1954 Supplement to the
METAL CLEANING
BIBLIOGRAPHICAL ABSTRACTS

Prepared by
JAY C. HARRIS

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PREPARED BY JAY C. HARRIS[1]

FOREWORD

This 1954 Supplement to the ASTM special technical publication No. 90 on "Metal Cleaning, Bibliographical Abstracts" is intended to bring up to date the coverage by this bibliography of the published data on metal cleaning. New references total 227.

This 1954 book supplements the 1953 edition (STP 90B) which was a combined publication of all references from 1842 to 1951. Therefore this supplement (STP90C) with the 1953 combined bibliography (STP90B) contains all available references for the years 1842 – 1953. The references are arranged by year and secondarily by author or by the journal in which the article appeared if anonymous. The same system has been followed in this supplement.

The references are numbered consecutively. Additional references that fall within the dates covered by a previous edition have capital letters appended to numbers to indicate their correct position, thus: 72A, 72B. Later references that have to be inserted where capital letters are already in use have been given lower case letters (for example, 72a) to indicate references prior to 72A.

In order to facilitate reference to the abstracts they have been thoroughly indexed in the following four ways:

Subject Index
Author Index
Specification Index
Patent Index

An improvement has been made in the specifications index. The listings have been grouped together according to issuing agency. Specification number and date have been added to the abstract number. The previous method for indexing did not prove particularly useful.

Wherever possible the original articles have been abstracted. In a field of such size, to read and abstract each original reference is virtually impossible of accomplishment, so that many articles which appear herein are re-abstracts from journals such as *Chemical Abstracts* or *Journal of the Institute of Metals.*

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[1] Asst. Dir. Research, Monsanto Chemical Co., Dayton, Ohio.

BIBLIOGRAPHICAL ABSTRACTS

1907-1954

ADDITIONAL REFERENCES FOR 1907 TO 1951

1907

(1b) W. H. Walker, "The Corrosion of Iron and Steel," Journal, Am. Chemical Soc., Vol. 29, pp. 1251-1264 (1907).

Used potassium ferricyanide to show points of corrosion evidenced by liberation of hydrogen and formation of bright red area at oxidized surface. This was utilized to show areas of nonred color, where soil was retained.

1923

(5C) M. H. Devaux, "La Mouillabilite d'une Surface," Le Journal de Physique et le Radium, Vol. 4, Series 6, pp. 293-309 (1923).

Concerned with films of Japan wax (tripalmitin) on glass, but refers to possible application to metal surfaces. Preferred water break method for estimation of cleanliness.

1930

(32D) D. J. Macnaughtan, "The Determination of the Porosity of Electro Deposits," Transactions, Faraday Soc., Vol. 26, pp. 465-481 (1930).

Potassium ferricyanide adsorbed on paper to show sites of localized corrosion. Describes both a jelly and a paper test. The preferred mixture comprised:

Sodium chloride	60 g
Potassium ferricyanide	10 g
Potassium ferrocyanide	10 g
Water	1000 cc

Typist copying paper is satisfactory and is preferred to filter paper. It is immersed for 30 min in the solution. Prepared papers are dried and stored in dark to prevent partial decomposition of potassium ferricyanide. In use the paper is moistened, applied to the metal surface for several minutes, removed, and rinsed; when dry it is a permanent record.

1935

(79B) R. B. Mears and U. R. Evans, "The Probability of Corrosion," Transactions, Faraday Soc., Vol. 31, Part 1, pp. 527-542 (1935).

Corrosion test methods either by "square drop" or "scratch lines". The square drop method comprised generally 108 3-by 3-mm squares per test piece, the square areas defined by paraffin. Exposure of the test piece to corrosive agents then accomplished, and corrosion reduced to a numerical rating. The scratch-line technique utilized a cell technique, except that within each cell was scratched a line of known length and depth.

1941

(134B) N. K. Adam, "The Physics and Chemistry of Surfaces," Oxford University Press, London, 3rd Edition, 436 pages (1941).

Frequent reference to the theory of cleaning and clean surfaces as applied to metals.

