-conductor shall be in addition to any insulating covering on the wires.

2. Low- and medium-power transmitting stations.

(a) Lead-in conductors shall be securely fastened to suitable insulators.

(b) Clearance between lead-in conductor and any supply wire shall be at least 5 inches.

(c) Lead-in conductors shall be installed and protected to prevent persons from readily coming into accidental contact with them.

SECTION 54. CONSTRUCTION AT BUILDING ENTRANCE

540. Application of Rules.

The requirements of this section apply to construction at receiving stations and transmitting stations of low and medium power. Construction at building entrances at high-power transmitting stations shall meet such requirements of part 1, "Supply stations," as apply.

541. Entrance Bushing.

Lead-in conductors shall enter the building through a rigid, non-combustible, non-absorptive, insulating tube or bushing, or through a drilled windowpane.

542. Creepage and Air-Gap Distance.

The entrance bushing or windowpane mentioned in rule 541 above shall afford the following creepage and air-gap distance from extraneous bodies:

Receiving stations.....	No requirement.
Low- and medium-power transmitting stations using damped waves.....	5 inches.
Low- and medium-power transmitting stations using undamped waves.....	3 inches.

543. Mechanical Protection of Bushings.

Entrance bushings of porcelain or other fragile material at transmitting stations shall be protected where exposed to mechanical injury.

SECTION 55. PROTECTIVE AND OPERATING GROUNDING CONDUCTORS

550. Application of Rules.

The requirements of this section apply to grounding conductors of receiving stations and transmitting stations of low and medium power. Grounding conductors of high-power transmitting stations shall meet such requirements of part 1, "Supply stations," as apply.

551. General.

The protective grounding conductor may be used also as the operating grounding conductor.

552. Material and Size.

A. Receiving stations.

1. *Material.*—No requirements.

2. *Size.*—

(a) OPERATING GROUNDING CONDUCTOR.

No requirements.

(b) PROTECTIVE GROUNDING CONDUCTOR.

This conductor shall not be smaller than the lead-in conductor.

B. Transmitting stations.—The operating and grounding conductors shall have strength and conductance per unit length not less than No. 14 A. W. G. (0.064 inch) hard-drawn copper.

553. Installation of Grounding Conductors.

A. Method of running.

1. Grounding conductors shall be run in as straight a line as possible from the set or the protective device to a good permanent ground.

2. Grounding conductors may be run either inside or outside of the building.

Recommendation.—It is recommended that the protective grounding wire for low- and medium-power transmitting stations be run outside of the building.

B. Mechanical protection.—Grounding conductors shall be guarded where exposed to mechanical injury.

C. Insulation.—Grounding conductors may be of insulated or bare wire and need not be run on insulating supports.

SECTION 56. GROUND CONNECTIONS

560. Application of Rules.

The requirements of this section apply to ground connections for all classes of transmitting stations and to protective ground connections of receiving stations.

561. General.

Grounding shall be done in accordance with the following methods. (See section 9 for complete rules for grounding.)

562. Gas Pipe Not to be Used.

Gas pipe should not be used for grounding purposes.

563. Water-pipe Grounds.

The ground connections shall be made to a cold-water pipe where such pipe is available and is in service and connected to the street mains. An outlet pipe from a water tank fed by a street main or a well may be used, provided such outlet pipe is adequately bonded to the inlet pipe connected to the street water main or well.

564. Attachment to Pipes.

Grounding conductors shall be attached to pipes by means of suitable ground clamps. The entire surface of the pipe to be covered by the clamp shall be thoroughly cleaned.

565. Driven or Buried Grounds.

If cold-water pipes are not available, ground connections may be made to a galvanized-iron pipe or to a rod driven into permanently damp earth or to a metal plate or other body of metal buried similarly.

566. Attachment to Ground Rod or Plate.

The grounding conductor shall be attached to the rod, buried plate, or other body of metal so as to give reliable connection both mechanically and electrically. This connection shall be made so that it

will not fail through corrosion, even when the joint is buried in the earth.

SECTION 57. PROTECTIVE DEVICES

570. Application of Rules.

The requirements of this section apply to protective devices for receiving stations and transmitting stations of low and medium power. Protective devices for high-power transmitting stations shall meet such requirements of part 1, "Supply stations," as apply.

571. Lightning Arrester.

A. Where required.—Each lead-in conductor of a receiving station shall be provided with a lightning arrester, whether or not an antenna grounding switch is used.

B. Operating voltage.—The lightning arrester shall be such as to operate at a potential of 500 volts or less.

C. Location.—The arrester may be located outside the building as near as practicable to the point of entrance, or inside the building between the point of entrance and the receiving set and convenient to a ground. The arrester shall not be placed in the immediate vicinity of easily ignitable material or in a location exposed to dust, inflammable gases, or flyings of combustible materials.

572. Antenna Grounding Switch.

A. Where required.—An antenna grounding switch shall be used at low- and medium-power transmitting stations. An antenna grounding switch is not required at receiving stations, but may be used in addition to the lightning arrester.

B. Type of switch.

1. *Receiving stations.*—The switch should be of the single-pole double-throw type.

2. *Low- and medium-power transmitting stations.*—The switch shall be of the double-throw type and shall meet the following requirements:

Minimum break distance 4 inches.

Minimum cross-section of switch blade $\frac{1}{4}$ inch \times $\frac{1}{2}$ inch

Switch base: Non-absorptive insulating material.

C. Location.—The switch may be located either outside or inside the building. The switch should be placed in the most direct line between the lead-in conductor and the point where the grounding connection is made.

D. Clearance for live switch parts.—The switch shall be mounted so that its current-carrying parts will clear the building wall or conductors not connected to the switch by the following distances:

Switches for receiving stations: No clearance required.

Switches for low- and medium-power transmitting stations:

Damped-wave sets.....	5 inches.
Undamped-wave sets.....	3 inches.

E. Method of connection.

1. *Receiving stations.*—The switch shall be wired so that the antenna lead-in conductor can be disconnected from the set and connected to the grounding conductor. When in the grounding position the switch shall short-circuit the lightning arrester.

2. *Low- and medium-power transmitting stations.*—No requirements.

F. Operation of switch.

1. *Receiving stations.*—No requirements.

2. *Low- and medium-power transmitting stations.*—Antenna and counterpoise lead-in conductors of low- and medium-power transmitting stations shall be connected to the grounding conductor whenever the station is not in use.

573. Protection Against Kick-back.

A. Where required.—Protection should be provided at low- and medium-power transmitting stations where necessary to protect the supply system against high-potential surges and "kick-backs."

Any of the following methods may be used:

1. Two condensers, usually of 0.1 to 0.5 microfarad capacity and capable of withstanding five times the normal voltage to which they are subjected, placed in series with one another across the supply line with mid-point between condensers grounded. Across (in parallel with) each of these condensers shall be connected a shunting fixed spark gap capable of not more than $\frac{1}{32}$ -inch separation.

2. Two vacuum-tube-type protectors in series with one another across the line with the mid-point grounded (if the line voltage does not exceed 110 volts).

3. Electrolytic lightning arresters, such as the aluminum-cell type.

C. Location.—Apparatus for protection against "kick-back" should be installed across the supply conductors as near as possible to each radio transformer, rotary spark gap, motor, and generator (in motor-generator sets), or other auxiliary apparatus.

SECTION 58. CONNECTION TO POWER SUPPLY LINES

580. Connection to Power Supply Lines.

Devices used in connection with power supply lines and methods of wiring shall be in accordance with the rules covering permanent or portable fixtures, devices, and appliances. (See section 37.)

SECTION 59. BATTERIES

590. Application of Rules.

The requirements of this section apply to batteries for receiving stations and transmitting stations of low and medium power. Battery installations for high-power transmitting stations shall meet such requirements of part 1, "Supply stations," as apply.

591. Care in Handling.

Care shall be used in handling batteries in order to avoid contacts with terminals having a high enough difference of potential to cause shock.

592. Storage Battery.

A. Wiring.—The wiring of storage batteries used with radio receiving equipment shall be subject to the rules covering the wiring of permanent or portable fixtures, devices, and appliances. (See section 37.)

B. Ventilation.—Storage batteries shall be located where there is adequate ventilation.

C. Precautions.

1. Open flames shall be kept away from storage batteries.

2. Storage batteries should be placed on trays or mats of lead, rubber, or other material which will not be affected by the electrolyte.

D. Large battery installations.—Installations of non-portable storage batteries of more than 50-kilowatt-hour capacity at the 8-hour rate of discharge, if used for radio, shall comply with section 13 and rule 353.

CATALOG *of* MEMBERSHIP

ARRANGED ALPHABETICALLY

and

GEOGRAPHICALLY

NOTE

The following list of membership is divided into two sections; the first contains an alphabetical list of members of the Institute of all grades and the second comprises a geographical list of members. In the alphabetical portion, the letter and date immediately following the member's name indicate the grade of membership and date of election. Where more than one letter and date group follow the member's name, the subsequent notations refer to the grade and date of transfer to a higher grade. (F) denotes the grade of Fellow; (M) Member; (A) Associate; (J) Junior.

Where only one address is shown in the alphabetical list it is the mailing address.
The geographical list contains the state and town in which the member is located and his present grade of membership in the Institute.

CATALOG OF MEMBERSHIP

(This list is corrected only to December 31, 1929)

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Arranged Alphabetically

(See note on page 108)

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January 1, 1930

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Bell, John C. (A)
Duran, Albert E. (A)
Williams, G. H. (A)

Dothan

Hallman, L. B. (A)

Mobile

Blakeney, George H. (A)
Helt, Scott (A)
Heyen, Rudolph J. (A)

Montgomery

Trum, Alexander D. (A)

Pratt City

Hassler, W. Dan (A)

ARIZONA

Kingman

Nolan, Arthur B. (A)

Phoenix

Wilburn, Frank (A)

Prescott

De Witt, Harold (A)

Tucson

Bannister, M. W. (A)
Percy, F. W. (A)
Warner, Earle H. (A)

Winslow

Fridgen, Edward N. (A)

ARKANSAS

Blytheville

Lintzenich, C. L. (A)

Conway

Cordrey, E. E. (M)

Fort Smith

Barry, James A. (A)

Hot Springs

Peel, Delacy J. (A)

Little Rock

Beem, Arthur W. (A)
Beem, Raymond M. (A)
Bilheimer, Joe A. (A)
Boone, Virgil (A)
Bracken, Ben (A)
Heim, Rupert A. (A)
Hofstatter, F. H. (A)
McDonald, A. H. (A)
Minor, Robert Lee (A)
Stover, Arthur R., Jr. (J)

McGehee

Wallace, L. E. (A)

Siloam Springs

Chandler, C. G. (A)

CALIFORNIA

Alameda

Schlueter, Edward A. (A)

Alhambra

Grimes, William F. (A)
Hillegas-Baird, L. S. (A)

Altadena

Johnson, Paul F. (M)

Artesia

Corcoran, Edward M. (A)
Corcoran, George L. (J)

Azusa

Holcomb, Clyde A. (A)

Bell

Anderson, Edward R. (A)

Berkeley

Albin, Frederick G. (A)
Armer, Austin A. (A)
Davis, Daryl D. (A)
Greves, George L. (A)

Beverly Hills

Balsley, James R. (A)
Larsen, C. W. (A)
Waite, Samuel A. (A)
Whitaker, John C. (A)

Bishop

Wheeler, Walter R. (A)

Bolinas

Baker, Thomas S. (A)
Clark, Robert W. (A)
Park, Charles W. (A)

Burbank

Garretson, Oliver S. (A)
Wainwright, Stuart F. (A)

Burlingame

Michalic, C. T. (A)

Covina

Ross, M. F. (A)

Crockett

Taylor, G. W. (A)

Culver City

Wersen, David T. (A)

Eagle Rock

Ford, Walter B. (A)
Tatreault, Leon E. (A)

El Centro

Cook, John W. (A)

El Segundo

Hart, William J. (A)

Fresno

Denny, R. C. (A)
Foin, Owen F., Jr. (J)
Gearhart, Erle J. (A)
Gifford, Delbert K. (A)
Mc Kay, William K. (A)

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Fullerton

Atherton, Malcolm J. V. (A)
 Finseth, E. B. (A)
 Hardison, Arthur A., Jr. (A)

Glendale

Bockhoven, Louis Murray (A)
 Bowles, Theodore C. (A)
 Eilers, John (J)
 Engen, Ralph E. (A)
 Farnsworth, Earl S. (M)
 Shomler, H. B. (A)

Hemet

Sorkness, Iardus (A)

Hermosa Beach

Carter, Everett D. (A)

Hollywood

Blackburn, John F. (A)
 Breeding, Charles S. (A)
 Brown, J. Kenneth (A)
 Burns, G. Austin (A)
 Clement, Jack D. (A)
 Coe, Ernest W. (A)
 Cook, Robert O. (A)
 Cooper, George R. (A)
 Cunningham, Lodge (A)
 Davey, Cedric V. (A)
 Dering, Fred J. (A)
 Ellis, George D. (A)
 Fox, Bert M. (J)
 Hansen, Edmund H. (M)
 Hanson, Harry (A)
 Harrington, Fred H. (A)
 Hart, Roy H. (M)
 Hill, Arthur P. (M)
 Hilliard, John K. (M)
 Levinson, Nathan (M)
 Newman, David H. (M)
 Pierce, Franklin W. (A)
 Ringold, H. Russell (A)
 Sarver, Frank M. (A)
 Sawyer, Gordon E. (A)
 Schiefer, C. Vreeland (A)
 Sheldon, Clinton C. (A)
 Signer, John J. (A)
 Snyder, William R. (A)
 Stewart, Ronald B. (A)
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 Thorburn, James M. (M)
 Tohey, E. S. (A)
 Van Why, Forbes W. (M)

Hollywoodland

Mott, Lawrence (A)

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Dalton, Stuart P. (A)
 Keyes, Edwin F. (A)
 Kirby, Melvin D. (A)

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Underwood, Ernest G. (A)

Jackson

Snyder, W. Gilman, Jr. (A)
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Kerman

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La Canada

Benioff, Hugo (A)

La Crascenta

Robinson, Frederick (A)

La Habra

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 Moore, Raymond C. (A)
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 Chapple, James M. (A)
 Cheney, John W. (A)
 Dewey, Fred L. (A)
 Dickson, H. L. (A)
 Edgcomb, A. J. (A)
 Eldridge, Robert H. (A)
 Felstead, Charles F. (A)
 Fraser, Graham (A)
 Gioga, Peter C. (A)
 Greger, J. G. (A)
 Gronoff, Harry (A)
 Haas, Clarence H. (A)
 Hankins, Marvin J. (A)
 Hauser, Carroll R. (A)
 Heather, Harold (J)
 Hecht, Royal H. (A)
 Herrfeld, Frank P. (A)
 Hill, Alfred L. (A)
 Holcomb, E. Russell (A)
 Hoover, Herbert, Jr. (A)
 Hopkins, Stephen (A)
 Houdysell, Lowell B. (A)
 Howe, Franklin Joaquin (A)
 Jakosky, John (M)
 Kent, Oliver C. (A)
 Korntved, George W. (A)
 Kratz, C. F. (A)
 Kruger, Bernard (A)
 Lang, William A. (A)
 Langrick, Paul D. (A)
 Lee, Gilbert C. (A)
 Leighton, Harold W. (A)
 Lindsay, W. W., Jr. (M)
 Ludlum, W. F. (A)
 Madsen, Norman L. (A)
 Marshall, Cloyd, Jr. (A)
 Mason, Curtis W. (A)
 McCabe, William E. (A)
 McCarroll, Marshall G. (A)
 McCreery, M. E. (A)
 McDonough, Thomas F. (A)
 McGonagill, H. A. (A)
 Meissner, Earl R. (A)
 Meyer, R. H. (A)
 Miller, Burton F. (A)
 Miller, Charles E. (A)
 Moore, Raymond M. (A)
 Morris, James W. (A)
 Newman, William H. (A)
 Olmstead, Charles B. (A)
 Oodrys, Arthur (A)
 Ormiston, Kenneth G. (A)
 Palethorpe, Harold J. (A)
 Partch, Paul C. (A)
 Pearce, Harry G. (A)
 Perkins, Lucius J. (A)
 Pflieger, Robert A. (A)
 Power, Ralph L. (A)
 Rhodes, L. G. E. (A)
 Ramsay, Alan N. (A)
 Ramsay, W. S. (A)
 Richards, W. S. (A)
 Riggs, Clare A. (A)

CALIFORNIA (Continued)

Los Angeles (Continued)

Roberts, Russell B. (A)
 Schreiber, Ernest H. (A)
 Silent, Harold C. (A)
 Smith, C. Bernard (A)
 Sorge, Barthold W. (A)
 Stevens, Sterling M. (A)
 Stolle, R. A. (A)
 Stratton, Ross A. (A)
 Tami, Joseph, Jr. (A)
 Taufenbach, Leslie E. (M)
 Walter, Edward F. (A)
 Ward, Jack (A)
 Whiston, R. William (A)
 Wright, James Lang, Jr. (A)
 Zweiger, O. (J)

Manhattan Beach

Tischer, Frank A. (A)

Mare Island

Weigand, Joseph S. (A)

Marshall

Case, Myron D. (A)
 Culley, Lester D. (A)
 Marsh, Hallock S. (A)
 Reid, Irl H. (A)
 Wissman, Joseph T. (A)

Menlo Park

Seal, H. Robert (A)

Merced

Shaffer, Frank (J)

Mission Beach

Farnum, Willis H. (A)

Monterey

Brokaw, Hal R. (A)

Monterey Park

Alker, Charles (A)
 Nikirk, Thomas E. (A)
 Sanmann, Edgar J. (A)
 Willson, Clarence L. (A)

Napa

Rawson, Clifford L. (A)

Oakland

Allen, Preston D. (A)
 Branson, Albert K. (A)
 Brearty, Lawrence S. (A)
 Brown, James F. (A)
 Ford, Charles Y. (J)
 Freeman, Robert H. (A)
 Freiermuth, Vincent J. (A)
 Gardiner, Paul C. (A)
 Hazeltine, Louis A. (F)
 Madison, C. E. (A)
 Parkhurst, Edgar L. (A)
 Slavin, Samuel B. (A)
 Wild, Sydney J. (A)

Orange

Charbonneau, L. H. (A)
 Waters, John E. (A)

Oxnard

Newcomb, Carleton A. (A)

Pacific Grove

Anderson, Adrien L. (A)
 Wood, Stanford J. (A)

Palo Alto

Beal, Ralph R. (A)
 Brower, William M. (M)
 Brown, Archibald S. (A)
 Cattell, Gilbert W. (A)
 Cordes, Henry G. (A)
 Dow, Clifford J. (A)
 Fuller, Leonard F. (F)
 Harrison, Charles I. (A)

Howard, L. W. (A)
 Kolster, Frederick A. (F)
 Lacabanne, Washington D. (A)
 Morgan, Nathaniel R. (A)
 Overacker, Horace E. (A)
 Penther, Carl Joseph (A)
 Ray, John N. (A)
 Redeker, Harry E. (A)
 Romander, Hugo (A)
 Saunders, William W. (A)
 Scofield, P. F. (A)
 Shermund, Ralph C. (A)
 Suydam, C. H. (M)
 Tanck, Henry (A)
 Thomas, Charles C. (A)
 Tinney, Francis B. (A)
 Veirup-Jensen, J. G. (A)
 West, Glenn Edwin (M)
 White, Ray H. (A)
 Whitwam, Lloyd F. (A)
 Whittern, Ray (A)

Pasadena

Bradshaw, Robert C. (A)
 Brown, Howell C. (A)
 Felch, H. F. (A)
 Hopper, Francis L. (A)
 Howes, Edgar T. (A)
 MacKeown, Samuel S. (M)
 MacMurphy, F. (A)
 Poorman, Edwin H. (J)
 Taylor, E. Kenneth (A)
 White, Harold (A)

Piedmont

Myers, Walter M. (A)

Pine Knot

Betterley, Jack A. (A)

Placentia

Gaines, B. R. (A)

Pomona

Farker, Evert L. (A)

Redwood City

Litton, Charles V. (A)

Riverside

Norwood, Donald W. (A)

Sacramento

Hayden, J. W. (J)
 Melnicoe, Samuel (A)
 Messner, Roy L. (A)
 Semoni, Anthony J. (A)

San Diego

Burnett, William L. (A)
 Conaughty, Robert B. (A)
 Curtis, Everett N. (A)
 Davidson, Martin (A)
 DeBaun, George H. (A)
 Doig, John H. (A)
 Gruenwald, Harold C. (A)
 Hart, Clyde Armand (A)
 Kiernan, Earl F. (A)
 Kinney, E. S., Jr. (A)
 Scott, Carl A. (A)
 Stone, John Stone (F)
 Wisner, Fred L. (A)

San Francisco

Arrigoni, Arthur (A)
 Baker, Lewis C. (A)
 Bear, William P. (A)
 Benson, Francis S. (A)
 Bouson, Herbert H. (M)
 Bradshaw, Lynwood (A)
 Brolly, A. H. (A)
 Danforth, Richard S. (A)
 Danielson, Ernest G. (A)
 Farnsworth, Philo T. (A)

CALIFORNIA (Continued)

San Francisco (Continued)

Fass, Sydney J. (A)
 Fenner, Paul R. (A)
 Fletcher, Earle S. (M)
 Gary, L. A. (A)
 Graham, Lloyd E. (A)
 Greene, Harry A. (A)
 Halloran, A. H. (M)
 Hanscom, W. W. (M)
 Hart, Arthur H. (A)
 Heintz, Ralph M. (M)
 Henry, Franklin M. (A)
 Highleyman, Richard (M)
 Hoffman, Samuel O. (A)
 Kaufman, Arthur W. (J)
 Kellogg, Richard B. (A)
 Kellogg, Walter D. (A)
 King, Howard D. (A)
 Lanc, Howard D. (A)
 Langevin, Carl C. (M)
 Larzelere, W. R., Jr. (A)
 Lathrope, Kenneth W. (J)
 Linden, Bernard H. (A)
 Lippincott, Donald K. (M)
 Lubeke, Harry R. (A)
 Maxwell, John F. (A)
 Maynard, Raymond K. (A)
 Moore, Paul (A)
 Myers, Gilbert B. (A)
 Nikonenko, Paul (A)
 O'Brien, Daniel L., Jr. (A)
 Packard, Alden C. (A)
 Parker, Ray H. (A)
 Patron, Alfonso E. (A)
 Pinkney, J. L. (A)
 Powell, Louis H. (J)
 Rowe, Victor G. (A)
 Royden, George T. (M)
 Saxton, Alfred H. (A)
 Schofield, William D. (A)
 Scott, Leo L. (A)
 Singleton, Harold C. (A)
 Smith, Charles S., Jr. (A)
 Smith, Herbert H. (A)
 Sohor, P. H. (M)
 Sphar, Clark H. (A)
 Stagnaro, John A. (A)
 Ternow, Helmut G. (A)
 Thiel, Harold A. (A)
 Todd, Stedman F. (A)
 Tustin, John L. (A)
 Weber, Glen L. (A)
 Weir, F. Torres (A)
 Wells, W. Bruce (A)
 Wetzel, Joseph A. (A)
 Winnegar, W. A. (A)
 Winner, William Lane, Jr. (M)
 Wolf, Benjamin (M)
 Wooiverton, R. B. (F)

San Gabriel

Ashbrook, Roy B. (A)

San Jose

Cozzens, Bradley (A)
 Engwicht, Harry (A)
 Kelliher, John E. (A)
 Lawrence, L. H. (A)
 Quement, Frank J. (A)
 Reynolds, F. T. (A)
 Saine, Harry (A)

San Lorenzo

Lewelling, Raymond (A)

San Marino

Pohlman, G. Anton (A)

San Mateo

Bradley, John T. (A)

San Pedro

Fredericks, John E. (A)
 Johnson, V. (A)
 MacDonald, H. J. (A)
 McCandlish, B. V. (A)
 Sherman, Warren K. (A)
 Skov, Jens Ingvard (A)

San Rafael

Parkin, John, Jr. (A)

Santa Ana

Sleeper, J. Lloyd (A)

Santa Barbara

Cooper, Harold G. (A)
 Davis, Chester L. (M)
 Kempton, Walter D. (A)
 Means, Paul S. (A)

Santa Cruz

Fisher, E. H. (A)

Santa Monica

Fenton, A. Norwood (A)
 Mann, Theodore H. (A)
 Willis, Edward N. (A)

Sawteille

Spiller, Cecil Charles (J)

Sherman

Smith, Wade H. (A)

Southgate

Hudson, T. L. W. (A)

Stanford University

Rathbun, Harry (A)
 Ryan, Harris J. (M)
 Skinner, Clifton Ross (A)
 Terman, Frederick E. (A)

Stirling City

Overton, Daniel C. (A)

Stockton

Clarkson, Charles N. (A)
 Green, Alfred H. (A)
 Holt, Pliny E. (A)
 Schulz, Paul C. (A)

Sunnyvale

Paul, Ernest E. (A)

Tujunga

Feringer, William (A)

Tuolumne

Elliott, William H. (A)

Vallejo

Robinson, R. J. (A)

Van Nuys

Black, Robert (A)
 Marsden, George K. (A)

Venice

Gleason, Sterling (A)

Ventura

Snow, Louis A. (A)

Wasco

Morrison, L. H. (A)

Whittier

Smith, L. E. (A)

COLORADO

Alamosa

Dillow, Arthur P. (A)

Arvada

Kelso, Rupert E. (A)

Colorado Springs

Blair, Wiley, Jr. (A)

Delta

Fulghum, Charles K. (A)

COLORADO (Continued)

Denver

Cummings, George B. (A)
 Earnhart, Glen W. (A)
 Foraker, William Nelson (J)
 McClimans, Abner E. (A)
 Owen, Robert H. (A)
 Painter, Charles E. (A)
 Pyle, William D. (A)
 Reynolds, William W. D. (A)
 Scanlon, Dale L. (A)
 Scheneman, Henry Wesley (A)
 Strelsky, Herbert J. (A)
 Vos, Arthur, Jr. (J)

Durango

Dieckman, William (J)

Eaton

Nichols, Frederick A. (A)

Fort Collins

Sammons, Floyd (A)

Loveland

Houge, Charles A. (A)

Pueblo

Bowen, Clyde L. (A)
 Nelson, A. LeRoy (A)

Seibert

Fingado, Francis H. (A)

CONNECTICUT

Bridgeport

Appleby, Bertie (A)
 Bishop, Nathaniel (A)
 Campbell, Charles H. (A)
 Chopsky, Peter A. (J)
 Cousins, Maurice Nicholas (J)
 Elias, Louis W. (A)
 Graylin, Lee F. (A)
 Ham, Frank M. (A)
 Harrington, Carlton E. (J)
 Ivanko, John G. (A)
 Le Boeuf, Wilfred F. (A)
 Mapes, Harold T. (A)
 Morse, Louis R. (A)
 Nothnagle, George E. (A)
 Tomlinson, Harry E. (A)

Danbury

Gillotti, Albert C. (A)

East Hartford

Randall, J. Clayton (M)

Greenwich

Nally, Edward J. (A)
 Thomas, William A. (M)

Hartford

Beckwith-Ewell, Starr L. (A)
 Bourne, Roland B. (M)
 Corbett, Walter E. (A)
 Cowles, Walter G. (A)
 Dudley, Beverly (A)
 Handy, Francis E. (A)
 Hebert, Arthur A. (M)
 Heris, George C. (A)
 Lamb, James J. (A)
 Le Conche, Carl C. (A)
 Maxim, Hiram Percy (A)
 Page, Atwood C. (A)
 Pember, Harold H. (A)
 Rushing, Wallace E. (A)
 Scell, Russell G. (A)
 Wood, Herbert H. (A)

Hazardville

Thompson, Stanley W. (A)

Kensington

Edgerly, Albert Henry (A)

Litchfield

Vanderpoel, Floyd L. (A)

Meriden

Wilcox, Ernest C. (A)
 Young, Frank A. (A)

Middletown

Cady, Walter G. (F)
 Van Dyke, Karl S. (M)

Millford

Hadden, Harold L. (A)

Mount Carmel

Croteau, Carlton W. (A)

Naugatuck

Backlund, Louis R. (J)

New Britain

Johnston, Douglas A. (A)

New Haven

Doolittle, Franklin M. (A)
 Gounarides, A. D. (A)
 Jipp, John (A)
 Turner, H. M. (M)
 Underhill, Charles R. (A)
 Weed, C. Bronson (A)

Noroton Heights

Higgins, Alfred K. (A)

Norwich

Hubbard, James L. (A)

Plainville

Jones, H. Garfield (A)
 Stephenson, Martin A. (A)

Seymour

Dana, Alan S. (A)

Southington

Lewis, Earl B. (A)

Stamford

Cronkhite, Minton (M)

Stratford

MacIntyre, James R. (A)

Storrs

Noble, Daniel E. (A)

Torrington

York, Peter J. (A)

Waterbury

Bennett, Morris H. (A)
 Cohen, Edward (A)
 Greenblatt, Louis (A)
 Winchell, Alfred M. (A)

West Hartford

Beckley, F. Cheyney (M)
 Gade, William H. F. (A)
 Kruse, Robert S. (M)
 Kutscher, Louis F. (A)
 Montgomery, Philip (A)
 Mueller, Paul M. (A)
 Warner, Kenneth B. (M)

West Haven

Phillips, Edward I. (A)

Westport

Perry, William A. (A)

West Suffield

Colson, James L. (J)

Wethersfield

Carini, Louis (J)
 Mitchell, James A. (A)

Wilton

Van Heiningen, Willard A. (J)

Windsor

Keily, Delbar P. (A)

DELAWARE

Claymont

Tatnall, Joseph S. (A)

Wilmington

Boylan, E. Brandt (A)
Casey, K. K. V. (A)
Henning, Clarence I. B. (A)
Mertz, John M. (A)
Smyth, Earle (A)
Wilcox, Robert L. (A)

DISTRICT OF COLUMBIA

Anacostia

Booth, Howard A. (A)
Cooper, Orville T. (A)
Fetsch, Joseph T., Jr. (A)
Hyland, Lawrence A. (A)
Meyer, R. B. (A)
Noyes, Robert H. (A)
Owens, Raymond B. (M)
Struthers, Francis W. (A)
Taylor, A. Hoyt (F)
Walker, Guy P. (A)
Wallace, James D. (A)
Wheeler, Lynde P. (F)
Wilkie, Harry (A)
Williams, Charles Haddon (A)
Wortman, Frank W. (A)

Takoma Park

Mertie, J. B., Jr. (A)

Washington

Appich, William H. (A)
Arnold, Prescott N. (A)
Austin, Louis W. (F)
Backus, Cyrus D. (M)
Barron, J. H., Jr. (M)
Bower, Ward E. (A)
Boyer, William P. (A)
Bradford, Henry K. (A)
Brattain, Walter H. (A)
Burger, Clarence Walter (A)
Burgess, Warren B. (A)
Burke, David J., Jr. (A)
Burke, James W. (A)
Butman, Carl H. (M)
Carroll, Thomas D. (A)
Chamberlin, Robert R. (A)
Chromy, B. J. (A)
Chubb, William M. (A)
Cohen, Louis (F)
Cole, G. C. (A)
Colvin, Ruel (A)
Corderman, William P. (A)
Corrigan, James T. (A)
Coulme, J. B. H. (A)
Cox, George C. (A)
Craven, T. A. M. (F)
Crawford, David M. (A)
Culver, Clarence C. (M)
Curtis, Westley F. (A)
Davis, Thomas M. (M)
Day, John F. (A)
Detwiler, Donald J. (A)
Diamond, Harry (A)
Doremus, Cornelius W. (A)
Dorsey, Herbert G. (M)
Dow, J. B. (M)
Downey, W. E. (M)
Ellis, James G., Jr. (J)
Gebhard, Louis A. (A)
Gilliland, Ted R. (A)
Glaser, Stanley (A)
Graf, Alois W. (A)
Greeley, Philip H. (A)
Gross, Gerald C. (A)

