

CS3-38
Solvent; dry-cleaning
(Stoddard Solvent)

U. S. DEPARTMENT OF COMMERCE

DANIEL C. ROPER, Secretary

NATIONAL BUREAU OF STANDARDS

LYMAN J. BRIGGS, Director

STODDARD SOLVENT

(Second Edition)

COMMERCIAL STANDARD CS3-38

Supersedes CS3-28

Bureau of Standards
OCT 15 1938
Effective from February 10, 1938



A RECORDED STANDARD OF THE INDUSTRY

UNITED STATES
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PROMULGATION
of
COMMERCIAL STANDARD CS3-38
for
STODDARD SOLVENT
(Second Edition)

On December 2, 1927, at the instance of the National Association of Dyers and Cleaners, a general conference of manufacturers, distributors, and users of Stoddard solvent adopted a recommended commercial standard, which was later accepted by the industry and became effective March 1, 1928. The success of the standard and improvements in manufacturing processes during succeeding years led the standing committee on January 6 and June 11, 1937, to recommend the revisions which the industry accepted, as shown herein for promulgation by the U. S. Department of Commerce, through the National Bureau of Standards.

The standard is effective for new production from February 10, 1938.

Promulgation recommended.

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

Promulgated.

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

Promulgation approved.

Daniel C. Roper.
Secretary of Commerce.

FWR:RB

TS-2549
OCTOBER 7, 1938

SUPPLEMENT TO
STODDARD SOLVENT
COMMERCIAL STANDARD CS3-38

RECOMMENDATIONS OF THE STANDING COMMITTEE TO LABORATORIES TESTING STODDARD SOLVENT FOR CONFORMANCE TO COMMERCIAL STANDARD CS3-38.

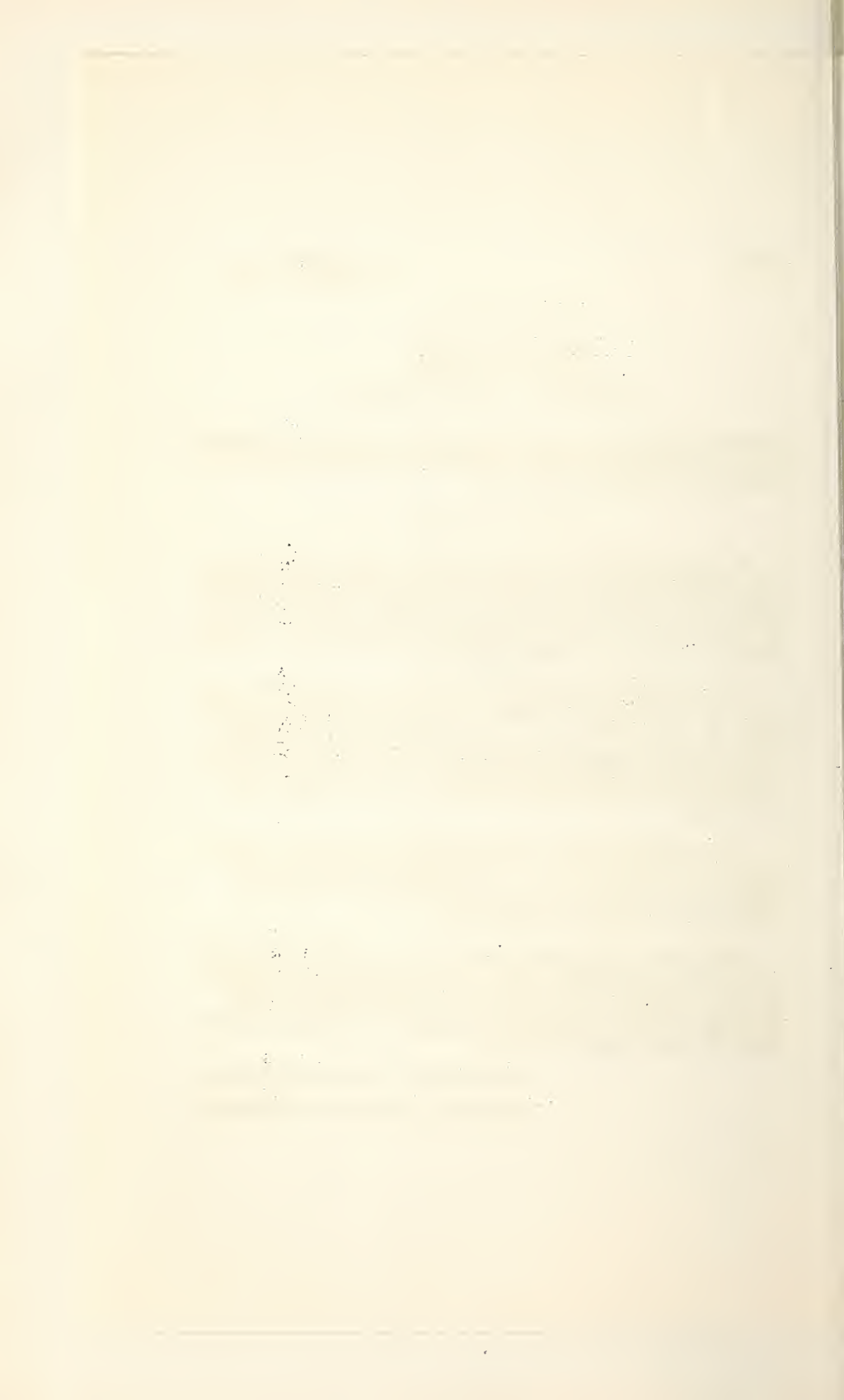
A RECENT STUDY OF THE SULPHURIC ACID ABSORPTION TEST SPECIFIED IN PARAGRAPH 20C OF STODDARD SOLVENT, COMMERCIAL STANDARD CS3-38, INDICATES THAT THE IMPLIED TOLERANCE IN THE CONCENTRATION OF ACID (1.83 TO 1.84 SP. G. AT 20° C) IS TOO INDEFINITE TO INSURE UNIFORM RESULTS ON SOME SOLVENTS.

THE STANDING COMMITTEE THEREFORE RECOMMENDS THAT THE CONCENTRATION OF ACID USED BE AS NEAR 93.2 PERCENT AS PRACTICABLE AND HELD WITHIN THE LIMITS OF 93.0 PERCENT AND 94.0 PERCENT H₂SO₄, DETERMINED BY TITRATION OF A WEIGHED SAMPLE. IT IS FURTHER RECOMMENDED THAT THE ACID BE COOLED IN ICE WATER BEFORE USE.

THE COMMITTEE ALSO RECOMMENDS THAT, AS AN ALTERNATIVE EQUIVALENT TO THE PROCEDURE SPECIFIED FOR SEPARATING THE PHASES, A CENTRIFUGE MAY BE USED WHEN IT IS DESIRED TO AVOID THE LOSS OF TIME REQUIRED FOR STANDING OVER NIGHT.

ALTHOUGH THESE RECOMMENDATIONS DO NOT CONSTITUTE A REVISION OF CS3-38, BUT ONLY THE RECOMMENDATIONS OF THE STANDING COMMITTEE AS A REFINEMENT OF ANALYTICAL METHOD, IT IS BELIEVED THAT LABORATORIES MAY FIND THEM OF VALUE AS A MEANS OF SECURING MORE UNIFORM AND PROMPT RESULTS.

DIVISION OF TRADE STANDARDS
NATIONAL BUREAU OF STANDARDS



STODDARD SOLVENT

(Dry Cleaning)

(Second Edition)

COMMERCIAL STANDARD CS3-38

PURPOSE

1. The purpose of this commercial standard is to provide a nationally recognized specification for guidance of producers, distributors, and users of dry-cleaning fluid known as Stoddard solvent, and to provide a basis for certification of quality.

SCOPE

2. This commercial standard covers a grade of petroleum distillate of low flammability used in dry cleaning.

GENERAL REQUIREMENTS

3. *Material*.—Stoddard solvent shall be a petroleum distillate conforming to the requirements given herein.

4. *Appearance* shall be clear and free from suspended matter and undissolved water.

5. *Color* shall be water-white or not darker than 21 by Saybolt chromometer.

6. *Odor*.—Solvent shall be free from rancid and objectionable odors; shall be typical of a "sweet" refined naphtha.

7. *Corrosive properties*.—A clean copper strip shall show not more than extremely slight discoloration when submerged in the solvent for 3 hours at 212° F. (See par. 18.)

8. *Doctor test*.—A negative result shall be obtained by testing according to paragraph 19.

9. *Sulphuric acid absorption test*.—Not more than 5 percent of the solvent shall be absorbed by concentrated "cp" sulphuric acid when tested in accordance with paragraph 20.

10. *Flash point*.—The flash point shall be not lower than 100° F when tested in accordance with paragraph 21.

11. *Distillation*.