1946

(394C) L. M. Oldt, "Protective and Decorative Treatment of Magnesium," Light Metal Age, Vol. 4, No. 3, pp. 10-13 (1946); Chemical Abstracts, Vol. 40, p. 4646 (1946).

Formulas given for suitable cleaning and protective treatments.

1948

(486B) W. J. Sinton, "Chemical Descaling of Boilers," Australasian Engineer, pp. 51-54 (March, 1948); Chemical Abstracts, Vol. 46, p. 6298 (1952).

A 33 per cent solution of hydrochloric acid is circulated through the tubes of the boiler. Alkali-phosphate solutions are successful over a period of time. Principal advantages of chemical descaling are: reduced time of layoff and dismantling, cleaner surfaces, and fewer replacements.

1949

(492A) "Principles of Electrolytic Cleaning (of Steel) and Their Application to H. M. Ships," Admiralty Corrosion Committee, Hull Corrosion, Sul. Com. ACSIL/ADM/48/-771; Journal, Iron and Steel Inst., Vol. 161, p. 264 (1949); British Abstracts, BI-7, p. 729 (1950).

Details given for cathodic cleaning and derusting by using sea water as the electrolyte. Factors involved in design of anode systems, in electrolysis, and time requirements discussed and illustrated by theoretical examples.

(504B) G. C. Cox, "Marine Electrocleaning and Electropickling Apparatus," U. S. Patent No. 2,476,286, August 19, 1949; British Abstracts, BI-7, p. 517 (1951).

Arrangement of shields about hull to maintain circulation of sea water and a high current density at a given area.

(504C) Crown Cork and Seal Co., Inc., "Cleaning of Strip Steel Prior to Annealing," British Patent No. 659,933, April 5, 1949; British Abstracts, BI-5, p. 233 (1952).

Palm oil applied to steel strip removed by combustion in controlled nonoxidizing atmosphere as in annealing chamber and heat of combustion of oil used to raise temperature of strip to annealing temperature.

(510D) M. Frager and J. Iserson, "Electrolytic Removal of Resin from Metal," U. S. Patent No. 2,480,845, Sept. 6, 1949; British Abstracts, BI-7, p. 1293 (1952).

Synthetic resin removed from ferrous metals by making the metal anodic or cathodic in 15 per cent aqueous sodium hydroxide at 93-104 F using a current density of 13 to 27 amps per sq ft.

1950

(574A) Gebr. Böhler & Co. A.-G., "Descaling Metal Articles," Austrian Patent No. 166,058, June 10, 1950; Chemical Abstracts, Vol. 46, p. 6581 (1952).

Articles from iron, steel, copper or copper alloys are descaled without deleteriously affecting the surfaces thereof by dipping them into molten salt mixtures melting below 250 F, drying the coatings so obtained, and removing them together with the adhering rust, scale, etc.

(595A) G. Fischer, "Corrosion Protection in the Cleaning of Evaporators with Mixed (Metal) Tubing," Korrespondenzbriefe Zuckerfabrik., No. 5, pp. 4-5 (1950); Sugar Industry Abstracts, Vol. 12, p. 124 (1950); Chemical Abstracts, Vol. 47, p. 11117 (1953).

Tests with "Lithsolvent EB" showed that it gave equal protection, with 2 per cent hydrochloric acid, for iron alone or for copper tubes in iron plates. With 7 per cent acid however, the protection is very much less.

(595B) H. M. Frend and J. Frasch, "Cleaning and Protecting Metals," French Patent No. 966,785, October 18, 1950; Chemical Abstracts, Vol. 46, p. 4990 (1952).

A composition which both degreases and protects metals is made comprising ethanol, pyridine, triethanolamine, and chromic oxide.

(616A) J. S. Kirkpatrick, "Surface Protection of Magnesium," Modern Metals, Vol. 6, pp. 36-38 (1950); Chemical Abstracts, Vol. 45, p. 10179 (1951).

Techniques of protection discussed. Cleaning of magnesium done in an alkali soak of 15 min in 10 per cent sodium hydroxide at 200 F. Parts are then immersed in chromic acid bath for 1 to 3 min at room temperature. Pickling follows in a chrome solution with bifluoride in place of hydrofluoric acid.

