U. S. DEPARTMENT OF COMMERCE
JESSE H. JONES, Secretary

NATIONAL BUREAU OF STANDARDS
LYMAN J. BRIGGS, Director

DIAL INDICATORS

(For Linear Measurements)

COMMERCIAL STANDARD (EMERGENCY) CS(E)119-45

Effective date for new production from January 1, 1945

A RECORDED VOLUNTARY STANDARD
OF THE TRADE

UNITED STATES
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PROMULGATION

of

COMMERCIAL STANDARD (EMERGENCY) CS(E)119–45

for

DIAL INDICATORS (For Linear Measurements)

On March 8, 1944, at the instance of the War Production Board, a proposed commercial standard for dial indicators (for linear measurements) was circulated to leading user organizations, Government agencies, distributors, and to manufacturers for comment. Following adjustment in the light of that comment, the proposed commercial standard was circulated May 18, 1944, to the entire trade for written acceptance.

Those concerned have since accepted and approved the standard as shown herein for promulgation by the United States Department of Commerce, through the National Bureau of Standards.

The standard is effective for new production from January 1, 1945.

Promulgation recommended.

I. J. Fairchild,
Chief, Division of Trade Standards.

Promulgated.

Lyman J. Briggs,
Director, National Bureau of Standards.

Promulgation approved.

Jesse H. Jones,
Secretary of Commerce.

DIAL INDICATORS

(For Linear Measurements)

COMMERCIAL STANDARD (EMERGENCY) CS(E)119–45

PURPOSE

1. The purpose of this commercial standard is to provide minimum essential requirements for precision dial indicators described herein, as a basis for a better understanding between sellers and buyers, a basis for fair competition and identification of precision dial indicators conforming thereto.

SCOPE

2. This standard covers the major essential requirements of the following precision dial indicators in four size groups of nominal bezel diameters: Group 1, ranging from above 1⅜ in. to and including 2 in.; group 2, above 2 in. to and including 2⅜ in.; group 3, above 2⅜ in. to and including 3 in.; and group 4, above 3 in. to and including 3¾ in.; with four classes of dial markings in English measure, .00005, .0001, .0005, and .001 in.; and with four classes of dial markings in metric measure, .001, .002, .005, and .01 mm. (See table 2 for combinations regularly available.)

NOMENCLATURE

3. For the purposes of this standard the nomenclature shown in figures 1 to 4 shall apply.

GENERAL REQUIREMENTS

4. *Type.*—This standard covers only the AD (the symbol for American Gage Design) type shown in figure 1. The monogram, it will be noted, consists of the initials "AD", the right-hand side of the "A" and the straight side of the "D" being common. The monogram, if used, should be placed adjacent to the maker's trade mark.

5. *Material.*

5a. Contact surface of contact points shall be of suitable material to provide a smooth durable surface.

5b. Dial faces shall be clear and legible.

5c. Crystals shall be clear and preferably of the nonshattering type.

6. *Construction.*

6a. Dial-indicator cases shall be of such strength and rigidity that free movement of mechanism is maintained under conditions of normal use.

7. *Dial.*—Unless otherwise specified a movable dial with suitable clamp shall be furnished.