Guthrie, Frederick P. (M)
Hafstad, L. R. (A)
Hall, E. L. (A)
Hanson, Malcolm P. (M)
Hastings, Harris F. (A)
Heaton, Vincent E. (A)
Hentschel, Ernest R. (A)
Heron, Louis M. (M)
Hill, Guy (F)
Hinemon, John H., Jr. (A)
Hooper, S. C. (F)
Hromada, Joseph C. (A)
Hudiburg, Rea S. (A)
Jansky, C. M., Jr. (F)
Jardine, W. N. (A)
Jenkins, C. Francis (A)
Jett, Ewell K. (A)
Johnson, Albert E. (A)
Jolliffe, Charles B. (M)
Judson, Elbert B. (A)
Kaplan, Jacob (A)
Kear, Frank G. (A)
Kinley, Clifford B. (A)
Kirby, Samuel S. (A)
Kriz, Joseph (A)
Leahy, John E. (A)
Lee, Wm. Justice (M)
Lee, William J. (A)
Loomis, Mary Texanna (M)
Looney, Don B. (A)
Luckel, Frank (A)
MacGregor, John J. (A)
Maddox, Charles H. (M)
Martin, George L. (A)
Mates, T. Joaquin (A)
May, Albert (A)
McClelland, Harold M. (M)
McIlwraith, Charles G. (A)
McKinley, Howard W. (A)
Mirick, C. B. (M)
Moore, Adam H. (A)
Moulton, Theodore S. (A)
Newton, Jane Elizabeth (A)
Norton, Kenneth A. (A)
Page, Robert M. (A)
Parkinson, Taintor (A)
Powell, Edwin L. (M)
Rhoades, A. L. (A)
Rietzke, Eugene H. (A)
Ring, Andrew D. (A)
Rohrich, George J. (A)
Segal, Paul M. (M)
Simon, Isaac B. (A)
Smith, David H. (A)
Smith, James E. (M)
Sprayberry, Frank L. (A)
Squier, George O. (F)
Stahl, Barton E. (A)
Stevens, Waldo W. (A)
Stewart, Jessica Dee (M)
Stewart, Ralph B. (M)
Terrell, Robert L. (A)
Terrell, W. D. (F)
Weber, Carl F. (A)
Webster, B. M., Jr. (A)
Wiseman, William W. (A)
Worrall, Robert H. (A)
Wright, J. Warren (A)
Young, Leo C. (M)
Zandonini, Elizabeth M. (A)

FLORIDA

Coral Gables

Entrekin, Carl A. (A)

Fort Pierce

Taylor, James C. (A)

FLORIDA (Continued)

Gainesville

Loucks, Ivan H. (A)

Hialeah

Angle, G. B. (A)

Jacksonville

Cooper, John C., Jr. (A)
Washburn, Cyrus, Jr. (A)

Key West

Rosso, Thomas (A)

Lake Worth

Dickins, Golfrey (J)

Melbourne

Fill, John V. (J)

Miami

Adams, George G. (A)
Bliss, Alonzo O., Jr. (A)
Christensen, Bernard J. (A)
Erickson, Carl E. (A)
Frederick, Calvin M. (A)
Hoselton, Frank B. (A)
Sullinger, Ferris W. (A)

Orlando

Green, Charles M., Jr. (A)
Skelton, Kenneth W. (A)

Pensacola

Taylor, Francis William (A)

Sarasota

Service, Charles A., Jr. (A)

South Jacksonville

Grange, Gifford (A)

St. Petersburg

Johnson, Carl C. (A)
Preece, Richard, Jr. (A)
Wittstruck, Harold H. (A)

Tampa

Fisher, Carroll S. (A)
Moore, William P. (A)

GEORGIA

Atlanta

Alexander, David C. (A)
Allen, Otis, T. (A)
Boucheron, Pierre H. (M)
Brewin, Robert R. (A)
Bussey, H. E. (A)
Cook, J. M. (A)
Daugherty, Carl F. (A)
Dobbs, Harry F. (A)
Gardberg, Joseph (A)
Gue, Earl M. (A)
Harrison, Richard H. (J)
Hillegas, John W. (A)
Hobart, James C., Jr. (A)
Holliday, F. S. (A)
Jones, Albert L. (J)
Jorgenson, Wesley J. (A)
Llewellyn, George (A)
MacNaughton, A. K. (A)
Matthews, Allen A., Jr. (J)
Murphy, Brower (A)
Reid, Henry L. (A)
Rothemberger, William L. (A)
Russell, B. A. (A)
Thornton, Henry P. (A)
Walker, Joseph R. (A)
Wallace, Lawrence T. (A)
Wills, Harry L. (M)
Yancey, E. F. (A)

Avondale Estates

Bangs, Philip C. (A)

Columbus

Kirkland, A. H. (A)
Stuart, John F. (A)

Commerce

Hood, Sam (J)

Fort Benning

Sosebee, Frank E. (A)
Tate, Robert L. (A)

Macon

Rankin, George P., Jr. (A)

Royston

Berryman, Forrest G. (A)

Savannah

Carlson, C. O. (J)
Rollinson, John W. (A)

Statesboro

Blitch, James D. (A)

IDAHO

American Falls

Brose, Fred O. (A)

Pocatello

Davis, Glenwood (A)

Twin Falls

Belleville, Logan (J)

ILLINOIS

Alton

Duval d'Adrian, A. L. (M)

Aurora

Bliss, Floyd D. (A)

Beardstown

Barregarye, Laurence H. (J)

Berwyn

Burns, Elmer E. (A)
Komm, Paul M. (A)
Schnell, William J. (A)
Wilkinson, L. G. (A)

Bloomington

Stillhamer, Arthur G. (A)

Blue Island

Damm, George J., Jr. (A)

Brookfield

Courter, H. L. (A)

Canton

Ingersoll, William P. (A)

Carbondale

Chapman, David E. (J)

Carpentersville

Bennett, Leslie W. (J)

Champaign

Duncan, Don C. (A)

Chicago

Adair, Samuel E. (M)
Albee, Norman E. (A)
Alexander, Donald W. H. (A)
Alexander, Wayne (A)
Allain, Joseph A. (J)
Andres, Lloyd J. (A)
Andres, Paul G. (A)
Andrews, Edward F. (A)
Ankersen, G. W. (A)
Armstrong, Harold W. (J)
Arthur, Guy B. (A)
Bank, Maurice (A)
Barlow, William H. (A)
Barrett, Herman R. (A)
Beane, E. A. (M)
Beindorf, Lucien J. (A)
Benjamin, Abraham S. (A)
Beusman, Robert M. (A)

ILLINOIS (Continued)

Chicago (Continued)

Blom, Roy (A)
 Boltson, Jacob A. (A)
 Bogardus, Henry I. (M)
 Brack, G. S. (A)
 Braun, W. C. (A)
 Brewer, Francis T. (A)
 Bridgman, Francis K. (A)
 Brittin, Frank L. (M)
 Bronson, G. E. (A)
 Browne, L. N. (A)
 Burchard, John C. (M)
 Burdett, Sam (A)
 Burkwest, Leonard G. (A)
 Burns, Robert P. (A)
 Butler, Raymond H. (A)
 Butterfield, Roy O., Jr. (A)
 Byrnes, Walter C. (A)
 Caldwell, Louis G. (M)
 Campbell, Robert H. (A)
 Canon, Hartman B. (J)
 Carothers, R. F. (A)
 Carter, A. J. (M)
 Cassens, Fred Benjamin (A)
 Chadwick, Ray E. (J)
 Chatlos, Albert (A)
 Chernikoff, Leo J. (A)
 Chun, Herbert H. (A)
 Clausing, LeRoy M. E. (A)
 Clark, Paul H. (A)
 Clough, Kendall (A)
 Cohen, Theodore (J)
 Colwell, Frederick E. (A)
 Comb, David M. (A)
 Crossett, Edward C. (A)
 Cubert, Joseph R. (A)
 Cumming, George (A)
 Davis, Joseph A. (A)
 Deeley, Paul M. (M)
 Demikis, Anton, Jr. (J)
 Dokas, Konstantinos B. (A)
 Douglas, James M. (A)
 Dubuclet, Sidonio L. (A)
 Durkee, James D. (M)
 Edelman, Phillip E. (A)
 Edwards, Charles (A)
 Eells, M. Merwin (A)
 Elam, David L. (A)
 Ellis, Robert Marcus (A)
 Eppstein, Ralph M. (A)
 Esmaker, John B. (A)
 Ewald, Fred J., Jr. (A)
 Falknor, Frank B. (M)
 Fast, John E. (A)
 Felio, Orin J. (A)
 Fernandez, Dan T. (A)
 Ferris, Frank (A)
 Fetterman, D. M. (J)
 Fischer, Andrew, Jr. (A)
 Fitzgerald, John J. (A)
 Flick, A. A., Jr. (A)
 Forbes, Allan C. (M)
 Foringer, Edgar C. (A)
 Forsberg, Otto J. (A)
 Fortington, William H. (M)
 Frankel, Mortimer (M)
 Freeman, Ernest H. (M)
 Freimann, Frank (A)
 Friday, Wilbur L. (A)
 Friend, Halton H. (A)
 Fritzel, Joseph (A)
 Gay, Paul F. (A)
 Giard, E. A. (A)
 Glassford, J. O. (A)
 Glassman, George (A)
 Goldman, Stanley (A)

Golten, J. N. (A)
 Grimes, David (M)
 Gunther, W. J. (A)
 Haire, A. F. (A)
 Hall, Edward G. (A)
 Hall, Harlan R. (A)
 Halligan, William J. (A)
 Hansen, Clarence A. (A)
 Hansen, Harvey Bennett (A)
 Hansen, William H. (J)
 Hanson, Earl C. (A)
 Harper, W. W. (M)
 Hassel, Karl E. (M)
 Hauschild, John P. (A)
 Hauser, Albert (A)
 Hayes, H. D. (M)
 Hellman, Milton E. (A)
 Henninger, Andrew F. (A)
 Henry, Charles C. (A)
 Hermanutz, Ray J. (A)
 Heselton, Charles C. (M)
 Hillegas-Baird, L. S. (A)
 Hines, Albert D. (A)
 Hitzhammer, De V. (A)
 Hoag, J. Barton (M)
 Holmquist, Carl T. (A)
 Holroyd, Richard J. (A)
 Holst, Wendell L. (M)
 Howard, Austin A. (M)
 Howard, C. M. (M)
 Hukle, R. M. (A)
 Izenstark, Maurice J. (A)
 Jelen, Matt J. (A)
 Jensen, Karl K. (A)
 John, Kenneth B. (A)
 Johnson, E. O. (A)
 Johnson, John K. (A)
 Johnston, Ivan F. (A)
 Kahn, Lamos (A)
 Kamin, Vernon A. (A)
 Kehm, Clarence H. (A)
 Kelley, Harvey T. (A)
 Kempf, Frank J. (A)
 Kessler, P. W. (A)
 Knowles, Hugh S. (A)
 Koblitz, August P. (A)
 Koch, Earl L. (A)
 Korb, George W. (A)
 Koutnik, J. A. (A)
 Kramer, Andrew W. (A)
 Krueger, Alfred (A)
 Lagasse, Albert (A)
 Lamb, Harold A. (A)
 Lanterman, Walter F. (A)
 Larson, John M. (A)
 Lawton, Harvey B. (A)
 Leidy, W. J. (A)
 Levin, Sam (A)
 Levy, Henry (A)
 Levy, Samuel L. (A)
 Lorich, George H. (A)
 Lotter, John G. (A)
 MacDermaid, L. D. (A)
 Magos, John P. (A)
 Marco, Frederick J. (M)
 Marshall, Charles E. (A)
 Martin, E. F. (A)
 Martin, Neill H. (A)
 McAvoy, Edward J. (A)
 McCammon, Donald (J)
 McClintock, W. S., Jr. (A)
 McCullah, Arthur B. (A)
 McGregor, Arthur M. (A)
 McJilton, De Witt (A)
 Mead, Leo R. (A)
 Meinhard, Herman (A)
 Mercer, John E. (A)

ILLINOIS (Continued)

Chicago (Continued)

Michalowicz, Leon (A)
 Miller, Gerald E. (A)
 Million, John W., Jr. (M)
 Mills, Elmer E. (A)
 Minnium, Byron B. (A)
 Mooney, Raymond (A)
 Moore, James S. (A)
 Morey, W. J. (A)
 Morley, William L. (A)
 Morris, John F. (A)
 Morrison, Huber R. (A)
 Morrison, Montford (M)
 Morse, Arthur H. (M)
 Mraz, Edwin (A)
 Mueller, Eugene L. (A)
 Muirhead, John E. (A)
 Nardin, George F., Jr. (J)
 Nelson, R. G. (A)
 Nieman, Thomas A. (A)
 Nolan, James J. (M)
 Nordhaus, Charles H. (A)
 Nourse, Philip R. (A)
 Novak, Joe J. (A)
 O'Brien, William J. (A)
 O'Byrne, Leo C. (A)
 O'Callaghan, Jerome J. (A)
 Owens, Richard M. (A)
 Oxner, Edwin K. (A)
 Paradise, Maurice E. (A)
 Parisek, Edward E. (A)
 Parker, Leonard E. (A)
 Patterson, Joseph A. (A)
 Pestlin, Le Roy J. (A)
 Petersen, Howard E. (A)
 Petzing, Erwin W. (A)
 Pew, Richard K. (A)
 Pfaff, Ernest R. (M)
 Pietz, Raymond G. (A)
 Plekka, James (A)
 Polydoroff, W. J. (M)
 Prentiss, John G. (A)
 Preston, Cecil W. (A)
 Procunier, W. R. (J)
 Rafferty, Frank A. (M)
 Ramm, Carl H. (A)
 Randall, Harry K. (A)
 Rech, Charles B. (A)
 Remde, Jack (A)
 Richards, Horace Jerome (A)
 Richards, Philip A. (A)
 Riddel, O. A. (J)
 Riggs, John H. (A)
 Ross, Frank C. (A)
 Ross, Kenneth B. (A)
 Rossiter, Donald R. (J)
 Rowe, Thomas L. (A)
 Royal, Roscoe (A)
 Schaefer, Harold W. (J)
 Scharf, Joachim Barschach (A)
 Schnell, Fred H. (M)
 Schoenwolf, Fred L. (M)
 Schor, F. W. (A)
 Schulz, Emil H. (A)
 Shaffer, Paul E. (A)
 Shaw, Robert E. (A)
 Shultise, Q. M. (A)
 Sieben, Clarence M. (A)
 Silver, McMurdo (A)
 Siovic, John E. (A)
 Sloan, Francis V. (M)
 Smith, Ernest F. (M)
 Smith, Howard L. (A)
 Smith, K. R. (M)
 Smith, Sereno E. (A)
 Smythe, Edwin H. (M)

Somersalo, G. A. (A)
 Sorensen, Carl P. (A)
 Stewart, Arthur C. (A)
 Stone, Carrington H. (M)
 Swisher, O. V. (A)
 Tamburino, Anthony C. (A)
 Ten Cate, Arthur (A)
 Thorsen, Orville T. (A)
 Threlkeld, Howard M. (A)
 Tittle, Hulburt C. (A)
 Trimble, Loren (A)
 Turner, C. G. (A)
 Turner, George S. (M)
 Turner, Harry E. (A)
 Turner, Russel (A)
 Van Antwerp, Max C. (A)
 Van Sickle, R. E. (A)
 Wagner, Elmer H. (A)
 Walgren, C. A. (A)
 Wang, Theodore J. (A)
 Wareing, Herbert F. (A)
 Wasservogel, Gunther (A)
 Wegner, Charles W. (J)
 Weibler, Carleton T. (A)
 Weissmantel, C. H. (A)
 Weitzel, Leroy B. (A)
 Whan, Loren H., Jr. (A)
 Wilcox, G. M. (M)
 Williamson, Frederick E. (A)
 Willoughby, John A. (M)
 Wilm, Carl F. (A)
 Wise, Roger M. (A)
 Woods, A. A. (A)
 Woodward, Clarence H. (A)
 Zurian, P. D. (A)

Chicago Heights

Tartak, Paul H. (A)

Cicero

Engst, Norbert K. (A)
 O'Brien, Elwin J. (A)

Crete

Courchene, Homer B. (A)

Danville

Parsons, Charles (A)

Decatur

Cameron, Henry L., Jr. (A)
 Pennington, D. J. (J)
 Spies, Mark C. (A)

Deerfield

Carment, James M. (A)

Dixon

Hall, Howard J. (A)

Downers Grove

Allen, Justus (A)
 Johnson, Arthur R. (A)

East Peoria

Hoffman, John L. (J)

Effingham

Osgood, Albert S. (A)

Elmhurst

Haag, Merlin W. (A)
 Hercher, Frederick J. (A)
 Inglis, Alexander W. (A)
 Kenney, M. W. (M)
 Kranz, Herman E. (M)

Evanston

Bergman, G. Wiley (A)
 Burt, Andrew G. (A)
 Clarke, R. E. (A)
 Fisk, Lawrence S. (A)
 Hill, James H. (A)
 Hughes, Robert E. (A)
 Lund, Russell O. (A)
 Pennington, Paul (A)
 Stein, Harold A. (A)
 Wolcott, C. Frederick (A)

ILLINOIS (Continued)

Evergreen Park
Randall, Lemuel E. (A)

Fort Sheridan
Hoover, Richard T. (A)

Freeport
Meyer, Winston F. (A)
Nestlerode, Boyd W. (A)
O'Connell, Gerald (A)

Geneva
Crozier, William D. (A)
Greaves, V. Ford (F)
Kranz, Frederick W. (A)

Glencoe
Marsh, Carlton H. (A)

Harrisburg
Tate, Joseph R. (A)

Highland Park
Rollefson, Karl E. (M)
Tucker, G. Lloyd (A)

Hinsdale
Doyle, E. J. (A)
Hill, Frederick A. (A)

Kankakee
Wilhelmi, Julian A. (A)

Kenilworth
Lahman, Wilford C. (A)

Kewanee
Larson, Clifford L. (A)

La Grange
Hofert, Fred A. (A)

Lake Bluff
Klock, R. A. (A)
Olesen, Harold L. (M)

Lake Forest
Baker, James M. (A)
Haviland, Lyman J. (A)

La Salle
Arnold, Elmer J. (A)

Litchfield
Weller, Earl Selwyn (J)

Lombard
Hollenbeck, A. T. (A)
Puhalski, Donald (A)

Macomb
Eller, Walter H. (M)

Maywood
Peary, Malcolm J. (A)
Winkel, Herbert C. K. (A)

Mt. Prospect
Gustafson, Gilbert E. (A)

Naperville
Stoos, Joseph A. (A)

Niles Center
Potter, M. L. (A)

North Chicago
Dady, Arthur O. (A)
Taylor, H. S. (J)

Oak Park
Armstrong, H. M. (A)
Augustine, Roy W. (M)
Bluzat, Claude R. (A)
Chase, Leslie H. (A)
Drummond, Ralph S. (A)
Hoffman, Walter Henry (A)
Hough, William E. (A)
Kobberup, Jack R. (A)
Kobberup, Julius (A)
Miller, John H. (M)
Nangle, W. O. (A)

Pearson, Oscar A. (M)
Phillips, James H. (A)
Pye, Harold C. (A)
Roe, Douglas J. (A)
Weiser, Carl (A)
Westcott, Philip S. (A)
Willing, William P. (A)
Woodruff, Albert E. (A)

Park Ridge
Carr, J. O. (A)

Paw Paw
Braffet, Donald H. (A)

Pekin
McGarvey, Harold R. (A)

Peoria
Kelly, Earl L. (A)
Shalkhauser, Eric George (M)
Snyder, Roy A. (A)

Plainfield
Rand, George L. (A)

Plano
Victoreen, Charles J. (A)

Quincy
Johnson, J. Robert (A)
Wilson, A. J. (A)

Rankin
Denton, Frank O. (A)

Rantoul
Arnold, Thomas E. (A)
Fiechtner, Theodore G. (A)
Richard, Charles W. (M)

River Forest
Edwards, George W. (J)
Heald, Merwyn (A)
Mellvaine, H. A. (M)

Riverside
Greaves, Walter M. (A)
Wills, David C. (A)

Rockford
Ferdinand, Harry P. (A)
Johnson, Arthur A. (A)
Ward, Lloyd S. (A)
Westlund, J. V. (A)

Rock Island
Foley, Jack (J)

Savanna
Graham, George W. (A)

Springfield
Holtz, Frederick C. (A)
Kunz, H. L. (A)
Whannel, Raymond L. (A)

St. Charles
Hawkins, John B. (A)
Shotwell, Harold H. (A)
Voorhaar, Frederick R. (A)

Stockton
Hanson, Ralph L. (A)

Streator
Licht, Henry M. (A)
Melody, Bernard J. (A)
Williams, N. B. (A)

Sycamore
Boynnton, Frederick L. (A)

Tuscola
Barnett, Louis W. (J)
Fortner, Obed D. (J)
Moulden, Roy B. (A)

Urbana
Brown, Hugh A. (M)
Knipp, Charles T. (M)

ILLINOIS (Continued)

Urbana (Continued)
Morris, Lloyd P. (A)
Reich, Herbert J. (A)
Tingley, Freeman T. (A)
Tykociner, J. T. (M)

Villa Park
Jacker, Edward W. (A)

Waukegan
Herrmann, Albert, Jr. (J)
Weeks, Robert H. (A)

Western Springs
Scott, Kenneth L. (A)

West Frankfort
Alley, Kenneth G. (A)

West Liberty
Waddell, George G. (A)

Wheaton
Taylor, Hawley O. (M)

Wilmette
Freis, J. H. (A)
Shabino, Clarke L. (A)
Sholes, S. R. (A)

Winnetka
Gregory, Charlotte C. (A)
Hinson, Marcus W. (A)
Johnstone, George A. (A)
Manly, Harold P. (A)

INDIANA

Albion
Evans, Harry R. (A)

Anderson
Miller, Louis (A)
Perkins, Laurence M. (A)

Angola
Biar, L. E. (J)
Huntley, Kenneth L. (A)

Ashley
Urey, George M. (A)

Aurora
Achatz, Raymond V. (A)

Bloomington
Hazel, Herbert C. (A)
Ramsey, R. R. (M)

Butler
Ratts, Bruce H. (A)

Connersville
Hamilton, Charles E. (J)
Hanes, Fred B. (A)

Crown Point
Hall, Fred F. (J)

Evansville
Norwood, Vandle Clarence (A)

Fort Wayne
Baker, Dean R. (A)
Bohling, C. F. (A)
Cook, Edward H. (A)
Knouf, Ralph J. (A)
Miller, Paul E. (A)
Ramm, Harold W. (A)
Rekart, Arthur F. (A)
Rockwell, Ronald J. (A)
Schryver, Henry A. (A)

Gary
Molony, John D. (A)

Hammond
Sherman, Russell H. (A)

Indianapolis
Byers, Russell R. (A)
Chapel, I. C. (A)
Dutton, Charles E. (A)

Kokomo
Ashlock, H. D. (A)

Linnsburg
Doyel, Lee Conan (A)

Marion
Boji, Louis D. (A)
Detrick, Harold M. (A)
Emerson, Kenneth H. (A)
Foster, Dudley E. (A)
Pressley, Jackson H. (A)
Rose, Joseph K. (A)

Notre-Dame
McCoy, Julius C. (A)

Princeton
Karras, George S. (A)

Richmond
Turner, W. E. (A)

South Bend
Gebhardt, Paul B. (A)
Heimberger, Albert E. (A)
Kahn, Albert R. (A)
Kennedy, James P. (A)
McNamee, B. F. (A)
St. James, Robert T. (M)
Timmings, George H. (A)

Sweetser
Myers, Delbert (A)

Syracuse
Freeman, Stephen, Jr. (A)

Terre Haute
Hershman, J. B. (A)

Valparaiso
Cummings, Wilbur H. (A)
Hayes, Arthur J. (A)
Leigh, Charles W. (A)
Munroe, A. D. (A)
Noller, Roy E. (A)
Olinger, Robert (A)
Packman, M. E. (A)

Westfield
Brown, Wilfred E. (A)

West Lafayette
Tanke, Harold T. (A)
Yoder, Leo E. (A)

IOWA

Ames
Huntsinger, Paul R. (J)
Konkle, Phil (A)
Smith, Earl D. (J)

Blairsburg
Baughman, Raymond C. (A)

Burlington
Jeffrey, Byron B. (A)

Cedar Rapids
Collins, Arthur A. (J)
Hajny, George F. (A)
Miller, Clair R. (A)

Clarinda
Whitnah, R. B. (J)
Wilcox, Nathan (A)

Clinton
La Batt, Manor D. (A)

Council Bluffs
Anderson, Gordon A. (A)

Davenport
Ehlers, Paul (A)
Elliott, Frank W. (A)
Schricker, John R. (A)
Speers, John C. (A)
Wildman, Thomas S. (A)

IOWA (Continued)

Des Moines
Haigh, M. C. (A)
Hutchison, Sam T. (A)

Dubuque
Roedell, LeRoy W. F. (A)

Estherville
Center, Edgar R. (A)

Fort Dodge
Willits, Andrew A. (A)

Hale
Kruse, Gerald D. (A)

Iowa City
Griffith, Paul E. (A)
Woodward, V. M. (A)

Marshalltown
Pickett, Earl L. (A)

McGregor
Woods, T. DeWitt (A)

Mt. Vernon
Kafer, Merle D. (A)

Muscatine
Baker, Norman G. (A)

Onslow
Koon, Cecil (A)

Sioux City
Coates, Frank M. (A)
Kerby, Edward J. (A)

Villisca
Harris, Merion C. (A)

Wapello
Fry, Lloyd L. (A)

KANSAS

Abilene
Brewer, Noble E. (A)

Atchison
Dimond, Benjamin D. (A)
Gier, Willard Marion (A)
Moore, Eugene A. (A)
Robb, Joseph S. (A)
Stein, Frederick W. (A)

Bendena
Johnson, Milton L. (A)

El Dorado
Graham, Ira H. (A)

Ellis
Harrison, Louis A. (A)

Emporia
Miller, R. F. (A)

Great Bend
Karr, Henry P. (A)

Hamlin
Herold, Jos. L. (A)

Independence
Elliott, Ralph W. (A)

Lawrence
Anderson, Harold W. (A)
Compton, Robin D. (A)
Douglas, Norvel (J)
Jones, George I. (A)
Wheeler, Frederick (J)

Leavenworth
Hageman, Oliver C. (A)

Liberal
Reid, Halbert G. (J)

Manhattan
Bueche, Harry S. (A)

Milford
Weldon, James O. (A)

Topeka
Cook, John W. (A)

Wichita
Byers, Harrison O. (A)
Demuth, G. W. (J)
Marshall, George E. (A)
Mitchell, G. A. (A)
Mitchell, Theodore R. (A)
Walter, Loren E. (A)

KENTUCKY

Ashland
Carr, Edward Mayes (A)

Covington
Frassa, Charles F. (A)
Charbonneau, Allan P. (A)
Heffernan, S. K. (A)
Reid, Ralph J. (A)

Hardinsburg
Pyle, R. C. (J)

Jeffersonton
Strassman, Irving (A)

Lexington
Tillett, Jesse (A)

Louisville
Graft, J. Emmet (A)

Newport
Kolo, R. E. (A)
Pepper, Robert K. (A)
Preuss, Arthur C. (A)

Owensboro
Koechel, W. P. (A)
Schoene, Russell L. (A)
Wuertz, John L. (A)

Paducah
Shelton, Raymond W. (A)

LOUISIANA

Baton Rouge
Fisher, Theodore (A)
Webre, Andrew S. (A)

Lake Charles
Lake, Thornton G. (J)

New Orleans
Adler, Leonard E. (A)
Alcus, Isaac (A)
Allston, William F. (A)
Ammen, Charles E. (A)
Andres, Charles, Jr. (A)
Breedlove, Frederick W. (A)
Chateau, Arthur (A)
Clemmons, Wallace A. (A)
Dahlstrom, Hugo Wolf (J)
Deller, Theodore G. (M)
Dover, M. H. (J)
Du Treil, L. J. N. (M)
Elliott, Harry M. (A)
Gallo, Louis J. (M)
Goldstein, Henry R. (A)
Hart, M. E. (A)
Hibbett, James Orlin (A)
Hilgedick, W. C. (A)
Jensen, Valdemar (A)
Jones, Edward T. (M)
Lehde, Pendleton E. (F)
Macke, William (A)
Maier, Otto T. (A)
McCabe, Louis L. (A)
Moore, Frank C. (A)
O'Neil, Maurice B. (A)

LOUISIANA (Continued)

New Orleans (Continued)
Pasquet, Jean E. (A)
Peirce, George H. (A)
Peters, C. W. (A)
Salzer, Herman M. (A)
Salzer, H. S. (A)
Scheffer, Roy J. (A)
Schiele, Anton A. (A)
Stevens, William J. (A)
Voegtlin, Elmo (A)

Port Barre
Futral, John E. (A)

Shreveport
Claycomb, Hugh (A)

Slagle
Hayes, Fred D. (A)

St. Francisville
Harris, David D. (A)

MAINE

Bangor
Creamer, W. J., Jr. (A)
Hartz, Leslie C. (A)

Belfast
Ashmore, J. W. (A)
Coxhead, Harry B. (M)

Brunswick
Little, Noel C. (A)

Fort Preble
Behr, Francis (F)

Houlton
Thrush, Paul W. (A)
Wilkes, Emerson T. (A)
Willis, F. H. (A)

Northeast Harbor
Knowles, Jerome H., Jr. (A)

Orono
Cloke, Paul (M)

Portland
Collins, Lewis R. (A)
Giro, Daniel J. (A)
Rice, Harold E. (A)
Ryall, Henry (J)

Yarmouth
Tamminen, Nestor (A)

MARYLAND

Annapolis
Behner, Herbert C. (M)
Dowd, Alfred (J)
Giet, G. Robert (M)
North, J. Harold (A)
Robinson, Gordon D. (A)
Robison, Samuel S. (F)

Baltimore
Allen, John E. (A)
Allner, Frederick A. (A)
Ault, Arthur K. (A)
Cohen, Hyman A. (A)
Collins, Laurence H. (A)
Cooke, Gerald W. (A)
Cunningham, K. S. (A)
Del Court, George (A)
Dudley, Charles B., Jr. (A)
Ellert, Charles A. (A)
Emmerich, Henry J. S. (A)
Fallon, Glover P. (A)
Graf, Herman, Jr. (A)
Hannah, George M. (A)
Herndon, Landon C. (M)
Houston, George P., III, (A)
Kreb, William N. (A)

Lange, Edward H. (A)
Mathers, Earl S. (A)
Miller, J. Purnell (A)
Ranit, William Q. (A)
Ridenour, William S. (J)
Seitz, J. Fred (A)
Sterling, George E. (M)
Wallgren, Alric E. (A)
Waltz, William W. (A)

Bethesda

Bush, George P. (M)

Chevy Chase
Berkner, Lloyd V. (A)
Dellinger, J. H. (F)
Kelley, George W., Jr. (A)
Walls, Hoy J. (M)

Ft. Howard
Wilson, Luther E. (A)

Hyattsville
Lyon, Harry H. (A)
Rogers, J. Harris (M)

Mount Rainier
Eisenhauer, Harry D. (A)

Silver Spring
Quaintance, Leland C. (A)
Thomsen, Paul H. (A)

Somerset
Brady, John B. (M)

Westminster
Utz, William C. (A)

MASSACHUSETTS

Adams
Barschdorf, Harry Oliver (J)

Allston
Cook, Wilbert H. (A)
Pearlstein, Charles D. (A)

Arlington
Asten, Oliver B. (A)
Treffry, Laurence D. (A)