(620A) G. R. Landi, "Descaling of Metals," Metallurgie, Vol. 82, pp. 795-798 (1950); British Abstracts, BI-4, p. 63 (1952).

Discussion of trend from chemical descaling to sand blasting. Technique, economy and hygienic aspects of descaling and characteristics of inhibitors described.

(632A) Remover, Fingerprint, Military Specification MIL-R-15074 (Ships), March 15, 1950.

Requirements include removal of synthetic fingerprints, corrosion, removability, flashpoint, etc. Cold rolled 4 by 2 by 1/8-in. low carbon steel panels are polished to maximum roughness, of 40 microinches, cleaned with benzol or drycleaning solvent, and stored in a desiccator prior to use for not more than 24 hr. Handled in tongs and after benzol cleaning are rinsed in boiling methanol before using. Panels to be used within 30 min after final rinse in boiling methanol. All tests in triplicate in air conditioned room at 75 ± 3 F with maximum humidity of 55 per cent. Panels soiled with synthetic fingerprint solution of C. P. chemicals: Sodium chloride 7 g, urea 1 g, lactic acid 4 g. Equal parts of methanol and distilled water are added to make one liter.

Two drops of the solution (approximately 0.1 ml) dropped from burette onto a clean dry glass plate. A No. 6 rubber stopper approximately 1 sq in. on the smaller face is roughened with emery cloth, dipped into the solution on the glass plate and printed onto prepared panels. Panels then cured within 5 sec in a high velocity oven at 220 ± 2 F for 5 min and cooled. After 10 min panels transferred to slushing machine with length of stroke 4 in. and a speed of 40 ± 5 cycles per min in fingerprint remover solution for 2 min. Removed and rinsed with benzol until free from remover, air dried and dipped into melted petrolatum, transferred to humidity cabinet after 24 hr aging, for 120 hr. No visible signs of rust signify test qualification.

(639A) J. C. Müller, "Solution Inhibitors for Aluminum in Sodium Hydroxide Solutions," Revista de la facultad de quimica industrial y agricola, Vol. 19, No. 32, pp. 92-96 (1950); Chemical Abstracts, Vol. 45, p. 6144 (1951).

Weight loss of 99.5 per cent aluminum in 0.3 N sodium hydroxide solutions for 1 hr, measured with several inhibitors. Meat peptone, 0.3 per cent reduced the loss 70 per cent. Mannite showed loss at low concentrations, but behaved as an inhibitor at higher. Tragacanth was also effective.

(639B) A. Nagel, "Solution for Removing Corroded Layers from Metals," Swiss Patent No. 269,804, July 31, 1950, Chemical Abstracts, Vol. 45, p. 7948 (1951).

Rust or copper oxides are removed by a solution composed of water 880, phosphoric acid 120 ml, tartaric acid 8.0, pyrogallol 3.8, and potassium chloride 5.5 g.

(666A) H. G. Verner and L. S. Wood (to Du-Lite Chem. Corp.), "Phosphate Coating of Metal Parts," U. S. Patent No. 2,515,934, July 18, 1950; Chemical Abstracts, Vol. 44, p. 8311 (1950).

Parts of steel, cast iron and some nonferrous metals (except aluminum and cadmium plated metals) are phosphatized without separate degreasing operation by use of phosphatizing liquid consisting of 1 to 7 per cent (2 to 4 per cent) concentrated phosphoric acid dissolved in organic solvent such as acetone to which carbon tetrachloride is added to raise the flash point, with substantially no water phase present.

1951

(670A) A. J. Beghin, P. F. Hamburg, Jr., and H. E. Smith (to Insl-X-Corp.,), "Rust Remover," U. S. Patent No. 2,558,167, June 26, 1951; Chemical Abstracts, Vol. 45, p. 8964 (1951).

Stable paste made by adding 1/3 to 5 per cent sodium carboxy methylcellulose and 3 to 30 per cent pectin to an acid of the group consisting of phosphoric acid, citric or trichloroacetic acid.

(670B) C. F. Boe and W. R. Lowstuter (to Atomix Inc.), "Combined Cleaning and Polishing Composition," U. S. Patent No. 2,566,716, September 4, 1951.