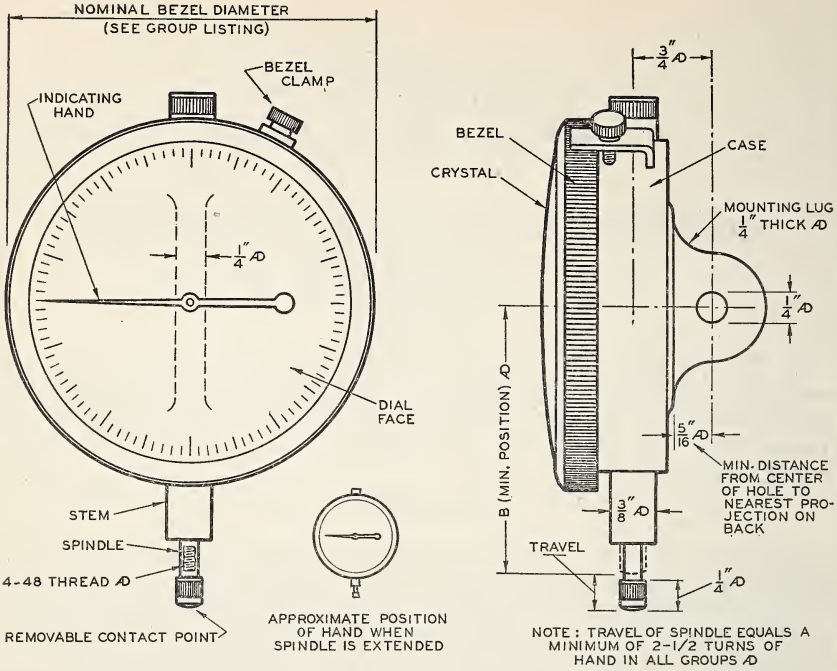

FIGURE 1.—*AD Dial indicator standards.*

Travel of spindle equals a minimum of 2½ turns of hand in all groups AD

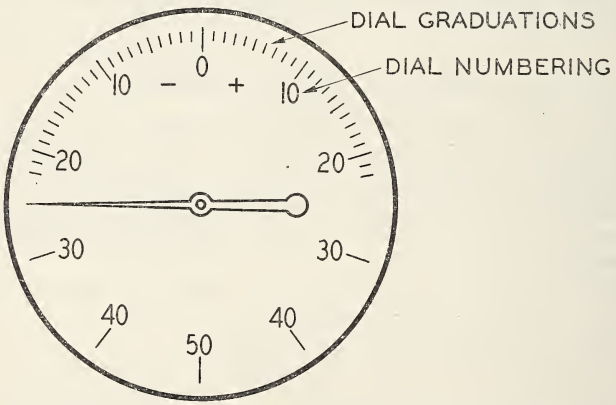

FIGURE 2.—*Balanced dial showing specimen numbering.*

Balanced dials will be furnished in all sizes and classes unless continuous reading is specified by the purchaser

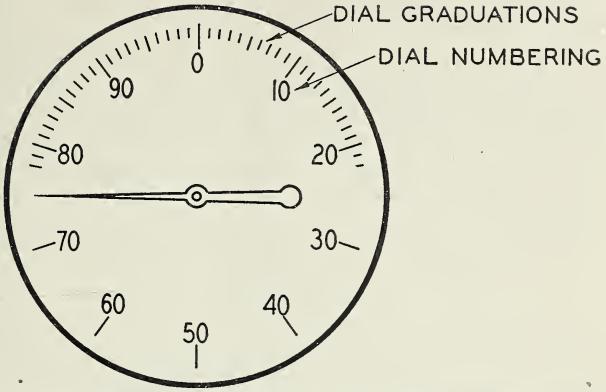

FIGURE 3.—*Continuous dial showing specimen numbering.*
When specified by the purchaser, continuous reading dials will be furnished in all sizes and classes.

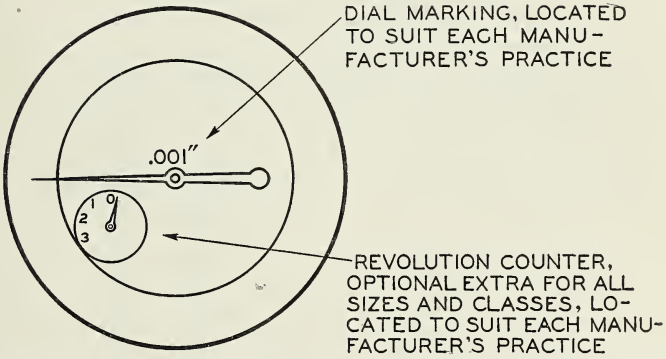

FIGURE 4.—*Dial showing specimen dial marking and revolution counter.*

DETAIL REQUIREMENTS

8. *Dial indicators.*—Length of contact point, distance between spindle axis and center of lug hole, diameter of lug hole, thickness of lug and diameter of stem, which are identical for all sizes, shall be as shown in figure 1. Spindle travel, or range, shall be a minimum of 2½ revolutions of the indicating hand unless otherwise specified for special applications requiring greater travel. The indicating hand shall be set at the approximate 9-o'clock position (one-fourth revolution to the left of zero) when the spindle is fully extended. Size group limits for nominal bezel diameters and corresponding minimum position distances along spindle axis, between contact point and center of dial shall be as shown in table 1.