11a. *Distillation range*.—When a sample is distilled in accordance with paragraph 22, not less than 50 percent shall be recovered in the receiver when the thermometer reads 350° F and not less than 90 percent when the thermometer reads 375° F. The end point (maximum distillation temperature) shall be not higher than 410° F.

11b. *Residue*.—When a sample is distilled in accordance with paragraph 22, the residue shall be not more than 1.5 percent.

12. *Acidity*.—The residue remaining in the flask after the distillation is completed shall not show an acid reaction to methyl orange. (See par. 23.)

METHODS OF SAMPLING, INSPECTION, AND TESTING

13. *Detection and removal of separated water.*—Draw a portion of the solvent by means of a glass or metal container with a removable stopper or top, or with a “thief” from the lowest part of the container, or by opening the bottom valve of the perfectly level tank car. If water is found to be present, draw it all out, record the quantity, and deduct it from the total volume of liquid delivered.

14. *Sampling.*—The method of sampling given under 14a shall be used whenever feasible. When this method is not applicable, method 14b, 14c, or 14d is to be used, according to the special conditions that obtain.

14a. *While loading tank car or while filling containers for shipment.*—Samples shall be drawn by the purchaser's inspector at the discharge pipe where it enters the receiving vessel or vessels. The composite sample shall be not less than 5 gallons and shall consist of small portions of not more than 1 quart each taken at regular intervals during the entire period of loading or filling. The composite sample thus obtained shall be thoroughly mixed, and from it three samples of not less than 1 quart each shall be placed in clean, dry, glass bottles or tin cans, which must be nearly filled with the sample and securely stoppered with new, clean corks or well-fitting covers or caps. These shall be sealed and distinctly labeled by the inspector; one shall be delivered to the buyer, one to the seller, and the third held for check in case of dispute.

14b. *From loaded tank car or other large vessel.*—A composite sample of not less than 5 gallons shall be made up of numerous small samples of not more than 1 quart each taken from the top, bottom, and intermediate points by means of a metal or glass container with removable stopper or top. This device, attached to a suitable pole, is lowered to the various desired depths, when the stopper or top is removed and the container allowed to fill. The sample thus obtained is handled as in 14a.

14c. *Barrels and drums.*—Barrels and drums shall be sampled after gaging contents. Five percent of the packages in any shipment or delivery shall be represented in the sample. Thoroughly mix the contents of each barrel to be sampled by stirring with a clean rod and withdraw a portion from the center by means of a “thief” or other sampling device. The composite sample thus obtained shall be not less than 3 quarts, shall consist of equal portions of not less than $\frac{1}{2}$ pint from each package sampled, and shall be handled as in 14a. Should the inspector suspect adulteration, he shall draw the samples from the suspected packages.

14d. *Small containers, cans, etc., of 10 gallons or less.*—These should be sampled, while filling, by method 14a whenever possible, but in case this is impossible the composite sample taken shall be not less than 3 quarts. This shall be drawn from at least five packages (from all when fewer), and in no case from less than 2 percent of the packages. The composite sample thus taken shall be thoroughly mixed and subdivided, as in 14a.

15. *Appearance.*—Examine to determine compliance with paragraph 4.

16. *Color.*—Color shall be determined by the Saybolt chromometer, ASTM ¹ method D 156-34 T. (21 Saybolt color is the equivalent of

¹ American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa.

a freshly prepared solution of potassium bichromate in distilled water, containing 0.0048 g of $K_2Cr_2O_7$ per liter.) Method of test as follows:

16a. *The Saybolt chromometer* shall be as described in ASTM designation D 156-34 T, section 2.

16b. *Illumination* shall be as specified in ASTM designation D 156-34 T, section 3.

16c. *Color standards* shall be as specified in ASTM designation D 156-34 T, section 4.

16d. *Procedure*.—The oil tube shall be cleansed by rinsing with some of the oil² to be tested, care being taken to allow the tube to drain thoroughly. The petcock on the oil tube shall then be closed and the tube shall be filled with the oil to be tested to a depth of 12 inches. If at this depth the color of the oil is lighter than one-half disk, the one-half disk shall be used for the test. If it is darker, the oil level shall be lowered to 10.5 inches and the color compared to two disks. If the color of the oil is lighter than two disks, one disk shall be used and if darker, two disks shall be used. After determining the number of disks to be used and with the proper number in place, the level in the oil tube shall be raised if necessary until the color of the oil is decidedly darker than the color standard. The oil shall then be drawn off slowly by means of the petcock until the oil appears slightly darker than the color standard. The oil shall then be drawn down to the nearest depth corresponding to a standard color as shown in table 1. If the color of the oil observed through the eyepiece is still darker than the color standard, the oil shall be drawn down to the next depth given in table 1 and examined again. This operation shall be continued until the oil and color standard match or show questionable differences. The column of oil shall be lowered one color more and if the oil is unmistakably lighter than the color standard, the previous color shall be recorded as the Saybolt chromometer color.

The following examples of the procedure are given:

USING ONE DISK		In.
Oil darker at depth of.....	16	
Oil darker at depth of.....	14	
Oil questionable at depth of.....	12	
Oil lighter at depth of.....	10.75	
Color is.....	+21	
USING TWO DISKS		In.
Oil darker at depth of.....	4.5	
Oil darker at depth of.....	4.25	
Oil questionable at depth of.....	4.0	
Oil lighter at depth of.....	3.75	
Color is.....	—2	

² The term "oil" as used herein refers to Stoddard solvent.

TABLE 1.—Saybolt chromometer color corresponding to depths of oil

Number of disks	Depth of oil	Color	Number of disks	Depth of oil	Color
	<i>Inches</i>			<i>Inches</i>	
One-half.....	20.00	+30	Two.....	6.50	+8
One-half.....	18.00	+29	Two.....	6.25	+7
One-half.....	16.00	+28	Two.....	6.00	+6
One-half.....	14.00	+27	Two.....	5.75	+5
One-half.....	12.00	+26	Two.....	5.50	+4
			Two.....	5.25	+3
One.....	20.00	+25	Two.....	5.00	+2
One.....	18.00	+24	Two.....	4.75	+1
One.....	16.00	+23	Two.....	4.50	0
One.....	14.00	+22	Two.....	4.25	-1
One.....	12.00	+21	Two.....	4.00	-2
			Two.....	3.75	-3
One.....	10.75	+20	Two.....	3.625	-4
One.....	9.50	+19	Two.....	3.50	-5
One.....	8.25	+18	Two.....	3.375	-6
One.....	7.25	+17	Two.....	3.25	-7
One.....	6.25	+16	Two.....	3.125	-8
			Two.....	3.00	-9
Two.....	10.50	+15	Two.....	2.875	-10
Two.....	9.75	+14	Two.....	2.75	-11
Two.....	9.00	+13	Two.....	2.625	-12
Two.....	8.25	+12	Two.....	2.50	-13
Two.....	7.75	+11	Two.....	2.375	-14
			Two.....	2.25	-15
Two.....	7.25	+10	Two.....	2.125	-16
Two.....	6.75	+9			

17. *Odor*.—Note whether or not the odor conforms to requirements of paragraph 6.

18. *Corrosion test at 212° F (Copper strip)*.—(Fed. Spec. VV-L-791a, method 530.31). Place a clean strip of mechanically polished pure sheet copper about $\frac{1}{2}$ inch wide and 3 inches long in a clean test tube. Add enough of the sample to be tested to cover the strip completely. Close the tube with a vented stopper and maintain for 3 hours at 212° F. Rinse the copper strip with sulphur-free acetone and compare it with a similar strip of freshly polished copper. Discoloration or pitting indicates corrosion.

19. *Doctor test* as follows:

19a. *Sodium plumbite (doctor solution)*.—Dissolve approximately 125 g of sodium hydroxide (NaOH) in 1 liter of distilled water. Add 60 g of litharge (PbO) and shake vigorously for 15 minutes or let stand with occasional shakings for at least a day. Allow to settle and decant or siphon off the clear liquid. Filtration through a mat of asbestos may be employed if the solution does not settle clear. The solution should be kept in a tightly corked bottle and should be refiltered before use if not perfectly clear.

19b. *Procedure*.—Shake vigorously together in a test tube 10 ml of the sample to be tested and 5 ml of sodium plumbite solution for about 15 seconds. Add a small pinch of pure, dry flowers of sulphur, again shake for 15 seconds, and allow to settle. The quantity of sulphur used should be such that practically all of it floats on the interface between the sample and the sodium plumbite solution.

19c. *Interpretation of results*.—If the sample is discolored, or if the yellow color of the sulphur film is noticeably masked, the test shall be reported as positive and the sample condemned as "sour." If the sample remains unchanged in color, and if the sulphur film is bright yellow or only slightly discolored with gray or flecked with black, the test shall be reported negative and the sample considered "sweet."