Emulsion of the oil-in-water type comprises water in the continuous phase, a film-forming, water insoluble resinous material having a melting point not lower than 50 C, an oil-miscible and water-immiscible solvent for the resinous material, a solvent miscible with both oil and water, a water-soluble film-forming agent comprising polyvinyl alcohol, and an emulsifying agent, the resinous material and the solvent therefor being in the dispersed phase, and the film-forming and the emulsifying agents being in the continuous water phase.

(671A) L. F. de Brocq and L. Rakowski, "Cleaning and Re-Chromate Treatment of Magnesium Alloy Castings with Special Reference to Corroded Parts Machined to Close Limits," Selected Gov't. Research Reports (London), Protection and Electro-Deposition of Metals, Vol. 3, pp. 72-86 (1951); Metallurgical Abstracts, Vol. 19, p. 729 (1952); British Abstracts, BI-6, p. 1427 (1952).

Description of development of methods of cleaning and rechromating finished magnesium alloy castings previously chromate treated. Mild alkaline cleaner recommended for removing grease or loosely-adherent foreign matter. When considerable damage to chromate film or corrosion had occurred, the original film was removed by treatment with nitrobenzene-nitric acid. Recommended for treating painted surfaces. When considerable loss of metal is permitted, acid chromate bath may be used, but it is not satisfactory on aluminum-magnesium alloys after the hydrofluoric acid dip.

(671B) J. P. Burke (to Birco Chemical Corp.), "Composition for Cleaning Metals," U. S. Patent No. 2,554,358, May 22, 1951; Chemical Abstracts, Vol. 45, p. 7946 (1951).

Metallic oxides removed from metal surface after welding and before painting by applying to their surface a jelly made of sodium silicate, a strong mineral acid, and some substance to inhibit rusting after the metal is cleaned and the jelly removed. For the latter purpose phosphoric acid may be used to form a phosphate coating, or copper sulfate and similar salts may be added to produce an electrolytically deposited metallic layer.

(672A) P. F. Clements, "Detergents for Use in the Aluminum Industry," Light Metals, Vol. 4, pp. 104-108 (1951).

Discussion of theory and practice. Illustrates use of soak, barrel cleaning and jet washer by schematic diagrams. Discussion of use of silicates and in particular the sodium metasilicate for cleaning because of effectiveness and inhibition of corrosion.

(673A) H. G. Cole and E. Parry, "Treatment in Cold Chromating Baths of Magnesium Alloy Parts Previously Treated in Acid Chromate Dip and Lanolined," Selected

Gov't. Research Reports (London), Protection and Electro-Deposition of Metals, Vol. 3, pp. 67-71 (1951); Metallurgical Abstracts, Vol. 19, p. 729 (1952); British Abstracts, BI-6, p. 1427 (1952).

Experiments on chemical cleaning of magnesium alloy parts before chromate treating in cold electrolytic and cold immersion baths described. Parts should be given preliminary degreasing in organic degreaser followed by aqueous metal cleaner. Existing chromate film should be removed completely as by abrasion with pumice. Cleaning by chemical methods which do not completely remove previous film may affect adversely, the appearance and protection of final chromate film.

(673B) S. G. Daniel, "Adsorption on Metal Surfaces of Long-Chain Polar Compounds from Hydrocarbon Solutions," Transactions, Faraday Soc., Vol. 47, pp. 1345-1359 (1951); Chemical Abstracts, Vol. 46, p. 6459 (1952).

Various long chain fatty acids, alcohols, and esters were adsorbed on several metal surfaces, and it was found that ease of adsorption increased with increasing chain length; for a given chain length, the acid was most strongly adsorbed and the ester least with the alcohol intermediate. When reaction between the adsorbate and the metal surface occurred it was the physical properties of the reaction products, the metal soaps, that determined the observed behavior.

(673C) A. Davidsohn, "Solvent-Detergent Products," Soap, Vol. 27, No. 8, pp. 47, 49, 149 (1951).

Solvent-detergent mixtures useful in metal cleaning are cited. Several compositions are discussed in particular and kerosene is used as a solvent.