TABLE 1.—*Nominal bezel diameters and minimum distance from contact point to dial center with spindle fully retracted*

Size group	Nominal bezel diameters		B
	Above	To and including	Minimum position (See fig. 1.)
	in.	*in.*	*in.*
1	1⅜	2	1⅝
2	2	2⅜	2
3	2⅜	3	2⅛
4	3	3¾	2 9/16

9. *Dial classes.*—Dial markings indicating the value of the smallest graduations shall be in four classes, see table 2, which shows the combinations of dial sizes and markings regularly available.

TABLE 2.—*Dial sizes and classes of markings*

American Gage Design group	Bezel diameters	English measure	Metric measure
	in.	*in.*	*mm*
1	1⅜ to 2	.0001	0.005
		.0005	.01
		.001	
2	2 to 2⅜	.00005	.001
		.0001	.002
		.0005	.005
		.001	.01
3	2⅜ to 3	.0001	.001
		.0005	.002
		.001	.005
			.01
4	3 to 3¾	.00005	.001
		.0001	.002
		.0005	.005
		.001	.01

10. *Dial markings.*—Dial markings, both English and metric measure, shall indicate the smallest value of the graduation of the dial, and shall be in decimals, e. g., .001″, not 1/1,000″; or .01 mm, not 1/100 mm.

11. *Dial numbering.*

11a. On English-measure dials the dial numbering shall always indicate thousandths of an inch, irrespective of the class of dial marking.

11b. On metric-measure dials the dial numbering shall always indicate hundredths of a millimeter, irrespective of the class of dial marking.

12. *Repetition and accuracy.*—The degree of repetition and accuracy varies with the magnification factor of the dial indicator and the magnitude of the difference measured; therefore, the values established below are to be considered only as maximum tolerances.

12a. *Repetition of readings.*—Readings at any point shall be reproducible through successive movements of the spindle to plus or minus one-fifth graduation.

12b. *Accuracy.*—The dial indicator shall be accurate to within one graduation, plus or minus, at any point from the approximate ten o'clock position to the final two o'clock position (2⅓ turns).

PACKING

13. *Packing.*—Dial indicators shall be packed in cartons or boxes that afford protection during shipment.

MARKING

14. *Manufacturer's name or trade-mark.*—Unless otherwise specified, each dial indicator shall have legibly marked upon it, in characters not less than 0.025 in. high, the manufacturer's name or trade-mark.

15. It is recommended that the individual manufacturers list in their catalogs and data sheets appropriate references to dial indicators of American Gage Design, AD as recorded in CS(E)119–45.

EFFECTIVE DATE

16. The standard is effective for new production from January 1, 1945.

STANDING COMMITTEE

17. The following individuals comprise the membership of the standing committee, which is to review, prior to circulation for acceptance, revisions proposed to keep the standard abreast of progress. Comment concerning the standard and suggestions for revision may be addressed to any member of the committee or to the Division of Trade Standards, National Bureau of Standards, which acts as secretary for the committee.

Warren Ames (chairman), B. C. Ames Co., Waltham 54, Mass.

F. C. Tanner, Federal Products Corporation, Providence 1, R. I.

Erik Aldeborgh, Standard Gage Co., Inc., Poughkeepsie, N. Y.

Arthur H. Starrett, The L. S. Starrett Co., Athol, Mass.

General Electric Co., Schenectady 5, N. Y. (Invited to name a representative.)

General Motors Corporation, Detroit 23, Mich. (Invited to name a representative.)

Sidney French, Pratt & Whitney Aircraft, E. Hartford 8, Conn.

W. C. Mueller, Western Electric Co., Hawthorn Station, Chicago, Ill.

F. W. Fisher, Office of Procurement and Material, Navy Department, Washington 25, D. C.

J. R. Tucker, United States Testing Co., Inc., Hoboken, N. J.

Stanford University, Stanford University, Calif. (Invited to name a representative.)