Arlington Heights
Lamson, Horatio W. (M)

Ashmont
Mullen, Joseph A. (A)

Atlantic
Brown, George W. (A)
Heap, Sheldon S. (A)

Auburndale
Clapp, James K. (M)

Belmont
Anthony, A. W., Jr. (A)
Dolbear, Benjamin L. (M)
Hughes, A. Morris (A)
Lane, Henry M. (M)

Beverly
Appleton, Samuel (A)
Colby, Edward B. (A)
Porter, Ronald G. (A)
Woodbury, Stephen E. (A)

Boston
Baird, Hollis S. (A)
Beakes, William E. (M)
Boyd, Davis S. (A)
Browne, Monte C. (A)
Cabot, George E. (A)
Chetham, Harry R. (M)
Crawford, John D. (A)
Cumming, L. Gordon (A)
Emery, R. C. (A)
Ford, John R. (J)
Fowler, Elisha (A)
Gerber, Nathan (A)

MASSACHUSETTS (Continued)

Boston (Continued)

Goodrich, Robert R. (A)
Greene, Lloyd C. (A)
Harris, C. C. (M)
Hayes, Hammond V. (A)
Hurd, Volney D. (A)
Imlach, George (A)
Jappe, Holger (M)
Kelly, Michael P. (A)
Nunez, F. J. (A)
Parnagian, Aram (A)
Pitts, Francis D. (A)
Proctor, John A. (M)
Putnam, John P. (A)
Rines, David (A)
Rosenwald, Edwin D. (A)
Stone, C. W. (A)
Wass, Howard H. (A)
Weston, Irving L. (A)

Bradford

Knowlton, Robert G. (A)

Braintree

Robinson, Philip F. (A)

Brighton

Wallace, Gordon S. (A)
Sylvester, John C. (A)

Brockton

Sampson, Edward J. F. (J)
Wright, William L. (A)

Brookline

Bowker, Winthrop H. (A)
Cabot, Sewell (M)
Campbell, Harold G. (A)
Peckham, J. H. (A)
Ready, William A. (A)
Weeks, Miles W. (A)

Cambridge

Barrow, W. L. (A)
Batchelder, Laurence (A)
Bauer, Paul S. (A)
Blodgett, Edward D. (A)
Bousquet, Arthur G. (A)
Bowles, Edward L. (M)
Browne, Theodore C. (M)
Burke, Charles T. (M)
Campbell, Winifred H. (A)
Chaffee, E. Leon (F)
Cullum, A. Earl (J)
Eastham, Melville (F)
Elser, F. Johnson (A)
Fahnestock, Harris, Jr. (A)
Gager, F. Malcolm (A)
Gleason, Harold H. (A)
Grant, Lawrence E. (A)
Hickman, Roger W. (A)
Hisamoto, Masyauki (A)
Horton, J. Warren (F)
Hsu, C. L. (J)
Hunt, Frederick V. (A)
Ide, John M. (J)
Jen, C. K. (A)
Johnson, Montgomery H., Jr. (A)
Kennelly, Arthur E. (F)
Mc Elroy, Paul K. (M)
Mickey, Leroy (A)
Phillips, Henry B. (M)
Pierce, George W. (F)
Pilkington, E. J. (A)
Pratt, P. W. (A)
Richmond, Harold B. (F)
Shaw, Henry S. (M)
Shen, Pao-Guay (A)
Spike, J. Edward, Jr. (A)
Thiessen, Arthur E. (A)
Weare, John (A)
Weeks, Paul T. (M)

Whittier, Ellerton W. (A)
Wilder, Marshall P. (A)
Wildes, Karl L. (A)
Woodrow, James A. S. (A)
Worthen, Charles E. (A)

Chatham

Robinson, Forrest D. (A)
Thing, K. (A)

Chelsea

Fox, Robert (A)
Murdock, D. R. W. (A)

Chestnut Hill

Dellenbaugh, F. S., Jr. (M)

Chicopee Falls

Andrew, Victor J. (A)
Ellsworth, William C. (A)
Harlow, Fred G. (A)
Kinsman, Warren D. (A)
Lapori, Edmund A. (M)
Little, Donald G. (F)
Taggart, Samuel E. (A)
Tholstrup, Henry (A)
Winstead, Theodore Bernard (A)

Concord

Hall, Henry D. (A)

Danvers

Turenne, Wilfred J. (A)

Dedham

Cowan, Edward J. (A)

Dennis Port

Skinner, Oscar E. (A)

Dorchester

Barry, Francis J. (J)
Berkowitz, Louis (J)
Chessler, Maxwell A. (A)
Clarke, Ralph S. (A)
Hardy, Carroll N. (A)
Meredith, William B. (A)
Purssell, Clarence V. (A)

East Boston

Limonc, Joseph (A)

East Falmouth

De Mello, William (A)

East Holliston

Peters, John L. (A)

East Pepperell

Hills, Eugene K. (J)

East Springfield

Batchelder, S. P. (A)
Henderson, Roy A. (A)
Hurff, Joseph L. (A)
Madsen, Carl J. (A)
Miller, Harold R. (A)
Russ, George H. (A)
Trigger, Vernon A. (A)

East Taunton

Hoard, Norman F. (A)

Fall River

Bowen, Harold C. (A)
Stanko, Edward (A)

Framingham

Forbes, E. D. (F)

Gloucester

Hammond, John Hays, Jr. (M)
Trenor, Albert D. (A)

Great Barrington

Barkley, Howard F. (A)
Parrish, Robert R. (A)

Greenwood

Clement, Ivan C. (A)

MASSACHUSETTS (Continued)

Hamilton

Dane, Francis W. (M)

Haverhill

Taylor, B. H. (A)

Hingham

Macadam, Mark L. (A)
Pratt, Fearing (A)

Holyoke

Klemin, Robert Carl, Jr. (A)

Hudson

Kaulback, Harold D. (A)

Hyde Park

Gould, William B., III

Jamaica Plain

Canner, William (A)
Dallin, Edwin B. (M)
Hazard, Willis Gilpin (A)
Mayer, Arthur W. (A)

Lawrence

Theberge, Albert R. (A)

Lexington

Chute, Dudley H. (A)

Longmeadow

Booth, James D. (A)
Brackett, Quincy A. (M)
Coleman, John B. (M)
Forbes, Henry C. (M)
Greis, W. Karl (A)
Phillips, Lloyd B. (A)
Taylor, Edward C. (A)

Lowell

Morton, Clarence F. (A)

Lynn

Abrahams, Samuel L. (A)
Amato, Peter (A)
Bailey, W. M. (M)
Le Bel, C. J. (A)
Mayo, Royal E. (A)

Malden

Millen, James (A)

Marion

Brunette, Deo Z. (A)
Canfield, N. A. (A)
Carson, Joseph (A)
Morris, Hedley B. (A)

Mattapan

Hosford, Harold B. (A)
Rothberg, Joseph (J)
Weber, Harold C. (A)

Medford

Cook, Bernard L. (A)
Greene, C. Francis (A)
Wyman, Raymond C. (A)

Medford Hillside

Leoser, Thomas S. (A)

Melrose

Hubbard, Beverly R. (A)
Jepson, Warren F. (A)
Philbrick, Lawrence S. (A)
Tyzzler, Howard J. (A)

Needham

Keim, J. D. (A)

New Bedford

Catterall, John (J)
Hodgdon, Herbert J. (A)
Vermilya, Irving (M)

Newburyport

Scott, Gilbert H. (A)

Newton

Colby, Charles C., Jr. (A)

Newton Center

Miller, William T. (A)
Pickard, Greenleaf W. (F)

Newtonville

Stark, Eldon E. (A)

North Attleboro

Hale, Willis L. (A)
Langlois, Gerald L. (A)

North Cambridge

Grenier, Henry N. (A)

Northampton

Metty, Bradford Joseph (A)

North Weymouth

Hollis, Hammond H. (A)

Oak Bluffs

Horne, William P. (A)

Orleans

Snow, Albert E. (A)

Plymouth

McCarty, Laurence (A)

Quincy

Renton, Ralph J. (A)
Toivonen, Egon O. (A)

Revere

Burns, Laurence (A)
Gelardi, Matthew (A)
Speirs, George E. (J)

Rockport

Mills, William P. (A)

Roslindale

Van Brocklin, William S. (A)

Roxbury

Dalton, Robert E. (A)
Katz, Louis S. (A)
Paley, Albert A. (A)
Salowitts, Louis W. (A)
Stone, Elmer F. (A)

Saler

Bolan, Robert S. (A)
O'Neill, George D. (A)
Poor, Walter E. (A)
Porter, Ralph H. (A)

Siasconset

Holden, Harry H. (A)

Silver Lake

Stein, Adam, Jr. (F)

Somerville

Dillaby, Edwin F. (A)
McLaughlin, William P. (A)
Root, Leland B. (M)

Southbridge

Wells, John M. (A)
Yates, Wilfred (A)

South Dartmouth

Chinn, Howard A. (A)
Hendricks, Paul S. (A)
Houghton, Henry G., Jr. (A)
Olmstead, Noel C. (A)

Springfield

Beard, J. Gregson (A)
Bock, Ashley P. (A)
Bord, M. E. (A)
Burnside, Carrol J. (A)
Cole, Neil D. (A)
Cotter, William F. (A)
Coulson, Everett J. (A)
Creaser, Isaiah (A)
Curtis, Leslie F. (M)
Davis, William G. (A)
Der Bedrossyan, Mark (A)
Dyson, H. R. (A)

MASSACHUSETTS (Continued)

Springfield (Continued)

Ferguson, George W. (A)
 Garvey, Edmond (A)
 Gilliatt, Leland W. (A)
 Gundrum, Edward (A)
 Holt, Hillis W. (A)
 Hutcheson, John A. (A)
 Knapp, Harold D. (A)
 Moauro, Joseph S. (A)
 Morehouse, Dayton J. (A)
 Neal, Chester T. (A)
 Nystrom, Raymond A. (A)
 Phelps, Roger E. (A)
 Raskhodoff, Nicholas (A)
 Walker, C. L. (A)
 Wells, Daniel W. (A)
 Wilson, R. A. (A)
 Wolf, Lester J. (A)

Stockbridge

Harrington, George N. (A)

Swampscott

Humphrey, Stanley M. (A)

Tufts College

Kenrick, Gleason W. (M)

Uxbridge

Kozaczko, Walter H. (J)

Waban

Church, Vallette S. (A)

Waltham

Clark, R. W. (A)
 Hatton, Arthur Thomas (A)

Watertown

Field, Robert F. (A)

Wellesley

McDowell, L. S. (M)
 Palmer, Harry W. (A)
 Russell, Robert D. (A)

Wellesley Farms

Hills, Charles E. (A)

West Medford

Stockellburg, Arthur A. (A)

West Roxbury

Wolf, Edwin A. (A)

West Somerville

Ekstrand, Edward B. (J)
 Kolster, Charles C. (M)

Whitman

Lovell, Webster A. (A)

Winchester

Allen, Albert, (A)
 Browning, Glenn H. (M)
 Burgoyne, Roger M. (A)
 Page, Newell C. (A)

Winthrop

Colton, Howard C. (J)

Wollaston

Gray, Alfred R. (A)
 McGrath, Joseph L. (A)
 Sigmon, L. C. (A)
 Surette, Dennis C. (A)

Worcester

Adams, Stuart (A)
 Anderson, Paul E. (J)
 Bates, Lee A. (A)
 Gleason, Albert E. (A)
 Newell, Hobart H. (A)

MICHIGAN

Allen

Moore, Harold A. (A)

Alpena

Snyder, Leslie T. (A)

Ann Arbor

Campbell, George R. (A)
 Case, Nelson P. (A)
 Holland, Lewis N. (A)
 Martin, Paul E. (A)
 Palmer, Edward D. (A)
 Suez, Robert K. W. (J)
 Susnich, Eugene W. (A)
 Uehling, Edwin A. (A)
 Underwood, O. De Los (A)

Battle Creek

Doty, W. E. (A)
 Fay, Lewis C. (A)
 Johnson, Julian S. (J)
 Kinch, Oscar A. (A)
 Roof, Raymond B. (A)

Bay City

Carpenter, Ralph H. (A)

Benton Harbor

Miles, K. Walker (A)

Berrien Springs

Fetzer, John E. (M)

Birmingham

Soeters, Raymond A. (A)

Blanchard

Kersey, Russell (A)

Detroit

Allen, Albert B. (A)
 Almas, Stan L. (A)
 Alston, Vernon C. (A)
 Bailey, Stuart L. (A)
 Ball, I. Dale (A)
 Blumenthal, Raymond W. (A)
 Bobertz, W. E. (A)
 Brown, Jesse E. (M)
 Buchanan, Arthur B. (A)
 Byerlay, H. Le Roy (A)
 Byram, F. Cameron (A)
 Carson, Walter E. (A)
 Cash, George B. (A)
 Clark, Thomas E. (M)
 Clarke, George R. (A)
 Collins, Frederick V. (A)
 Courtis, Reginald P. (A)
 Cox, Charles H. (A)
 Cray, Frederick W. (A)
 Davis, Chester (A)
 Du Bois, Edward P. (J)
 Edwards, Samuel W. (M)
 Evison, Samuel J. (A)
 Faulkner, Douglas (A)
 Firestone Samuel (A)
 Friedenthal, Andrew (A)
 Gasparovitch, Stephen (A)
 Geiger, Arthur H. (A)
 Goldman, Sherman (A)
 Green, Walter M. (A)
 Griva, John (A)
 Grove, George A. (A)
 Grunow, Oscar H. (A)
 Haston, Claude W. (A)
 Hoffman, Walter R. (A)
 Jackson, William E. (A)
 Joy, Henry B. (A)
 Joyce, Herbert A. (A)
 Kirby, Corley W. (A)
 Kirby, Otto I. (A)
 Kratokvil, Frank M. (A)
 Lathrop, F. A. (A)
 Malo, Charles D. (A)
 Manning, Stanley R. (A)
 Martin, Robert D. (A)
 McCaffry, James A. (A)
 Moore, J. Burton (A)
 Osborn, Paul I. (A)

MICHIGAN (Continued)

Detroit (Continued)

Outzen, Andrew N. (A)
 Owen, Charles W. (J)
 Porter, Samuel (A)
 Putnam, Erle T. (A)
 Ransom, G. B. (A)
 Scanlan, Richard J. (A)
 Schmalzriedt, T. (A)
 Seielstad, Harold (A)
 Seymour, Fred M. (A)
 Simons, Orlin B. (A)
 Stansfield, Selwyn (A)
 Steinhauser, Clarence J. (A)
 Sturman, George M. (A)
 Taylor, Harold E. (A)
 Thomas, Walter J. (A)
 Tomchuck, John (J)
 Trainer, George T. (A)
 Trittenbach, John M. P. (A)
 Trowbridge, O. H. (A)
 Wilber, Delbert J. (A)
 Worel, Frank (A)

East Lansing

Clark, Ralph L. (A)
 Murray, William A. (A)
 Osborn, Burr K. (A)
 Richards, A. R. (A)

Farmington

Kreuzer, A. R. (A)

Fenton

Dobbs, F. W. (A)

Flint

Blanford, Edwin C. (J)
 Fallain, Frank D. (A)
 Forbey, William D. (A)
 Lutes, Clifford (A)

Fordson

Knight, Donald M. (A)

Grand Rapids

Esveld, Clarence D. (A)
 Goebel, Eugene S. (A)
 Van Niman, Roy T. (A)

Grosse Pointe Park

Smith, Walter C. (A)

Harbor Springs

Wright, Wilford C. (J)

Highland Park

Gould, Howard S. (A)
 Glatzel, Earle D. (A)

Jackson

Atkins, Carl Edward (J)
 Bowmaster, J. M. (A)
 Brooks, Kenneth E. (A)
 Lee, Kenneth G. (A)
 Pacholke, Fred (A)
 Pickles, Arthur W. (A)
 Planck, R. M. (A)
 Rich, C. E. (A)
 Richmiller, Earl R. (A)
 Stahl, Theodore H. (A)
 Strait, Clarence L. (A)
 Troup, Everett O. (A)
 Volkenant, Gordon W. (A)
 Ward, Donald H. (A)
 Whitlock, Fred (A)
 Williams, Billy G. (A)

Lakeside

Meier, H. G. (A)

Lansing

Wells, Lawrence V. (A)
 Willis, Ellsworth D. (A)

Lapeer

Margraf, Frank J. (A)

Lennon

Reed, Stanley C. (A)

Menominee

Westervelt, H. P. (A)

Midland

Mathison, Gerald (A)

Muskegon

Beezer, Joseph E. (A)
 Hewitt, C. Tefft (A)
 Lowe, Carr E. (A)
 Owens, Robert F. (A)
 Schwarz, Harvey F. (A)
 Yoder, Raymond S. (A)

Osseo

Lapham, Olin J. (J)

Oxford

Beardsley, Franklin (A)
 Capron, E. S. (A)

Port Huron

Brown, Kenneth L. (A)

Rives Junction

Ostrander, R. M. (A)

Royal Oak

Miller, Robert L. (A)

Saginaw

Boyse, Robert E. (A)
 Sullivan, Robert J. (A)
 Trumble, L. A. (A)

Scottville

Krivitsky, George (A)

South Haven

Arthur, Ralph L. (A)
 Crossley, Alfred (M)
 Hansen, Leland S. (A)
 Jorgenson, Harold (A)

St. Clair Shores

Osborne, Robert L. (A)

Trenton

Williamson, Charles G. (A)

Wyandotte

Morris, Carleton D. (M)
 Steffin, V. J. (A)

Ypsilanti

Augustus, Lee M. (A)

MINNESOTA

Baudette

Gjelhaug, John A. (A)

Carver

Olson, Marvin S. (A)

Chisholm

Ambrozich, John L. (A)

Detroit Lakes

Hetland, L. C. (A)

Duluth

Cosandey, Charles J. (A)
 Ross, Russell H. (A)

Edgerton

Rust, Leslie W. (A)

Faribault

Carney, Philip G. (A)

Hopkins

Fuxa, Albert E. (A)

Kent

Olson, Martin N. (A)

Kenyon

Hjermstad, Hans U. (J)

Lakefield

Tkach, George (A)

MINNESOTA (Continued)

Minneapolis

Anderson, Chester H. (A)
Brooke, Robert O. (J)
Cottam, Dean F. (A)
Edwards, Henry W. (A)
Gould, Payson R. (J)
Hawley, Douglass (A)
Hawn, Robert C. (A)
Roth, Harold B. (A)
Schnell, Louis J. (A)
Smeby, Lynne C. (A)
Stevens, Carl T. (A)
Tynan, Thomas E. (A)
Young, Sumner B. (A)

Northfield

Culver, Charles A. (M)

Ponsford

Cox, Hector S. (J)

St. Paul

Cotton, Richard J. (A)
Hance, Kenneth M. (A)
Heiser, Edwin S. (A)
Janes, Clinton W. (A)
Mills, H. Lawrence (A)
Rankine, James C. (A)
Strout, Everett M. (A)

Virginia

Hauta, Theodore (A)

Waseca

Johnson, Edgar F. (A)

MISSISSIPPI

Corinth

Essary, William M. (A)

Greenwood

Johnson, Vivion A. (A)

Hattiesburg

Crews, J. H. (A)

Jackson

Myers, James A. (A)

Kosciusko

Sowell, George O. (A)

Meridian

Woodruff, B. H. (A)

Mississippi City

Pecoul, F. A. (A)

Vicksburg

George, Edward M. (A)

MISSOURI

Bucklin

Holmlund, A. Earle (A)

Cape Girardeau

Hirsch, Oscar C. (A)

Columbia

Lewis, Earl W. (A)

Hughesville

Rissler, Harold D. (A)

Independence

Church, Arthur B. (A)
Moler, A. R. (A)

Jefferson City

Corwin, Willis P. (A)
Sloan, Fergus M. (A)

Kansas City

Bielenberg, John F. G. (A)
Blum, Sidney J. (A)
Boat, John (A)
Bradbury, G. V. (A)

Clements, Thomas C. (A)
Cook, Ellis C. (A)
Davis, Dudley J. (A)
Fouts, Avery L. (A)
Goldenberg, Henry E. (A)
Gordon, Herbert C. (A)
Groendycke, Richard W. (A)
Hodge, Albert William (A)
Kent, James M. (A)
Kent, Paul N. (A)
McDonell, William J. (A)
MacDowell, Earl B. (A)
Obright, Alvin C. (A)
Pitt, William (A)
Rippeteau, Charles W. (A)
Schilling, John T. (A)
Schulze, Heri T. (A)
Smith, Percy De Willard (A)
Vasen, Gustave (A)
Williams, Palmer H. (A)
Yates, Clarence C. (A)
Young, William M. K. (A)

Kearney

Thomason, Marvin (A)

Mendota

Davis, Glen A. (A)

Nevada

Kluth, William J., Jr. (A)

Rolla

Frame, Floyd H. (A)
Martin, J. Douglas, Jr. (J)

Springfield

Hicks, Kenneth F. (A)
Moss, Terry L. (A)
Ward, G. Pearson (A)

St. Joseph

Abercrombie, Julius B. (A)
Bauer, Fritz (A)
Watts, Harold F. (A)

St. Louis

Althoff, Frederick E. (A)
Berest, Anton (A)
Browning, Roy H. (A)
Bush, Walter S. (A)
Cook, Jesse A. (A)
Croxtton, Galen B. (A)
Duffy, Charles A. (A)
Fenton, William C. (A)
Fillmore, Francis A. (J)
Fowler, D. W. (A)
Fritz, Harry R. (A)
Garvey, Arthur (A)
Humphreys, Irl W. (A)
Koehler, Elmer F. (A)
McDaniel, Otto S. (A)
Montgomery, Martell, (A)
Nugent, Thomas (A)
Pingree, Samuel J. (A)
Proehl, Robert O. (A)
Quinby, Porter H. (A)
Riddle, Ruston L. (A)
Ruddy, Ralph P. (A)
Schechter, Leo (J)
Suggs, Thomas B. (A)
Tevis, Graham L. (A)
Van Sickle, George W. (A)
West, William H. (A)
Wooley, W. C. (A)
Zehr, Nicholas J. (A)

University City

Glasgow, Roy S. (M)

Waldron

Barker, L. T. (A)

MONTANA

Anaconda

Horsfall, James R. (A)

Billings

Pelton, George A. (J)

Bozeman

Woodhouse, Geoffrey Arthur (A)

Butte

Crouter, Leslie E. (A)
Walker, Raymond E. (A)
Whidden, Ira P. (A)

Forsyth

Roberson, Carl (A)

Froid

Jacobs, Marcellus L. (A)

Havre

Peters, Vern (A)

NEBRASKA

Alliance

Cox, Ralph V. (A)

Aurora

Spencer, Albert H. (A)

Clay Center

Hertel, Roger H. (J)
Swanson, Carl R. (A)

Falls City

Chesley, Arthur D. (A)
Quigley, James H. (A)

Howells

Prucha, Ernest F. (A)

Lincoln

Brackett, Richard T. (A)
Jensen, John C. (M)
Koch, J. Wesley (J)
Norris, William C. (J)
Rohwer, Paul C. (A)

Norfolk

Leeman, Wilson (A)

Omaha

Badgerow, Bert E. (J)
Crawford, J. B. (A)
Diehl, Charles B. (A)
Eaton, Waldo W. (A)
Henry, Gordon I. (J)
Kotera, William J. (A)
McIntosh, Frank H. (A)
Phillips, Elmo W. (A)
Shirk, Kenneth C. (A)
Stratman, Fred W. (J)
Stultz, Earl D. (J)

Rising City

Schulke, Enno (A)

York

Meyer, Albert (A)

NEVADA

Elko

Michael, Charles (A)

Reno

Peters, Jay (A)
Sandorf, Irving J. (A)

NEW HAMPSHIRE

Claremont

Hodge, V. W. (A)

Gorham

Dodge, Joseph B. (A)

Keene

Rickey, Lawrence (A)

Manchester

Ryan, M. John (A)

Portsmouth

Martin, Julius (M)

Sunapee

Graves, William S. (A)

NEW JERSEY

Allenhurst

Lewis, Harold M. (M)

Ampere

Cassell, Joseph L. (A)
Hund, August (F)
Powers, Walter P. (M)

Asbury Park

Straussman, Arnold D. (A)

Atlantic City

Flett, William J. (A)
Riser, Morris (A)

Audubon

Fisher, Norman (A)

Bayonne

Dillenbeck, Preston van D. (A)

Belleville

Clegg, Edward B. (A)

Bergenfield

O'Connor, Mort F. (A)

Bloomfield

Born, W. Theodore (A)
Donovan, Daniel R. (A)
Hall, Norman C. (A)
Hanson, Ernest R. (A)
Henry, T. J. (A)
Hoffman, Henry J. (A)
Kannenstine, F. M. (A)
Mitchell, Clair D. (M)
Newell, Guy (A)
Otterbein, Milton Henry (J)
*eck, Gordon V. (A)
Taber, William T. (A)
Weaver, Karl S. (A)
Widell, E. Gideon (M)

Boonton

Albert, William H. (A)
Ballantine, Stuart (F)
Black, K. Charlton (M)
Cordell, Peter C. (A)
Drake, Frederick H. (M)
Ferris, Malcolm (M)
Haas, John G. (A)
Hughes, Everett J. (A)
Hull, L. M. (F)
Landon, Vernon D. (M)
Loughlin, William D. (M)
Morrison, John F. (A)
Noyes, Atherton, Jr. (A)
Pittenger, Arthur W. (A)
Seabury, Richard W. (M)
Snow, Harold A. (A)
Stone, G. Edgar (A)
Willemotte, R. M. (M)

Bound Brook

Hagmann, Nicklaus (A)
Lindstrom, Arthur J. (A)
Stair, Daniel N. (A)

Bridgeton

Nichols, H. L. (A)

Caldwell

Cole, Arthur B. (M)
Eberhard, Lawrence E. (A)
Hotopp, Alfred H. (M)

NEW JERSEY (Continued)

Camden

Ackerman, Milton J. (A)
Brown, Elmer L. (A)
Cooley, Elihu H. (A)
Darlington, Edgar T. (A)
Dickey, Edward T. (M)
Engel, Francis H. (M)
Galvin, Robert (A)
Geoghegan, Eamonn D. A. (A)
Gray, J. Calvin (A)
Hardin, L. L., Jr. (A)
Heiser, Albert E. (A)
Miller, Leonard H. (A)
Mkitarian, Luther M. (A)
Potts, John H. (A)
Roberts, Richard P. (A)
Satern, M. G. (A)
Spencer, George E. (A)
Sumner, Raymond Stokes (A)

Cedar Grove

Attmore, William B. (A)

Clayton

Purvis, Charles G. (A)

Clementon

Attmore, William B. (A)

Cliffwood

Crawford, Arthur B. (A)
Feldman, Carl B. (A)
Jansky, Karl G. (A)
Lowry, Lewis R. (A)
Mutch, W. W. (A)
Sharpless, William M. (A)

Clifton

Pearl, Eugene S. (M)
Watts, Ivor B. (J)

Clinton

Wagner, Harry S. (A)

Collingswood

Barton, Loy E. (M)
Jones, Newell R. (A)

Coytesville

McLaughlin, James L. (A)

Cranford

Briggs, Loyd A. (M)
Pulley, Lester A. (A)

Deal

Eberhardt, George M. (A)
Ferrell, Enoch B. (M)
Goodall, William M. (A)
Kerwien, Arthur E., Jr. (A)
Schlaack, Norman F. (A)
Schwartz, Lyle H. (A)
Shaw, Robert C. (A)
Sterba, E. J. (A)

Denville

Harlan, Edwin W. (A)

East Orange

Ackerman, Rudolph W. (M)
Akers, Dallas C. (A)
Beidleman, Howard B. (A)
Borgeson, Carl A. (A)
Brigham, Cecil E. (A)
Brigham, Cyril A. (A)
Butler, H. R. (A)
Clarry, Harold E. (A)
Crom, George C., Jr. (M)
Curtis, Austen M. (M)
Dannals, Earl W. (M)
Davis, Nathan A. (A)
Duncan, R. D., Jr. (M)
Edison, Theodore M. (A)
Gawler, Henry C. (M)

Gerns, William H. (M)
Harris, Sylvan (M)
Hiller, Harry E. (A)
Jackson, Donald S. (A)
Keary, Hugh F. (A)
Lederer, Ernest A. (M)
McClary, James P. (A)
Monfort, Ray A. (A)
Morrison, Howard (A)
O'Donohue, James P. (A)
Perry, Irving D. (A)
Pickard, Richard W. (A)
Roetken, A. A. (A)
Rudebeck, Everett L. (A)
Shackelford, Benjamin E. (M)
Somers, Richard M. (A)
Spencer Millard C. (A)
Stanwick, Charles A. (A)
Towner, Orrin W. (M)
Tucker, George B. (A)
Weston, John L. (A)
Woodworth, Fred B. (A)

Elizabeth

Brick, Frank R., Jr. (M)
Crowley, David A. (A)
Engel, Albert L. (J)
Horning, Louis P., Jr. (A)
Jatlow, J. L. (A)
Mazik, John, Jr. (A)
Morris, Robert M. (A)
Morrow, Granville P. (A)
Schiff, Frank (A)
Sery, Lester (A)
Tucker, John, Jr. (A)
Walsh, Lincoln (A)
White, Charles P. (A)

Englewood

Ashton, John E. (J)
Emanuel, John H. (A)
Gillett, Glenn D. (M)

Essex Fells

Bernhard, Frederick S. (A)

Fairview

Nickless, William H. (A)

Fanwood

Hall, Clifford A. (A)
Todd, Harold C. (A)

Fort Monmouth

Bender, Louis B. (M)
Black, Garland C. (A)
Conrad, Victor A. (A)
Hahn, Richard W. (A)
Hayden, Gilbert (A)
Kono, T. (M)
Lyman, Reginald P. (M)
Murphy, William H. (M)
Poteet, Daniel P. (A)

Franklin

Tillson, Benjamin F. (M)

Freeport

Englund, Carl R. (F)

Glen Ridge

Cunliffe, Paul R. (A)
Dart, Harry F. (M)
Umbach, Walter R. (A)

Glen Rock

Bailey, Ralph G. (A)
Clark, Louis E. (A)

Grantwood

Dana, David W. (A)
Herbst, John A. (A)

Great Notch

Warner, Herbert M. (A)

NEW JERSEY (Continued)

Hackensack

Slocum, K. W. (A)

Haddonfield

Barnes, John L. (A)
Dichl, William F. (M)
Elliott, H. F. (M)
Fithian, William S. (A)

Haddon Heights

Burrill, Charles M. (A)
Holmes, Ralph S. (A)
Pettengill, George W., Jr. (A)

Hasbrouck Heights

Baker, Neil D. (A)
Beach, Chester L. (A)
Roth, Jesse E. (A)
McLaughlin, James L. (A)

Hillside

McCauley, John H. (A)
Warren, Chester L. (A)

Hoboken

Gorton, Rolland E. (A)
Izzo, Anthony (A)
Paulling, Herbert L. (A)
Roters, Herbert C. (A)
Stempel, Waldemar M. (A)

Irvington

Bazley, Paul B. (A)
Coman, George E. (A)
Fread, Harold (A)
Hart, James J. (A)
Momon, Ernest J. (A)
Mortimer, Harry H. (A)

Jersey City

Bremer, Frank V. (A)
Bremer, Harry A. (A)
Costello, John J. (A)
DeAmicis, D. Sicari (A)
Drews, Ernest (A)
Goodwin, Robert F. (A)
Hanks, Alfred J. (A)
Holmes, George R. (A)
Murray, Albert F. (M)
Odenbach, J. F. (A)
Oliver, George E. (M)
Palmer, C. Walter (A)
Scarr, Henry F. (A)
Sullivan, Edward S. (A)
Walker, C. Robert (A)
Weber, Walter (A)