20. *Sulphuric acid absorption test* as follows:

20a. *Apparatus*.—One modified Babcock bottle with ground-glass stopper, graduated to 0.2 ml (see fig. 1); one 50-ml graduated cylinder; and one 10-ml pipette standardized to agree with stoppered Babcock bottle specified above.

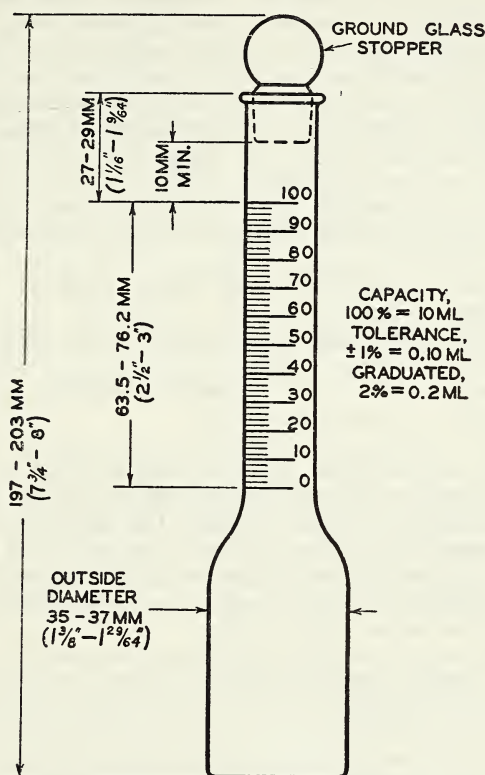


FIGURE 1.—Modified Babcock bottle for unsaturation tests.

20b. *Babcock bottle*.—The total height of the bottle, including stopper, shall be $7\frac{3}{4}$ to 8 inches (18.7 to 20.3 cm). The bulb shall have an outside diameter of between 35 and 37 mm. The graduated portion of the neck shall have a length of $2\frac{1}{2}$ to 3 inches (63.5 to 76.2 mm). The total percent graduation shall be 100, subdivided to 2 percent. Each 10-percent line shall be longer than the 2 percent, and shall be numbered, placing the numbers at the right of the scale. The capacity of the neck for each whole percent shall be 0.10 ml. The maximum error of the total graduation or any part thereof shall not exceed one-half the volume of the least graduation (1 percent or 0.10 ml). The 100-percent mark shall be 28 ± 1 mm from the top of the neck. The neck shall be provided with an accurately ground-glass stopper. The distance between bottom of the stopper and the uppermost graduation shall be not less than 10 mm. The stopper and bottle shall bear a corresponding serial number.

20c. *Procedure*.—Bring the temperature of the sample to $20 \pm 1^\circ \text{C}$. Measure out 10 ml of the sample into the clean, dry modified Babcock bottle with the standard pipette and cool in ice water for 5 minutes.

Add from a graduate 20 ml of cp sulphuric acid of 1.83 to 1.84 specific gravity at 20° C (approximately 93.2 percent). The acid should be poured down the side of the bottle to prevent splashing. Again cool by allowing the bottle to stand in ice water for 10 minutes, so that the water level is above the level of the sample in the bottle. Remove the Babcock bottle from the water bath, place glass stopper previously wet with sulphuric acid in bottle and shake it violently for 1 minute. Carefully add to the bottle sufficient sulphuric acid to bring the liquid level almost to the top graduation, and allow the stoppered bottle to stand over night (at least 12 hours is necessary). Place the bottle in a water bath at $20^{\circ} \pm 1^{\circ}$ C for 15 minutes. Add sulphuric acid, previously brought to the temperature of 20° C., to bring the liquid level exactly to the top graduation. Read the scale at the lower surface of the solvent and report as percentage absorbed in sulphuric acid.

21. *Flash point by the Tag closed tester.*—(ASTM designation D 56-36), as follows:

21a. *Tag closed tester* shall be as described in ASTM designation D 56-36, section 2.

21b. *Thermometer.*—Two thermometers shall be as described in ASTM designation D 56-36, section 3.

21c. *Procedure.*

21c (1). The test shall be performed in a room or compartment darkened sufficiently to permit ready detection of the flash.

21c (2). Care shall be taken to have the tester level and steady. It shall be surrounded on three sides by an enclosure for protection from drafts. (A shield 18 inches square and 24 inches in height, open in front, is suggested. Tests made in a laboratory hood or near ventilators are not to be relied upon.)

21c (3). Gas may be used for the test flame and for heating the water bath. If gas is not available for the test flame, a wick of cotton cord may be inserted in the burner tip, a small quantity of cotton waste placed in the oil chamber to which the burner tip is attached and the chamber filled with signal, sperm, or lard oil. An alcohol lamp may be used for heating the water bath as a substitute for gas.

21d. The water-bath thermometer shall be placed in the collar provided for it and the bath filled with water until it overflows. The temperature of the water in the bath shall be such that when testing is started it will be at least 20° F (11° C) below the probable flash point of the oil to be tested.

21e. The oil cup shall be placed in its proper position in the water bath and 50 ml of the oil to be tested shall be measured into it, using an accurate graduate or other measuring device for the purpose. The temperature of the oil shall be at least 20° F (11° C) below its probable flash point when the test is started. Air bubbles on the surface of the oil shall be destroyed, and the cover with the flash point thermometer in place shall then be properly attached to the bath collar. The test flame shall be lighted, the flame being adjusted to the size of the small white bead on the cover.

21f. The gas burner or alcohol lamp shall be centrally placed in the base of the tester and lighted. The flame shall be so adjusted that the temperature of the oil in the cup rises at the rate of 1.8° F (1° C) per minute as closely as possible, but in any case not faster than 2° F (1.1° C) nor slower than 1.6° F (0.9° C) per minute.

21g (1). The barometric pressure shall be recorded. If a barometer is not available, the figure may be obtained from the nearest Weather Bureau Station and an appropriate correction made for difference in altitude between such station and the laboratory.

21g (2). The initial temperature of the oil shall be recorded.

21g (3). When the temperature of the oil is 9° F (5° C) below its probable flash point, the knob on the cover shall be turned in such a manner as to introduce the test flame into the vapor space of the cup, and *immediately* turned back again. The time consumed in turning the knob down and back shall be about 1 full second, or the time required to pronounce distinctly the words "thousand and one."

21g (4). The time at which the first introduction of the test flame is made and the temperature of the oil shall be recorded.

21g (5). The application of the test flame shall be repeated after each 1° F (0.5° C) rise in temperature of the oil until a distinct flash in the interior of the cup is observed. The true flash must not be confused with the bluish halo which sometimes surrounds the test flame during applications immediately preceding the actual flash.

21g (6). The time and the temperature of the oil when the flash point is reached shall be recorded.

21h. *Repeat tests.*

21h (1). If the rise in temperature of the oil from the time of making the first introduction of the test flame to the time at which the flash point is observed was more rapid than 2° F (1.1° C), or slower than 1.6° F (0.9° C) per minute, the test shall be repeated, adjusting the gas burner or alcohol lamp to the proper rate of heating.

21h (2). It is not necessary to turn off the test flame with the small regulating valve on the cover; it may be left adjusted to the proper size of flame.

21h (3). After completing the preliminary test to determine the approximate flash point, the burner or lamp shall be removed, the oil cover lifted, and the thermometer bulb carefully wiped off. The oil cup shall be removed, emptied, and carefully wiped until dry.

21h (4). The temperature of the bath shall be lowered by the addition of cold water until it is 15° F (8° C) below the flash point of the oil as shown by the preliminary test.

21h (5). The oil cup shall be replaced and a fresh 50-ml sample measured into it. The test procedure, as described in paragraphs 21c (1) to 21e, inclusive, shall then be repeated, introducing the test flame for the first time, however, when the oil temperature is 10° F (5.5° C) below the flash point obtained in the preliminary test.

21h (6). Oil which has once been subjected to the flash test shall be discarded.

21h (7). If test is to be repeated, a fresh sample shall be used.

21i. *Average value of flash point.*—If two or more determinations agree within 1° F (0.5° C), the average of these results, corrected for barometric pressure, shall be considered the flash point. If two determinations do not check within 1° F (0.5° C), a third determination shall be made, and if the maximum variation of the three tests is not greater than 2° F (1° C), their average, after correcting for barometric pressure, shall be considered the flash point.

21j. *Correction for barometric pressure* shall be made only in cases of dispute or when the barometer reading varies more than ½ inch (13 mm) from the standard pressure of 29.92 inches (760 mm).

When the barometer reading is below this standard pressure, add to the thermometer reading 1.6° F (0.9° C) for each 1 inch (25 mm) of barometer difference to obtain the true flash point. When the barometer reading is above the standard pressure, deduct 1.6° F (0.9° C) for each 1 inch (25 mm) of barometer difference to obtain the true flash point.

22. *Distillation*.—(ASTM designation D 86-35), as follows:

22a. *Flask* shall be as described in ASTM designation D 86-35, section 1.

22b. *Condenser* shall be as described in ASTM designation D 86-35, section 2.