D. R. Miller, Gage Section, National Bureau of Standards, Washington 25, D. C.

Oliver K. Holden, International Business Machines Corporation, Endicott, N. Y.

Hoover Ball & Bearing Co., 200 Hoover Ave., Detroit, Mich. (Invited to name a representative.)

HISTORY OF PROJECT

18. The War Production Board, on September 30, 1943, requested the cooperation of the National Bureau of Standards in the establishment of commercial standards for precision hand tools, of which dial indicators represent an important category. A preliminary manufacturers' conference in New York City, on December 14, 1943, voted unanimously that the industry desired to establish a commercial standard for dial indicators, and proceeded to the consideration of a preliminary draft.

19. The work of drafting the standard continued by correspondence, and was concluded at the conference of January 4, 1944, in New York City. On March 8, 1944, the proposed standard was circulated to leading user organizations, Government agencies, and distributors, for constructive comment. On April 11, 1944, this comment was reviewed and the proposed standard was changed accordingly.

20. The revised draft was circulated May 18, 1944, to the entire trade for written acceptance, as it appeared that there was substantial approval of the draft; and for this reason, coupled with wartime emergency conditions, further conferences seemed unnecessary.

21. Upon receipt of acceptances in writing from a satisfactory majority of the production volume of the industry, announcement was issued on June 30, 1944, that the standard would become effective for new production from January 1, 1945.

ACCEPTANCE OF COMMERCIAL STANDARD

If acceptance has not previously been filed, this sheet properly filled in, signed, and returned will provide for the recording of your organization as an acceptor of this commercial standard.

Date _____

Division of Trade Standards,
National Bureau of Standards,
Washington, D. C.

Gentlemen:

Having considered the statements on the reverse side of this sheet, we accept the Commercial Standard (Emergency) CS(E)119–45 as our standard of practice in the

Production [1] Distribution [1] Use [1] Testing [1]

of dial indicators.

We will assist in securing its general recognition and use, and will cooperate with the Standing Committee to effect revisions of the standard when necessary.

Signature of individual officer _____
(In ink)

(Kindly typewrite or print the following lines)

Name and title of above officer _____

Organization _____
(Fill in exactly as it should be listed)

Street address _____

City and State _____

[1] Please designate which group you represent by drawing lines through the other three. Please file separate acceptances for all subsidiary companies and affiliates which should be listed separately as acceptors. In the case of related interests, trade papers, colleges, etc., desiring to record their general approval, the words "in principle" should be added after the signature.

(Cut on this line)

TO THE ACCEPTOR

The following statements answer the usual questions arising in connection with the acceptance and its significance:

1. *Enforcement.*—Commercial standards are commodity specifications voluntarily established by mutual consent of those concerned. They present a common basis of understanding between the producer, distributor, and consumer and should not be confused with any plan of governmental regulation or control. The United States Department of Commerce has no regulatory power in the enforcement of their provisions, but since they represent the will of the interested groups as a whole, their provisions through usage soon become established as trade customs, and are made effective through incorporation into sales contracts by means of labels, invoices and the like.

2. *The acceptor's responsibility.*—The purpose of commercial standards is to establish for specific commodities, nationally recognized grades or consumer criteria and the benefits therefrom will be measurable in direct proportion to their general recognition and actual use. Instances will occur when it may be necessary to deviate from the standard and the signing of an acceptance does not preclude such departures; however, such signature indicates an intention to follow the commercial standard where practicable, in the production, distribution, or consumption of the article in question.

3. *The Department's responsibility.*—The major function performed by the Department of Commerce in the voluntary establishment of commercial standards on a Nation-wide basis is fourfold: first, to act as an unbiased coordinator to bring all interested parties together for the mutually satisfactory adjustment of trade standards; second, to supply such assistance and advice as past experience with similar programs may suggest; third, to canvass and record the extent of acceptance and adherence to the standard on the part of producers, distributors, and users; and fourth, after acceptance, to publish and promulgate the standard for the information and guidance of buyers and sellers of the commodity.