Kearny

Knowlton, John J. (A)

Lakehurst

Coulter, Howard N. (M)

Lawrenceville

Ernst, Murray C. (A)
Gilman, George W. (A)
Wright, Oliver (A)

Leonia

Erickson, Herman E. (A)
Mustermann, H. G. A. (A)
Replogle, Delbert E. (M)

Linden

Holetz, Alexander C. (A)

Little Falls

Farnsworth, Daniel W. (A)

Little Silver

Ohl, Russell S. (M)

Long Branch

Cohn, Ralph I. (A)
Herson, Jacob S. (A)
Reinhart, Sidney M. (A)
Watson, Paul E. (A)

Lyndhurst

Kannenberg, Walter F. (A)
MacDowell, Theron W. (A)

Madison

De Coutouly, Gustave C. (A)
Manning, Charles T. (M)
Phelps, Walter A. (A)

Maplewood

Barkley, William J. (M)
Boerner, Thomas J. (A)
Bohn, William C. (A)
Cunningham, Frederick W. (M)
Darrow, Leo H. (A)
Pidgeon, Howard A. (M)
Strassner, Frank J. (A)
Trogner, Arthur M. (M)
Rowe, Charles R. (M)
Stinchfield, J. M. (A)

Maywood

Kersta, Laurence G. (A)
Stanley, J. J. (M)

McKee City

Read, George T. (A)

Merchantville

Closson, Luke E. (A)
Hopkins, A. R. (A)
Patterson, Edward B. (A)
Pischzan, Hans E. (A)
Whitehead, Jesse C. (A)

Metuchen

Bohlke, W. Hollander (A)

Milburn

Cassedy, William F. (A)
Schauler, Vincent A. (A)

Montclair

Charlton, Paul W. (A)
De Long, Oscar A., Jr. (A)
Hervey, John P. (A)
Huffman, Charles E. (A)
Krahl, Walter L. (M)

Moorestown

Shumard, Charles C. (M)

Morristown

Poole, Robert J. (A)

Mountain Lakes

Asserson, Raymond (M)
Flannagan, Coke (M)

Neptune

Schafer, J. Peter (A)

Netcong

Giovanini, Frank (A)

Newark

Amick, William M. (A)
Barnes, T. Dana (A)
Barone, Salvatore A. (A)
Bennett, Robert W., Jr. (A)
Bliziotis, George E. (M)
Brach, Leon S. (M)
Canfield, Wilson R. (A)
Carle, Nathaniel A. (A)
Clement, Lewis M. (F)
Dauber, Arthur O. F. (A)
Dolesh, Frank J. (A)
Drury, Paul O. (A)
Feindel, Abbott (A)
Gardner, Francis S. (A)
Glauber, John J. (A)
Goodwin, W. Nelson, Jr. (M)
Gordon, Malcolm K., Jr. (A)
Hardwick, Ambrose H. (A)
Hooven, Morris D. (A)
Horle, Lawrence C. F. (F)

NEW JERSEY (Continued)

Newark (Continued)

Kahn, Frederick J. (M)
 Lewis, George H. (M)
 Marzulli, Angelo N. (A)
 McCrea, M. Walter (A)
 Meacham, J. F. B. (A)
 Miles, William E. (A)
 O'Dowd, Thomas E. (A)
 Oman, Niles Johann (A)
 Peterson, Cornelius (A)
 Reiner, Leonard (A)
 Rodriguez, Alexander E. (A)
 Schermerhorn, J. L. (A)
 Schiftenhaus, Daniel H. (A)
 Schmidt, Joseph H. (A)
 Scott, Walter F. (A)
 Sels, Hollis K. (A)
 Simpson, Fred H., Jr. (J)
 Sternberg, F. B. (A)
 Valentine, Russell D. (A)

New Brunswick

Lucas, Earle F. (A)
 Rohman, Victor A. (A)
 Ruckle, Ernest G. (A)
 Shore, Henry (A)
 Ward, Donald G. (A)

Newton

Landone, Brown (A)

North Arlington

Collins, John (A)

North Bergen

Girard, Edward J. (A)
 Perryman, G. H. (A)
 Wichern, Leonard (A)

North Merchantville

Frenz, Harry J. (A)

North Plainfield

Cumming, Kenneth N. (M)
 Sommer, Emitt H. (A)

Nutley

Humphrey, Hartley C. (A)
 Saunders, Alfred W. (A)

Oradell

Brackett, Harold H. (A)
 De Lime, Thomas L., Jr. (A)

Orange

Corbin, Francis L. (A)
 Harris, Gwin C. (A)
 Herdman, Raymond C. (A)
 Kynor, Merrill W. (A)
 Miller, Walter H. (A)
 Powell, Ralph C., Jr. (A)
 Rypinski, Maurice C. (M)

Palisade

Jones, Dramin D. (A)

Passaic

Berger, Henry C. (A)
 Eklund, Gus (A)
 Himoe, Clifford E. (A)
 Littman, Leon L. (A)
 Manke, Arthur G. (A)
 Rodgers, George H. (A)
 Weinberg, Isaac (A)

Paterson

Coddington, Raymond L. (A)
 Gold, Herman (A)
 Hogencamp, Harold C. (A)
 Trifari, Edmund (A)
 Whittaker, Edmund (A)

Pitman

Boise, Everett B. (A)

Plainfield

Nielsen, H. V. (A)
 Oscanyan, Paul C., Jr. (A)

Princeton

Roberts, Walter Van B. (F)
 Ware, Paul (A)

Rahway

Gibson, Robert D. (A)

Ramsey

Secor, Harry W. (A)

Red Bank

Bruce, Edmond (M)

Ridgefield Park

Smith, Arthur E. (A)

Ridgewood

Affel, Herman A. (A)
 Bondy, Hugo Alois, Jr. (A)
 Engel, G. C. (A)
 Felix, Edgar (M)
 Smith, Theodore A. (A)

Riverton

Ehle, Francis R. (M)
 Jones, H. Rossiter (A)

Roseland

Arnold, Lowell George (A)

Roselle

Bosler, Gustave A. (A)
 Guber, Fred H. (A)
 McConnell, W. G. (A)

Roselle Park

McNicol, Donald (F)

Rumson

Friis, H. T. (F)

Rutherford

Gage, David H. (M)
 Hild, George E. (A)
 Jackson, Benjamin B. (A)
 Sargeant, Charles E. (A)
 Wattson, Harry B. (A)

South Orange

Field, W. Thayer (A)
 Hartley, Ralph V. L. (F)
 Johnson, Kenneth S. (M)
 Lee, Henry L. (M)
 Schuetz, Robert F. (A)
 Walsh, Arthur L. (A)
 Rodman, I. P. (M)

Stanhope

Gray, DeWayne R. (J)
 Moorhead, George H. (A)
 Peterson, Arthur C., Jr. (A)

Summit

Biele, Charles E. (A)
 Fairchild, F. Earl (A)
 Snook, H. Clyde (M)

Trenton

Burrroughs, Irving D. (A)
 Kale, Samuel S. (A)
 Knowles, Edward P., Jr. (A)
 Raser, Edward G. (A)
 Wentzel, Amandus G., Jr. (A)

Tuckerton

Baldwin, Preston de Grauw (A)

Union

Edwards, Joseph B. (A)

Union City

Erhard, John A. (A)
 Masalkovics, J. A. (A)

Upper Montclair

Glenn, Earl R. (A)
 Godley, Paul F. (A)

NEW JERSEY (Continued)

Upper Montclair (Continued)

Hallborg, H. E. (F)
 Versiell, Emery L. (A)

Verona

Holborn, Frederick A. (M)

Weehawken

Gruenberg, Edwin L. (A)

West Caldwell

Willis, Frederick C. (A)

West Collingswood

Pettit, Albert R. (A)
 Wunderlich, Norman E. (M)

Westfield

Baukat, Henry W. (M)
 Phillips, Leo E. (A)

West Long Branch

Burrows, Charles R. (A)

Westmont

James, Wallace McNeal (A)

West Orange

Kober, Paul A. (A)
 Osgood, Victor L. (A)
 Tucker, Murray E. (A)

West New York

Machiorletti, Louis (A)
 Schoenfeld, K. (A)

Whippany

Doherty, William H. (A)
 Mellor, William N. (A)

Woodcliff

Seid, Fred C. (A)

Wyckoff

Frey, Robert H. (A)

NEW MEXICO

Albuquerque

Hardy, William H. (A)
 Stone, C. D. (A)

Raton

Abshere, Lilburn O. (A)

State College

Goddard, Ralph W. (M)

NEW YORK

Albany

Corey, James H. (A)
 Kaiser, Fred J. (A)
 Mezger, George (A)
 Peck, Emerson P. (A)
 Pozelsky, Leonard (A)
 Schultz, Arthur (A)
 Skinkle, Myron H., Jr. (A)
 Thomas, Joseph D. (A)

Amityville, L.I.

Melhuish, Harold T. (M)

Angola

Clark, Charles W. (A)

Astoria, L.I.

Anderson, J. E. (A)
 Berkley, Fred (A)
 Dewhurst, Thornton P. (A)
 Geise, Harold (A)
 Greene, George J. (A)
 Greene, Harry A. (A)
 Gritzner, Fred A. (A)
 Gunther, Frank A. (A)
 Kunicky, Barney F. (A)
 Leslie, Frank (A)
 Loscalzo, Peter A. (A)
 Martin, Louis (A)
 Nagy, A. Wheeler (A)

Schramm, William (A)
 Zatorsky, E. F. (A)

Auburn

Lumb, Frank J. (A)

Babylon, L.I.

Smith, J. O. (M)
 Thompson, Edward Philip (A)

Baldwin, L.I.

Schlenker, Vesper A. (A)

Bath

Loveless, Lawrence M. (A)

Bayside, L.I.

Babcock, Wallace C. (A)
 Lorch, Albert (A)
 Troxler, Lucien J., Jr. (A)

Bellaire, L.I.

Brennan, John B., Jr. (A)

Bellerose, L.I.

Speicher, John D. (A)

Bellmore, L.I.

Wright, Marshall C. (A)

Binghamton

Adams, William E. (A)
 Hall, Victor E. (A)

Brightwaters, L.I.

Camp, V. F. (A)
 Knight, Harold E. H. (A)

Bronxville

Weeden, William N. (A)

Brooklyn

Abraham, Irving (A)
 Adachi, William Y. (A)
 Alexander, Louis (A)
 Aymar, Erwin (A)
 Bartal, Otto (A)
 Bartnosky, Harry (A)
 Baum, Sydney H. (A)
 Baunach, Edward L. (A)
 Belock, Harry D. (A)
 Bernard, Herman (A)
 Berner, Aaron (A)
 Betts, Frederick H. (A)
 Bower, James (A)
 Brady, Leslie R. (A)
 Brandt, Kristian (A)
 Brimberg, Isaac (A)
 Bristow, Frederick R. (A)
 Browne, Walram S. (A)
 Bryan, Herman W. (A)
 Bullock, Walter H. (A)
 Burdick, Adelbert B. (A)
 Burns, George D. (A)
 Callahan, John L. (A)
 Calligheris, John S. (A)
 Canavaciol, Frank E. (M)
 Carroll, James H. (A)
 Castor, Amasea H. (A)
 Charlat, Arnold (J)
 Coe, Alfred (A)
 Cohen, Samuel (M)
 Cole, Fred S. (A)
 Consoli, Vincent (A)
 Cook, Arthur L. (A)
 Crowell, Claude S. (A)
 Dean, Leon W. (A)
 De Mann, William (J)
 Dissar, William G. (J)
 Dlugatch, Irwin (J)
 Dobler, William (A)
 Dolid, Abraham (A)
 Dreyer, Harry W. (M)
 Dummett, H. W. (A)
 Dunn, Lawrence J. (M)

NEW YORK (Continued)

Brooklyn (Continued)

Edgar, J. Clifton (A)
 Ellingham, Irving (A)
 Evans, Porter H. (M)
 Feldstein, M. A. (A)
 Ferrotta, Joseph L. (A)
 Fishberg, Sidney (A)
 Flomenbaum, Hyman (J)
 Fogel, Mortimer H. (J)
 Francione, Dominick A., Jr. (A)
 Fultz, Miles E. (A)
 Gabel, Morris (J)
 Galea, Vincent (A)
 Garity, William E. (M)
 Geloso, John (A)
 Gerel, Alexander (A)
 Gillule, William J. (A)
 Glaser, Marcus (A)
 Glasscock, Glen R. (A)
 Goddard, Frederick M. (A)
 Goldberg, Emanuel (A)
 Grainger, Maurice J. (A)
 Gruetzke, Charles P. E., Jr. (A)
 Hadden, Weston (A)
 Hajim, Jack (A)
 Hakam, Samuel (A)
 Halligan, Clair W. (A)
 Hammer, Robert H. (A)
 Harris, Leonard F. (A)
 Hausmann, Erich (M)
 Herman, Joseph M. (A)
 Hesse, Henry R. (A)
 Hewlett, Oscar H., Jr. (A)
 Heymann, Joseph (A)
 Hines, Joseph (A)
 Holland, Jesse W. (A)
 Hughes, William P., Jr. (A)
 Hurwitz, Solomon Bernard (A)
 Inskip, Leonard S. (A)
 Isaacson, Herbert M. (A)
 Johnson, R. Stanley (A)
 Katzin, Martin (A)
 Kayser, Herbert (A)
 Kennedy, Harold E. (A)
 Kirdahy, Emil (A)
 Krivan, Fred A. (A)
 Lazarus, Benjamin N. (A)
 Leferts, B. (A)
 Le Quesne, Charles A. (A)
 Leuteritz, Hugo C. (A)
 Levine, Harry (A)
 Le Viness, John E. (A)
 Lewis, Robert V. W. (A)
 Liberman, Henry C. (A)
 Liebner, Barney (J)
 Lussier, Elphege Achille (A)
 MacCoun, Townsend D. (A)
 Mahoney, Joseph N. (M)
 Marra, Anthony (A)
 Marriott, Robert H. (F)
 Marsten, Jesse (M)
 Mauran, John (A)
 McGonigle, William J. (J)
 Milano, Clarence (A)
 Miller, Le Roy J. (A)
 Moore, Henry H. (A)
 Morehouse, Raymond L. (A)
 Mullane, J. W. (A)
 Nachemson, Paul R. (A)
 Ostrove, William (A)
 Painting, John A. (A)
 Parker, Oliver B. (A)
 Pearson, Herbert B. (A)
 Peck, William (A)
 Perrin, Arthur G. (A)
 Perry, Harold D. (A)

Potter, Max (A)
 Pownall, Roger F. (A)
 Redfern, Forest F. (A)
 Reesor, Delbert A. (A)
 Rehbein, Arthur Frederick (A)
 Reimer, August Charles (A)
 Renke, Adolph (A)
 Riccobono, Sebastian (A)
 Ringel, Abraham (M)
 Rippere, R. Oliver (J)
 Romeo, Anthony (A)
 Rosenbaum, Jacob (J)
 Rosin, Arthur (A)
 Ross, Uda B. (M)
 Salzman, David (A)
 Sass, Isidore (A)
 Schenke, Kurtiss P. (A)
 Schich, William H. (A)
 Secan, Harry (A)
 Seidman, Charles (A)
 Seligsohn, Max (A)
 Shaffer, Irving R. (A)
 Shestacovsky, John (A)
 Shortland, James W. (A)
 Siegel, Ralph (A)
 Siegel, Samuel (M)
 Silver, Benjamin L. (A)
 Sinsheimer, Arthur (A)
 Skinker, Murray F. (A)
 Slater, Saul I. (A)
 Smith, Franklin S. (A)
 Starr, Alfred R. (A)
 Steinberger, Louis (M)
 Stobbe, John A. (A)
 Stromeyer, Charles F. (A)
 Talley, David (A)
 Thomas, Edward H. (A)
 Thomas, Howard H. (A)
 Thomas, Roy Verner (A)
 Torrell, Roy (A)
 Trott, Barnet (A)
 Tuckerman, Lucien P. (A)
 Uzman, George J. (M)
 Vogel, Erwin William (A)
 Wardwell, Arthur S. (A)
 Weber, Paul (A)
 Weinberg, Sidney (J)
 Welker, Paul L. (A)
 White, Milton (A)
 Widmann, Erwin (A)
 Winchell, Walter H. (A)
 Wing, Arthur K., Jr. (J)
 Wood, Wilbert C. (A)

Buffalo

Banditson, Harry (A)
 Barker, Howard T. (A)
 Benin, Zolmon (A)
 Bergmann, Howard J. (J)
 Beyer, Glen R. (A)
 Brown, Stanley W. (A)
 Carlson, Einar C. (A)
 Chamberlain, Adolph B. (A)
 Donlon, Bernard J. (A)
 Dunning, Orville M. (A)
 Eichman, John, Jr. (A)
 Felmet, Albert (A)
 Fox, John (A)
 Fox, Reginald A. (A)
 Freedman, Sam (J)
 Hector, L. Grant (A)
 Hemedinger, Willard (A)
 Hobbs, Frank B. (A)
 Huntsinger, F. J. (A)
 Johnson, James A. (A)
 Karslake, James S. (A)
 Knowlton, Eugene W. (A)
 Lewis, John C. P. (A)
 Lounsbury, Isaac R., Jr. (M)
 March, Philip S. (A)

NEW YORK (Continued)

Buffalo (Continued)

Miller, George H. (A)
 Miller, John G. C. (A)
 Moore, Charles G. (A)
 Mullett, Charles B. (A)
 Nichols, Raymond De H. (A)
 Noel, Lionel S. (A)
 Nowak, Victor V. (A)
 Patey, Harold W. (A)
 Pilegor, Carroll M. (A)
 Pickett, Glenn H. (A)
 Racke, Clarence (A)
 Root, Harry (A)
 Schelling, Robert F. (A)
 Simpson, Burton T. (A)
 Smith, Stanley C. (A)
 Telaar, Theodore J. (A)
 Vanacore, Thomas (A)
 Wagoner, W. Hall (A)
 Waud, Eugene C. (A)
 Weiss, Earl (J)

Canandaigua

Thompson, John M. (A)
 Waldorf, E. T. (A)

Candor

Williams, Warren R. (A)

Canton

Priest, Ward C. (A)

Carmel

Light, Frank B. (A)

Central Valley

Raynolds, Edward F. (A)

Corning

Gage, Henry Phelps (A)

Corona, L.I.

Solari, Frank (A)

Cortland

Greenman, Roger B. (A)

Croton-on-Hudson

Lescarboura, Austin C. (M)
 Osborn, William R. (A)

Douglas Manor, L.I.

Weagant, Roy A. (F)

Dover Plains

Pleasanton, Archie W. (A)

Easthampton, L.I.

Lee, Walter O. (A)

East Rockaway, L.I.

Carter, Frank L. (A)
 Van Duyne, Eugene D. (A)

Ellenville

Saylor, W. Edwin (A)

Elmhurst, L.I.

Banks, Adrian C. (A)
 Eckweiler, Warren M., Jr. (A)
 Freeman, Edward E. (M)
 Haines, Howard J. (A)
 Lundie, Ernest S. (J)
 Roos, Oscar C. (F)

Elmira

Dow, M. Thornton (A)
 Downing, Richard E. (A)
 Taylor, Dale L. (A)

Far Rockaway, L.I.

Sharp, Watkin W. (A)

Floral Park, L.I.

Densham, Robert S. (A)

Flushing, L.I.

Baker, Brothwell H. (A)
 Bouck, Zeh (M)
 Carter, E. Finley (A)

Cook, Ellsworth D. (A)
 Dreisbach, Robert H. (A)
 Harvey, Clyde C. (A)
 Matthews, A. C., Jr. (A)
 Sage, Frederic H. (A)
 Scofield, Robert W. (A)

Forest Hills, L.I.

Bonanno, Joseph L. (A)
 Goodwin, W. Carlyle (A)
 Waring, Alfred (A)

Freeport, L.I.

O'Neill, John J. (A)

Garden City, L.I.

Henney, Julian K. (M)
 Howe, Willard C. (A)
 Wing, Willis K. (M)

Geneva

Biles, Frank V. (A)

Gerry

Starr, Troy S. (A)

Glen Cove, L.I.

Coles, Robert R. (J)

Great Neck, L.I.

Gemmer, Gordon W., Jr. (A)
 Rigney, Douglas (M)

Greenport

Larsen, Carl L. (A)

Hamburg

Hartloff, Gordon S. (A)

Hamilton

Goode, Kenneth H. (A)

Hastings-on-Hudson

Baker, Judd O. (A)

Hempstead, L.I.

Crane, Edwin S. (A)

Hempstead Gardens, L.I.

Clayton, John M. (M)

Hicksville

Schlitz, Karl W. (A)

Holts, L.I.

Batcher, Ralph R. (M)
 Caputo, Nicholas J. (A)
 Ehlert, Fred C. (A)
 Ma Dan, Edwin M. (M)
 Srebroff, Charles M. (M)
 Stroock, Reeve O. (A)

Huntington, L.I.

Flathman, Edward (J)
 Flessel, Frank B., Jr. (J)

Hurley

Warren, William A. (A)

Ithaca

Ballard, William C. (M)
 Dye, Leaman A. (A)
 Merritt, Ernest (M)
 Meserve, Wilbur E. (A)
 Sohon, Harry (A)
 Verman, Lal C. (A)
 Webb, J. S. (A)

Jackson Heights, L.I.

Atwood, Warren S. (A)
 Fredendall, Beverly (A)
 Hickman, C. Nichols (A)
 Mac Ilvain, Karl M. (A)
 Meserve, G. Donald (A)
 Stotler, Albert (A)
 Wheeler, Harold A. (M)

Jamaica, L.I.

Phelps, Boyd (A)
 Pleasanton, Douglas W. (J)
 Schwartz, Nathan (A)

NEW YORK (Continued)

Jamaica, L.I. (Continued)
 Steinberger, Arthur W. (A)
 Sterns, Morton W. (M)
 Styles, Thomas J. (A)
 Yenoli, Dominick J. (A)

Jamesport
 Colvin, R. S. (A)
 Seaman, Gerald C. (A)

Jamestown
 Beaumont, William Frederick (A)

Kenmore, L.I.
 Patterson, Curtis B. (J)
 Wullenweber, Milton O. (A)

Kew Gardens, L.I.
 Goldsmith, Lloyd T. (A)
 Montgomery, A. Peers (A)

Larchmont
 Nilson, Arthur R. (M)

Liberty
 Mauer, William V. (A)

Little Neck, L.I.
 Di Blasi, John (M)
 Schultes, Martin F. (A)

Lockport
 Connette, T. W. (A)

Long Island City, L.I.
 Asch, Marcus (A)
 Farrand, C. L. (M)
 Field, John (A)
 Gilcher, V. J. (A)
 Hanson, Oscar B. (M)
 Harrison, Perry (A)
 Holzinger, Theodore E. (A)
 Ractliffe, Charles Lionel (A)
 Schmidt, Erwin (A)
 Tuttle, C. W. (A)
 Underhill, Charles R. (A)

Lynbrook, L.I.
 Fedotoff, Nicholas V. (A)
 Shaw, James (J)
 Williams, John C. (A)

Malverne, L.I.
 Aubry, Pierce J. (A)

Manhasset, L.I.
 Young, Harold H. (A)

Mamaroneck
 Jarabin, Frank G. (A)

Middletown
 Callender, Edwin R. (A)
 Dempsey, William E. (A)
 Fish, Edward H. (A)
 Shen, Pinlu (A)

Milton-on-Hudson
 Taber, C. Kenneth (A)

Mt. Vernon
 Decker, Donald Philips (A)
 Houck, Harry W. (M)
 Macalpinc, William W. (A)
 Muhleman, Maurice L. (A)
 Stone, Clarence G., Jr. (A)
 Velasco, Jose M. (A)

New Brighton, S.I.
 Macken, H. I. (A)

New City
 Doellner, Le Roy J. (A)

New Rochelle
 Annucci, Louis M. (A)

New York
 Adams, Ira J. (M)
 Adams, Quinton (M)
 Aiken, Charles B. P. (A)

Aikens, Andrew J. (A)
 Alderman, Lawrence T. (A)
 Allyn, R. S. (A)
 Almquist, Milton L. (A)
 Alverson, George S. (A)
 Amy, Ernest V. (M)
 Anderson, Clifford N. (A)
 Anderson, Edwin C. (A)
 Anderson, Pierson A. (M)
 Anderson, Sidney E. (A)
 Andrews, Joseph F. (M)
 Appel, Henry W. (A)
 Armstrong, Edwin H. (F)
 Arnold, John W. (A)
 Arps, Mervin W. (M)
 Ashbaugh, Edwin C. (A)
 Aster, Alvin K. (A)
 Atkin, Robert (A)
 Aull, Wilson, Jr. (M)
 Bailey, Arnold B. (A)
 Bailey, Austin (M)
 Bair, Ralph S. (A)
 Barnes, James C. (A)
 Barnueba, Richard (A)
 Batcheller, Arthur (M)
 Batsel, Max C. (F)
 Bauer, Brunton (A)
 Baxter, Charles E. (A)
 Bayles, Joseph (A)
 Beatty, W. E. (A)
 Beltz, Willis H. (A)
 Bemis, Edwin W. (A)
 Bender, Martin, Jr. (A)
 Berry, James L. (A)
 Beshgetoor, Ray V. (A)
 Betts, Philander H. (A)
 Beverage, Harold H. (F)
 Binns, John R. (A)
 Black, Oliver M. (A)
 Blackmar, Abel E., Jr. (A)
 Blackwell, George C. (A)
 Blackwell, Otto B. (F)
 Blan, Michael (A)
 Blenheim, William J. (M)
 Bloomenthal, Sidney (A)
 Boehme, H. O. (M)
 Boesche, F. W. (A)
 Bond, Elmer Frederick (A)
 Bonell, Ralph K. (A)
 Bonett, David J. (A)
 Borislavsky, Michael A. (A)
 Bostad, John (A)
 Bown, Ralph (F)
 Braden, Rene A. (A)
 Brennecke, Cornelius (A)
 Brown, Charles J. (A)
 Brown, D. S. (A)
 Brown, William A. R. (A)
 Bruggeman, John T. (J)
 Brunet, Meade (M)
 Bucher, E. E. (F)
 Buckler, John J. (A)
 Buckley, Beyton E. (A)
 Bullard, William R. (A)
 Burghard, G. E. (M)
 Busch, Gus A. (A)
 Butler, E. W. (M)
 Butterfield, Charles E. (M)
 Buttner, Harold H. (M)
 Cahill, William J. (A)
 Cain, Robert E. (A)
 Caldwell, O. H. (M)
 Campbell, John A. (A)
 Carboni, Anthony (A)
 Carduner, William (A)
 Carleton, Thomas F. (J)
 Carlton, Roger C. (A)

NEW YORK (Continued)

New York (Continued)
 Carroll, Michael J. (A)
 Carson, John R. (M)
 Cass, Lewis S. (A)
 Chaffee, Joseph G. (A)
 Chernow, Morris (A)
 Chu, Quong Y. (J)
 Cilin, Louis (A)
 Clark, Baynard H. (A)
 Clausen, H. P. (A)
 Cochran, Eugene C. (A)
 Cockatlay, Laurence M. (A)
 Coggshall, Ivan S. (M)
 Colpitts, Edwin H. (F)
 Cooper, C. B. (A)
 Cornwall, Lionel B. (A)
 Corwin, Charles I. (A)
 Cousins, Van Meter (A)
 Craft, E. B. (F)
 Credner, Louis L. (A)
 Crite, Mitchel (A)
 Crosby, George L. (M)
 Cunningham, H. C. (A)
 Currier, Guy, Jr. (A)
 Curry, Walter A. (A)
 Cutting, Fulton (F)
 Dagg, T. Ralph (A)
 Danz, Herman (A)
 Danziger, Harold I. (M)
 Davis, Robert J. (A)
 Deakin, Gerald (A)
 Dean, C. E. (A)
 Dean, Samuel W. (M)
 Decino, Alfred (A)
 De Forest, M. J. (A)
 Dehmel, Richard C. (A)
 Della Corte, J. P. (A)
 Demarest, Charles S. (M)
 Desnoes, Arnold B. (A)
 De Sousa, George S. (M)
 Diaz, Ernesto (A)
 Dietrich, Frederick (A)
 Dietze, Eginhard (A)
 Di Giacomo, Aniello (A)
 Dingley, Edward N., Jr. (A)
 Doubles, David J. (A)
 Dreher, Carl (F)
 Drew, Charles E. (M)
 Drisko, Benjamin B. (A)
 Dubilier, William (F)
 Duncan, Rudolph L. (M)
 Dunham, John S. (A)
 Dunlap, Orrin E., Jr. (M)
 Dunn, Gano (F)
 Dunning, John R. (A)
 Easton, J. H. (A)
 Eldredge, Frank E. (M)
 Eller, Keith B. (A)
 Emerson, Charles W., Jr. (A)
 Espenschied, Lloyd (F)
 Everett, Lynn C. (M)
 Facey, John W. (A)
 Fairburn, A. J. B. (A)
 Farnsworth, Philip (F)
 Farrington, John F. (M)
 Fay, Clifford E. (A)
 Fearing, Justin L. (A)
 Felthousen, A. (A)
 Fernald, Paul R. (A)
 Fernando, K. A. (A)
 Fielding, Charles F. (M)
 Fielding, Edward J. (A)
 Fillmore, Harry P. (A)
 Finch, William G. H. (M)
 Finlay, Robert C. S. (A)
 Fischer, Herbert B. (A)

Fischer, Leonard O. (A)
 Fish, Arthur S. (M)
 Fisher, Joseph J. (A)
 Flythe, Thomas Y. (J)
 Frank, James, Jr. (A)
 Frank, K. G. (M)
 Franklin, L. W. (A)
 Frederick, Halsey A. (M)
 Freed, Joseph D. R. (F)
 Freericks, Lambert (A)
 Frimmerman, Frank (A)
 Furia, John J. (A)
 Furness, George C. (M)
 Gabriellini, William (A)
 Gati, Bela (A)
 Giese, Raymond C. (A)
 Gihring, Herman E. (A)
 Gilbert, John J. (A)
 Goldman, Arthur Z. (A)
 Goldsmith, Alfred N. (F)
 Gould, Leslie A. (A)
 Goulden, Stanley W. (M)
 Graham, Frank H. (A)
 Graham, William A. (M)
 Graveson, George L. (A)
 Green, Ashbel (A)
 Green, Estill I. (A)
 Greene, Paul A. (M)
 Greenstein, Philip (A)
 Greiff, Victor (M)
 Greig, John (A)
 Griffiths, Clarence M. (A)
 Grinan, John F. (M)
 Guild, Baldwin (M)
 Gutoff, Boris (A)
 Guy, Raymond F. (A)
 Hance, P. D., Jr. (A)
 Hanley, John F. (A)
 Harley, John B. (A)
 Harnett, Daniel E. (A)
 Hartman, Charles D. (A)
 Hastings, Gerald M. (A)
 Hauck, Vernon D. (A)
 Hauffe, Otto (A)
 Haug, Joseph (A)
 Haynes, A. J. (A)
 Heberlein, Arthur (A)
 Hedges, Ellsworth J. (A)
 Heindel, Harold J. (A)
 Heising, Raymond A. (F)
 Hemberger, E. F., Jr. (A)
 Henderson, Ken L. (A)
 Henline, Henry H. (M)
 Herber, John C. (A)
 Herbert, Harold R. (M)
 Hertzberg, Robert (A)
 Heuschkel, Paul J. (A)
 Hiller, Nicolai H., Jr. (A)
 Hineine, Harris D. (M)
 Hirsch, Harry (A)
 Hoernel, Paul C. (A)
 Hogan, John V. L. (F)
 Hogg, William S., Jr. (M)
 Hohenstein, Jac. (A)
 Holcombe, Henry W. (M)
 Holden, C. F. (M)
 Holloway, Jack (A)
 Holm, Henry R. (J)
 Honaman, R. Karl (A)
 Hoopes, Thomas T. (A)
 Horn, Charles W. (M)
 Hornung, Julius L. (A)
 Horowitz, Saul (A)
 Hough, Clinton Wallace (A)
 Hovgaard, Ole M. (M)
 Howard, Edward J. (A)
 Howell, Clifford Alexander (A)