22c. *Shield* shall be as specified in ASTM designation D 86-35, section 3.

22d. *Ring support and hard asbestos boards* shall be as described in ASTM designation D 86-35, section 4.

22e. *Gas burner or electric heater* shall be as described in ASTM designation D 86-35, section 5.

22f. *Low-distillation thermometer* shall be as described in ASTM designation D 86-35, section 6 (a).

22g. *Graduate* shall be as described in ASTM designation D 86-35, section 7.

22h. *Procedure*.

22h (1). The condenser bath shall be filled with cracked ice³ and enough water added to cover the condenser tube. The temperature shall be maintained between 32 and 40° F (0 and 4.45° C).

22h (2). The condenser tube shall be swabbed to remove any liquid remaining from the previous test. A piece of soft cloth attached to a cord or copper wire may be used for this purpose.

22h (3). 100 ml of the product shall be measured in the 100-ml graduated cylinder at 55 to 65° F (12.8 to 18.3° C) and transferred directly to the engler flask. None of the liquid shall be permitted to flow into the vapor tube.

22h (4). The thermometer provided with a cork shall be fitted tightly, into the flask so that it will be in the middle of the neck and so that the lower end of the capillary tube is on a level with the inside of the bottom of the vapor outlet tube at its junction with the neck of the flask. The thermometer shall be approximately at room temperature when placed in the flask.

22h (5). The charged flask shall be placed in the $1\frac{1}{4}$ inch (3.18 cm) opening in the 6 by 6 inch (15.24 by 15.24 cm) asbestos board with the vapor outlet tube inserted into the condenser tube. A tight connection may be made by means of a cork through which the vapor tube passes. The position of the flask shall be so adjusted that the vapor tube extends into the condenser tube not less than 1 inch (2.54 cm) nor more than 2 inches (5.08 cm).

22h (6). The graduated cylinder used in measuring the charge shall be placed, without drying, at the outlet of the condenser tube in such a position that the condenser tube shall extend into the graduate at least 1 inch (2.54 cm) but not below the 100-ml mark. Unless the temperature is between 55 and 65° F (12.8 and 18.3° C) the receiving graduate shall be immersed up to the 100-ml mark in a transparent bath maintained between these temperatures. The top of the grad-

³ Any other convenient cooling medium may be used.

uate shall be covered closely during the distillation with a piece of blotting paper or its equivalent, cut so as to fit the condenser tube tightly.

22i (1). *Distillation*.—When everything is in readiness, heat shall be applied at a uniform rate, so regulated that the first drop of condensate falls from the condenser in not less than 5 nor more than 10 minutes. The distillation thermometer shall be read 2 minutes after heat is applied and the indication recorded as the “correction temperature.” This figure is of significance only in cases when there is a question as to the accuracy of the initial boiling point, as subsequently determined. When the first drop falls from the end of the condenser the reading of the distillation thermometer shall be recorded as the initial boiling point. The receiving cylinder shall then be moved so that the end of the condenser tube shall touch the side of the cylinder. The heat shall then be so regulated that the distillation will proceed at a uniform rate of not less than 4 nor more than 5 ml per minute. The volume of distillate collected in the cylinder shall be observed and recorded to the nearest 0.5 ml, when the mercury of the thermometer reaches each point that is a multiple of 10° C or the Fahrenheit equivalent of this point (30, 40, 50, 60, etc., or 86, 104, 122, 140° F, etc.). If preferred, the reading of the distillation thermometer may be observed and recorded when the level of the distillate reaches each 10-ml mark on the graduate. In case a product is being tested to ascertain whether or not it conforms with a given specification, all necessary observations shall be made and recorded, whether or not they are included in the series ordinarily employed by the laboratory making the test.

22i (2). No adjustment of the heat shall be made after the liquid residue in the flask is approximately 5 ml unless the time required to bring over the last 5 ml of distillate and reach the end point exceeds 5 minutes. The end point is the maximum temperature observed on the distillation thermometer and is usually reached after the bottom of the flask has become dry. If the bottom of the flask is not dry the operator shall record this fact.

22i (3). In case the time required to bring over the last 5 ml of distillate and reach the end point exceeds 5 minutes, the test shall be repeated and the heat shall be adjusted when the liquid residue reaches 5 ml. This adjustment may be either an increase or a decrease but must accomplish the purpose of bringing the period required to vaporize the last 5 ml of distillate and reach the end point within the limits of 3 and 5 minutes.

22i (4). The total volume of the distillate collected in the receiving graduate shall be recorded as the *recovery*.

22i(5). The cooled residue shall be poured from the flask into a small cylinder graduated in 0.1 ml, measured when cool and the volume recorded as *residue*.

22i (6). The difference between 100 ml and the sum of the recovery and the residue shall be calculated and recorded as *distillation loss*.

22j. *Accuracy*.—With proper care and attention to detail, duplicate results obtained for initial boiling point and end point, respectively, should not differ from each other by more than 6° F. (3.3° C). Duplicate readings of the volume of distillate collected in the cylinder when each of the prescribed temperature points is reached should not differ from each other by more than 2 ml. In case observations are

made on the basis of prescribed percentage points, the differences in temperature readings should not exceed the amounts equivalent to 2 ml of distillate at each point in question.

22k. *Correction for barometric pressure.*—The actual barometric pressure shall be ascertained and recorded, but no correction shall be made except in case of dispute. In such cases the temperature points shall be corrected to 760 mm (29.92 inches), by the use of the Sydney Young equation, as follows:

For centigrade readings:

$$C_c = 0.00012 (760 - P) (273 + t_c)$$

For Fahrenheit readings:

$$C_f = 0.00012 (760 - P) (460 + t_f)$$

in which C_c and C_f are, respectively, corrections to be added to the observed temperature t_c or t_f , and P is the actual barometric pressure in millimeters of mercury.

23. *Acidity.*—This test shall be made immediately after recording the volume of residue. Transfer the cooled residue to a test tube, add three volumes of distilled water, and shake the tube thoroughly. Allow the mixture to separate and remove the aqueous layer to a clean test tube by means of a pipette. Add 1 drop of a 0.1-percent solution of methyl orange. No pink or red color shall be formed.

24. *Containers.*—Stoddard solvent shall be delivered in clean containers or tanks. If container previously has been used for other materials, such as fuel oil, etc., it shall be thoroughly cleaned and rinsed with Stoddard solvent.

CERTIFICATION

25. Producers or distributors may certify conformance with the requirements of this commercial standard by means of the following statement on invoices or incorporated in labels on containers:

The ----- Company certifies this Stoddard solvent to conform with all requirements of the Commercial Standard CS3-38.

EFFECTIVE DATE

The standard is effective for new production from February 10, 1938.

STANDING COMMITTEE

The following comprises 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.

LLOYD E. JACKSON (chairman), Crandall-McKenzie and Henderson, Inc., 7021 Chaucer Street, Pittsburgh, Pa.
W. J. STODDARD, Stoddard's, Inc., West Peachtree at Third Street, Atlanta, Ga.
A. LUDLOW CLAYDEN, Sun Oil Co., 1608 Walnut Street, Philadelphia, Pa.

- H. M. HANCOCK, The Atlantic Refining Co., 3144 Passyunk Avenue, Philadelphia, Pa.
T. H. ROGERS, Standard Oil Company of Indiana, Whiting, Ind.
C. C. HUBBARD, Hubbard Textile Bureau, "Rock Crest", Silver Spring, Md.
GEORGE G. GAUBATZ, Jr., National Association Institute of Dyeing and Cleaning, Inc., Silver Spring, Md.
F. W. SMITHER, 403 Chemistry Building, National Bureau of Standards, Washington, D. C.
F. W. REYNOLDS, ex-officio secretary, National Bureau of Standards, Washington, D. C.

HISTORY OF PROJECT

With a view to reducing the loss of life, property damage, and other fire hazards in the dry-cleaning industry, W. J. Stoddard, of Atlanta, Ga., assisted by Lloyd E. Jackson, senior industrial fellow, of the Mundatechnical Society of America, carried out intensive studies and tests of various petroleum distillates in the laboratories of the Mellon Institute of Industrial Research, Pittsburgh, Pa., and in his dry-cleaning plant at Atlanta. As a result of this work a recommended specification for a satisfactory and comparatively safe dry-cleaning solvent was announced in May 1925.

The National Association of Dyers and Cleaners adopted the name "Stoddard solvent" for this product in view of the personal sacrifices of time and money made by president Stoddard in developing it. The National Association of Dyers and Cleaners has supported research associates at the Bureau of Standards for several years, and through this contact the bureau has assisted indirectly, if not directly, in furthering the development and use of specifications for this solvent.

At the request of the National Association of Dyers and Cleaners, the National Bureau of Standards extended its cooperation in drafting a revised specification to cover certain deficiencies in the original specification that had become apparent through purchases made under the specification, and on December 2, 1927, a general conference adopted a recommended commercial standard based on the specification with certain further modifications. The industry later accepted the standard, which became effective March 1, 1928, and was designated CS3-28.