4. *Announcement and promulgation.*—When the standard has been endorsed by a satisfactory majority of production or consumption in the absence of active, valid opposition, the success of the project is announced. If, however, in the opinion of the standing committee or the Department of Commerce, the support of any standard is inadequate, the right is reserved to withhold promulgation and publication.

ACCEPTORS

22. The organizations and individuals listed below have accepted this commercial standard as their standard of practice in the production, distribution, and use of dial indicators. Such endorsement does not signify that they may not find it necessary to deviate from the standard, nor that producers so listed guarantee all of their products in this field to conform with the requirements of this standard. Therefore, specific evidence of conformity should be obtained where required.

ASSOCIATIONS

American Association of Engineers, Chicago, Ill.
American Society of Tool Engineers, Potomac Chapter, No. 48, Arlington, Va. (In principle.)

FIRMS

Able Machine & Tool Works, New York, N. Y.
Accurate Tool Co., Detroit, Mich.
Ace Manufacturing Corporation, Philadelphia, Pa.
Acklin Stamping Co., The, Toledo, Ohio.
Acme Foundry & Machine Co., Coffeyville, Kans.
Acme Machine Tool Co., The, Cincinnati, Ohio.
Advance Manufacturing, Inc., Detroit, Mich.
Aeronautical Manufacturing Corporation, Niagara Falls, N. Y.
Ahlberg Bearing Co., Chicago, Ill.
Ainsworth & Sons, Inc., Wm., Denver, Colo.
Akron, University of, Akron, Ohio.
Allen Gauge & Tool Co., Pittsburgh, Pa.
Allen Manufacturing Co., The, Hartford, Conn.
Alliance Manufacturing Co., Alliance, Ohio.
Alpha Industries, Logansport, Ind.
Alten's Foundry & Machine Works, Lancaster, Ohio.
Aluminum Industries, Inc., Cincinnati, Ohio.
American Brake Shoe Co., Kellogg Division, Rochester, N. Y.
American Measuring Instruments Corporation, New York, N. Y.
American Tool & Manufacturing Co., Urbana, Ohio.
American Tool Works Co., The, Cincinnati, Ohio.
American Viscose Corporation, Marcus Hook, Pa.
American Well & Prospecting Co., Corsicana, Tex.
Ames Co., B. C., Waltham, Mass.
Andover Motors Corporation, Elmira, N. Y.
Andrews, A. B., Lewiston, Maine.
Arter Grinding Machine Co., Worcester, Mass.
Autocar Co., The, Ardmore, Pa.
Automatic Products Co., Milwaukee, Wis.
Axelson Manufacturing Co., Los Angeles, Calif.
Barrett Hardware Co., Joliet, Ill.
Bauer Bros. Co., The, Springfield, Ohio.
Bausch & Lomb Optical Co., Rochester, N. Y.
Berger Engineering Works, Inc., Seattle, Wash.
Bickford & Co., H., Lakeport, N. H.
Birdsboro Steel Foundry & Machinery Co., Birdsboro, Pa.
Black & Decker Manufacturing Co., The, Towson, Md.
Blanchard Machine Co., The, Cambridge, Mass.
Bolinders Co., Inc., New York, N. Y.
Boston Machine Works Co., Lynn, Mass.
Brady, Inc., F. A., New York, N. Y.
Brewer Dry Dock Co., Staten Island, N. Y.
Brill Co., The J. G., Philadelphia, Pa.
Brown-Camp Hardware Co., Des Moines, Iowa.
Bruce Williams Laboratories, The, Joplin, Mo.
Bryant Chucking Grinder Co., Springfield, Vt.
Buerk Tool Works, Buffalo, N. Y.
Buffalo Testing Laboratories, Inc., Buffalo, N. Y.