(674A) A. Dittfeld, "Liquid Detergent for Cleaning Metallic Surfaces before Painting," Italian Patent No. 468,080, Dec. 29, 1951; Chemical Abstracts, Vol. 48, p. 392 (1954).

Solution contains 99 per cent water, sulfonated higher alcohols and/or sulfonated petroleum compounds. Water soluble solvent may also be added.

(675A) E. Duetsch, "Cleaner and Polish," Swiss Patent No. 273,348, May 1, 1951; Chemical Abstracts, Vol. 47, p. 1413 (1953).

Paste containing chalk 50-54, tripoli 17-15, bole (clay) 5-4, magnesium oxide 2-1, vaseline 18.1-19.2, paraffin 7.2-6.2, and saponifiable fat 0.7-0.6, for cleaning and polishing silverware, glass, etc.

(675B) A. Dugnami, "Cleaning Mixture," Italian Patent No. 462,459, March 21, 1951; Chemical Abstracts, Vol. 46, p. 7800 (1952).

Kerosene 40 parts emulsified with sulforicinoleate 12 to 16 and olein 1 to 2.8 parts, and 50 to 60 parts soda ash is added to obtain a paste, 5 to 20 per cent of which is dissolved in water.

(676A) J. L. v. Eichborn, "Wetting of Metals by Water," Werkstoffe und Korrosion, Vol. 2, pp. 212-221 (1951); Chemical Abstracts, Vol. 45, p. 9334 (1951).

Survey of the values for surface tension of solid metals and heats of adsorption of metal catalysts gives a comparative measure of the adsorptive power of various metal surfaces. A hypothesis for the adhesion of traces of water is given.

(676B) G. Fernhaden, "Cleaning Iron Castings At Norrahammars Bruk," Gjuteriet, Vol. 41, No. 7, pp. 99-102 (1951); Journal, Iron and Steel Inst., Vol. 170, p. 168 (1952); British Abstracts, BI-5, p. 687 (1952).

Layout of cleaning shop at a large Swedish foundry and some specification cleaning equipment illustrated.

(676C) C. B. Francis (to United States Steel Co.), "Removing Scale from Ferrous Articles," U. S. Patent No. 2,569,158, Sept. 25, 1951; Chemical Abstracts, Vol. 46, p. 87 (1952).

Oxide removed from ferritic and austenitic stainless steels by immersion at 700 to 900 F in a fused bath of caustic soda containing 0.5 to 3 per cent sodium peroxide for periods up to 15 min, followed by pickling in dilute sulfuric acid and in dilute nitric acid or a nitric-hydrofluoric acid mixture. Other peroxides are given.

(676D) J. Frasch, "Corrosion, Cleaning, Inhibition and Passivation of Metals," Metaux-Corrosion-Industries, Vol. 28, No. 2, pp. 81-94 (1951); Journal, Iron and Steel Inst., Vol. 169, p. 91 (1951); British Abstracts, BI-4, p. 197 (1952).

Processes of oxidation, deoxidation and prevention of oxidation reviewed and chemical reactions involved; chemico-physical theories involved are discussed.

(681A) J. W. Hensley, H. A. Skinner and H. R. Suter, "A Metal Cleaning Test Using Radioactive Stearic Acid as Soil," Papers on Evaluation of Soaps and Detergents, ASTM Special Technical Publication No. 115, pp. 18-32 (1951).

Carbon 14 tagged stearic acid used as soil when applied to 1 1/2 in. diam SAE 1010 type disk especially prepared as to surface character, using special polishing machine. A micro pipet was used to deliver tagged stearic acid in kerosene to disk placed on special traversing device to evenly spread the soil. Kerosene is removed after permitting solution to evenly coat metal by treatment under infra red lamp.

Cleaning procedure was to suspend disks in fixed volume of the cleaning solution without agitation at 90 C and then rinsing at room temperature. Disk supported in a vertical position by inserting small magnet in a test tube and attaching to it the soiled disk. Soil density and removal measured with a Geiger tube assembly. Sensitivity indicated as 4 x 10^{-9} g per sq cm.