The standard rapidly came into almost universal use by the industry and on September 13, 1933, was reaffirmed by the standing committee.

Late in 1936, the supply of printed pamphlets became entirely exhausted. The Division of Trade Standards reported this fact to the National Association Institute of Dyeing and Cleaning before proceeding to reprint the standard in its original form. After some correspondence relative to revision, a joint meeting of the standing committee and Technical Committee D of ASTM Committee D-2 was called and a recommended revision was adopted. This recommendation of the standing committee was circulated to the industry for written acceptance on January 12, 1937. Subsequently, the National Association Institute of Dyeing and Cleaning recommended closer control over distillation range by reinsertion of a 50-percent point requirement, which had been replaced by the 90-percent point. After approval by the standing committee the amendment was presented to the industry for endorsement on June 11, 1937. The success of the project was announced August 10, 1937.



ACCEPTANCE OF COMMERCIAL STANDARD

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 CS3-38 as our standard of practice in the

Production ¹

Distribution ¹

Use ¹

of Stoddard solvent.

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-----

(Kindly typewrite or print the following lines)

Name and title-----

Company-----

Street address-----

City and State-----

¹ Please designate which group you represent by drawing lines through the other two. 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.

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 the industry. 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 industry 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 branches of the industry 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 companies representing a satisfactory majority of production, the success of the project is announced. If, however, in the opinion of the standing committee of the industry or the Department of Commerce, the support of any standard is inadequate, the right is reserved to withhold promulgation and publication.

ACCEPTORS

Individuals and organizations listed below have indicated in writing, acceptance of this specification as their standard of practice in the production, distribution, or use of Stoddard solvent, but such endorsement does not signify that they may not find it necessary to deviate from the standard, nor does it signify that the producers so listed guarantee all of their products to conform with the requirements of this standard. Therefore specific evidence of quality certification should be obtained where required.

ASSOCIATIONS

Associated Factory Mutual Fire Insurance Co.'s, Boston, Mass. (In principle.)
 Factory Insurance Association, Hartford, Conn. (In principle.)
 National Association Institute Dyeing and Cleaning, Silver Spring, Md.
 National Association of Mutual Casualty Co.'s, Chicago, Ill. (In principle.)
 National Research Council, Ottawa, Canada. (In principle.)
 Ohio State Association of Dyers and Cleaners, Columbus, Ohio. (In principle.)
 Western Factory Insurance Association, Chicago, Ill.

FIRMS

Abbott-Hogan, Inc., Orange, N. J.
 Acme Laundry and Cleaners, El Paso, Tex.
 Alma City Dry Cleaners, Alma, Mich.
 Alox Corporation, Niagara Falls, N. Y.
 American Benzol Dry Cleaning Co., The, Columbus, Ohio.
 American Cleaners, Moorehead, Minn.
 American Dry Cleaning Co., Charlotte, N. C.
 American Mineral Spirits Co., Chicago, Ill.
 American Oil Co., Baltimore, Md.
 Anderson Prichard Oil Corporation, Oklahoma City, Okla.
 Arcade-Sunshine Co., Inc., Washington, D. C.
 Argo Oil Corporation, Detroit, Mich.
 Arkansas Fuel Oil Co., Shreveport, La.
 Art Dyers and Cleaners, Inc., Louisville, Ky.
 Ashland Oil and Refining Co., Ashland, Ky.

Atlantic Refining Co., The, Philadelphia, Pa.
 Atlas Laundry and Cleaning Co., Inc., Evansville, Ind.
 Atlas Oil Corporation, Shreveport, La.
 Baird's Dry Cleaners, Boise, Idaho.
 Baker Cleaning Co., Tarrant, Ala.
 Balloon Dye Works, San Diego, Calif.
 Barnsdall Refining Corporation, Tulsa, Okla.
 Beck Cleaners and Dyers, Inc., Rochester, N. Y.
 Bell Co., The, Riverside, Calif.
 Bell Oil and Gas Co., Tulsa, Okla.
 Better Fabrics Testing Bureau, New York, N. Y.
 B & F—Model Cleaners, Portland, Oreg.
 Bickel's Cleaners, E. Moline, Ill.
 Bigelow-Sanford Carpet Co., Inc., Thompsonville, Conn.
 Billings Laundry Co., Billings, Mont.
 Bishop Laundry Co., Rocky Mount, N. C.
 Black & Horcher, Inc., Chicago, Ill.
 Blake's Dry Cleaning, Plainview, Nebr.
 Blanton & Smith, Selma, Ala.
 Bob's Laundry and Dry Cleaning Co., Concord, N. C.
 Boor's Cleanatorium, Martinsburg, W. Va.
 Borger Steam Laundry, Borger, Tex.
 Bornot, Inc., Philadelphia, Pa.
 Bosbach, Inc., Herman, Holyoke, Mass.
 Boston Dry Cleaners, Bradford, Pa.
 Bowser & Co., Ltd., S. F., Fort Wayne, Ind.
 Brenner's Cleaning and Dye Works, San Antonio, Tex.
 Broadway Cleaners and Laundry, Council Bluffs, Iowa.
 Broadway Dyers and Cleaners, Inc., Portland, Oreg.

- BroLeen Cleaning Co., Bloomington, Ill.
 Brown Co., The R. J., St. Louis, Mo.
 Brown's, Cynthiana, Ky.
 Burkhart's Laundry and Dye Works, Houston, Tex.
 Bush & Co., Inc., New Bedford, Mass.
 Butte Laundry Co., Steubenville, Ohio.
 Cain Cleaners, Mt. Hope, Kans.
 Caled Products Co., Inc., Cottage City, Brentwood, Md. (In principle.)
 California Co., The, San Francisco, Calif.
 California, State of, Bureau of Purchases, Sacramento, Calif.
 Canfield Oil Co., The, Cleveland, Ohio.
 Cannan Co., The, Toledo, Ohio.
 Canton Laundry and Cleaning Co., Canton, Ohio.
 Capital Laundry, Helena, Mont.
 Capital Laundry Co., Bismarck, N. Dak.
 Capitol Barg Dry Cleaning Co., Cincinnati, Ohio.
 Capitol Dry Cleaning and Dyeing Co., Scranton, Pa.
 Cascade Laundry Co., Des Moines, Iowa.
 Cascade Laundry and Dry Cleaning Co., Port Arthur, Tex.
 Cash Cleaning Co., Memphis, Mo.
 Central Dry Cleaning Co., Buffalo, N. Y.
 Cery Cleaners and Dyers, Gary, Ind.
 Chalmette Oil Distributing Co., Inc., New Orleans, La.
 Charlotte Laundry, Inc., Charlotte, N. C.
 Checker Cleaners and Dyers, Chicago, Ill.
 Chehalis City Laundry, Chehalis, Wash.
 Chenoweth Dyeing and Cleaning Co., J. O., St. Louis, Mo.
 Cheyenne Steam Laundry and Cleaning Co., Cheyenne, Wyo.
 Cincinnati, City of (City Purchasing Agent), Cincinnati, Ohio.
 Cities Service Oil Co., Refining Division, Tulsa, Okla.
 City Dye Works, Wallace, Idaho, and Bozeman, Mont.
 Clark's Laundry and Dry Cleaning Co., Mishawaka, Ind.
 Cleaners Supply House, Chicago, Ill.
 College Cleaners and Dyers, Corvallis, Oreg.
 Colonial Beacon Oil Co., Boston, Mass.
 Columbus Lace Cleaning Works, Columbus, Ohio.
 Commerce Petroleum Co., Chicago, Ill.
 Conner, Frank E., Morgantown, W. Va.
 Conser Laundry, St. Joseph, Mo.
 Cooper's Cleaning Works, Rockford, Ill.
 C. P. Chemical Solvents, Inc., The, New York, N. Y.
 Craighead Laundry & Cleaners, Hot Springs, Ark. (In principle.)
 Crandall, McKenzie & Henderson, Pittsburgh, Pa.
 Crawford Laundry Co., The, Bridgeport, Conn.
 Crescent Laundry Co., Macon, Ga.
 Cross Laundry Co., Martinsville, Va.
 Crown Central Petroleum Corporation, Baltimore, Md.
 Crown Laundry & Dry Cleaning Co., Indianapolis, Ind.
 Danville Laundry & Dry Cleaning Co., The, Danville, Ky.
 Davenport Cleaning Works, Sioux City, Iowa.
 Daytona Beach Laundry, Daytona Beach, Fla.
 Deep Rock Oil Corporation, Chicago, Ill.
 Demaree, Cleaner, A. C., Indianapolis, Ind.
 Dengler Cleaning Works, G., Susanville, Calif.
 Derbes, George, Pottsville, Pa.
 Derby Oil Co., Wichita, Kans.
 Deuser's, Inc., Dayton, Ohio.
 Direct Cleaners, Inc., Upper Darby, Pa.
 Dods Cleaning & Dyeing Works, Inc., Thomas, Kansas City, Mo.
 Dorfner & Sons, Inc., Anton, Philadelphia, Pa.
 Dresher Bro., Inc., Omaha, Nebr.
 Dreyer Dry Cleaning Co., Hannibal, Mo.
 Dudley Laundry Co., Norfolk, Nebr.
 Duke Cleaners, Lyons, Kans., and Burlington, Iowa.
 Dyo Chemical Corporation, Dallas, Tex.
 Eagle Dye Works Co., The, Hartford, Conn.
 East Side Cleaning Co., Kansas City, Mo.
 Eggert, E., Cleaning and Dyeing, Harrisburg, Pa.
 Eimer & Amend, New York, N. Y. (In principle.)
 Eldorado Refining Co., The, Eldorado, Kans.
 Electric Cleaners, Eugene, Oreg.
 Electric Laundry Co., The, Ashtabula, Ohio.
 Elk Launderers and Cleaners, St. Paul, Minn.
 Elk Refining Co., Charleston, W. Va.
 Empire Dry Cleaning Co., Inc., Charleston, W. Va.
 Empire Laundry Co., Montgomery, Ala.
 Empire Oil and Refining Co., Tulsa, Okla.
 Etheridge Cleaners, Jackson, Miss.
 Eureka Laundry Co., Corpus Christi, Tex.
 Eyre & Co., Inc., A. D., Jersey City, N. J. (In principle.)
 Fanset Dye Works, Los Angeles, Calif.
 Fashion Dry Cleaners, Inc., Indianapolis, Ind.