NEW YORK (Continued)

New York (Continued)

Howell, Walter J. (M)
 Hubbard, Frank A. (A)
 Hudack, John Martin (A)
 Hulan, A. G. (A)
 Hunkins, Harold R. (A)
 Hurlbut, Ronald (A)
 Hutchison, Miller (M)
 Isele, Harold Adolph (A)
 Israel, John O. (A)
 Jacobs, Louis (A)
 Jamross, Rudolph (A)
 Janke, Alfred H. (M)
 Jensen, A. G. (M)
 Jensen, George L. (A)
 Jewett, F. B. (F)
 Johnson, C. M. (M)
 Johnson, Reverdy (A)
 Johnson, William J. (A)
 Johnston, John P. (M)
 Jones, Lester L. (F)
 Kahant, Charles G. (A)
 Kahn, Morton B. (A)
 Kaplan, Benjamin G. (A)
 Keefe, Oscar A. (A)
 Keim, Llewellyn B. (A)
 Kelley, Leo A. (A)
 Kelly, Mervin J. (M)
 Kendall, John A. (A)
 Kennedy, T. R., Jr. (A)
 Kennedy, William A. (J)
 Kilbourne, Covington G. (A)
 Kilmer, T. W., Jr. (A)
 King, Frank (A)
 Kishpaugh, Arthur W. (A)
 Kitchin, H. W. (M)
 Kleist, Alfred H. (A)
 Klesse, William (A)
 Klosner, Morris (A)
 Knaack, Frank E. (A)
 Knapp, Joseph F. (A)
 Knight, J. B., Jr. (A)
 Knight, Octavius (A)
 Knights, Alexander H. (A)
 Knopp, Ernest (A)
 Koerner, Allan M. (A)
 Koerner, Lawrence F. (A)
 Kreuzer, Barton (A)
 Kroger, F. H. (F)
 Kuhn, Alfred S. (A)
 Kunc, Frank (A)
 Kurtinaitis, John V. (A)
 Lack, Frederick R. (A)
 Lakatos, Emory (A)
 Lane, Frederic A. (A)
 Latimer, Chester W. (F)
 Lawrence, Walter L. (A)
 Layng, Grant (A)
 Lazarovich-Hrebelianovich, D. (A)
 Leach, Harvey B. (A)
 Lee, Emery H. I. (M)
 Lee, Fat Chang (A)
 Leibe, Frank A. (A)
 Leins, Ernest P., Jr. (J)
 Lemmon, Walter S. (A)
 Lenz, Charles S. (A)
 Levy, A. Kingdon (A)
 Levy, Lester (A)
 Levy, Mortimer N. (A)
 Lewis, Elmer H. (A)
 Lindmark, Elmer S. (A)
 Llewellyn, Frederick B. (A)
 Loftin, Edward H. (M)
 Logan, Mason A. (A)
 Long, Maurice B. (A)
 Lopes, John (A)
 Lopez, Melchor, Jr. (A)
 Loynes, Owen H. (A)
 Lundahl, Tore (A)
 Lyford, Elmore B. (A)
 Lynch, Arthur H. (M)
 MacDonald, W. A. (M)
 MacDougall, Arthur (A)
 Mackay, William Andrew (A)
 Malter, Louis (A)
 Manderfeld, Emanuel C. (A)
 Manley, Edward (A)
 Marrison, W. A. (M)
 Marron, George P. (A)
 Marshall, Albert E. (A)
 Marshall, Cesar B. (A)
 Marshall, F. W. (A)
 Martin, De Loss K. (M)
 Mathes, R. E. (A)
 McConnell, Alexander F. (A)
 McCullough, Maurice B. (A)
 McCutchen, Brunson S. (M)
 McElrath, George (M)
 McFarlane, M. L. D. (A)
 McLagan, Donald R. (A)
 McLean, Phillip S. (A)
 McNally, James O. (A)
 McNary, James C. (M)
 McSweeney, Roger (A)
 Meyer, Henry W. (A)
 Miller, H. P., Jr. (M)
 Miller, Marvin L. (A)
 Miller, Reese Hutchison (M)
 Miller, Samuel C. (M)
 Mills, John (M)
 Milnor, Joseph W. (M)
 Misenheimer, Harvey N. (M)
 Molzen, Charles F. (A)
 Montcalm, S. R. (M)
 Moore, E. B. (A)
 Morecroft, J. H. (F)
 Morehouse, Terry B. (A)
 Morehouse, W. B. (M)
 Morro, Jack J. (A)
 Morton, Alfred H. (M)
 Murphy, E. Edward (A)
 Myers, Theobald (A)
 Naimark, Boris S. (A)
 Nakamura, T. (M)
 Nein, Harry R. (A)
 Nelson, Edward L. (M)
 Neville, T. P. (A)
 Newman, Alfred C. (A)
 Nicely, Ralph N. (A)
 Nicholides, E. (J)
 Nichols, Eldon (A)
 Nichols, Leroy C. (A)
 Nickerson, Fred W. (A)
 Nicolai, Erwin W. (A)
 Nielsen, John E. (A)
 Nimmcke, Frederick E. (A)
 Nisley, Paul H. (A)
 Nivison, Theodore E. (A)
 Norberg, Clifford M. (A)
 Nordahl, John G. (A)
 Norton, Frederick A. (A)
 Nyman, Alexander (M)
 Oikle, O. A. (A)
 Osborne, Harold S. (M)
 Oswald, Arthur A. (F)
 Pacent, Louis G. (F)
 Palmer, Robert T. (A)
 Pamphilon, Leon E. (J)
 Pannill, Charles Jackson (F)
 Parker, R. D. (A)
 Pate, Carlton O. (A)
 Patten, Stanley F. (A)
 Pavlow, Nicholas (A)
 Payne, Charles C. (A)

NEW YORK (Continued)

New York (Continued)

Pease, Reginald M. (M)
 Pegram, George B. (A)
 Penick, D. B. (A)
 Peterson, L. C. (A)
 Pierrepoint, John Jay (A)
 Polkinghorn, Frank A. (A)
 Pope, James C. (A)
 Ports, Earl G. (A)
 Potter, Ralph K. (M)
 Pratt, Haraden (F)
 Price, H. Stewart (M)
 Pristas, John E. (A)
 Proskauer, Julien J. (A)
 Pumphrey, Walter H. (M)
 Pupin, Michael I. (F)
 Putnam, Ralph E. A. (A)
 Randolph, L. F. (A)
 Ranger, Richard H. (F)
 Rathner, Jack (A)
 Reb, Frank F. (A)
 Reber, Samuel (F)
 Reeber, Herman E. (A)
 Reeves, J. Russell (A)
 Regottaz, Joseph M. (A)
 Reinken, Louis W. (A)
 Reoch, Alexander E. (F)
 Reynolds, John L. (A)
 Rhodes, Thomas B. (A)
 Rider, John F. (A)
 Ridgway, James L. (A)
 Rifkin, J. L. (A)
 Roder, Hans (M)
 Rodwin, George (A)
 Rose, Arthur F. (M)
 Rose, Charles F. P. (A)
 Rose, John A. (A)
 Rosenberg, Irving (A)
 Rossi, Ralph J. T. (A)
 Rossmassler, Edward C. (A)
 Ryan, Francis M. (M)
 Sacia, C. Fred (A)
 Salzberg, Bernard (J)
 Samoiloff, Leon (A)
 Samuel, Arthur L. (A)
 Sanborn, John W. (A)
 Sarnoff, David (F)
 Schechter, Jack (A)
 Schelleng, John C. (F)
 Schmied, James W. (A)
 Schmit, Dominic F. (A)
 Schneider, Samuel (A)
 Schneider, W. A. (M)
 Schnoll, Nathan (A)
 Scholle, Frederick (A)
 Schramm, Fred W. (A)
 Scott, Herbert J. (A)
 Searing, Hudson R. (A)
 Seidler, Abraham (A)
 Seigal, Joseph A. (A)
 Senauke, Alexander (M)
 Shannon, Joseph H. (M)
 Shelby, R. E. (A)
 Shen, S. Z. (A)
 Sherman, Jesse B. (J)
 Shute, Emmett R. (M)
 Sigety, Louis (J)
 Singer, Emanuel (A)
 Sivian, Leon J. (A)
 Skirrow, John E. (M)
 Small, Percy L. (A)
 Smith, John S. (M)
 Smith, John W. (A)
 Smith, Samuel S. (A)
 Snow, William B. (A)
 Solov, Abraham (A)
 Sonkin, David (M)
 Soule, Harold (A)
 Southworth, G. C. (M)
 Spence, P. W. (A)
 Spicer, Floyd O. (A)
 Spielman, H. Max (A)
 Sprague, Clarence A. (M)
 Stansel, Frank R. (A)
 Stone, Ellery W. (F)
 Swain, Robert R. (A)
 Sweeney, Carey P. (A)
 Sykes, Rodger Allen (A)
 Taussig, Charles W. (A)
 Taussig, William S. (A)
 Taylor, Charles H. (F)
 Taylor, Edmund R. (A)
 Taylor, Jay L. (A)
 Taylor, S. Gordon (A)
 Taylor, W. H., Jr. (M)
 Teeter, Albert A. (A)
 Theremin, Leon (A)
 Thielen, E. J. (A)
 Thompson, Albert C. (A)
 Thompson, Roy E. (M)
 Thurston, George (A)
 Tierney, Walter L. (M)
 Toth, Albert F. (A)
 Trapkin, Jack H. (A)
 Truax, John (A)
 Tuel, A. Y. (A)
 Turner, Alva (A)
 Turney, Eugene T., Jr. (A)
 Vaill, Edward W. (A)
 Valesio, Mario J. (A)
 Van Wyck, William Paterson (A)
 Vaughan, Carroll B. (A)
 Venable, Richard Neel (A)
 Verralls, J. Maynard (A)
 Victoria, Joseph Lawrence (A)
 Volkmann, John E. (A)
 Volney, S. C. (A)
 Voorhees, Lee J. (A)
 Vreeland, Frederick K. (F)
 Waas, Albert (A)
 Wald, David (A)
 Wallach, Moses U. (A)
 Walsh, A. L. (A)
 Walworth, Fred (A)
 Washington, Bowden (F)
 Waterman, Frank N. (M)
 Weiland, Christian F. (A)
 Weinberger, Julius (F)
 Wellman, William R. (A)
 West, L. E. (A)
 Wettermann, John A. (A)
 Wheeler, George D. (A)
 White, Philip S. (A)
 Whitmer, Robert M. (A)
 Whittemore, L. E. (F)
 Wickersheim, L. W. (A)
 Wilbur, Edwin C. (A)
 Willhofft, Frederick O. (A)
 Wilson, H. Warden (A)
 Wilson, Leon T. (M)
 Wilson, William (F)
 Winner, Lewis (A)
 Winterbottom, William A. (M)
 Wintringham, William T. (A)
 Wisegarver, Orton H. (A)
 Wolf, Irving (A)
 Woodcock, N. A. (A)
 Woodrow, William (A)
 Wortman, E. C. (A)
 Wright, Harry M. (A)
 Wunderlich, H. A. F., Jr. (A)
 Yolles, Jacob (A)
 Young, Owen D. (F)

NEW YORK (Continued)

New York (Continued)

Youngstrom, Nels C. (A)
Zeamans, Harold R. (A)

Niagara Falls

Brown, Orlan R. (A)
Guinther, George (A)
Lidbury, F. A. (A)
White, John A. (A)

North Tarrytown

Sandalls, George T., Jr. (A)

North Tonawanda

Maxwell, George G. (A)
Schurr, William (A)
Shapiro, L. (M)
Wesselman, Eugene (A)

Orient

Vail, Leslie G. (A)

Ossining

Akin, Robert M., Jr. (A)
Gowen, Robert F. (M)

Ozone Park, L.I.

Misenheimer, Robert G. (A)
Weilminster, Charles (A)

Pelham

Kelly, C. Merrill, Jr. (A)
Kolb, Walter R. (A)

Pelham Manor

Kelly, Dale (A)

Poland

Prentiss, Howard H. (A)

Port Jefferson, L.I.

Carter, Phillip S. (A)
Hansell, Clarence W. (M)

Port Jervis

Gibbons, Joseph W. (A)

Port Washington, L.I.

Hafner, Gilbert (A)
Whiting, Donald F. (M)

Poughkeepsie

Boyle, Frank A. (A)
Smith, Harold E. (A)

Rhinebeck

Lang, Walter T. (A)

Richmond Hill, L.I.

Brothers, James T. (A)
Grebe, Alfred H. (F)
Heins, Henry F. (A)
Hudtwalker, William Theodore (A)
Leyh, William D. (A)
Oram, Donald K. (A)
Weinwurm, Robert (A)

Riverdale-on-Hudson

High, John M., Jr. (A)

Riverhead, L.I.

Braaten, Arthur M. (A)
Crosby, Murray G. (A)
Hollingsworth, R. L. (A)
Matthews, Walter I. (A)
Moore, John B. (A)
Morris, Leon A. (A)
Peterson, Harold O. (A)
Pfautz, Christian E. (A)
Rundquist, Elliot C. (A)
Schoenborn, Ferdinand (A)
Smith, Arthur Z. (A)
Stagg, Carl (A)
Trevor, Bertram (A)
Wickizer, Gilbert S. (A)

Rochester

Bachofer, C. L. (A)
Balling, Alfred W. (A)

Barfield, A. R. (A)
Bedford, Donald D. (A)
Brown, Gordon P. (A)
Brown, Howard A. (A)
Clarke, Maurice H. (A)
Cote, Omer E. (A)
Dwyer, Vincent J. (A)
Ester, Perry W. (A)
Foster, Charles W. (A)
Friedler, Dewey P. (A)
Gallagher, Edward M. (A)
Gordon, Harry E. (A)
Graham, Virgil M. (M)
Haas, Paul (J)
Hanover, Edward A. (A)
Haugh, Arthur T. (M)
Hitchcock, Joseph F. (A)
Huntington, Maurice B. (A)
Karker, Earl C. (A)
Klumb, Harvey J. (A)
Levy, Maurice L. (A)
Lewis, Bertram L. (A)
Lucia, Raymond H. (A)
Maloff, Ioury G. (M)
Manson, Ray H. (M)
Martin, V. G. (A)
McCall, Keith E. (A)
McCanne, Lee (A)
McCanne, W. Roy (M)
Melchior, Frants Ansgar (A)
Moore, Eric J. T. (M)
Mott, Frederick A. (A)
Reddy, Walter G. (A)
Roesser, Edward A. (A)
Schneider, Mendell (A)
Schoen, Arthur L. (A)
Scoville, George A. (A)
Serge, Igor Bobrovsky (M)
Sigl, A. J. (A)
Soderholm, Arthur E. (A)
Studier, Walter A. (A)
Sylvester, Arthur (A)
Welsh, Fred E. (A)
White, Warren W. (A)
Wiebach, William T. (A)
Wishart, William R. (A)
Wood, Merrill A. (A)
Woodworth, E. C. (J)
Worrell, Richard A. (A)

Rockville Center, L.I.

Cardwell, Allen D. (A)
Harper, A. E. (M)
Hart, Lester B. (A)
Hinnners, Frank A. (F)
Lester, Paul Sabine (A)
Weeks, Norman E. (A)

Rocky Point, L.I.

Abbott, Walter (A)
Clifton, B. S. Y. (M)
Finch, James L. (M)
Goldstine, Hallan E. (A)
Henery, R. S. (A)
Kipp, Aaron (J)
Michelman, Edward A. (A)
Tammara, Joseph C. (A)
Usselman, George L. (A)

Rome

Bevitt, William D. (A)

Sanborn

Welsler, Carl E. (A)

Saranac Lake

Riddle, William E. (A)
Williams, Thomas E. (A)

Sayville, L.I.

Hart, Frank A. (A)

NEW YORK (Continued)

Scarsdale

Appel, Joseph H., Jr. (A)
Kinsley, Carl (M)

Schenectady

Acheson, Marcus A. (A)
Alexanderson, E. F. W. (F)
Andrews, Paul D. (M)
Anson, C. T. (A)
Austin, Kirby B. (A)
Ayer, Raymond B. (A)
Baker, W. R. G. (F)
Ballentine, Edwin C. (M)
Berejkoff, Anatol Petrovich (A)
Berg, Ernest J. (A)
Bergeron, Rosario (A)
Billings, James H. (A)
Bradbury, Burke (A)
Brockman, Francis C. (A)
Brokaw, Charles A. (A)
Brown, William W. (M)
Byrnes, Irving F. (A)
Carlson, Wendell L. (A)
Carpenter, Glenn W. (A)
Coombs, Clyde F. (A)
Cottrell, McKenzie (A)
Crippen, Eugene G. (A)
Cummings, B. Ray (M)
Darlington, Eugene S. (A)
David, William R. (A)
De Haven, Thomas V. (A)
Demmer, A. H. (A)
De Nardo, Federico (J)
Devaud, Albert J. (A)
De Wait, K. C. (A)
Dickinson, Theodore M. (A)
Dodge, Albert O. (A)
Dome, Robert B. (A)
Douthit, M. L. (A)
Duttera, W. S. (A)
East, Lawrence A. W. (A)
Edwards, Edmund P. (M)
Engstrom, Elmer W. (A)
Eveleth, Laurence Nelson (A)
Ferris, Warren Robert (A)
Fitch, William (A)
Ford, Warren A. (A)
Frank, Charles W. (A)
French, Henry G. (A)
Frink, Frederick William (A)
Fritschel, Eugene H. (A)
Garrett, Charles R. (A)
Grover, Frederick W. (M)
Gunter, Clarence A. (A)
Hansen, John C. (A)
Hargrave, W. A. (A)
Henyman, George W. (A)
Hitt, A. B. (A)
Hopkins, John S. (J)
Hoxie, Charles A. (A)
Jackson, Henry W. (M)
Johnson, T., Jr. (M)
Jones, L. F., III (A)
Junken, L. H. (A)
Kaar, Ira J. (M)
Kinney, Ely M. (A)
Lamb, G. F. (A)
Langdon, G. G. (A)
Langmuir, Irving (F)
Larson, Robert W. (A)
Lee, Samuel T., Jr. (J)
Leibing, Joseph K. (A)
Loughren, Arthur V. (M)
Lyndon, William L. (A)
Lynn, L. H. (A)
Lynn, Roland A. (A)

Scotia

Allen, Hugh E. (A)
Artzt, Maurice (A)
Chittick, K. A. (A)
Clarke, Varro J. (A)
Fick, Clifford G. (A)
Juchter, Pieter (A)
Poch, Waldemar J. (A)
Richardson, L. Walton (A)
Schwarzaupt, Paul J. (M)
Smith, J. P. (A)
Steiner, Harry C. (A)
Thomas, George G. (A)

Maser, Harold T. (A)
Maynard, J. E. (A)
McLennan, Miles Aryault (A)
Mead, Milton S. (A)
Meahl, Harry R. (A)
Metcalf, George F. (A)
Moles, Frank J. (A)
More, Clifton C. (A)
Morgan, Howard K. (A)
Mullaney, Dudley A. (A)
Nergaard, Leon S. (A)
Newton, Raymond A. (A)
Nickle, Emil G. (A)
Nolte, Henry J. (A)
Orr, Robert W. (A)
Patterson, Franklin G. (A)
Payne, John H. (A)
Petterson, Junior (A)
Pike, Otis W. (M)
Prescott, Maurice L. (M)
Priebe, Frank (A)
Priest, Conan A. (A)
Pulley, Albert A. (A)
Rice, Chester W. (F)
Robinson, Harris A. (A)
Rochford, John (A)
Rockwood, Alan C. (A)
Roys, H. E. (A)
Ryder, Jack D. (A)
Sadenwater, Harry (M)
Scheldorf, Marvel W. (A)
Selby, Eugene O. (A)
Serrell, Robert (A)
Sherman, Kenneth S. (A)
Short, Donald William (A)
Simonds, D. T. (A)
Simpson, Le Roy C. (J)
Sloan, David H. (A)
Snyder, Norman (A)
Somers, Brock A. (A)
Spitzer, Edwin E. (A)
Stanton, Clair F. (A)
Stauffer, Ray Everett (A)
Stocker, Arthur C. (A)
Stone, F. Byron (A)
Taylor, John Pratt (A)
Taylor, Laurens A. (A)
Taylor, R. B. (A)
Terrell, John A. (A)
Thompson, B. J. (A)
Tolson, W. A. (M)
Tyler, Kenneth G. (A)
Vose, Charles H. (A)
Wallace, Martin J. (A)
Warner, John C. (M)
Watts, D. E. (A)
Weir, Irwin R. (A)
Westendorp, W. F. (A)
Whelan, Dow O. (A)
White, William C. (M)
Wilson, Donald (A)
Woodworth, John L. (A)
Young, Charles J. (A)

NEW YORK (Continued)

Sea Cliff, L.I.
Husted, Donald R. (A)
Mickelson, C. D. (A)
Tangen, Reider (J)

Sheepshead Bay
Asch, Moe (A)

Southampton, L.I.
Buckingham, William D. (A)
Homer, Edward C. (A)
O'Connor, John G. (A)
Pollard, Leon G. (A)
Weik, Adolph L. (A)

Springfield, L.I.
Benjamin, Wesley E. (A)

Spuyten Duyvil
De Forest, Lee (A)

Stafford
Sheffer, Olan N. (A)

Stapleton, S.I.
McArdell, Wesley E. (A)
West, Clarence H. (A)

Staten Island
Younger, Charles (A)

Suffern
Ennis, Fred E. (A)
Osterland, Edmund (J)

Sunnyside, L.I.
Shannon, James E. (A)
Stewart, G. Edwin (A)

Syracuse
Blaich, J. Ray (A)
Christy, Donald P. T. (A)
Meredith, Clive B. (A)
Nicholson, E. J. (A)
Pierson, Theodore (J)
Porter, R. A. (A)
Potter, Melville R. (A)
Randall, Dormus P. (A)
Wolverton, Byron C. (A)

Tarrytown
Dinga, Emil (A)
Pineau, Norman T. (A)

Trudeau
Steneri, Arthur J. (A)

Tuxedo Park
Loomis, Alfred L. (M)

Utica
King, Francis N. (A)
Terrill, W. Nessler (A)

Victor
Long, John J. (A)

Water Mill, L.I.
Corwith, Howard P. (M)

Watkins Glen
Pomeroy, Rupert C. (A)

West Brighton, S.I.
Garland, J. Arnold (A)
Wombacher, Joseph A. (A)

West Hempstead, L.I.
Magness, Scott A. (A)
Westman, Harold P. (M)

West New Brighton, S.I.
Bedford, George W. (A)

West Point
Serig, Howard W. (A)
Wenstrom, W. H. (A)

White Plains
Griggs, Elmer V. (A)
Halstead, William S. (A)

Lamarque, James W. (A)
Locke, G. Edgar (A)
Minton, John P. (F)

Whitestone, L.I.
Adler, Benjamin (A)
Lederhaus, Herman William (A)
Summers, Llewelyn L. B. (A)

Williamsville
Hopkins, Nelson S. (A)
Trago, Robert A. (A)

Woodhaven, L.I.
Cooper, Gustavus A. (A)
Stellwagen, Frank W. (A)

Woodmere, L.I.
Birkhahn, Robert C. (A)
Ziegler, Frederick J. (A)

Woodside, L.I.
Reitenmeyer, Francis X. (M)
Reuman, William H. (A)

Yonkers
Craig, Albert G. (A)
Enders, Charles F. (A)
Runyon, Carman R., Jr. (A)
Seitz, Frank A., Jr. (J)
Swanson, John W. (M)
Terwilliger, Donald J. (A)
Whitaker, James N. (A)
Van Dyck, Arthur F. (F)

NORTH CAROLINA

Asheville
Lance, Hubert H. (A)
So Relle, J. L. (A)

Charlotte
Callahan, Thomas G. (A)
Gluck, E. J. (A)
Saylor, James G. (A)

Durham
Seeley, Walter J. (A)

Gastonia
Morris, Robert S. (A)

Henderson
Woodlard, E. W. (A)

Mt. Airy
Worrall, W. W. (A)

Washington
Jowdy, Mitchell (A)

NORTH DAKOTA

Bismarck
Lucas, Stanley M. (A)

Fargo
Cook, Tedd W. (A)
Swisher, Charles L. (A)

Grand Forks
Garard, Earl A. (A)
Jenkins, David R. (A)

Mandan
Hood, Norman R. (A)

OHIO

Akron
Aitkenhead, John, Jr. (A)
Curtis, James O. (A)
Dinger, Harold E. (A)
Ehrisman, Henry O. (A)
Ludlow, Gilbert H. (A)
Mintz, John W. (A)
Palmer, Roland F. (A)
Smith, Paul Clarence (A)

OHIO (Continued)

Akron (Continued)
Townsend, Samuel W. (A)
Weaver, Rayman E. (A)
Werhan, Alfred B. (A)
Wilkens, Bernard T. (A)

Alliance
Ackerman, F. R. (A)
Morgan, O. K. (A)

Ashtabula
Andrus, Roy E. (A)

Ashtabula Harbor
Hopper, C. L. (A)

Athens
Green, Darrell B. (A)

Avon Lake
Harris, John (A)

Barberton
Hillebrand, W. A. (M)

Berea
Anderson, Raymond T. (A)

Canton
Catterall, John B. (A)
Herbruck, William M. (A)
Pennock, P. L., Jr. (A)

Chardon
Canfield, Ira A. (A)

Cincinnati
Aughenbaugh, William K. (A)
Austin, Edward (A)
Boes, W. W. (A)
Bussard, E. J. H. (A)
Chambers, Joseph A. (A)
Craig, Palmer H. (A)
Crosley, Powel, Jr. (M)
Dixon, C. C. (A)
Felix, Clarence G. (A)
Glover, Ralph P. (A)
Hunter, Theodore A. (A)
Israel, Dorman D. (A)
Jeng, L. Y. (A)
Kellogg, Leonard A. (A)
Kilgour, Charles (A)
Klein, Helen (A)
Kolks, Richard H. (A)
Lampkin, Guy F. (A)
Langley, Ralph H. (F)
Lehnhoff, Raymond G. (A)
Meyrose, Hubert S. (A)
Osterbrock, W. C. (A)
Peterson, Charles W. (A)
Vanek, Lawrence J. (A)
Verkley, B. M. (A)
Walker, Frank (A)
Youngs, Howard E. (A)

Cleveland
Ackerman, E. K. (A)
Ayer, Oliver G. (A)
Baeckler, Walter (A)
Benkelman, Glen F. (A)
Bowditch, Fred T. (A)
Butler, Roy (A)
Calkins, William G. (A)
Canady, Donald Ray (A)
Carlton, Raymond A. (A)
Covey, Gerald G. (A)
Crocus, John S. (A)
David, Bruce W. (M)
Daymude, John F. (A)
Deutsch, E. J. (A)
Disbrow, John N. (A)
Dodds, Lee L. (A)
Domizi, Dante (A)
Donaldson, Robert O. (A)
Dorazil, A. F. (A)

Cleveland Heights
Baier, Arthur H. (A)
Baier, Henry J. (A)
Farnham, Ralph E. (A)
Snyder, Robert E. (A)
Williams, Hollie (A)

Columbus
Bidlack, Cecil S. (A)
Conrad, Willard Oliver (J)
Crisante, Aldo (A)
Everitt, William L. (M)
Graham, J. P. (A)
Higgy, Robert C. (A)
Krumm, Louis R. (M)
Leeka, Warren C. (A)
Mercer, Alva (A)
Newby, R. W. (A)
Rosenfeld, Millard (A)
Smith, Sereno E. (A)
Storck, Howard C. (A)

Dorn, Harry P. (A)
Durante, Jean Andre (A)
Eberle, Wilbert H. (A)
Engholm, Bernard A. (M)
Filgate, John T. (A)
Fouse, Harold (A)
Fowler, J. Randall (A)
Glatz, Henry (A)
Gove, Edward L. (A)
Gray, Floyd E. (A)
Gray, Harold E. (M)
Hannum, J. C. (A)
Henry, Allen W. (A)
Hunt, Louis W. (A)
Hybarger, H. K. (J)
Irvine, Robert P. (A)
Jarvis, Kenneth W. (M)
Jenkins, Myron Z. (A)
KaDell, Harold William (A)
Kaehni, Frank J. (A)
Kintner, Deane S. (A)
Klein, Israel (A)
Lefler, Ralph H. (A)
Martin, Frank J. (A)
McCollister, Donald (A)
McGeorge, Donald (A)
McIlvaine, Oran T. (M)
McMahon, Alvin (A)
Melrose, James W. (A)
Nelson, James R. (M)
Newman, Joseph S. (A)
O'Connor, Albert J. (A)
Okeson, Hugh Bingham (A)
Ostrander, Russell S. (J)
Pruitt, Wilbur C. (A)
Robertson, Frank E. (A)
Schneeberger, G. B. (A)
Schregardus, Dirk (A)
Scott, Ernest P. (A)
Scott, Hoyt S. (M)
Seitz, Valentine (A)
Shaw, John J. (A)
Simpson, Paul A. (A)
Smith, F. J. (A)
Sturtevant, Mark (A)
Teunisson, John F. (A)
Tummonds, Harry A. (A)
Umbreit, Stanton (A)
Victoreen, John A. (M)
Waite, Howard G. (A)
Ward, Donald O. (A)
Watts, E. Gerald (A)
Wells, Leland E. (M)
Worst, J. S. (A)
Yurgionas, John A. (A)

OHIO (Continued)

Dayton

Anderson, J. E. (A)
 Barbulesco, Constantin D. (M)
 Bickel, Howard I. (A)
 Copp, Roy S. (A)
 Cotter, Edwin Meredith (A)
 De Wesse, Herbert William (A)
 Finter, C. V. (A)
 Flewelling, Edmund T. (A)
 Franzwa, Frederick J. (A)
 Friedman, Harry (A)
 Gerstle, John (A)
 Glendenning, D. B. (A)
 Harmon, W. S. (A)
 Hendricks, Lester A. (A)
 Knott, William M. (A)
 Loftis, Homer J. (A)
 Lohmann, Robert S. (A)
 Richmond, L. P. (A)
 Roberts, Haydn P. (M)
 Shaw, Frederick L. (A)
 Zimmerman, Robert F. (A)

Dover

Weber, H. S. (A)

East Cleveland

Beasley, Ira E. (A)
 Gimmy, Norman H. (A)
 Leonard, S. Edwin, Jr. (A)
 MacLaren, Wallace E. (A)
 Siddall, Richard (A)
 Shipman, Charles H. (A)

East Sparta

Walker, Nolan S. (A)

Fairview Village

Black, Albert J. (A)

Fostoria

Elsca, Farrel F. (A)

Gambier

Cottrell, Casper L. (A)

Gibsonburg

Clark, Edgar J. (J)

Green Camp

Barber, D. G. (A)

Greentown

Myers, Willard D. (A)

Hamilton

Petry, C. A. (A)
 Probst, John E. (A)

Holland

Line, F. M. (A)

Hudson

Lowrer, R. W. (A)

Indian Lake

Thomas, W. Raymond (A)

Kent

Kline, Robert L. (A)

Lakewood

Drummond, P. (A)
 Hamman, G. B. (A)
 Hood, William A. (A)
 King, Maurice V., Jr. (A)
 La Ganke, H. C. (A)
 Little, D. S. (A)
 Marsal, Paul A. (A)
 Pichon, Richard S. (J)
 Satterthwaite, William F. (A)
 Sturtevant, James W. (A)
 Worden, Ralph P. (A)