Stearic acid is very sensitive to surface finish. With five common alkalies and an alkylaryl sulfonate, found that with a given cleaning solution the amount of residual soil tends to reach an equilibrium value which is not reduced by prolonged cleaning.

Single component alkali cleaners are effective in a range of 0.1 to 1.0 per cent sodium oxide in solution but above 1 per cent gave rapid decrease in cleaning efficiency.

(681B) "Effect of Inhibitors for Economical Pickling of Steel," Hutnik, Vol. 18, July-August 1951; Biul Inform, Glown. Inst. Met., 25-27; Journal, Iron and Steel Inst., Vol. 170, p. 176 (1952); British Abstracts, BI-5, p. 702 (1952).

Apparatus described for determining rate of hydrogen evolution during steel pickling. For inhibitor testing, diffusion of hydrogen into specimen should be considered in addition to rate of hydrogen evolution. Factor H_N for per cent Brittleness introduced. After pickling 2 to 3 hr the specimen is washed and repeatedly bent until breakage occurs. H_N equals $100N/N_0$ where N_0 and N are number of bends to cause fracture before and after treatment respectively.

(681C) "Ultrasonic Cleaner Cuts Cleaning Costs," Iron Age, Vol. 168, No. 8, p. 77 (1951); British Abstracts, BI-4, p. 198 (1952).

Brush cleaning of capillary holes in finished machine products eliminated by ultrasonic method which removed grease, oil, metal shavings and lapping compound. Quartz resonator used to produce ultrasonic waves in solution of sodium chloride and these passed to cleaning solvent by a diaphragm.

(681D) "Metal Cleaning. Cleaning Station in Strip Line Cuts Handling," Iron Age, Vol. 168, No. 17, p. 112 (1951); British Abstracts, BI-4, p. 63 (1952).

Strip copper-nickel, nickel-silver and bronze cleaned after annealing to remove dirt, carbon from burned lube oil and zinc "sweat" by treatment in room bath temperature of 10 per cent sulfuric acid, cold- and hot-water jets and air dried, cutting 40 per cent from handling time.

(681E) E. R. Irwin (to Standard Oil Co.), "Cleaning Composition," U. S. Patent No. 2,566,298, September 4, 1951.

Cleaning composition consists of the following materials in proportions by volume: 15-28 per cent alkali metal soap of mahogany sulfonic acids, 12-20 per cent catalytic reformed naphtha bottoms having initial boiling point above 400 F and final boiling point below 600 F, 25-30 per cent monochlorobenzene, 10-20 per cent cresylic acid, 3-7 per cent isopropyl alcohol, 3-10 per cent naphthenic acid, 3-6 per cent water and 0.25-1 per cent monoethanolamine.

(681F) J. F. S. Jack, "Cleaning and Preservation of Bronze Statues," Museums Journal, Vol. 50, pp. 231-236 (1951); Metal Abstracts, Vol. 19, p. 419 (1952); British Abstracts, BI-6, p. 708 (1952).

Natural weathering and means of producing artificial patinas described and detailed instructions given for treating new statues, periodic cleaning and treatment after neglect.

(682A) G. J. Kahan, "Hydrophobic Films on Solid Surfaces," Journal, Colloid Science, Vol. 6, pp. 571-575 (1951).

Using a platinum dipper technique and rinsing with deionized water, showed that potassium stearate and certain quaternary salts caused formation of hydrophobic film on metal surface while alkyl sulfate and alkylaryl sulfonate did not. Fact that platinum dipped in potassium stearate wetted metal but on rinsing did not, indicated complex film formation in which rinsing removed a portion of the film leaving substantially monolayer sorbed to metal, which is hydrophobic. Rinsing in tap water left colloid adsorbed on surface and no water break was evident, while deionized water desorbed a layer, leaving a hydrophobic water-break surface.

(682B) L. F. de Brocq and L. Rakowski, "Cleaning and Re-Chromate Treatment of Magnesium Alloy Castings--Corroded Parts Machined to Close Limits," Selected Govt. Research Reports (London), Protection and Electro-Deposition of Metals, Vol. 3, pp. 72-86 (1951); Chemical Abstracts, Vol. 47, p. 2110 (1953).