- Fauquier Laundry and Cleaning Co., Warrenton, Va. (In principle.)
 Fifth Avenue Cleaners and Dyers, LaGrange, Ill.
 Fish Dry Cleaning Co., Baltimore, Md.
 Fishburn-Oriental Dyeing and Dry Cleaning Co., Dallas, Tex.
 Fletcher Co., Inc., W. F., Ithaca, N. Y.
 Fond du Lac Model Laundry Co., Fond du Lac, Wis.
 Forest Cleaners and Dyers, Inc., The, Detroit, Mich.
 Fort Scott Laundry and Cleaning Co., Fort Scott, Kans.
 Fowler's Valet Cleaners, Charlottesville, Va.
 Franklin Creek Refining Corporation, Franklin, Pa.
 Fray, Welch & Fray, Fort Madison, Iowa.
 Frazier's Cleaners-Hatters, Jackson, Tenn.
 Freedom Oil Works Co., The, Freedom, Pa.
 French Dyers and Cleaners, Uniontown, Pa.
 Fuel Oil and Gas Co., St. Paul, Minn.
 Gardner Dry Cleaning Works, Gardner, Mass.
 Gardner's, Inc., Greenville, Miss.
 Garland Cleaners - Dyers - Furriers, Roanoke, Va.
 Gaubatz Dyeing and Cleaning Co., G., St. Louis, Mo.
 General Petroleum Corporation of California, Los Angeles, Calif.
 Gilmore Oil Co., Los Angeles, Calif.
 Globe Chemical Co., The, St. Bernard, Cincinnati, Ohio.
 Globe Cleaners and Dyers, Sweetwater, Tex.
 Godwin Co., Inc., The, Connellsville, Pa.
 Golden Bell Cleaners, Inc., Malden, Mass.
 Goodwin Co., Inc., The, Connellsville, Pa.
 Grand Fair Lawn Cleaners, Fair Lawn, N. J.
 Grays Harbor Dye Works, Inc., Aberdeen, Wash.
 Gulf Oil Corporation, Pittsburgh, Pa.
 Gulfport Laundry and Cleaning Co., Gulfport, Miss.
 Hanford Laundry and Dry Cleaning Co., Inc., Hanford, Calif. (In principle.)
 Harvard University, Cambridge, Mass.
 Hatch Textile Research, Inc., New York, N. Y.
 Hawkeye Laundry and Dry Cleaning Co., Boone, Iowa.
 Henderson's, Inc., Johnstown, Pa.
 Hibbing Laundering and Cleaning Co., Hibbing, Minn.
 Hicks Laundry and Dry Cleaning, Danville, Ill.
 Hoff Bros. Cleaners and Hatters, Hastings, Nebr.
 Hoffman's Cleaning Works, Oneonta, N. Y.
 Home Laundry, The, Port Arthur, Tex.
 Home Laundry, Inc., Charlottesville, Va.
 Hospital Bureau of Standards and Supplies, Inc., New York, N. Y.
 Houston, Better Business Bureau of, Houston, Tex. (In principle.)
 Howards Cleaners, Inc., Auburn, R. I.
 Howell, R. F., Hamilton, Ohio.
 Hrubby Cleaners, Valley City, N. Dak.
 Hubbard Textile Consulting Bureau, C. C., Silver Spring, Md. (In principle.)
 Hudson Cleaners, Inc., Detroit, Mich.
 Huebsch Laundry Co., Eau Claire, Wis.
 Huebsch Laundry Corporation, Milwaukee, Wis.
 Humphrey Cleaning Co., Meadville, Pa.
 Hutchinson Dry Cleaning Co., G. C., Butler, Pa.
 Ideal Launderers and Dry Cleaners, McCook, Nebr.
 Ideal Laundry and Dry Cleaners, Roanoke, Va.
 Ideal Laundry and Dry Cleaning Co., The, Larned, Kans.
 Insurance Co. of North America, Chicago, Ill. (In principle.)
 Insurance Library of Chicago, Chicago, Ill. (In principle.)
 Johnson Laundry Co., Inc., Albert Lea, Minn.
 Johnson Oil Refining Co., Chicago, Ill.
 Kanotex Refining Co., The, Arkansas City, Kans.
 Keep-U-Neat Cleaners, Alliance, Nebr.
 Keller Bros., Du Bois, Pa.
 Kimble Glass Co., Vineland, N. J. (In principle.)
 Kimble Glass Co., Vineland, N. J. (In principle.)
 Kitterman's Cleaners, Cedar Rapids, Iowa.
 Klamath Cleaning and Dye Works, Klamath Falls, Oreg.
 Klean Klose Shop, Storm Lake, Iowa.
 Kramer, The Kleaner, Wabash, Ind.
 Kraus & Co., Memphis, Tenn.
 Kuhne Libby Co., New York, N. Y.
 La Jolla Dry Cleaners, La Jolla, Calif.
 Lake Side Laundry, Lake Charles, La.
 LaMeasure Bros., Inc., Detroit, Mich.
 Langlade Laundry and Cleaners, Antigo, Wis.
 Lavanderia Juarez (Juarez Laundry), Ciudad Juarez, Chihuahua, Mexico.
 Lawler's Cleaners, Dyers, and Furriers, Rochester, Minn.
 Leary's Cleaners and Dyers, Inc., Rochester, N. Y.
 Leon's Cleaners-Dyers-Launderers, Red Bank, N. J.
 Lewandos French Dyeing and Cleaning Co., Watertown, Mass.
 Lewis Cleaners and Dyers, Hutchinson, Kans.