Builders Iron Foundry, Providence, R. I.
Bulotti Machinery Co., C. F., San Francisco, Calif.
Busch-Sulzer Bros. Diesel Engine Co., St. Louis, Mo.
California Testing Laboratories, Inc., Los Angeles, Calif.
Cedar Rapids Engineering Co. of Delaware, Cedar Rapids, Iowa.
Cessna Aircraft Co., Wichita, Kans.
Chicago Rivet & Machine Co., Bellwood, Ill.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Citadel, The, (The Military College of South Carolina), Charleston, S. C.
City Engineering Co., The, Dayton, Ohio.
Clausing Manufacturing Co., Ottumwa, Iowa.
Clearing Machine Corporation, Chicago, Ill.
Colorado, University of, Department of Civil Engineering, Boulder, Colo.
Columbia Machine Works, Inc., Brooklyn, N. Y.
Consolidated Vultee Aircraft, Stinson Division, Wayne, Mich.
Consulting Co., The, Cincinnati, Ohio.
Cooper-Bessemer Corporation, The, Mt. Vernon, Ohio.
Cornwell Quality Tools Co., The, Mogadore, Ohio.
Covel Manufacturing Co., Benton Harbor, Mich.
Craig Shipbuilding Co., Long Beach, Calif. (In principle.)
Cramp Shipbuilding Co., Philadelphia, Pa.
Dallas Laboratories, Dallas, Tex.
Davenport Besler Corporation, Davenport, Iowa.
De Laval Steam Turbine Co., Trenton, N. J.
Delaware Bay Shipbuilding Co., Leesburg, N. J.
Delaware, University of, Materials Testing Laboratory, Newark, Del.
Detroit Testing Laboratory, The, Detroit, Mich. (In principle.)
Detroit Testing Machine Co., Detroit, Mich.
DeWalt Products Corporation, Lancaster, Pa.
Dravo Corporation, Pittsburgh, Pa.
Eitzen Co., Louis C., New York, N. Y.
El Paso Testing Laboratories, El Paso, Tex.
Electric Sprayit Co., Sheboygan, Wis.
Electrical Testing Laboratories, New York, N. Y.
Ex-Cell-O Corporation, Detroit, Mich.
Fairbanks Morse & Co., Beloit, Wis.
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Fay & Scott Machine Shop, Dexter, Maine.
Federal Products Corporation, Providence, R. I.
Filer & Stowell Co., The, Milwaukee, Wis.
Fitzsimons Manufacturing Co., Detroit, Mich.
Flood & Co., Walter H., Chicago, Ill.
Fosdick Machine Tool Co., The, Cincinnati, Ohio.
Fray Machine Tool Co., Inc., Glendale, Calif.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
General Electric Co., Schenectady, N. Y.
General Engineering & Manufacturing Co., St. Louis, Mo.
General Engineering Works, Chicago, Ill.
General Machinery Corporation, Hamilton, Ohio.
General Motors Corporation, Cleveland Diesel Engine Div., Cleveland, Ohio.
Geometric Tool Co., The, New Haven, Conn.
Georgia School of Technology, Atlanta, Ga.
Gisholt Machine Co., Madison, Wis.
Gould & Eberhardt, Inc., Irvington, N. J.
Granite State Mach. Co., Inc., Manchester, N. H.
Graphic Calculator Co., Chicago, Ill.
Haarmann Steel Co., Holyoke, Mass.
Hallmark Laboratories, The, Jamestown, N. Y.
Harris Laboratories, Lincoln, Nebr.
Hart Brothers Machine Co., Clarksburg, W. Va.
Hatch Textile Research, New York, N. Y.
Herron Co., The James H., Cleveland, Ohio.
Hill Acme Co., The, Acme Machinery Division, Cleveland, Ohio.
Holm's Manufacturing Co., Kenosha, Wis.
Hubbard Textile Consulting Bureau, C. C., Silver Spring, Md.
Hughes Aircraft Co., Culver City, Calif.