Lexington

Shuler, John H. (A)

Lorain

Fox, Robert A. (A)

Marietta

Johnson, J. L. (A)
 Muscari, Pietro J. C. (A)

Massillon

Schwab, Charles B. (A)
 Trubey, Lester E. (J)

Mason

Berry, Robert C. (A)
 Davis, Irving C. (A)
 Whitehouse, Joseph E. (A)

Mt. Healthy

Lockwood, Edward C. (A)

New Philadelphia

Murray, Charles J. (A)
 Nolan, John M. (A)

Niles

Coleman, Robert M. (A)
 DeCola, Rinaldo (A)
 Parlas, Joseph L. (A)

North Canton

Boger, Clair E. (A)

Norwalk

Leonhardt, Charles C. (A)

Norwood

Blair, Russell M. (A)
 Dwyer, Robert J. (A)

Parma

Burkhardt, Karl R. (A)

Payne

Huguenin, Glenda (J)

Port Clinton

Anderson, Gilbert J. C. (A)

Portsmouth

Jackson, Sylvan E. (A)

Ravenna

Rettig, Floyd A. (A)

Sandusky

Voight, Richard J. (A)

Shiloh

White, Kenneth E. (A)

South Charleston

Wells, Martin M. (A)

South Euclid

Glover, Gerald W. (A)

Springfield

Biver, Carl J. (A)
 Estey, F. Clifford (A)
 Hayslett, L. E. (A)
 Reid, Thomas A. (A)
 Schaefer, Carl A., Jr. (A)
 Stolzenbach, R. W. (A)
 Thomas, Harry E. (A)

Toledo

Bitter, A. Romeyn (A)
 Browne, Merton S. (A)
 Dietsch, Carl G. (A)
 Dupuis, Ernest F. (J)
 Foley, J. W. B. (A)
 Franklin, Townsend U. (A)
 Pilzecker, Arthur (A)
 Skeels, Dudley K. (A)

Wapakoneta

Copeland, Herman A. (A)

Warren

Fleming, Edward E. (A)

Youngstown

Hoffman, Donald A. (A)
 Kincaid, Owen D. (A)

OHIO (Continued)

Youngstown (Continued)

Pennock, P. L., Sr. (A)
 Phillips, R. G. (A)
 Remedio, Dominic (A)

Zanesville

Bell, Lewis M. (A)

OKLAHOMA

Alva

Sears, Garold D. (J)

Bartlesville

Fisher, Frank E. (A)
 Miller, Erdene K. (A)

Chelsea

Jones, Varnakale L. (A)

Chickasha

Shultz, E. Patterson (J)

Enid

Edwards, Lyman M. (A)

Lawton

Newsom, T. (A)

Muskogee

Sams, E. E. (A)

Oklahoma City

Allen, Roy (A)
 Bathe, Charles E. (A)
 Challenner, Ansel (A)
 Cole, Roy H. (A)
 Gordon, Earl P. (A)
 Hirdler, F. C. (A)
 Kramer, V. J. (A)
 Lovell, Herman J. (A)
 Mier, C. W. (A)
 Miller, Wayne (A)
 Moffett, Leroy, Jr. (A)
 Moore, Paul J. (A)
 Pata, Yaromir J. (A)
 Prell, George R. (A)
 Stokes, Ray (A)
 Wallace, David R. (A)

Okmulgee

White, R. Jordan (A)

Peckham

Brown, Edwin C. (A)

Stillwater

Oboukhoff, Nicholai M. (M)

Stillwell

Necley, Carl E. (J)

Tulsa

Banks, J. Vernon (A)
 Bowen, Leonard R. (A)
 Breeding, S. H. (A)
 Carpenter, Hugh (A)
 Drake, Norman B. (A)
 Jones, Burle R. (A)
 McNally, Eugene C. (J)
 Mealy, Max B. (J)
 Miller, Claude E. (A)
 Murphy, Paul L. (A)
 Phillips, Howard W. (A)
 Probert, Edward (A)
 Stinson, Lawrence W. (A)
 Thompson, W. H. (A)
 Unruh, Franklin T. (A)
 Van Doeren, C. A. (A)
 White, Karl K. (J)
 Willson, P. L. (A)
 Wise, James O. (A)

Tuttle

Coates, B. Franklin (A)

OREGON

Astoria

LaSalle-Dilley, L. L. (A)

Corvallis

Jordan, Jacob (A)
 Klein, William S. (A)
 Morris, James M. (A)

Falls City

Paul, Byron R. (J)

Hillsboro

Julien, Ira F. (M)

Oregon City

Newman, Clarence D. (A)

Portland

Dixon, Ashley C. (A)
 Johnson, I. W. (A)
 Last, George O. (A)
 McCargar, S. Harold (A)
 Neubauer, Edwin William (A)
 O'Day, Marcus (A)
 Sachs, Harold S. (A)
 Trumbull, A. F. (A)

Salem

Churchill, H. B. (A)
 Leamer, Frank D. (A)
 Poujade, D. G. (J)

PENNSYLVANIA

Adelia

Woodward, Bruce J. (A)

Aldan

Earle, Ralph P. (A)

Allentown

Bowman, Charles W. (A)
 Clauss, Fred W. (A)
 Dreisbach, Blair (A)
 Eckert, Byron H. (A)
 Foley, W. R. (J)
 Haines, A. J. D. (A)
 Hardner, Francis J. (A)
 Heimbach, Charles W. (A)
 Hilliard, Winfield E. (J)
 Keck, Kenneth K. (A)
 Kurtz, Clyde R. (A)
 Muthart, John A. (A)
 Peters, Arthur A. (J)
 Pond, Edward W. (A)
 Rauhofer, Frank (A)
 Richardson, George A. (J)
 Sauerwine, Charles Augustus (A)
 Thomas, Charles V. (A)
 Williams, Thomas R. (A)
 Wissler, Benjamin F. (A)
 Young, Charles S. (A)

Allenwood

Schooley, Harold (A)

Altoona

Douglas, Earl C. (A)
 Leutz, Charles R. (M)
 Youngkin, Ernest E. (J)

Ambridge

Svegel, Peter J., Jr. (J)

Ardmore

Wilkinson, Gordon O. (A)
 Worrell, Howard S. (A)

Avalon

Allen, James G. (A)

Bala-Cynwyd

Croft, Samuel H. (A)
 March, Hallman W. (J)

Bangor

Bruschi, Lewis John (A)

PENNSYLVANIA (Continued)

Bath Graver, Frank S. (A)

Bellevue
Armor, James C. (A)
Dauber, Albert E. (A)
Donbar, C. Floyd (A)

Bethlehem
Bertolet, Benneville S. (A)
Hottel, C. W. (A)
Maylott, Carleton F. (A)
Seyfert, Stanley S. (M)

Bradford
Francis, Thomas C. (A)

Brownstown
Harnish, Ray M. (A)

Bridensburg
Kearney, William A. (J)

Bryn Mawr
Tuttle, William N. (A)

Bywood
Brown, Henry J. (A)

Cambridge Springs
Lord, Harry R. (A)

Carrolltown
Brophy, Francis Joseph, Jr. (A)

Chambersburg
Ramsey, R. W. (A)

Chester
Nadig, Stanton E. (A)
Rapagnani, Peter A. (A)

Chestnut Hill
O'Neill, John P. (A)

Churchville
Hinkel, Walter A. (A)

Clearfield
Moyer, Elmo Emerson (A)

Connellsville
Craig, Jack (J)
Silcox, Albert S., Jr. (A)

Crescon
Vaughan, Kenneth A. (A)

Cynwyd
Chubb, Lewis W. (M)

Danville
Deaner, Haydn M. (A)

Darby
Knight, Winfield W. (A)

Darlington
Rohrmann, Edward R. (A)

Dormont
Thomas, William K. (A)

Drexel Hill
Brandt, William A. (A)
Shafer, Albert G. (A)
Sharpless, A. Roberts (A)
Willard, Joseph M. (A)

Easton
Beans, Floyd (A)
Deutschman, Borah (A)
Fox, Paul S. (A)
Raesly, James B. (A)
Weller, Everett C. (A)

East Pittsburgh
Conrad, Frank (F)
Evans, Walter C. (M)
Hanna, Clinton R. (M)
Hitchcock, R. C. (A)
Kintner, Samuel M. (F)

Edgewood
Lewis, L. V. (A)
McCullough, F. S. (M)

Emporium
Jones, Walter R. (A)
Rishell, George L. (A)

Eric
Jordan, Ralph E. (A)
Swanson, Merrill J. (A)

Etna
Johnstone, R. S. (A)

Fox Chase
MacFadden, Wilford C. (A)

Frackville
Horwat, Peter (A)

Fullerton
Bachman, Edwin J. (A)

Germantown
Bromley, John E., Jr. (A)
Burnside, Don G. (A)
Weyl, Charles N. (M)

Glassport
Hertz, Stanton (A)

Glenside
Griffith, Charles H. (A)

Greensburg
Hawk, William K. (A)

Harrisburg
Beachley, Vance E. (A)
Chambers, William B. (J)
Detweiler, Jay E. (J)
Gardner, William L., Jr. (A)
Grim, Clair R. (A)
Hall, Thomas, Jr. (A)
Hardy, George E. (A)
Heckman, J. W. (A)
Hoover, Reuben R. (A)
Knerr, G. Russell (A)
McCachren, W. S. (A)
Miles, Lester F. (A)
Mummert, Russell E. (J)
Novinger, Earl M. (A)
Peffer, Ralph M. (A)
Poorman, Arthur E. (A)
Schwanger, Robert M. (A)
Sours, M. D. (A)
Steiger, Charles H. (A)
Stormfeltz, S. H. (A)
Walanka, M. R. (A)

Highland Park
Greenwald, Arthur A. (A)

Honesdale
Burlein, Lester F. (A)
Stephens, William H. (A)

Irwin
Brook, Alf (A)

Jenkintown
Greenway, William L. (A)

Johnsonburg
Baldwin, Arthur V. (A)

Johnstown
Hanson, Herbert (A)
Reid, A. J. (A)

Kane
Beatty, Rue Thompson (A)

Kingston
Brown, Ralph M. (A)

Knox
Smith, Jesse W. (A)

MEMBERSHIP (Geographical)

PENNSYLVANIA (Continued)

Lancaster
Gaintner, Joseph R. (A)
Geise, Julius C., Jr. (A)
Snavey, B. L. (A)
Stauffer, J. Luke (A)

Landisville
Mumma, Earle L. (A)

Langhorne
Newbold, W. H. (A)

Lansdale
Schieber, Leonard B. (A)

Lansdowne
Kimball, Gardner W. (A)
Thompson, Roland F. (A)
Warren, S. Reid, Jr. (A)
Wilson, A. T. (A)

Lehigh
Butler, Harry F. (A)

Lemoine
Rogers, Clifford H. (A)

Lester
Causse, Roger D. (J)

Mill Hall
Miller, Carl (A)

Narberth
Bates, Clifford W. (A)

Matamoras
Willers, Theodore H., Sr. (A)

Media
Delbert, Simon, Jr. (A)

Melrose Park
Druecking, Albert J. (A)

Mill Hall
Miller, Carl (A)

Milton
Butler, Wilson M. (A)

Mt. Airy
Ehret, Cornelius D. (F)
Ellinwood, Kenneth M. (J)
Keast, Philip M. (A)
McDowell, Albert P., Jr. (A)
Raycroft, Louis B. F. (A)

Mt. Carmel
Gross, Benjamin F. (A)

New Castle
Martin, Norman A. (A)

Norristown
Hausmann, Ernest O. (A)
Place, Samuel W. (A)
Rue, William F. (A)
Sands, William F. (A)

Northampton
Lewis, Chester, Jr. (A)

Oil City
Imler, Glenn M. (A)
Paca, William S. (A)

Overbrook
Closson, H. B., Jr. (J)

Palmyra
Balsbaugh, Clair L. (A)
Krieder, James L. (A)

Parnassus
McKinley, J. G. (A)

Pennbrook
Amsden, Frank Power (A)

Penn Wynne
Saunders, William P. (A)

Philadelphia

Apker, Charles L. (A)
Barton, R. W., Jr. (A)
Bechler, W. C., Jr. (A)
Benge, J. R. (A)
Bonn, Norman E. (A)
Borland, Albert S. (A)
Bosco, Joseph F. (J)
Brown, H. Wilbur (A)
Brown, William L. (A)
Burgess, Edward R. (A)
Butler, Richard A. (A)
Caporale, Peter (A)
Cerstvik, Stephen (A)
Chesney, John J. (A)
Clark, Charles F. (A)
Cordova, F. B. (A)
Deal, Harmon B. (M)
Doherty, George H. M. (J)
Doyle, E. D. (A)
Dunn, James C. (A)
Earnshaw, David P. (A)
Eaton, George W., Jr. (A)
Ebert, Burton E. (A)
Eby, Hugh H. (A)
Eby, John B. (A)
Eckert, Edward J. (A)
Ellis, William G. (M)
Etkin, Harry (A)
Fisher, Roy S. (A)
Fossett, Fred E. (A)
Freedman, H. J. (A)
Frigar, John, III (A)
Gengenbach, Albert W. (A)
Godsho, Albert P. (A)
Greathead, Arthur W. (A)
Griffith, M. H. (A)
Hagan, Edward J. (J)
Helfenstein, Edwin (A)
Hershey, Arthur W. (A)
Hofberg, Alf H. (A)
Holden, Ellis Gray (A)
Holland, Walter E. (M)
Holtzizer, Ralph (A)
Huttenloch, Robert M. (J)
Hyatt, C. Brown (A)
Johnson, Harmon (A)
Karcher, Donald (J)
Kearney, L. E. (A)
Keller, Paul A. (A)
Kienzle, D. R. (A)
Klenk, Julius G. (A)
Kloss, Frederick W. (A)
Leonard, John M. (A)
Lo, Tsu Zui (A)
MacHugh, William L. (A)
MacNabb, Vernon C. (A)
Martino, Alphonse E. (A)
Mattia, Ralph F. (A)
Mayea, Lawrence E. (A)
Mayers, Harvey F. (A)
Merkel, Henry F. (A)
Mevius, John C. (A)
Miller, Charles C. (A)
Miller, John M. (F)
Morris, George W. (A)
Morrow, Lorentz A. (A)
Mouradian, H. (A)
Mousley, Franklin (A)
Murri, Joseph (A)
Neutra, Benjamin B. (A)
Nichols, J. J. (A)
Overmiller, Clair M. (A)
Ponsford, Walter W. (A)
Rabinowitz, Meyer (A)
Reeb, Alfred (A)
Reeves, E. H. (A)

PENNSYLVANIA (Continued)

Philadelphia (Continued)

Reid, Floyd F. (A)
Remmlin, C. D. (A)
Robinson, Aloysius V. (A)
Roman, Frank E. (J)
Ross, Stewart C. (A)
Schulmerich, G. J. (A)
Schweikart, William F. (A)
Seaman, John C. M. (A)
Senior, David B. (A)
Shannon, Frank J. (A)
Shea, Richard F. (A)
Sirms, Wiswald J. (A)
Snyder, Christopher L. (A)
Snyder, Richard L. (A)
Stover, Wilmer A. (A)
Tarzian, Sarkes (A)
Tindel, Charles G. (A)
Traugott, Paul (A)
Travis, Charles (A)
Trinkle, Wilmer S. (A)
Trump, William II. (A)
Trumpy, Jay W. (J)
Tuska, Clarence D. (A)
Tuttle, Elbert B. (A)
Van Horn, J. C. (M)
Van Housen, C. H. (A)
Wockey, Peter F. (A)
Wolf, Clarence, Jr. (J)
Wynne, Walter M. (A)
Yost, John C. (A)

Phoenixville

Shuhart, John H. (A)

Pittsburgh

Armstrong, Ralph W. (A)
Baumgarten, Frank A. (A)
Brader, Norwood H. (A)
Buehl, Louis H. (A)
Buerger, Charles B. (A)
Buzzard, A. J. (A)
Clark, Clarence M. (A)
Cruikshank, Omar T. (A)
Davis, Robert L. (A)
Davis, Sheldon Irwin (A)
Diamond, Hyman (A)
Dill, George C. (A)
Faulstich, C. J. (A)
Gorham, Robert C. (A)
Griffith, Roy T. (A)
Haller, George L. (A)
Hand, Carl A. (A)
Harrison, Jamison R. (A)
Irving, Herbert W. (A)
Joller, Casper R. (A)
Lazich, Branko (A)
Miller, Paul J. (A)
Molk, F. T. (A)
Nichols, Harry J. (A)
Osborn, Perry H. (A)
Ostermeir, C. H. (A)
Overholt, Ralph, Jr. (A)
Peters, Leo J. (A)
Phillips, Joseph H., Jr. (A)
Rafferty, Charles H. (A)
Richards, Folke (A)
Schlesinger, Louis B. (A)
Seaverson, Oswald I. (A)
Shafer, William L. (A)
Shreve, A. French (A)
Staeger, Stephen A. (A)
Stayer, David (A)
Sunnergren, Arvid P. (A)
Terven, Lewis A. (M)
Wallace, H. Edward (A)

Wensley, Roy J. (A)
Wiesmann, Edward T. (J)
Wyckoff, Ralph D. (M)

Pottstown

Betz, C. Leonard (A)
Fisher, Charles H. (A)
Mellon, Ralph E. P. (J)
Roeller, Henry S. (A)

Punxsutawney

Bowser, Jacob W. (A)

Quakertown

Bartholomew, Robert G. (A)

Reading

Albert, William V. (A)
Good, Horace D. (A)
Kissinger, J. Herbert (A)

Ridgway

Anderson, Thure C. (A)

Rosemont

Forstall, Edward L. (A)

Royersford

Freed, R. E. (A)

Schwenksville

Benner, Harold S. (A)

Scranton

Dolph, Stanley E. (A)
Graf, Joseph J. (M)
Irving, Ira M. (A)
Oschmann, Adolph W. (A)
Stevens, Wilbur C. (A)
Witkowski, Joseph F. (A)

Sharon

Rankin, Samuel A. (A)

Sharon Hill

Travis, Irven A. (A)

Shenandoah

Dresher, G. A. (A)

Slatington

Newhard, Stanley C. (A)

Smethport

Biever, Fred H. (A)
Pierotti, William L. (A)

South Tamaqua

Delp, Paul L. (A)

Springdale

Armstrong, Reece M. (A)

State College

Long, Marvin (A)
Woodruff, Eugene C. (M)

St. David's

Stewart, Charles H. (M)

Sunbury

Bartlett, Millard C. (A)

Swarthmore

Alpern, Dwight K. (A)
Fussell, Lewis (A)
Hayes, Ralph S. (A)

Swatara

Cassady, P. H. (A)

Swissvale

Bossait, Paul N. (A)
Shuey, Paul F. (A)

Temple

Stanton, R. E. (A)

Turtle Creek

Gunby, O. B. (A)

Uniontown

Crow, John B. (J)

PENNSYLVANIA (Continued)

Upper Darby

Cahill, James A. (A)
Chamberlain, Newton M. (A)
Dudley, D. Clinton (A)
Frazier, Howard S. (A)
Lewis, Oliver I. (A)
Slattery, John J. (J)

Wall

Popsack, Andrew A. (A)

Warren

Gruninger, John E. (J)

Waverly

Mack, Dahl W. (A)

Wayne

Adelberger, Paul J. (A)

Wesleyville

Dutton, George L. (A)

West Manayunk

Sweeney, Harold V. (A)

West Philadelphia

Knoll, Lloyd M. (M)
Logan, William S. (A)
Muncey, Allan R. (A)

Wilkes-Barre

Haines, Joseph, Jr. (A)
Paessler, Robert T. (A)
Shuster, Edmund F. (J)
Speicher, Ellsworth J. (A)
Stenger, J. H., Jr. (A)
Warner, Barney H. (A)

Wilkesburg

Baudino, Joseph E. (A)
Beers, G. Lisle (M)
Boddie, Clarence A. (A)
Brindley, William E. (M)
Carothers, William D. McL. (A)
Cunningham, David H. (A)
Cunningham, Thomas D. (A)
Downey, William C. (A)
Gregory, S. D. (A)
Grundmann, Gustave L. (A)
Johns, Francis J. (A)
Koch, Winfield R. (A)
Kotsch, Elmer G. (A)
Lehman, James N. (A)
Mag, Anthony (A)
Reynolds, C. C. (A)
Roess, Harold (M)
Shoup, Allen (A)
Sinnott, Chester M. (A)
Sutherland, Lee (M)
Trouant, Virgil E. (A)
Ulrey, Dayton (A)

Williamsport

Petts, Ronald G. (A)

Wynnewood

Secley, Samuel W. (A)

York

Gottlieb, Morris (A)
Lever, Philip R. E. (A)
Stewart, James W. (A)
Weigel, Richard C. (A)

Zelienople

Bassler, Sherman G. (A)

RHODE ISLAND

Cranston

Bargamian, John (A)

Edgewood

Cumerford, Arthur S. (A)

Greenwood

Grain, Everard B. (A)

North Providence

Thomas, Harold (A)

Providence

Andrews, Howard L. (A)
Brewster, O. H. (A)
Ganz, Arthur W. (A)
Gordon, George (A)
Leibow, Saul A. (A)
Maker, Albert E. (A)
Smith, Malcolm H. (A)

Wakefield

Taylor, Alfred R. (A)

Woonsocket

Gerry, Frank L. (A)
Teachman, Alfred E. (A)

SOUTH CAROLINA

Aiken

Terry, Laurence M. (A)

Anderson

Mitchell, John A. (A)

Charleston

Smith, Jesse H. (A)
Zeigler, T. W. (A)

Clemson College

Garrison, Paul J. (A)
Wilson, Walter B. (A)

SOUTH DAKOTA

Brookings

Crothers, H. M. (A)

Huron

Griffiths, A. Elmer (A)

Rapid City

Halley, Samuel R. (A)
Kammerman, John O. (A)

Sanator

Tilgner, Shelton R. (J)

Yankton

Nelson, Ivar (A)
Seils, Harry A. (A)

TENNESSEE

Athens

Knight, Gaylord A. (A)

Chattanooga

George, Everett E. (A)

Cleveland

Slaughter, Jack D. (A)

Knoxville

Adcock, Stuart E. (A)

La Grange

Sims, James W. (A)

Memphis

Cowles, John W., Jr. (J)
Pearce, Arthur (A)
Slavick, Henry William (A)

Nashville

Harness, Sam A. (A)
Leftwich, E. H. (A)
Montgomery, L. H., Jr. (A)
Randolph, George T. (A)

Normal

Moss, W. Hall (A)

Saltillo

Berry, James S. (A)

TEXAS

Albany
Codrington, Jerome H. (J)

Amarillo
Berg, Arthur A. E. (A)
Reville, T. A., Jr.
Todd, William F. (A)
Wimberly, W. Ben (J)

Austin
Jones, F. Burton (J)

Bastrop
Barrow, Lemuel T. (A)

Baytown
Groves, Wayland M. (A)

Beaumont
Bryan, William J. (A)
Daniels, Paul H. (A)
Gower, S. Gifford (A)
Johnson, Charles A. (A)
Trevey, C. B. (A)
Wengel, Raymond W. (A)

Brownsville
De Bardeleben, John F. (A)
Ogg, Glen R. (A)

Brownwood
Stark, L. P. (A)

College Station
Honnell, P. M. (A)

Dallas
Anderson, Donald T. (A)
Bennett, Porter T. (A)
Campbell, Donald O. (A)
Chapman, Alan B. (A)
Corry, Hal F. (A)
Crabtree, Alfred E. (A)
Evans, W. J. (A)
Feickert, Carl A. (A)
Flynn, Roy M. (A)
Glass, Robert Z. (A)
Godard, L. G. (A)
Hull, Blake D. (A)
Kancely, Norman J. (A)
Lawther, Harry P., Jr. (A)
Lewis, William S. (A)
McKinney, Joe H. (A)
Melroy, Harry C. (A)
Rich, F. L. (A)
Ritzau, K. (A)
Sheffield, H. M. (A)
Stewart, W. H. (A)
Witty, W. M. (A)
Zeidlik, William J. (A)

Denton
Fain, Edgar A. (A)

El Paso
Harold, George (A)

Ft. Worth
Abey, Robert E. (A)
Branch, William E. (M)
Golder, Frank E. (A)
Sullivan, J. R. (A)

Galveston
Dickey, J. W. (A)
Hughes, Kenneth E. (A)

Harper
Hopf, Max H. (A)

Houston
Austin, Francis M. (A)
Carter, William H., Jr. (A)
Chinski, Gerald R. (A)
Coe, James C. (A)

Crossland, Henry A. (A)
Duprec, Edmund M. (M)
Harvey, Francis M. (A)
Hoskins, Laban A. (A)
Kelly, Claude H. (A)
Machotka, Slavomir (A)
McDermott, Eugene (A)
McFarland, M. Ralph (A)
Ricker, Norman H. (A)
Stuedle, Emry C. (A)
Waters, James S. (A)
Wheeler, Harvey T. (A)
Zimmerman, George E. (A)

Jacksboro
Isbell, G. Terrill (A)

Kelly Field
Teague, T. T. (M)

Laredo
Otal, Carlos, Jr. (A)

Lubbock
Abbitt, William H. (A)

Mercedes
Schmitter, Ray M. (A)

Moody
McCauley, E. Ray, Jr. (A)

Odessa
Green, William G. (A)

Plano
Hays, Howard D. (A)

Port Arthur
Coburn, E. D. (A)

Rockland
Wilson, S. Earle (A)

Rowena
Machotka, Miroslav (A)

San Angelo
Jones, Frank M. (A)

San Antonio
Bridge, Robert B. (A)
Kanoofsky, Raymond (A)
Kidd, Thornton L. (A)
Kush, Fred W. (A)
Marriner, Alfred W. (A)
McShane, Joe Bailey (A)
Rayburn, Geoffrey D. (A)
Stroebe, John C., Jr. (M)
Wall, Leavell D. (A)

Waco
Jackson, Frank P. (A)

Wichita Falls
Ridling, Carroll W. (A)

UTAH

Murray
Smith, Edwin W. (A)

Ogden
Stanton, James M. (A)

Salt Lake City
Baldwin, John M. (A)
Baldwin, Nathaniel (M)
DeRemer, C. W. (M)
Lasky, Philip G. (A)
Westphal, Richard D. (A)
Yeates, Ephraim LeRoy (A)

Spanish Forks
Fullmer, Don A. (A)

VERMONT

Northfield
Howes, Douglas E. (A)

VIRGINIA

Alexandria
Dowie, James A. (M)
Evans, Louis M. (A)
Goggins, W. B. (M)
Harrison, Edgar (A)
Meyers, Paul F. (A)
Roesch, Robert E. (A)

Arlington
Mackay, Warren S. (A)

Danville
Clarke, Allen S. (A)

Norfolk
Kenny, Matthew (A)
Kortes, George T. (A)
Lord, Wilfred F. (J)
Payette, Walter S. (A)
Regan, Smiley I. (A)

Portsmouth
Baart, John C. (A)

Quantico
Eiler, E. E. (M)
Mizell, M. H. (A)
Pierce, Francis E. (M)

Richmond
Auckerman, U. H. (A)
Wood, W. H. (A)

Roanoke
Avery, Robert D. (J)
Maddox, Francis E. (A)

Rosslyn
Billups, Robert W. (A)

WASHINGTON

Auburn
Nagata, Charles N. (A)

Bremerton
Novotney, Harry J. (A)
Peterson, A. W. (M)
Wilson, George F. (A)

Cattle Point
Riley, Conrad D. (A)

Chelan
Kaul, William (A)

College Place
Kretchmar, G. G. (A)

Everett
Sands, Leo G. (J)

Fort Lewis
Shaw, Robert M. (A)

Gig Harbor
Berkheimer, R. H. (A)

Port Angeles
Kalin, Albert (A)

Richmond Highlands
Walker, Robert M. (A)

Seattle
Albert, J. H. (A)
Austin, Leslie C. (A)
Avery, Alfred L. (A)
Bach, Roy O. (A)
Binder, Theodore Joseph (A)
Brewington, Carl W. (A)
Budden, Frank W. (A)
Burleigh, John A. (A)
Carver, Orin H. (A)
Davis, R. K. (A)
Dawson, W. Robert (A)
Deardorff, Ralph W. (A)
Douglas, William A. (A)

Eastman, Austin V. (A)
Fitzpatrick, George William (A)
Foster, Nich H. (A)
Hackett, Paul J. (A)
Hamilton, Edward A. (A)
Helgren, Oiva M. (A)
Hemrich, Walter A. (A)
Hodges, Arthur T. (A)
Iverson, I. Vee (A)
Kleist, Walter A. (A)
Kuhn, Frederick S. (A)
Lovejoy, Edwin W. (M)
Mason, Howard F. (A)
Melang, Bjorn L. (A)
Mood, George T. (A)
Renfro, Harold E. (A)
Renhard, Julius A. (A)
Rewak, C. T. (A)
Rieger, William (A)
Ross, J. D. (A)
Rotta, Allen E. (A)
Sletmoe, A. M. (A)
Thomson, Howard M. (J)
Tolmie, J. R. (A)
Williams, Charles E. (M)
Willson, Abner R. (A)
Winningham, H. W. (A)
Zaluskey, Eugene R. (A)

Spokane
Doody, William R. (A)
Drobrig, Leo (A)
Dunnigan, Frank A. (A)
Eberly, Austin D. (A)
Johnson, Carl A. (A)
MacLean, T. Wendell (A)
Prince, Frank W. (A)
Smith, Oliver C. (A)
Storms, Henry J. (A)
Van Dusen, Paul F. (A)
Wimmer, Joseph (A)

Tacoma
Evans, Leon R. (A)
Jensen, Sven (A)
Miller, George C. (A)

Vancouver
Ryan, Lloyd F. (J)

Wenatchee
Lanphere, Merle (A)

Yakima
Hagen, B. W. R. (A)

WEST VIRGINIA

Cameron
Chambers, Albert V. (A)

Charleston
Berry, Henry P. (A)
Moore, Thomas H. (A)
Morgan, J. T. (A)
Stalnaker, Burr (A)

Chester
Faudree, R. F. (A)

Clarksburg
Chorpening, George B. (A)

Fairmont
Beerbower, R. G. (A)

Fayetteville
Goddard, John B. (J)

Huntington
Bieber, Clarence G. (A)
Hines, Oscar T. (A)

Institute
Evans, James C. (A)

WEST VIRGINIA (Continued)

Kingwood
Michelson, Peter (A)

Morgantown
Colwell, Robert C. (M)

Wheeling
Boundy, Glen G. (A)
Hallam, John T. (A)
Risley, F. S. (A)
Weimer, Earl W. (A)
Weis, F. J. (A)

Williamson
Pirotte, Pete (A)

WISCONSIN

Antigo
Matthias, Lynn H. (A)

Eau Claire
Langdell, Henry R. (A)

Fond du Lac
Eckert, Walter R. (A)

Glen Flora
Knutson, Ben M. (A)

La Crosse
Lecman, Alvin (A)
Van Loan, Cullen G. (A)

Lodi
Evert, W. E. (A)

Madison
Austin, Otto C. (A)
Bennett, Edward (F)
Curran, George W. (A)
Hagen, Paul A. (A)
Hoffman, W. Hollis (A)
Holman, Henry (A)
Kochler, Glenn (A)
Lighty, Russell D. (A)
Sveen, Erwing A. (A)

Manitowoc
Scholten, Charles H. (A)

Menasha
Peerenboom, Cyril A. (A)

Menomonie
Nathness, Semore T. (A)