- Lewis Cleaning Co., Hannibal, Mo.
 Lewis Dry Cleaning System, Inc.,
 Louisville, Ky.
 Lewistown Dry Cleaning and Laundry
 Co., Lewistown, Pa.
 Lion Oil Refining Co., El Dorado, Ark.
 Little, Inc., Arthur D., Cambridge,
 Mass. (In principle.)
 Lloyd Cleaners, Inc., Atlanta, Ga.
 Lobdell Bros., Chico, Calif.
 Lockwood-Heath Cleaners, Inc., El-
 mira, N. Y.
 Loeb Dye Works, Inc., Roanoke, Va.
 Long Beach, Ltd., Better Business
 Bureau of, Long Beach, Calif. (In
 principle.)
 Lorenz Laundry Dyers and Cleaners,
 Dubuque, Iowa.
 Lungstras Dyeing and Cleaning Co.,
 St. Louis, Mo.
 Macy & Co., Inc., R. H., Macy's
 Bureau of Standards, New York,
 N. Y.
 Madsen Cleaning Co., Provo, Utah.
 Magnolia Petroleum Co., Dallas, Tex.
 Marquette Steam Laundry and Dye
 Works, Marquette, Mich.
 Marshall, F. R., Wisner, Nebr.
 Martinu Cleaning-Dyeing Corporation,
 Union City, N. J.
 Mayfair Cleaning Co., Cleveland
 Heights, Ohio.
 McEnerney Cleaners, Hutchinson, Kans.
 Miami Laundry Co., Miami, Fla.
 Michael, L., Amery, Wis.
 Michigan Cleaners, Inc., Chicago, Ill.
 Mickler's, Madison, Fla. (In prin-
 ciple.)
 Mid-Continent Petroleum Corporation,
 Tulsa, Okla.
 Middlesboro Steam Laundry, Middles-
 boro, Ky.
 Milady's Cleaners and Dyers, Tulsa,
 Okla. (In principle.)
 Minnehaha Cleaners and Dyers, St.
 Paul, Minn.
 Minnesota, State of, Oil Inspection
 Division, St. Paul, Minn. (In prin-
 ciple.)
 Mitchell, Leon D. and Emma A.,
 Sacramento, Calif.
 Modern Dry Cleaners, Algona, Iowa.
 Monkey Cleaners and Dyers, Inc.,
 Kansas City, Mo.
 Montana State College, Department of
 Home Economics, Bozeman, Mont.
 (In principle.)
 Montgomery Ward & Co., Chicago,
 Ill. (In principle.)
 Montpelier Steam Laundry, Mont-
 pelier, Vt.
 Moon & Moon, Inc., Huntington, Ind.
 Mooney Co., W. J., Pittsburgh, Pa.
 Morgenthalers Cleaners and Dyers,
 Inc., St. Louis, Mo.
 Morrison, M. J., Berlin, N. H.
 Mount Desert Cleaners, Northeast
 Harbor, Maine.
 Murray's Dyeing and Cleaning Co.,
 Punxsutawney, Pa.
 Mutual Laundry Co., The, Topeka,
 Kans.
 National Laundry Co., Twin Falls,
 Idaho.
 National Petroleum Publishing Co.,
 Cleveland, Ohio. (In principle.)
 National Refining Co., The, Cleveland,
 Ohio.
 Nevada Cleaning Works, Nevada, Mo.
 Nevens Co., Minneapolis, Minn.
 New Britain Dry Cleaning Corpora-
 tion, New Britain, Conn.
 New England Carpet Cleaning Co., Inc.,
 Greenwich, Conn.
 New E. & W. Laundry, The, Savannah,
 Ga.
 New Lafayette Steam Laundry, Inc.,
 The, Lafayette, La.
 New Method Cleaners, Eureka, Calif.
 New Orleans, Inc., Better Business
 Bureau of, New Orleans, La. (In
 principle.)
 New System Laundry, Leaksville, N. C.
 New System Laundry and Dry Cleaners,
 Rome, N. Y.
 New Way Dry Cleaning Co., York, Pa.
 New Way System, Inc., Savannah, Ga.
 Nickey, Harry W., Springfield, Ill.
 North Star Oil, Ltd., Winnipeg, Mani-
 toba, Canada.
 Odgen Troy Laundry and Dry Cleaning
 Co., Odgen, Utah.
 Ohio-Curtis Co., Inc., The, Columbus,
 Ohio.
 Oil and Gas Journal, The, Tulsa, Okla.
 (In principle.)
 Oliverius, Frank, Watsonville, Calif.
 Osborn Cleaners, Owosso, Mich.
 Page Dry Cleaning Co., Washington,
 D. C.
 Pahnke Cleaners and Dyer, W. D.,
 Chicago Heights, Ill.
 Panhandle Refining Co., Wichita Falls,
 Tex.
 Pantorium, The, Omaha, Nebr.
 Paramount Cleaners and Dyers, Mex-
 ico, Mo.
 Paris Dry Cleaning Co., South Bend,
 Ind.
 Paris Dye and Cleaning Works, Brock-
 way, Pa.
 Parisian Dry Cleaning Co., Lynn, Mass.
 Parker Cleaning and Dyeing Co., Inc.,
 Lake Forest, Ill.
 Pearson's Laundry and Dry Cleaning,
 Troy, Ohio.
 Peerless Cleaners, Carbondale, Ill.
 Peerless Cleaners and Dyers, Inc.,
 Edwardsville, Ill.
 Peerless Dry Cleaning Co., Elmira,
 N. Y.
 Peerless Laundry and Dry Cleaning Co.,
 The, Elyria, Ohio.
 Peerless Steam Laundry, Inc., Welch,
 W. Va.

- Pennsylvania Refining Co., Butler, Pa.
 Pennzoil Co., The, Oil City, Pa.
 Perfection Dry Cleaning Co., Inc., Binghamton, N. Y.
 Perfection Laundry Co., The, Springfield, Ohio.
 Peterson Co., George C., Chicago, Ill.
 Petri's Master Cleaners and Dyers, N. Adams, Mass. (In principle.)
 Petri's Odorless Cleaners, Long Beach, Calif.
 Petroleum Solvents Co., Butler, Pa.
 Phillips & Jacobs, Philadelphia, Pa.
 Phillips Petroleum Co., Bartlesville, Okla.
 Pico Cleaners and Dyers, Pico, Calif.
 Polle Co., Guy, Asheville, N. C.
 Pratt, F. E., St. Croix Falls, Wis.
 Pringle Cleaners O. G., Port Huron, Mich.
 Providence Dyeing, Bleaching and Calendering Co., Providence, R. I. (In principle.)
 Pullar, Robert Taft, New York, N. Y.
 Purkett Laundry Co., Joplin, Mo.
 Quality Cleaners and Dyers, Colorado Springs, Colo.
 Quality Dry Cleaners of Lakeland, Inc., Lakeland, Fla.
 Queen Cleaners and Dyers, Inc., Detroit, Mich.
 Rainbow Dyeing and Cleaning Co., Inc., Washington, D. C.
 Randall's Cleaning Plant, Hempstead, Long Island, N. Y.
 Randon's Cleaners and Dyers, New Orleans, La.
 Ranger Dry Cleaners, Ranger, Tex.
 Rasley's, Inc., Norfolk, Nebr.
 Rectern Cleaning Co., St. Charles, Mo.
 Redding Laundries, Inc., Redding, Calif.
 Redford Cleaners and Dyers, Richmond, Va.
 Refinery Supply Co., The, Tulsa, Okla.
 Regal Cleaners and Dyers, Inc., Washington, D. C.
 Republic Oil Co., Pittsburgh, Pa.
 Rice Ranch Oil Co., Santa Maria, Calif.
 Richfield Oil Corporation, Los Angeles, Calif.
 Richfield Oil Corporation of New York, New York, N. Y.
 Rinehart's Cleaners-Dyers, San Diego, Calif.
 Rio Grande Oil Co., Los Angeles, Calif.
 Ripley's (Topeka Laundry Co.), Topeka Kans.
 Risleys Cleaners, Mount Carmel, Ill.
 Rollins Cleaners-Dyers, Farmville, N. C.
 Rudie's Cleaners, St. James, Minn.
 Rudnick Cleaners, Williamstown, Mass.
 Rydahls Laundry and Cleaners, Marinette, Wis.
 Sacramento Golden State Laundry, Sacramento, Calif.
 Safandshur Chemical Co., Inc., New York, N. Y. (In principle.)
 St. Paul Dye Works, Santa Barbara, Calif.
 Sanitary Steam Laundry, Inc., Pikeville, Ky.
 Santa Fe Electric Laundry, Santa Fe, N. Mex.
 Savidusky's, Inc., Madison, Wis.
 Schaffer Cleaning Works, Winona, Minn.
 Schock Independent Oil Co., Mount Joy, Pa.
 Schoen Dry Cleaning and Dye Works, Saginaw, Mich.
 Schumann's, Hoopeston, Ill.
 Scott Dry Cleaners, Greenville, S. C.
 Scott & Roberts, Durham, N. C.
 Scott's Cleaning Co., St. Louis, Mo.
 Sears, Roebuck & Co., Illinois Paint Works, Chicago, Ill. (In principle.)
 Seruset Co., D. H., Pittsburgh, Pa.
 Shell Oil Co., San Francisco, Calif.
 Shell Petroleum Corporation, St. Louis, Mo.
 Shell Union Oil Corporation, New York, N. Y.
 Shepherd Laundries Co., Beaumont, Tex.
 Sheplers', Inc., Dry Cleaners, Detroit, Mich.
 Sherwood Bros., Inc., Baltimore, Md.
 Shull's Dry Cleaning Works, York, Pa.
 Sinclair Refining Co., New York, N. Y.
 Skelly Oil Co., Eldorado, Kans.
 Sloan & Zook Refining Co., The, Warren, Pa.
 Smith Cleaner, Joseph, Englewood, N. J.
 Smith Cleaning Co., The, Newark, Ohio.
 Smith's Cleaners and Dyers, New Castle, Pa.
 Socony-Vacuum Oil Co., Inc., New York, N. Y.
 Socony-Vacuum Oil Co., Inc., White Eagle Division, Kansas City, Mo.
 Solvex Refineries, Inc., Gladewater, Tex.
 Somersset Laundry and Cleaners, Inc., Somerset, Ky. (In principle.)
 Sommerfeld's (formerly Dubuque Steam Dye Works), Dubuque, Iowa.
 South Penn Oil Co., Pittsburgh, Pa. (In principle.)
 South Side Dye Works, St. Louis, Mo.
 Southern Cleaners, Fort Worth, Tex.
 Sperry's Dry Cleaners, Fort Dodge, Iowa.
 Spiegels Cleansing Corporation, Plattsburg, N. Y.
 Spurgeon's Cleaning and Dyeing Works, Sacramento, Calif.
 Standard Oil Co. of California, San Francisco, Calif.
 Standard Oil Co. of California (Utah corporation), San Francisco, Calif.