Hughes Tool Co., Houston, Tex.
Hunt Co., Robert W., Chicago, Ill.
Hunter Engineering Co., Riverside, Calif.
Illinois Tool Works, Chicago, Ill.
Index Machine & Tool Co., Jackson, Mich.
Indicating Calipers Corporation, New York, N. Y.
Integrity Supply, Inc., New York, N. Y.
International Business Machines Corporation, Endicott, N. Y.
Iowa State College, Ames, Iowa.
Isaacson Iron Works, Seattle, Wash.
Jacobs Aircraft Engine Co., Pottstown, Pa.
Jansson Gage Co., Detroit, Mich.
Johnson Motors, Waukegan, Ill.
Johnston & Jennings Co., The, Cleveland, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kennedy Van Saun Manufacturing & Engineering Corporation, Danville, Pa.
Knight Machinery Co., W. B., St. Louis, Mo.
Krueger & Co., H. R., Detroit, Mich.
Lamson & Sessions Co., The, Cleveland, Ohio.
Landis Machine Co., Waynesboro, Pa.
Landis Tool Co., Waynesboro, Pa.
Lapointe Machine Tool Co., Hudson, Mass.
Law & Co., Wilmington, N. C.
Leyman Manufacturing Corporation, McGowan Pump Division, Cincinnati, Ohio.
Lincoln Park Industries, Inc., Lincoln Park, Mich.
Linderme Machine & Tool Co., Inc., Detroit, Mich.
Link-Belt Co., Chicago, Ill.
Link-Belt Ordnance Co., Chicago, Ill.
Lombard Governor Corporation, New York, N. Y.
Los Angeles Testing Laboratory, Los Angeles, Calif.
Machined Products Co., Louisville, Ky.
Macnick Co., Tulsa, Okla.
Mann Tool Works, R. S. Oak Park, Ill.
Maryland Drydock Co., The, Baltimore, Md.
Merz Engineering Co., Indianapolis, Ind.
Messinger Bearings, Inc., Philadelphia, Pa.
Miami Shipbuilding Corporation, Miami, Fla.
Midwestern Tool Co., Chicago, Ill.
Miedendorp, Henry, Jr., Glen Rock, N. J.
Minnesota, University of, Minneapolis, Minn.
Missouri State Highway Department, Jefferson City, Mo.
Moore Engineering, Inc., South Bend, Ind.
Napoleon Products Co., The, Napoleon, Ohio.
National Automatic Tool Co., Inc., Richmond, Ind.
Nebraska, University of, Lincoln, Nebr.
New Albany Machine Manufacturing Co., New Albany, Ind.
Niles-Bement-Pond Co., Pratt & Whitney Division, West Hartford, Conn.
Nordberg Manufacturing Co., The, Milwaukee, Wis.
North Carolina State College, Raleigh, N. C.
Northrop Aircraft, Inc., Hawthorne, Calif.
Notre Dame, University of, Notre Dame, Ind.
Novo Engine Co., Lansing, Mich.
Ohio State University, Columbus, Ohio.
Oklahoma A. & M. College, Stillwater, Okla.
Oklahoma, University of, Department of Mechanics, Norman, Okla.
Oregon State College, Corvallis, Oreg.
Packard Motor Car Co. (Aircraft Engine Division), Detroit, Mich.
Palmer Bros. Engines, Inc., Cos Cob, Conn.
Parrott & Hahn, Inc., Olympia, Wash.
Patzig Testing Laboratories, Des Moines, Iowa.
Pease Laboratories, Inc., New York, N. Y.
Peck Stow & Wilcox Co., Southington, Conn.
Penniman & Browne, Baltimore, Md.
Perth Amboy Hardware Co., Perth Amboy, N. J.
Peters Co., O. S., Washington, D. C.
Pettibone Mulliken Corporation, Chicago, Ill.
Physicists Research Co., Ann Arbor, Mich.
Pipe Machinery Co., The, Cleveland, Ohio.
Portman Machine Tool Co., New Rochelle, N. Y.
Pratt Institute, Brooklyn, N. Y.
Purdy Co., Inc., W. S., New York, N. Y.
Pusey & Jones Corporation, The, Wilmington, Del.
Rasmussen Machine Co., Inc., Racine, Wis.
Rayl Co., The, Detroit, Mich.
Redmond Co., A. G., Owosso, Mich.
Reid Brothers Co., Inc., Beverly, Mass.