Milwaukee
Almes, William E. (A)
Bogenberger, John, Jr. (A)
Brafford, Charles P. (A)
Cordes, Edwin L. (A)
De Land, Robert E. (A)
Frish, Ben F. (J)
Gainer, William P. (A)
Halfpap, Bert A. (A)
Heim, Carl (A)
Hilton, Waldo R. (A)
Holst, Ernest W. (A)
Hostetler, Amos C. (A)
Irving, Emmanuel (J)
Kaetel, Herbert C. (J)
Kelly, Daniel S. W. (A)
Kuenne, K. R. (A)
Le Van, James D. (A)
Luecker, Fred W., Jr. (A)
Manney, G. C. (A)
Moorbeck, Clinton (A)
Nunn, E. D. (A)
Oetting, O. W. A. (M)
Paul, George Stewart (A)
Pfeifer, Joseph W. (A)
Richardson, A. G. (M)
Richardson, Marston S. (A)
Roscr, Clarence O. (A)

Simon, Arthur (A)
Snead, Sam (A)
Stoekle, Erwin R. (M)
Tagart, Sam W. (A)
Thomas, Morris W. (A)
Topolinski, Leo J. (A)
Vaughn, F. A. (A)
Weiss, Tobias (A)
Wendler, Erwin, Jr. (J)

Neenah
Ponto, Aaron E. (A)

Osseo
Nelson, Orrin B. (A)

Plymouth
Limberg, Raymond A. (A)

Racine
Host, Raymond H. (A)

Rewey
Carpenter, Archie V. (A)

Sheboygan
Flentje, Le Roy G. (A)
Herider, Ernest D. (A)
Pfeiler, Lawrence F. (A)

Stevens Point
Brickson, Herbert O. (A)

Watertown
Ebert, Sylvanus J. (A)

Waukesha
Golding, Robert M. (A)
Hebal, William H. (A)

Wausau
Krueger, Otto J. (A)

Wauwatosa
Devendorf, H. H. (A)
Pierl, Donald (M)

WYOMING

Casper
Martin, Donald E. (A)

Cheyenne
McQueen, Harry D. (A)

Torrington
O'Reilly, Gordon A. (J)

ALASKA

Du Marce, Herman (A)
Hannon, John P. (A)
Maki, George J. (A)
Quist, Jesper S. M. (A)
Urie, Sol J. (A)

CANAL ZONE

Bullock, Gilbert D. (A)
Grafe, Hans R. (A)
Young, John W. (A)

HAWAII

Balch, J. A. (M)
Borthwick, James H. (A)
Branch, L. W. (M)
Clark, George W. (A)
Eller, Willard H. (A)
Janitschke, E. O. (A)
McDowell, C. S. (M)
Schaefer, Carl T. (A)
White, Edwin L. (A)

PHILIPPINE ISLANDS

Castaneda, Santiago (A)
Del Rosario, Manuel S. (A)
Galvez, Manuel E. (A)
Grupe, Emilio (A)
McKesson, Lewis J. (A)
Nance, Curtis H. (M)
Rau, David S. (A)
Riddle, Elmer R. (A)
Slater, F. Robert (A)
Thomas, William M. (A)

PORTO RICO

Agusty, Joaquín (A)
Delworth, Lee J. (A)
Draigh, Canton V. (A)
Schell, Richard, Jr. (A)

CANADA

ALBERTA

Duncan, James E. (A)
Ryley, Raymond (A)

BRITISH COLUMBIA

Barclay, Hugh N. (A)
Bartholomew, Francis J. (A)
Benson, John P. (A)
Deacon, Alan I. (A)
Filtness, Arthur W. (A)
Gilbert, George (A)
Hawkins, Ernest H. (A)
Hawkins, Leslie S. (M)
Irvine, Basil (A)
Kitchin, J. E. (A)
Lapham, James B. (A)
Mawson, John T., Jr. (A)
McCullagh, Karl G. (A)
Murdoch, G. (A)
Rose, F. W. (A)
Sawford, Frank, Jr. (A)
Thomas, Clarence W. (A)

MANITOBA

Bishop, Ernest F. (A)
Cotton, W. R. (A)
Lee, Stanley A. (A)
Leitch, Donald J. H. (A)
Mills, Gilbert H. (A)
Pound, Harris D. (A)
Salton, Lynn V. (M)
Varcoe, H. R. (A)

NEW BRUNSWICK

Megarity, Everett A. (A)
Stevens, Ronald C. (A)
Thorne, Frank A. (A)
Vaughan, Frank P. (A)

NORTHWEST TERRITORY

Hastings, R. Stuart (A)

NOVA SCOTIA

Sutherland, Alexander (A)
Wood, William (A)

ONTARIO

Ainsworth, A. L. (A)
Anderson, John F. (A)
Annett, Earl (A)
Bailey, Ambrose L. (J)
Bain, J. R. (A)
Baldwin, George (A)
Barber, Walter G. (A)
Bayne, R. R. (A)
Blakely, Robert John (A)

Bond, Roydon J. (A)
Bowers, E. J. (A)
Brown, Alvin H. (A)
Brown, Harry S. (A)
Campbell, Henry Lawson (A)
Caton, William A. (A)
Choat, William F. (A)
Cline, Russell A. (A)
Cluff, Harold D. (A)
Cooper, Ashton B. (A)
Crittler, W. J. (A)
Crofts, Cecil T. (A)
Cusack, Sidney C. (A)
Dalton, F. K. (M)
Daly, Edmund (A)
De Grave, Claude (A)
Dibblee, John (A)
Dresser, Carl C. (A)
Edwards, Charles P. (F)
Emes, Karl C. (A)
Erwin, Raymond W. (A)
Evans, George L. (A)
Fiegehen, Maurice G. (A)
Fisher, Albert E. (A)
Ford, J. S. (A)
Fowler, Walter D. (A)
Fox, Florian J. (A)
Freeman, William (A)
Gaby, Frederick A. (A)
Gadsby, S. J. (A)
Galbraith, R. A. H. (A)
Geldert, George M. (A)
Gerric, William H. (A)
Goodspeed, Lynmore S. (A)
Gowan, Frank S. (A)
Gowan, Hubert S. (A)
Graham, Burwell (A)
Grant, Eric A. (A)
Gurd, Ronald H. (A)
Hackbusch, Ralph A. (A)
Hancox, Harold (J)
Hebbel, Charles T. (A)
Henderson, J. P. (M)
Hepburn, Dugald (M)
Hill, Orville (A)
Hodsoll, Martin (A)
Hollinsworth, V. E. (A)
Hughes, Peter (A)
Innes, Ronald G. (J)
Jackson, Leslie (A)
Jessop, F. R. (A)
Kelterborn, W. H. (A)
Kinnear, Donald R. (A)
Knapman, Jack (J)
Knight, Frank (A)
Kynnersley, Charles (A)
Langford, C. H. (A)
Laurie, William L. (A)
Leonard, Sydney L. (A)
Leslie, John M. (A)
Lowry, Charles A. (A)
Lundy, Stanley R. (A)
Mann, George F. (A)
McAleavey, Henry V. (A)
McClain, Gordon W. (A)
McFarquhar, Charles Clifton (A)
McMillan, Donald B. (J)
McMurtry, Cyril A. W. (A)
Meredith, C. C. (A)
Mitchell, Leonard W. (A)
Mock, Elmer E. (A)
Mogridge, J. Nairn (A)
Montagnes, Henry (A)
Mott, Harold E. (A)
Mullen, Joseph G. (A)
Nash, James C. (A)
Nauth, Raymond (A)

ONTARIO (Continued)

Newman, John R. (A)
 Nichols, W. A. (A)
 Northover, Harold W. (A)
 Oxley, Allan B. (A)
 Paisley, Stewart R. (A)
 Parsons, J. B. (A)
 Patience, A. Melbourne (M)
 Patterson, C. F. (A)
 Pipe, Gordon E. (A)
 Pollock, C. A. (A)
 Pounsett, Frank H. R. (A)
 Price, Harold W. (A)
 Price, Roland J. C. (A)
 Richardson, Charles L. (M)
 Rogers, Edward S. (M)
 Rose, Sidney (A)
 Rosebrugh, Thomas R. (A)
 Rothera, W. F. (A)
 Ruse, Arthur (A)
 Rush, Walter A. (F)
 Russell, Arthur H. K. (A)
 Russell, W. G. (A)
 Schwarz, Bertram A. (M)
 Sherratt, Joseph B. (A)
 Smith, Arthur (A)
 Smith, B. J. (A)
 Smith, C. C. (A)
 Smith, Victor G. (A)
 Steel, W. Arthur (M)
 Taber, Harold E. (A)
 Tanner, Charles J. (A)
 Thompson, Milton L. (A)
 Thomson, John Morton (A)
 Underwood, Clifford C. (A)
 Van Sickle, Melvin (A)
 Wallace, J. M. (A)
 Walsh, Harold E. (A)
 Ward, Charles (A)
 Warwood, W. E. (A)
 Watling, William J. (A)
 Way, Harry C. (A)
 Weaver, William E. (A)
 Weber, Rennie I. (A)
 Weir, Harold G. (A)
 Whitmore, Walter R. (A)
 Wilkinson, Allan E. (A)
 Williams, James (A)
 Wilson, F. Clinton (A)
 Wood, H. W. T. (A)

QUEBEC

Acton, Edward H. (A)
 Andrac, Robert T. (A)
 Barrow, Frederick A. (A)
 Bellaw, Leo T. F. (J)
 Blais, Alphy L. (A)
 Cann, John O. G. (F)
 Carr, John (A)
 Cash, J. Allan (A)
 Chagnon, Adolphe (A)
 Comach, Stanley I. (A)
 Conroy, Joseph M. (A)
 Cooper, Samuel J. (A)
 Gagnon, Elmore G. (A)
 Goldin, Hyman C. (A)
 Guilford, E. H. (A)
 Hodgson, Edward (A)
 Howe, A. E. (A)
 Jackson, Arthur (A)
 Leonard, Percy A. (A)
 McWilliam, Eric A. (A)
 Menard, J. L. (A)
 Moore, William H. (A)
 Mullin, James W. (M)
 Olive, Gordon W. (A)
 Payne, I. Stanley (M)

Peachey, C. Arthur (A)
 Platt, J. E. (A)
 Ratchford, William J. (A)
 Robb, Robert J. (A)
 Rogers, Harold A. (A)
 Runciman, Arthur S. (A)
 Short, Herbert M. (M)
 Smith, Frederick A. (A)
 Soucy, Chester I. (A)
 Spencer, Leonard (M)
 Starr, C. Harry (A)
 Thompson, John H. (A)
 Tremblay, Joseph (A)
 Turnbull, Allison D. (A)
 Vennes, H. J. (M)
 Wade, David (A)
 Walker, H. S. (A)
 Wallace, G. A. (A)
 Wilcox, B. B. (A)
 Wilson, Clifford A. (A)
 Wilson, C. T. R. (A)

SASKATCHEWAN

Durkec, K. M. (A)

BRITISH ISLES

CHANNEL ISLANDS

Laker, Edward W. (A)
 Manning, William Montagu (A)

ENGLAND

Abraham, F. X. J. (A)
 Adams, Frank S. (A)
 Addey, Frederick (F)
 Agate, Carlton S. (M)
 Albiston, William A. (A)
 Allan, J. T. (A)
 Allen, Charles G. (A)
 Allinson, Cyril P. (A)
 Amis, Frederick H. (M)
 Andrewartha, H. C. (A)
 Andrews, W. A. (M)
 Appleton, Edward V. (A)
 Appleton, William A. (M)
 Armstrong, L. J. Heaton (A)
 Ashwin, Cecil W. H. (A)
 Atkinson, Cyril T. (A)
 Axten, Bernard J. (A)
 Bagshaw, George W. (A)
 Bailey, Walter H. (M)
 Bainbridge-Bell, L. H. (A)
 Baird, Frederick (A)
 Baker, Thomas T. (M)
 Barber, William E. (M)
 Barker, Percy L. (A)
 Barrington, R. N. (M)
 Bartlett, A. C. (A)
 Bartlett, Wallace A. (A)
 Bates, Cyril R. (A)
 Bennett, F. T. (A)
 Berger, Maurice (M)
 Bever, Anthony J. M. (A)
 Biltcliffe, Thomas (A)
 Binyon, Basil (M)
 Bird, R. J. (M)
 Bonong, Edward (A)
 Bowen, Harry L. (A)
 Boyce, Frank A. (A)
 Boyd, W. Forbes (A)
 Boyle, Charles W. (M)
 Brown, Walter J. (M)
 Brown, William G. (A)
 Bulgin, Arthur F. (M)
 Burnham, Walter W. (F)
 Burrowes, Francis E. (A)
 Calver, Frank N. (M)

ENGLAND (Continued)

Carpenter, Rupert E. H. (M)
 Carter, F. C. (A)
 Casper, Christopher C. (A)
 Caswall, Herbert (M)
 Catt, James E. (M)
 Chandler, Charles K. (A)
 Chesterton, Arthur J. (M)
 Clarke, Douglas F. (A)
 Clarke, George E. (A)
 Cobb, F. Arthur (M)
 Cohen, Isaac J. (A)
 Cohen, Samuel H. (A)
 Cooper, J. A. (A)
 Cooper, W. H. B. (J)
 Coursey, Philip R. (A)
 Courtenay-Price, George (A)
 Cox, C. F. (A)
 Crampton, William J. (M)
 Crawford, Cecil G. (A)
 Curd, David A. (A)
 Curtis, Francis C. (A)
 Dack, Allan J. S. (A)
 Dack, John H. A. (A)
 De Burgh, Desmond H. (M)
 Dennis, Frank L. (A)
 Devine, William F. (A)
 De Wardt, Robert G. (M)
 Diggle, A. J. (A)
 Dinsdale, Alfred (A)
 Ditcham, William T. (M)
 Diver, Frederick G. (A)
 Dixon, Ronald (A)
 Downing, George E. C. (A)
 Dowssett, Harry M. (M)
 Drake, George P. (A)
 Dryland, Alan G. (M)
 Durrant, Reginald F. (M)
 Eekersley, P. P. (F)
 Edes, Noel H. (A)
 Elliott, Isaac (A)
 Elwell, Cyril F. (F)
 Emerson, R. Waldo (A)
 Emery, E. J. (M)
 Enderle, Jackson J. (A)
 Erdman, H. (A)
 Evans, Young W. P. (M)
 Everest, Augustine R. (A)
 Everett, Lionel E. B. (M)
 Faulkner, Harry (M)
 Featherstone, William A. E. (A)
 Field, Harry T. F. (A)
 Flagg, Leonard B. (A)
 Flintham, Herbert (A)
 Floyd, William F. (J)
 Foord, Henry D. G. (M)
 Frost, Cyril C. J. (M)
 Gambrell, Horace W. (A)
 Gee, Harry T. P. (A)
 Gee, Walter C. (A)
 Gill, Archibald J. (M)
 Glossop, Arthur A. (A)
 Glover, Phillip F. (M)
 Godfrey, Mason (A)
 Goldsman, J. L. (A)
 Goord, H. V. (A)
 Gracie, John A. (A)
 Green, Charles M. (A)
 Green, Ernest (A)
 Griffiths, Herbert V. (A)
 Griffiths, W. H. F. (M)
 Haigh, Norman E. (A)
 Hall, Albert (M)
 Hall, Norman (A)
 Hambling, Arthur W. (A)
 Hannah, W. J. (A)
 Hansford, R. V. (M)

Hardy, Harold (M)
 Harries, John H. O. (A)
 Harris, Percy W. (M)
 Harris, Raymond (A)
 Harrison, Walter L. (A)
 Harvey, Herbert J. (A)
 Harvey, Lionel (M)
 Hawes, R. Nesbitt (M)
 Hawkins, John H. (A)
 Hayman, William G. (A)
 Healey, Oliver (A)
 Henderson, Francis A. (A)
 Henderson, John T. (A)
 Henderson, Walter B. (A)
 Herd, James F. (M)
 Hewetson, Geoffrey B. (J)
 Hill, Ernest N. (A)
 Hinderlich, Albert (A)
 Hines, C. C. A. (A)
 Hinks, Geoffrey D. (A)
 Hinks, Henry J. (A)
 Hinton, Norman P. (M)
 Hirshman, Cyril L. (A)
 Hodgkinson, Henry (A)
 Holbeach, William M. (A)
 Holmes, Cyril T. (A)
 Holzman, Louis (A)
 Hotine, Leslie (M)
 Howard, C. Alexander (A)
 Howard, C. G. (A)
 Hows, Leonard J. (A)
 Howse, H. A. G. (M)
 Hughes, D. W. (A)
 Hughes, Lionel J. (A)
 Jackson, Willie (A)
 James, William P. (A)
 Jeffery, Jack H. (A)
 Joice, W. S. (A)
 Jones, Arthur B. (A)
 Jones, Frank E. B. (A)
 Joseph, J. (M)
 Kinman, Thomas H. (M)
 Kirke, Harold L. (M)
 Klein, Rene H. (M)
 Kynaston, B. H. J. (A)
 Ladner, Alan W. (A)
 Lamb, William H. (A)
 Lance, Thomas M. C. (A)
 Landale, S. E. A. (A)
 Lassman, Henry H. (A)
 Lawler, L. A. C. (A)
 Leathes, W. H. B. De M. (A)
 Lee, Albert G. (F)
 Lemon, Cecil G. (A)
 Litchfield, Gordon A. (A)
 Littledale, H. A. P. (A)
 Lyle, Herbert B. (A)
 Lyons, C. L. (M)
 MacKenzie, D. G. (A)
 Maitland, James L. (A)
 Male, Samuel C. (A)
 Mansell, Lionel H. (M)
 Marconi, Guglielmo (F)
 Marshall, J. A. (A)
 Matthews, Leslie A. (A)
 May, John (A)
 McDonald, George F. H. (A)
 McLeod, John S. (A)
 McMichael, Leslie (F)
 Meadows, Cyril (A)
 Megaw, E. C. S. (A)
 Mills, William F. (A)
 Minter, Robert W. (A)
 Mockford, Frederick S. (A)
 Moore, John T. (A)
 Morris, Robert (A)
 Moulin, E. B. (M)

ENGLAND (Continued)

Mulholland, William (A)
 Mumford, Albert H. (A)
 Murphy, Frank (A)
 Mustchin, Norman (A)
 Myers, George T. (A)
 Nancarrow, F. E. (M)
 Newnham, Leonard E. (A)
 Nicholson, James K. A. (M)
 Noden, Joseph (A)
 Nottage, William H. (A)
 Odell, Leslie F. (A)
 Ogg, John G. (A)
 O'Neill, R. F. (A)
 O'Shaughnessy, J. J. F. (M)
 Owner, John S. (A)
 Palmer, R. J. (A)
 Panagakis, Harry (A)
 Parker, A. Raymond (A)
 Parkin, Thomas D. (A)
 Parry, Albert H. (A)
 Payne, Eric A. (A)
 Pearce, R. A. (A)
 Pearson, Laurence H. (A)
 Pecorini, Robert R. (M)
 Petersen, Thomas G. (A)
 Phillips, Charles F. (M)
 Picken, William J. (A)
 Pill, Cecil R. (A)
 Pinnock, L. W. J. (A)
 Pipe, Robert E. (A)
 Pocock, Hugh S. (M)
 Potts, Edward (A)
 Pound, Ernest J. (A)
 Rae, William T. (A)
 Ramirez, Eduardo Garcia (M)
 Ratcliffe, J. A. (M)
 Reyner, John H. (M)
 Rhys-Jones, John E. (A)
 Richardson, F. C. (A)
 Rickard, Charles E. (M)
 Riddiough, John W. (A)
 Ridgeway, John W. (A)
 Ripley, Henry P. (A)
 Robb, Frederick G. (A)
 Robb, William I. (A)
 Robinson, Frederick H. (A)
 Rowland, Edgar S. (A)
 Russell, M. W. G. (M)
 Saltmarsh, Beatrice (A)
 Samarasekara, V. R. (A)
 Scott-Taggart, John (A)
 Shaughnessy, E. H. (M)
 Shaw, A. C. (M)
 Shore, Anak (A)
 Sieger, J. (A)
 Simmonds, E. J. (M)
 Simpson, Alexander V. (M)
 Slater, Wilfred (A)
 Slee, John A. (F)
 Smith, Harold I. (A)
 Smith, James H. (A)
 Smith, Sidney B. (M)
 Smurtwaite, F. W. (A)
 Somerset, E. T. (A)
 Sparrow, A. W. (A)
 Stanesby, Harold (A)
 Storry, Thomas G. (A)
 Strong, Charles E. (M)
 Struthers, G. A. (M)
 Sutton, William F. P. (A)
 Tanton, John H. (A)
 Taylor, Alfred O. (A)
 Thacker, M. S. (A)
 Thomas, Einion (A)
 Thomas, Guy H. (A)

Thompson, Alfred E. (M)
 Thomsett, H. S. (A)
 Thorpe, Stewart Meville (A)
 Tiltman, Ronald F. (A)
 Tingey, Robert (M)
 Tomlinson, Frank (A)
 Tompsett, F. J. (A)
 Towers, Robert (A)
 Townsend, Frank T. G. (M)
 Tozer, William C. (A)
 Trippier, Francis J. (A)
 Troutbeck, Wilfrid H. (A)
 Turlle, Edgar H. (M)
 Turner, Laurence B. (A)
 Turvey, Henry C. (A)
 Vernon, Basil H. (A)
 Wade, C. F. Newton (M)
 Wainwright, Albert (A)
 Walker, Harold S. (A)
 Wallace, Alex T. (A)
 Walmsley, Thomas (M)
 Ware, William (A)
 Warner, Frederick F. (A)
 Warner, H. J. (M)
 Warren, A. C. (A)
 Watson, George H. (A)
 Webb, James H. (A)
 Weight, H. Aubrey (A)
 White, Herbert G. (A)
 White, John W. (A)
 Wicks, Frank W. (A)
 Wicks, Reginald P. (A)
 Wilde, S. F. M. (A)
 Williams, Cecil G. (A)
 Williams, Eric (A)
 Wilson, William P. (A)
 Wood, Charles E. (A)
 Wood, Robert H. (M)
 Woodhead, H. C. (A)
 Woodward, P. J. (M)
 Wright, Sydney R. (M)
 Wroughton, Thomas H. (A)
 Young, Alfred W. (A)

IRELAND

Dunphy, Thomas O. (A)
 Ferguson, John D. (M)
 Jamison, Alexander (A)
 Kitchen, James P. (A)
 McVeigh, James P. (A)
 Neill, Frank R. (A)
 Wheeler, Edmund F. (A)

SCOTLAND

Allan, Ernest J. (A)
 Beveridge, John A. (M)
 Carnie, Ben (A)
 Chadder, E. G. (A)
 Dunbar, James (A)
 Edwards, R. M. (J)
 Fleming, Samuel (A)
 Jamieson, William E. (A)
 Knowles, J. G. (A)
 Logan, James S. (A)
 Murchie, John (M)
 Neil, William Russell, Jr. (A)
 Ramsay, John F. (J)
 Rollo, W. Smith (A)

WALES

Carson, John M. (A)
 Irving, Donald H. (A)
 Rees, David (A)
 Whale, Gordon S. (A)
 Yates, Ivan (A)

AFRICA

EAST AFRICA

Ball, George F. (A)

EGYPT

Baroudi, Kamel S. (A)

SOUTH AFRICA

Adendorff, Gerald V. (M)
 Allaway, George N. (A)
 Archer, C. (A)
 Barnett, Eric E. (A)
 Borthwick, Roderick J. (A)
 Brickhill, G. A. (A)
 Chenik, Aaron (A)
 Cumming, Noel D. (A)
 Gilmour, Peter (A)
 Goodman, Joseph M. (M)
 Howard, W. B. (A)
 Jacobs, Alwyn J. (A)
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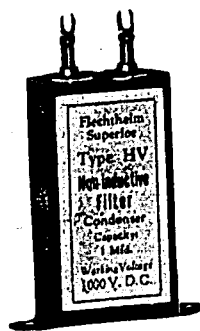
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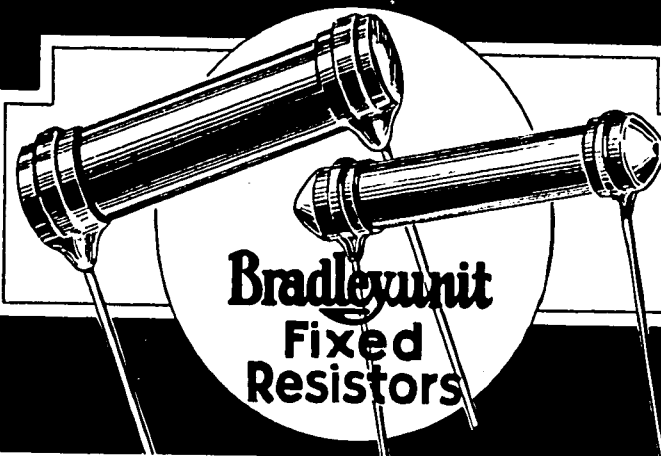
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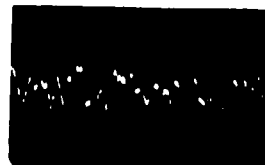


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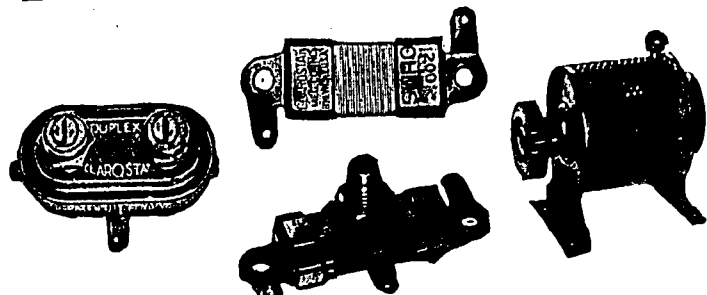
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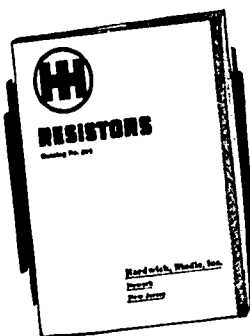
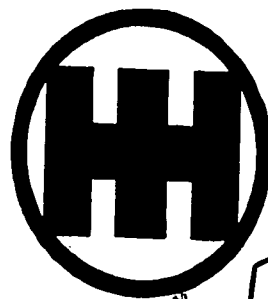
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VI



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VII



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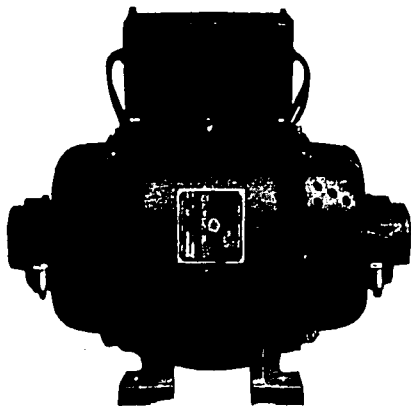
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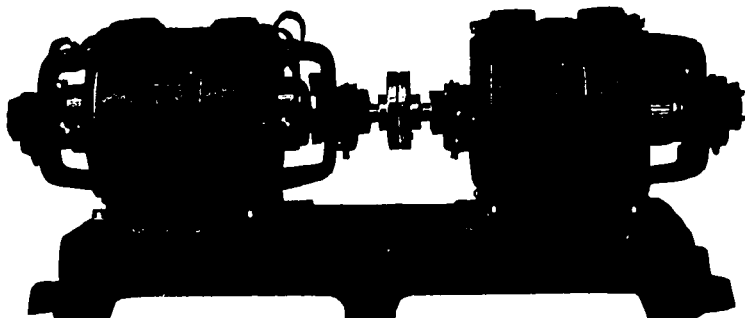


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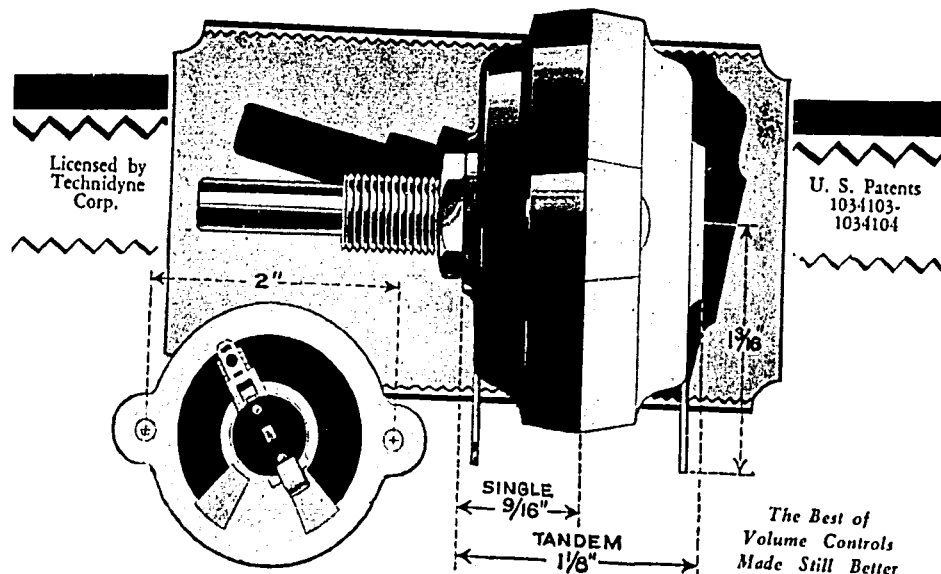
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The Super-Tonatol Model “B” For Manufacturers

The Model “B” has all of the outstanding characteristics of the remarkable Model “A” Super-Tonatrol, plus greater compactness, finer finish and availability in tandem units, if desired, controlled by a single shaft.

The Special resistance element is permanently fused to an enameled metal plate. Dissipates 3-watts. Pure silver floating contact provides amazingly smooth operation with stepless variation. Completely enclosed Bakelite case. Practically immune to temperature and humidity changes. Single or tandem units can be made with all usual resistance ratings and curves. Ask for blueprint and data.

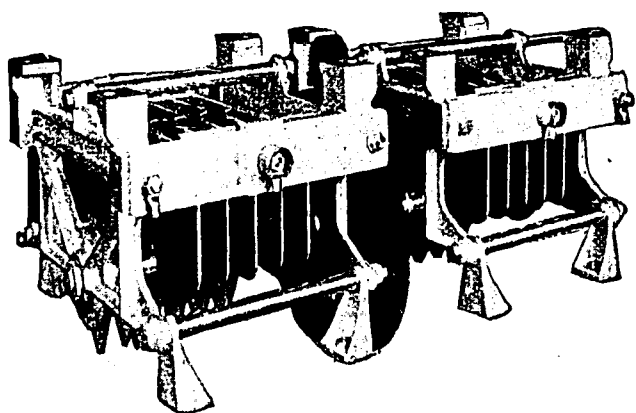
Write Dept. PE-A for details of all Electrad Products

175 Varick St., New York, N.Y.
ELECTRAD
 INC.

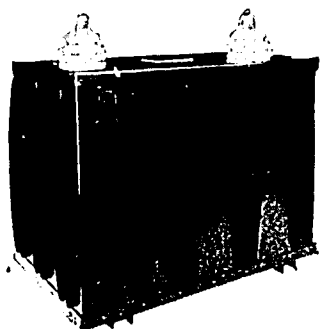
Electrad manufactures a complete line of resistances and voltage controls for all radio and power supply requirements, including Television.

CARDWELL

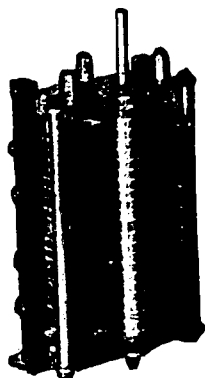
SOMEWHERE IN OUR LINE THERE'S
A CONDENSER FOR YOU



Fixed and Variable Transmitting
Condensers for High Voltages.



Oil Dielectric Fixed Condensers
for Induction Furnaces and Tube
Bombarders—Indestructible—the
Logical Replacement Unit. The
First Cost is the Last Cost.