- Standard Oil Co. (Indiana), Chicago, Ill.
 Standard Oil Co. (Kentucky), Louisville, Ky.
 Standard Oil Co. of Louisiana, New Orleans, La.
 Standard Oil Co. of New Jersey, New York, N. Y.
 Standard Oil Co. (Ohio), Cleveland, Ohio.
 Standard Oil Co. of Pennsylvania, Philadelphia, Pa.
 Standard Oil Co. of Texas, San Francisco, Calif.
 Star Cleaning Co., Inc., Richmond, Va.
 Star Laundry Co., Danville, Va. (In principle.)
 Star Laundry and Dry Cleaning Co., Inc., Visalia, Calif.
 Staub & Son, Inc., Rochester, N. Y.
 Steel Co., Marshall, Oakland, Calif.
 Stewart Dry Cleaning Co., Selma, Ala.
 Stoddard, Inc., Atlanta, Ga.
 Still Oil Refining Co., Louisville, Ky.
 Sun Oil Co., Philadelphia, Pa.
 Sunshine Laundry Co., Inc., Fredericksburg, Va.
 Superior Dry Cleaners and Dyers, Tallahassee, Fla.
 Swiss Restaurants, Inc., Arlington, Mass.
 Syracuse Dollar Dry Cleaning Co., Inc., Syracuse, N. Y.
 Tarr & McComb Oil Co., Ltd., Los Angeles, Calif.
 Teachout Bros., Flint, Mich.
 Terabentine Co., Philadelphia, Pa.
 Texas Co., The, New York, N. Y.
 Textile Testing and Research Laboratories, New York, N. Y.
 Tide Water Associated Oil Co., Associated Division, San Francisco, Calif.
 Tip Top Cleaners, Springfield, Mass. (In principle.)
 Trimack, Inc., Washington, D. C.
 Troy Dry Cleaning Co., Fort Wayne, Ind.
 Troy Laundry Co., Cedar Rapids, Iowa.
 Twin City Dry Cleaning Co., Winston Salem, N. C.
 Ultra-Penn Refining Co., Butler, Pa.
 Underwood Superior Cleaners, Inc., W. Palm Beach, Fla.
 Union Oil Co. of California, Los Angeles, Calif.
 Unique Cleaners and Tailors, The, Alexandria, Minn.
 United Refining Co., Warren, Pa.
 United States Testing Co., Inc., Hoboken, N. J.
 Utah Cleaning and Dyeing Co., Salt Lake City, Utah.
 Utah, State of, Salt Lake City, Utah.
 Vallet Cleaners, Huron, S. Dak.
 Valvoline Oil Co., E. Butler, Pa.
 Vermont Cleansing Co., Burlington, Vt.
 Wadhams Oil Co., Milwaukee, Wis.
 Walker, Max I., Omaha, Nebr.
 Wallis Cleaning Service, Tucson, Ariz.
 Wardrobe, The, Ottumwa, Iowa.
 Warner Quinlan Co., New York, N. Y.
 Warwick Dry Cleaners, Inc., Columbia, S. C.
 Wasbers' York City Laundry Co., H., York, Pa.
 Washington Laundry, Spokane, Wash.
 Watkins & Co., E. L., Portland, Maine.
 Wausau Laundry Co., Wausau, Wis.
 Waverly Oil Works Co., Pittsburgh, Pa.
 Weems Laundry Co., The, Quincy, Ill.
 Weitzel Dry Cleaning Co., Wooster, Ohio.
 Welch Cleaners, Wichita, Kans.
 Weller-Krouse Co., The, Sharon, Pa.
 Wesselmann, Inc., L. E., Buffalo, N. Y.
 White Swan Laundry and Dry Cleaning Co., Mobile, Ala.
 Wichita Cleaning and Dye Works, Wichita Falls, Tex.
 Wilcox Oil and Gas Co., H. F., Bristow, Okla.
 Winona Cleaning Works, Winona, Minn.
 Wirt Franklin Petroleum Corporation, Ardmore, Okla.
 Wisconsin Dye Works, Milwaukee, Wis.
 Wood's Dry Cleaning, Towanda, Pa.
 Worley-Bauder Cleaners, Inc., Indianapolis, Ind.
 Yackee, O. L., Stryker, Ohio.
 Yankee Cleaners, Pontiac, Ill.
 Yorgey's Cleaners and Dyers, Reading, Pa.
 Zannacker & Son, Inc., H., Manitowoc, Wis.
 Zengeler-Horan Co., Inc., Lake Forest, Ill.
 Zenith-Casino, Inc., Dallas, Tex.

U. S. GOVERNMENT

- Agriculture, U. S. Department of, Bureau of Home Economics, Washington, D. C.
 Interior Department, National Park Service, Washington, D. C.
 Treasury, U. S. Department of, Washington, D. C.
 Veterans Administration, Washington, D. C.
 War Department, Ordnance Department, Washington, D. C.

COMMERCIAL STANDARDS

CS no.	Item	CS no.	Item
0-30.	The commercial standards service and its value to business.	34-31.	Bag, case, and strap leather.
1-32.	Clinical thermometers (second edition).	35-31.	Plywood (hardwood and eastern red cedar).
2-30.	Mopsticks.	36-33.	Fourdrinier wire cloth (second edition).
3-33.	Stoddard solvent (second edition).	37-31.	Steel bone plates and screws.
4-29.	Staple porcelain (all-clay) plumbing fixtures.	38-32.	Hospital rubber sheeting.
5-29.	Steel pipe nipples.	39-37.	Wool and part wool blankets (second edition).
6-31.	Wrought-iron pipe nipples (second edition).	40-32.	Surgeons' rubber gloves.
7-29.	Standard weight malleable iron or steel screwed unions.	41-32.	Surgeons' latex gloves.
8-33.	Gage blanks (second edition).	42-35.	Fiber insulating board (second edition).
9-33.	Builders' template hardware (second edition).	43-32.	Grading of sulphonated oils.
10-29.	Brass pipe nipples.	44-32.	Apple wraps.
11-29.	Regain of mercerized cotton yarns.	45-36.	Douglas fir plywood (domestic grades) (second edition).
12-35.	Fuel oils (third edition).	46-36.	Hosiery lengths and sizes (second edition).
13-30.	Dress patterns.	47-34.	Marking of gold-filled and rolled-gold-plate articles other than watch cases.
14-31.	Boys' blouses, button-on waists, shirts, and junior shirts.	48-34.	Domestic burners for Pennsylvania anthracite (underfeed type).
15-29.	Men's pajamas.	49-34.	Chip board, laminated chip board, and miscellaneous boards for bookbinding purposes.
16-29.	Wall paper.	50-34.	Binder's board for bookbinding and other purposes.
17-32.	Diamond core drill fittings (second edition).	51-35.	Marking articles made of silver in combination with gold.
18-29.	Hickory golf shafts.	52-35.	Mohair pile fabrics (100-percent mohair plain velvet, 100-percent mohair plain frieze, and 50-percent mohair plain frieze).
19-32.	Foundry patterns of wood (second edition).	53-35.	Colors and finishes for cast stone.
20-36.	Staple vitreous china plumbing fixtures (second edition).	54-35.	Mattresses for hospitals.
21-36.	Interchangeable ground-glass joints, stop-cocks, and stoppers (third edition).	55-35.	Mattresses for institutions.
22-30.	Builders' hardware (nontemplate).	56-36.	Oak flooring.
23-30.	Feldspar.	57-36.	Book cloths, buckrams, and impregnated fabrics for bookbinding purposes except library bindings.
24-30.	Standard screw threads.	58-36.	Woven elastic fabrics for use in overalls (overall elastic webbing).
25-30.	Special screw threads.	59-36.	Woven dress fabrics—testing and reporting.
26-30.	Aromatic red cedar closet lining.	60-36.	Hardwood dimension lumber.
27-36.	Mirrors (second edition).	61-37.	Wood-slat venetian blinds.
28-32.	Cotton fabric tents, tarpaulins, and covers.		
29-31.	Staple seats for water-closet bowls.		
30-31.	Colors for sanitary ware.		
31-35.	Wood shingles (third edition).		
32-31.	Cotton cloth for rubber and pyroxylin coating.		
33-32.	Knit underwear (exclusive of rayon).		

NOTICE.—Those interested in commercial standards with a view toward accepting them as a basis of everyday practice in their industry, may secure copies of the above standards, while the supply lasts, by addressing the Division of Trade Standards, National Bureau of Standards, Washington, D. C.