Reliable Tool & Machine Works, Milwaukee, Wis.
Rice Institute, The, Houston, Tex. (In principle.)
Rogers Machine Works, Inc., Alfred, N. Y.
Ryan Aeronautical Co., San Diego, Calif.
Sales Service Machine Tool Co., St. Paul, Minn.
Sav-Way Industries, Detroit, Mich.
Savage Tool Co., Savage, Minn.
Schauer Machine Co., Cincinnati, Ohio.
Simmons Machine Tool Corporation, Albany, N. Y.
Skagit Steel & Iron Works, Sedro-Woolley, Wash.
Skinner Engine Co., Erie, Pa.
Smalley-General Co., Bay City, Mich. (In principle)
Smith-Emery Co., Los Angeles, Calif., and San Francisco, Calif.
Snow Manufacturing Co., Chicago, Ill.
Souther Engineering Co., The Henry, Hartford, Conn.
Southern Aircraft Corporation, Garland, Tex.
Southern Testing Laboratories, Inc., Birmingham, Ala.
Spartan Aircraft Co., Tulsa, Okla.
Standard Forgings Corporation, East Chicago, Ind.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Standard Machinery Co., The, Mystic, Conn.
Starrett Co., The L. S., Athol, Mass.
Steel City Testing Laboratory, Detroit, Mich.
Sterling Motor Truck Co., Inc., Milwaukee, Wis.
Stokerunit Corporation, Milwaukee, Wis.
Streeter-Amet Co., Chicago, Ill.
Streine Tool & Manufacturing Co., The, New Bremen, Ohio.
Sturgeon Bay Shipbuilding & Dry Dock Co., Sturgeon Bay, Wis.
Sunnen Products Co., St. Louis, Mo.
Taft-Peirce Manufacturing Co., The, Woonsocket, R. I.
Taylor Instrument Co.'s, Rochester, N. Y.
Tennessee, University of, Knoxville, Tenn.
Texas A. & M. College, College Station, Tex.
Thal, Nelson Edward, Toledo, Ohio.
Thompson & Lichtner Co., Inc., The, Boston, Mass.
Thompson Products, Inc., Cleveland, Ohio.
Treadwell Engineering Co., Easton, Pa.
Triplex Machine Tool Corporation, New York, N. Y.
Troy Tool & Gage Co., Detroit, Mich.
Tubular Micrometer Co., St. James, Minn.
Twin City Testing & Engineering Laboratory, St. Paul, Minn.
Twining Laboratories, The, Fresno, Calif.
United Aircraft Division, Stratford, Conn.
U. S. Automatic Corporation, Amherst, Ohio.
United States Testing Co., Inc., Hoboken, N. J. (In principle.)
Universal Engineering Co., Frankenmuth, Mich.
Van Camp Hardware & Iron Co., Indianapolis, Ind.
Vard, Inc., Pasadena, Calif.
Villanova College, Villanova, Pa.
Vinco Corporation, Detroit, Mich.
Vonnegut Moulder Corporation, Indianapolis, Ind.
Wabash College, Chemistry Department, Crawfordsville, Ind. (In principle.)
Waltham Machine Works, Waltham, Mass.
Ward & Co., E. H., Chicago, Ill.
Warner & Swasey Co., The, Cleveland, Ohio.
West Virginia University, Morgantown, W. Va.
Western Electric Co., Inc., New York, N. Y.
Western Gear Works, Pacific Gear Plant, Los Angeles, Calif.
Whiting Corporation, Harvey, Ill.
Wickman Corporation, The, Detroit, Mich.
Williams Inspection Co., A. W., Mobile, Ala.
Wisconsin Foundry & Machine Co., Madison, Wis.
Wisconsin Motor Corporation, Milwaukee, Wis.
Wisconsin Screw Co., Racine, Wis.
Wolverine Tool Engineering & Manufacturing Co., Chicago, Ill.
Worcester Polytechnic Institute, Worcester, Mass.
York Corporation, York, Pa. (In principle.)
Young Engine Corporation, Canton, Ohio.
Zehnder Engineering Service, Louisville, Ky.

U. S. GOVERNMENT

Agriculture, U. S. Department of, Washington 25, D. C.
Federal Works Agency, Public Buildings Administration, Washington 25, D. C.
War Production Board, Washington 25, D. C.