Many Types and Capacities in the smaller Trans-
mitting Condensers and a Wide Variety of Re-
ceiving Condensers are Included in the Cardwell
Line.

Send for literature

THE ALLEN D. CARDWELL
MANUFACTURING CORPN.

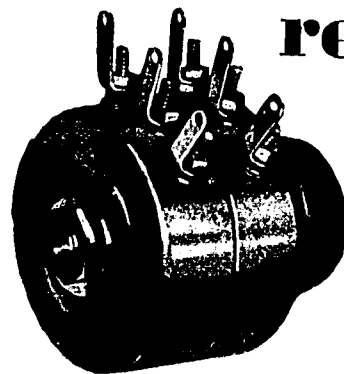
81 PROSPECT ST., BROOKLYN, N.Y.

Since the beginning of Broadcasting

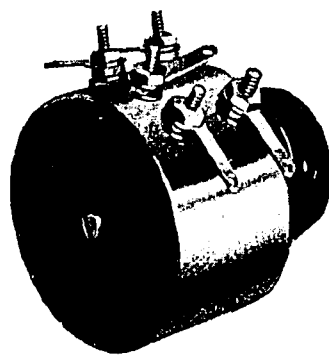
“THE STANDARD OF COMPARISON”

X

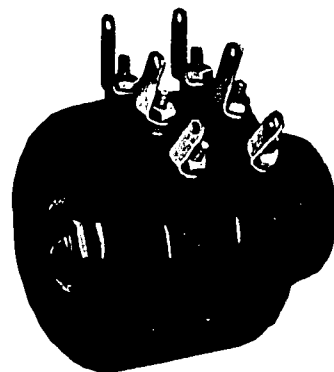
What are your exact requirements?



No. 280-280. Combination metal shell
wire wound and composition elements.
Wire wound up to 15,000 ohms. Composi-
tion, 5,000 to 1 megohm. Rheostat or poten-
tiometer type in either unit. Units insulated
from each other. Diameter, 1 11-16 in.
Depth of shell, 1 3-8 in.



No. 890. Double depth metal shell
unit in rheostat or potentiometer type.
Rotors in same electrical connection.
Composition elements, 5,000 ohms to
1 megohm in each unit. Diameter,
1 7-8 in. Depth of shell, 1 3-16 in.



No. 1880-1880. Same as 280-280 ex-
cept all bakelite.

Your volume control requirements—
what are they?

We know, if you are at all like
most manufacturers, that your re-
quirements as to volume controls are
exceedingly precise. That is why we
ask you: What are your *exact* re-
quirements?

Not knowing how we can best
serve you, we invite you to tell us.
We ask you to use our very con-
siderable facilities to help you secure
precisely the volume controls that
you require. We maintain a large
research department whose sole
function is to cooperate with manu-
facturers who seek perfection in fixed
and variable high resistors—and who
have not yet found what they want.

Won't you do this? To start on a
solution of your volume control
problem, we suggest you mail the
coupon below for fuller, more com-
plete information about the unique
service this company offers. Do this
today.

HERBERT H. FROST, INC.

Largest manufacturers in the world of high
grade variable resistors

Main Offices and Factory
ELKHART, IND.

160 North La Salle Street, Chicago

Herbert H. Frost, Inc.
Elkhart, Ind.

YB-30

We are interested in securing further facts
about your ability to supply us with suitable
variable resistors for our.....

Name.....
Address.....
City.....State.....

XI

CONSULTING & CONSTRUCTING
RADIO ENGINEERS



311 CALIFORNIA ST.
SAN FRANCISCO, U.S.A.

CABLE ADDRESS
HEIKAU

YOU CAN **HEAR** THE DIFFERENCE
AND **SEE** THE REASON
IN EVEREADY RAYTHEON
4-PILLAR TUBES « «

HERE is an entirely new type of tube . . . Eveready Raytheon! It combines the highest degree of sensitivity with lasting, rugged strength. The patented Eveready Raytheon 4-Pillar construction—a revolutionary improvement—safeguards fragile elements against the dangers of shipment and handling. Eveready Raytheon elements are assembled on jigs, to put them in most sensitive relation to each other. The 4-Pillar construction anchors these elements where they belong—assuring you of a new standard of reception.

You can see this exclusive construction inside an Eveready Raytheon. Look at the diagram on this page. See the solid, four-cornered glass stem. Notice, imbedded in it, the four sturdy pillars supporting the elements. That shows why Eveready Raytheons are stronger than ordinary tubes—and why they give you the best reception you can possibly get from your present receiver. No other tube can be made like this, because the 4-Pillar construction is patented.

Eveready Raytheons come in all types. They fit the sockets in every standard A. C. and battery-operated receiver in use today. They are built by the makers of the famous Eveready Layerbilt "B" Batteries—another radical improvement in radio. Get a set of new Eveready Raytheons from your dealer, and enjoy their reception today.

NATIONAL CARBON CO., Inc.
General Offices: New York, N. Y.

Branches: Chicago, Kansas City, New York,
San Francisco



Unit of Union Carbide
and Carbon Corporation



4-PILLAR TUBES

Showing the exclusive, patented EVEREADY RAYTHEON 4-Pillar construction with its solid, four-cornered glass stem, its four rigid pillars, and anchorage to a stiff mica plate at the top.



Trade-marks

Volume Controls

TO vary the intensity of the faithful reproduction built into radio receivers without introducing noise or distortion, can only be accomplished by a careful and complete consideration of both mechanical and electrical features of the volume control.

Mechanically—The Centralab exclusive and patented rocking disc contact precludes any possibility of wear on the resistance material. This feature adds to the smoothness of operation since the contact shoes ride only on the disc. The shaft and bushing are completely insulated from the current carrying parts—eliminating any hand capacity when volume control is placed in a critical circuit.

Electrically—Centralab engineers have evolved tapers of resistance that produce a smooth and gradual variation of volume. These tapers have been thoroughly tried and tested for each specific application for current carrying capacity and power dissipation.

Centralab volume controls have been specified by leading manufacturers because of their quality and ability to perform a specific duty—Vary the intensity of faithful reproduction—faithfully.

Write for full particulars of specific application.

Centralab

CENTRAL RADIO LABORATORIES

36 Keefe Ave. Milwaukee, Wis.

A CENTRALAB VOLUME CONTROL IMPROVES THE RADIO SET

Manufactured in three sizes

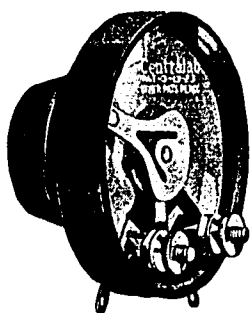
Standard

Junior

Midget

Also Double Standard
and Double Junior

Special Combination
Wire Wound and
Graphite Control



The Institute of Radio Engineers

Yr.Bk.

Incorporated

33 West 39th Street, New York, N. Y.

APPLICATION FOR ASSOCIATE MEMBERSHIP

(Application forms for other grades of membership are obtainable from the Institute)

To the Board of Direction
Gentlemen:

I hereby make application for Associate membership in the Institute. I certify that the statements made in the record of my training and professional experience are correct, and agree if elected, that I will be governed by the constitution of the Institute as long as I continue a member. I furthermore agree to promote the objects of the Institute so far as shall be in my power, and if my membership shall be discontinued will return my membership badge.

Yours respectfully,

(Sign with pen)

(Address for mail)

(Date)

(City and State)

References:

(Signature of references not required here)

Mr. Mr.

Address Address

Mr. Mr.

Address Address

Mr.

Address

The following extracts from the Constitution govern applications for admission to the Institute in the Associate grade:

ARTICLE II—MEMBERSHIP

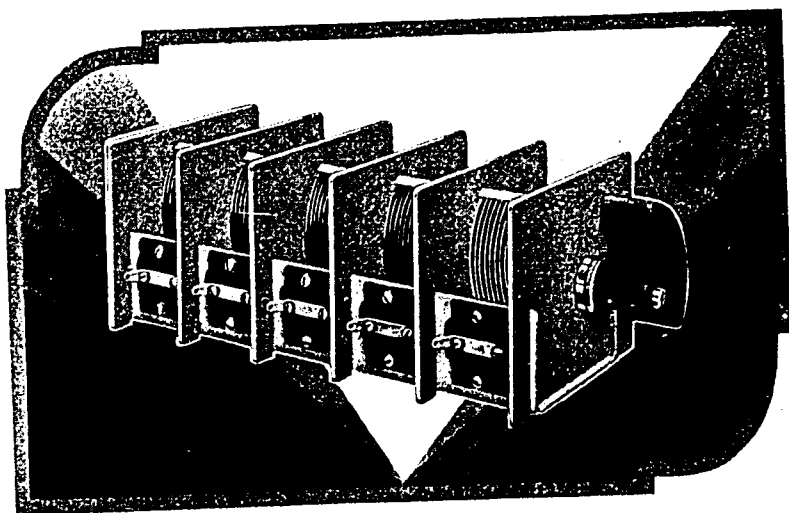
Sec. 1: The membership of the Institute shall consist of: * * * (d) Associates, who shall be entitled to all the rights and privileges of the Institute except the right to hold the office of President, Vice-president and Editor. * * *

Sec. 5: An Associate shall be not less than twenty-one years of age and shall be: (a) A radio engineer by profession; (b) A teacher of radio subjects; (c) A person who is interested in and connected with the study or application of radio science or the radio arts.

ARTICLE III—ADMISSION

Sec. 2: * * * Applicants shall give references to members of the Institute as follows: * * * for the grade of Associate, to five Fellows, Members, or Associates; * * * Each application for admission * * * shall embody a concise statement, with dates, of the candidate's training and experience.

The requirements of the foregoing paragraph may be waived in whole or in part where the application is for Associate grade. An applicant who is so situated as not to be personally known to the required number of members may supply the names of non-members who are personally familiar with his radio interest.



THE Scovill Manufacturing Company through its engineering and sales force offers you intelligent cooperation on your manufacturing problems. Scovill engineers have worked with several nationally known radio set manufacturers to produce radio condensers to meet their exact requirements.

The Scovill manufacturing departments have the equipment and the capacity for the production of quantities of condensers and radio parts constructed and tested to meet their specifications.

Scovill can help you on your radio condenser and radio metal parts problems. Why not consult Scovill about your next order?

PRODUCTS

Made to Order

Variable radio condensers
Metal stampings
Screw machine products
Special machine screws
Parts from brass, bronze, nickel silver, aluminum and other metals

Carried in Stock

Brass, bronze and nickel silver sheet, rod, wire and tubing
Standard cap and machine screws
High Speed brass rod for automatic screw machines
Etching brass

SCOVILL

Established 1802

MANUFACTURING COMPANY
· WATERBURY · CONNECTICUT ·



NEW YORK
PROVIDENCE
ATLANTA
CHICAGO

CLEVELAND
SAN FRANCISCO
BOSTON
SAN FRANCISCO
LOS ANGELES

PHILADELPHIA
DETROIT
IN EUROPE—THE
HAGUE, HOLLAND

XVIII

SHAKEPROOF'S PLACE

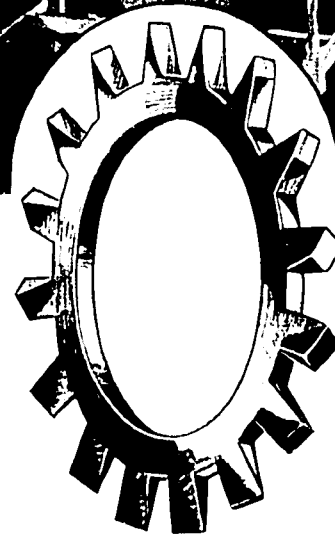
in the

RADIO

LEADERS in the radio field—the big manufacturers producing sets by the million—have turned to SHAKEPROOF as the final solution of their locking and terminal problems. SHAKEPROOF—the lock washer with twisted teeth of steel forms a multiple lock on nuts and bolts—a lock that won't let go—a lock that will loosen only on applied pressure with a wrench.

SHAKEPROOF Locking Terminals form perfect connections and eliminate all the troubles due to loose connections. SHAKEPROOF Lock Washers and Terminals will speed up your production and save their cost many times over in their application—they cannot tangle or link.

The roll call of SHAKEPROOF users is the roll call of America's Big Business. It will pay you to investigate why radio manufacturers large and small alike have almost unanimously turned to SHAKEPROOF. Complete information and samples will be mailed on request without obligation.



SHAKEPROOF

Lock Washer Company

(Division of Wilson Tool Works)

2501 North Keeler Avenue Chicago, Illinois



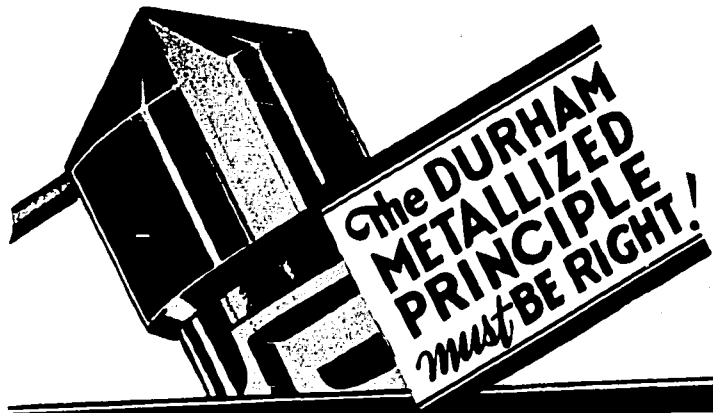
Type 20 Log Terminals

Type 12 Internal Teeth

Type 11 External Teeth

Type 15 Countersunk

XIX



A Million and a half used Monthly during 1929
in American Radio

To keep pace with 1930 receiver developments, Durham Metallized resistors and powerohms are now more accurate, have a greater power safety factor and can be obtained in even greater variety.

The advantages of the Durham Metallized principle have been proven by the millions of Durham resistors and powerohms now used by America's foremost manufacturers of radio receivers and allied products.

These units are now in standard production in all ratings, all types of tips for radio work.

Engineering data and samples for testing sent upon request. Please state ratings required.

International Resistance Company

2006 Chestnut Street, Philadelphia, Pa.

DURHAM
METALLIZED
**RESISTORS &
POWEROHMS**

XX



A.H.GREBE & CO., Inc.

RICHMOND HILL, NEW YORK

**Grebe
radio**

SUPER-SYNCHROPHASE 

WESTERN BRANCH

443 South San Pedro Street

Los Angeles, California

MAKERS OF QUALITY RADIO SINCE 1909

XXI

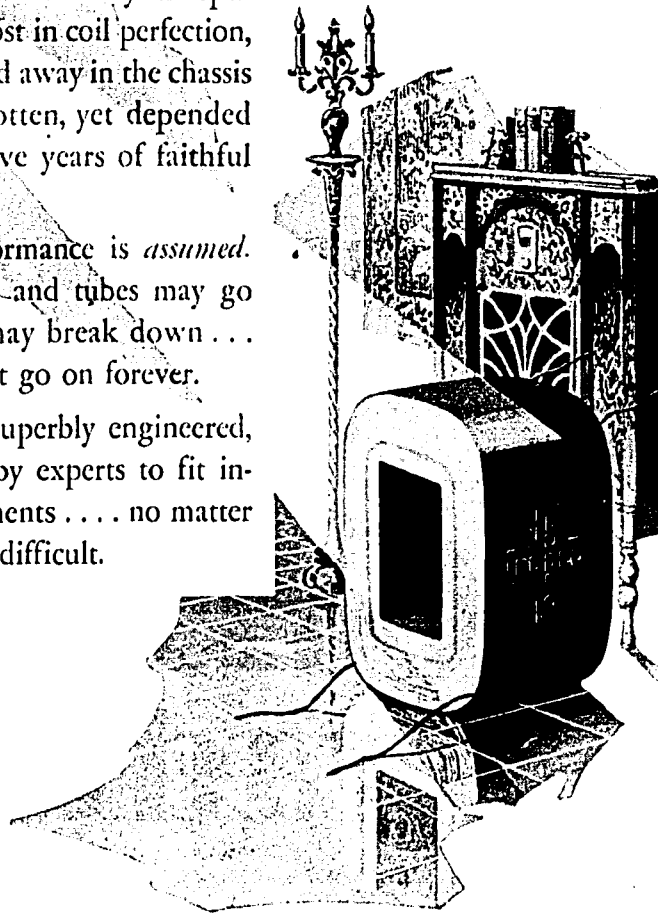
the Coils the thing!

In every radio hook-up an ideal coil is specified for each function in the set.

Each Dudlo coil is backed by its reputation as the utmost in coil perfection, and though tucked away in the chassis of a set . . . forgotten, yet depended upon . . . will give years of faithful performance.

Continuous performance is *assumed*. Tubes may come and tubes may go . . . condensers may break down . . . but the coils must go on forever.

Dudlo coils are superbly engineered, and constructed by experts to fit individual requirements . . . no matter how complex or difficult.



DUDLO

DUDLO MANUFACTURING COMPANY, FORT WAYNE, INDIANA
Division of General Cable Corporation

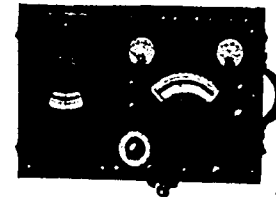
XXII

The important syllable in manufacture - is FACT!

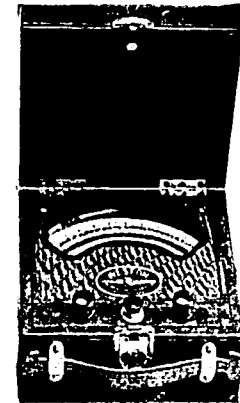
Design and build your products with insurance of electrical accuracy.
Here are four instruments that furnish important facts
—Protecting prestige and profit.

Model 526 Radio Tube Tester

This is an extremely precise laboratory instrument, yet entirely suitable for production testing. It affords quick and accurate measurements, giving the true A. C. values of the tube constants without the use of telephone or other complicated devices.

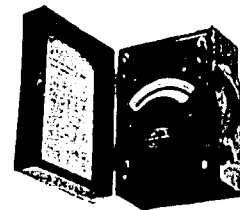


It will measure the voltage amplification factor, plate impedance in ohms, mutual conductance in micromhos, and the plate, filament and grid bias voltage.



Model 322 Microammeter

A laboratory D. C. instrument, made in single, double and quadruple ranges for the measurement of very small electrical quantities. Accuracy, $\frac{1}{2}$ of 1 %.



Model 1 Ohmmeter. A direct reading instrument like an ordinary voltmeter, offering speed of operation in making resistance measurements. May be operated on ordinary dry cells. No auxiliary apparatus required. A most valuable instrument for the electrical manufacturer.



Model 372 Microfaradmeter. A portable direct-reading instrument for capacity measurements where speed and accuracy are essential. For A. C. only.

WESTON ELECTRICAL INSTRUMENT CORPORATION
589 Frelinghuysen Ave. Newark, N.J.

Weston
PIONEERS
SINCE 1888
INSTRUMENTS

XXIII



Without A Doubt The Most Complete Line of Condensers & Resistors

NO matter what your requirements may be in the fixed condenser or resistor field, you are sure to find an Aerovox unit exactly suited to your needs.

Filter Blocks	Pyrohm Heavy Duty
Buffer Blocks	Edison Base Pyrohms
Socket Power	Tapped Pyrohms
High Voltage	Wire Wound Units
Transmitting	Grid Suppressors
Bypass	Center-Tapped Units
"A" Power	Non-Inductive Lavite
Bakelite Moulded Mica	Grid Leaks
Condenser	Resistorformer Kits
Interference Filters	Resistor Mountings

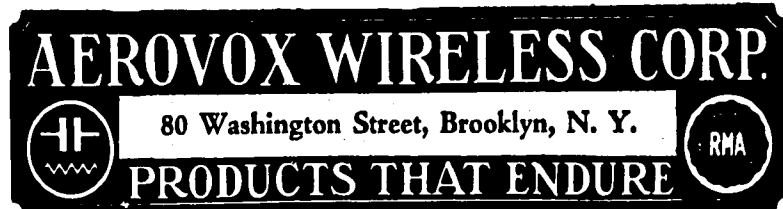
In addition to the large number of stock sizes of condensers and resistors, the Aerovox Wireless Corporation is equipped to supply to manufacturers special types and sizes of condensers, filter blocks and resistors in all fixed and tapped combinations on short notice.

SEND FOR COMPLETE CATALOG

Complete specifications of all Aerovox units, including insulation specifications of condensers, carrying capacities of resistors and all physical dimensions, electrical characteristics and list prices of condensers and resistors, are contained in a complete 1929-30 catalog which will be sent gladly on request.



The Aerovox Research Worker is a free monthly publication that will keep you abreast of the latest developments in radio. Your name will be put on the mailing list free of charge on request.



Special Transformers

FERRANTI special transformers are designed to meet the requirements of any audio frequency circuit wherein uniform frequency response between 35 and 8000 cycles is required.

FERRANTI special transformers have unusually flat frequency characteristics comparable with the standard AF-5 audio transformers as shown in the following tabulation.

	35 cycles	1000 cycles	8000 cycles
AF-5 standard audio.....	-.8 DB	0.0 DB	-.4 DB
500 ohm Line to tube.....	-.8 DB	0.0 DB	-.4 DB
600 ohm Line to 600 ohm Line	-.5 DB	0.0 DB	-.5 DB

FERRANTI standard and special transformers are improving the frequency characteristics of: Broadcast Stations, Recording Studios, Television Equipment, Radio Receivers, Laboratories, when used in Speech Amplifiers, Telephone Circuits, Test Equipment, Radio Receivers, Public Address System, Disc and Film Recording Devices and all types of equipment requiring flat characteristics over a very wide frequency range.

Some of the more usual types of special transformers are carried in stock for immediate shipment. Others can usually be made and shipped in 48 hours or less.

ALTERNATING CURRENT METERS

Rectifier type 1% accuracy 0-6000 cycles, Thermal Type accurate at very high frequencies.

FERRANTI has developed the Rectifier Type AC meter to the accuracy required for laboratory measurements and testing of mass production radio and audio products. Their wide frequency response and low current consumption makes them ideal for the measurement of audio frequency voltages and currents, "Hum Voltage," and a host of laboratory uses.

RANGES OF RECTIFIER TYPE

750 Microamperes to 50 Milliamperes
1 volt to 400 volts

Made in two types—667 ohms per volt and 133 ohms per volt.

Write for complete description of Ferranti:

Power Amplifiers Meters
Transformers Chokes
Non-Inductive Wire Wound Resistors

FERRANTI, Inc.

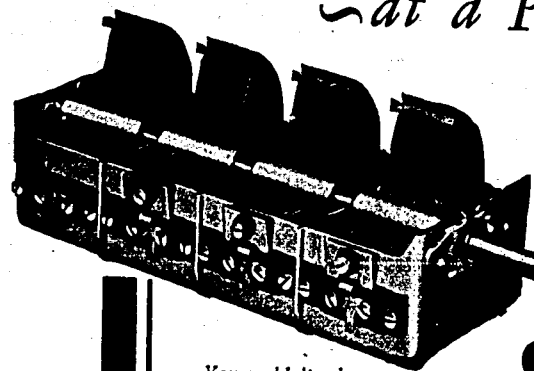
130 West 42nd St., New York City

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Hammarlund QUALITY

at a PRICE!



You couldn't ask more of a condenser and you can't get more at the price.

The New

"M-Q"

(Multiple-Quadruple)

CONDENSER

for

Manufacturers

VALUE, above all, the radio public will demand in 1930. But there is a limit to which quality can be sacrificed for price.

In this new "M-Q" model condenser, Hammarlund engineers have packed quality. In every detail it is worthy of the Hammarlund name. But simplified design has reduced manufacturing costs to a point where the careful buyer need not compromise on condensers of lesser value.

Rigid, die-cast frame, shielded between sections; long, hand-reamed bearings; reinforced non-microphonic plates; closely matched sections; wiping rotor contacts prevent coupling of circulating currents; separate high-resistance stator insulation; large, easily-adjusted trimmer condensers.

Let us quote on your requirements.

HAMMARLUND MANUFACTURING COMPANY

424-438 W. 33RD ST., NEW YORK.

For Better Radio
Hammarlund
 PRECISION
PRODUCTS



1919

10 YEARS of RADIO MANUFACTURING

*Plus Over 12 Years of Pioneering in
Electrical Reproduction of Sound*

1930

IN 1919 when the Pacent Electric Company began to manufacture radio essentials, the industry was truly in its infancy. The years since have seen a steady and healthy growth, until today, the company enjoys the distinction of being one of the oldest and most far-sighted manufacturers.

Today Pacent Electric Company has the largest engineering and research staff in its history. All Pacent devices are examples of modern leadership in engineering and in sound, creative manufacturing.

Pacem Quality and Service are enemies of business depression.

PACENT ELECTRIC CO.

91 Seventh Avenue, New York

Manufacturing Licensee for Great Britain and Ireland:
IGRANIC ELECTRIC CO., Ltd., Bedford, England
Licensee for Canada: White Radio Limited, Hamilton, Ont.

XXVIII

WHAT MORE
CAN YOU EXPECT FROM TUBES?

1. quick action

2. clear tone

3. long life

they're



blue!

ARCTURUS
LONG-LIFE
RADIO TUBES

STANDARD for EVERY
leading set

XXIX

INSTITUTE SUPPLIES

EMBLEMS

Three styles of Institute emblems, appropriately colored to indicate the various grades of membership in the Institute, are available. The approximate size of each emblem is that of the illustrations.

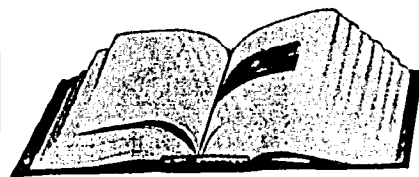
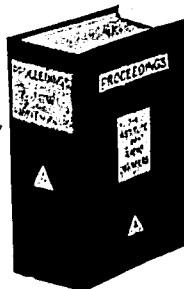


The lapel button is of 14k gold, the background being enamelled in the membership color, the lettering being gold. The button is supplied with a screw back with jaws which fasten it securely to the coat. This style emblem can be obtained for \$2.75, postpaid, for any grade.

The pin is also of 14k gold. It is provided with a safety catch and is appropriately colored for the various grades of membership. Price, for any grade, \$3.00 postpaid.

The watch charm is handsomely finished on both sides and is of 14k gold. The charm is equipped with a suspension ring for attaching to a watch fob or chain. Price for any grade \$5.00 postpaid.

BINDERS



The binder pictured here contains over three inches of filing space. It serves either as a temporary transfer binder or as a permanent cover. It is made of handsome Spanish Grain Fabrikoid in blue and gold. The binder is so constructed that each individual copy

of the PROCEEDINGS will lie flat when the pages are turned. Copies can be removed from the binder in a few seconds and can be permanently preserved in undamaged condition. Hundreds of these binders are sold each year. Price, \$1.50 each, or \$2.00 with the member's name or the PROCEEDINGS Volume Number stamped in gold.

BACK ISSUES OF THE PROCEEDINGS

Back issues of the PROCEEDINGS are available in unbound form for the years 1918, 1920, 1921, 1922, 1923, and 1926 at \$6.75 per year (six issues). Single copies for any of the years listed to 1927 are \$1.13 each. From 1927 on (where available) the single copy price is \$0.75. Foreign postage on the volume is \$0.60 additional. On single copies \$0.10.

A number of individual copies for years other than those listed above are available. For a list of these, members should apply to the Secretary. Bound volumes in Blue Buckram binding are available for the years 1920, 1921, 1922, 1923, and 1926 at \$8.75 per year. The bound volume for 1928 is priced at \$9.50. Foreign postage is \$1.00 per volume.

Bound volumes, for the above years, in Morocco Leather binding are available at \$11.00 each.

These prices are to members of the Institute.

FOURTEEN YEAR INDEX

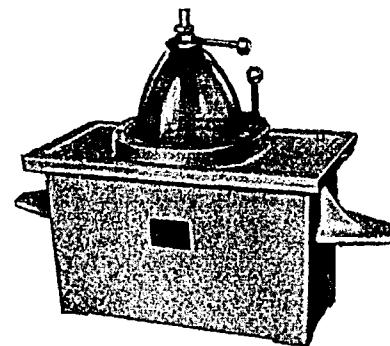
The PROCEEDINGS Index for the years 1909-1926, inclusive, is available to members at \$1.00 per copy. This index is extensively cross indexed.

YEAR BOOK

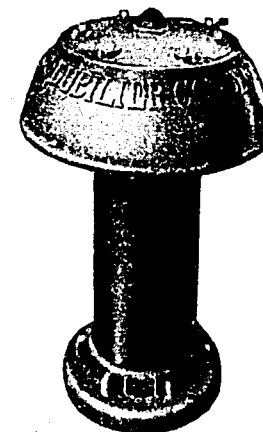
The 1927 and 1928 year books are available to members at \$0.75 per copy, per year. The 1929 year book, including the report of the 1928 Committee on Standardization, is available to members at \$1.00 per copy.

When ordering any of the above, send remittance, with order to The Secretary, The Institute of Radio Engineers, 33 West 39th Street, New York, N.Y.

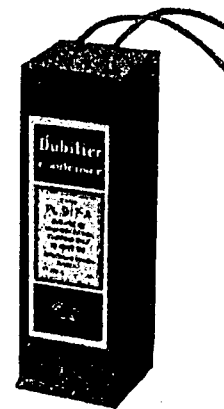
You Can forget the Condensers if they are DUBILIER'S



There is a Dubilier mica dielectric condenser available for any radio telegraph, telephone, signal or laboratory requirement.



Dubilier Mica Capacitors have stood the test of time and are recognized by the principal public utility companies as the only safe and dependable coupling medium for carrier current systems.



The ideal electrical characteristics and long life of Dubilier Chemical Condensers, which are used by leading manufacturers and laboratories, have shown the wisdom of not offering designs until a perfect product is assured.



Dubilier Filter Blocks are standard equipment for most receiving set makers. Condensers designed for all voltages. And in high voltage types, including 10,000 volts.

Dubilier

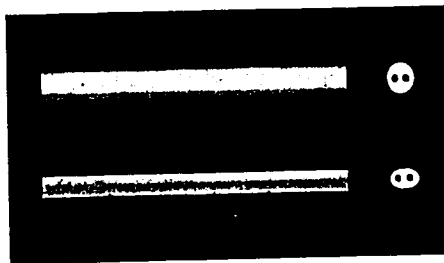
CONDENSER CORPORATION

342 Madison Avenue
New York, N. Y.

VITREOSIL

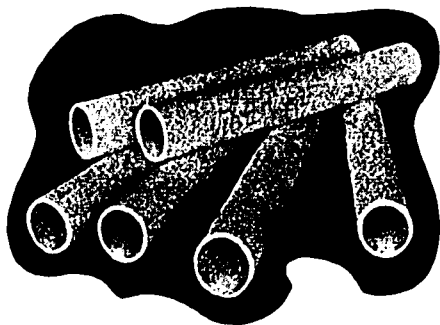
(Fused Pure Silica)

FOR RADIO TUBE MANUFACTURE



CATHODE INSULATION

Vitreosil is chemically inert, producing long life tubes. It does not crumble nor crack from temperature changes, is gas-free and contains no undesirable components. Vitreosil is obtainable in single, twin or multibore tubing in oval or circular cross-section from stock. Samples will be gladly sent upon request.



DEGASSING

Vitreosil tubes are particularly suitable for this work because of their gas-tight structure and their ability to withstand temperatures in excess of 1,000° C. and sudden cooling and heating without breakage. They may be obtained promptly in practically any diameter and length with open ends or one end closed. Vitreosil tubes are long-lived, and unexcelled for treating nickel plates, decarbonizing, etc.

*Write for complete particulars
(Other details also for television)*

THE THERMAL SYNDICATE, Ltd.

1734 Atlantic Avenue

Brooklyn, New York