Recovery of magnesium alloy parts by removal of paint, corrosion product or chromate film without seriously altering the dimensions of parts machined to fine tolerance. Mild alkali metal cleaner removed grease and so on, nitro-benzene and nitric acid mixture removed the original chromate film and corrosion products; for finely machined parts a caustic soda bath followed by chromic oxide solution, reimmersion in caustic bath, then a hydrofluoric acid bath worked well.

(686A) H. B. Linford and E. B. Saubestre, "Cleaning and Preparation of Metals for Electroplating," American Electroplaters' Society Research Report, Serial No. 18, 84 pages (1951).
See Reference Nos. 624, 684, 685.

(689A) I. B. McKenzie, "Cleaning of Metals in Engineering Processes," Australian Engineer, pp. 87-93, 137-141 (Dec. 7, 1951); Journal, Iron and Steel Inst., Vol. 171, p. 431 (1952); British Abstracts, BI-4, p. 1671 (1952).
Review of mechanical, chemical and solvent methods of cleaning with 33 references.

(692A) Compound; Grease-Cleaning, Solvent Emulsion Type, Military Specification MIL-C-7122(Aer), February 20, 1951. Superseding C-147, See Reference No. 342A.

(695A) Compound, Cleaner and Brightener, Nonflammable (for Use on Aluminum Surfaces), Military Specification, MIL-C-5410A, June 25, 1951.
Cleaner and brightener shall be nonflammable, phosphoric acid base, clear liquid, free from sediment or abrasives. Other requirements are for emulsifiability (Type II, concentrate), freedom from toxicity, minimum corrosiveness, effect on painted surfaces, cleaning and rinsing minima, surface tension, 2.6 per cent P_2O_5 minimum as orthophosphoric acid, normality not greater than 1.5 when titrated with standard 0.1 N. sodium hydroxide, lack of attack on acrylic plastics.
Control formula comprised in parts by weight:

85 per cent orthophosphoric acid	3.0
Citric acid C. P.	4.0
Synthetic soap	2.0
Methyl ethyl ketone	3.0
Distilled water	88.0

(695B) Compound, Cleaning, With Inhibitor, for Engine Cooling Systems, Military Specification, MIL-C-10597A(Ord), Amendment 1, July 25, 1951.
Major component oxalic acid, 71 to 100 per cent by weight, and the minor component anhydrous aluminum chloride.

(695C) Cleaning-Compound, Grease, Solvent-Emulsion, Military Specification, MIL-C-20207, October 16, 1951.
See Navy Dept. Specification 51C65, March 1, 1951, Reference No. 640.

(695D) Compound, Steam Cleaning, Military Specification, MIL-C-11494(Ord), October 18, 1951.
Superseding ES542b, Reference 315D. No definite chemical composition requirements, but must meet performance test of water softening or stability, cleaning efficiency equal or superior to standard comparison material, solubility, absence of fatty acid, or rosin, of soap and of starch, pH value, surface tension and corrosion. Cleaning test panels are of 2 1/2 by 2 1/2 in. in size of 20-gage cold rolled steel, degreased in acetone, polished with No. 1 emery cloth, cleaned in hot alkali solution until free from water-break, dipped in absolute alcohol and wiped dry with paper toweling. Panels then dipped into Military symbol oil 3065 at 26 ± 1 C, drained at same temperature for 30 min. The hanging oil drop is removed with absorbent cotton. Wash test made in a 2 liter beaker containing 1600 ml of 0.25 per cent weight to volume solution of the compound in distilled water. Panels are immersed in the solution at boil and at 2 1/2 and 5 min intervals respectively; panel is moved forward and backward three times in each direction, agitation to take not more than 6 sec. At end of 5 min immersion panel is removed, given two 6 sec rinses in distilled water with no agitation, and a 4 sec drain between rinses of 800 ml each at 23 ± 3 C. Panels dried at 50 C for 20 min, cooled and weighed. Panels washed with acetone, rinsed in absolute alcohol, dried with paper toweling and reweighed. Difference is the amount of residual soil, for tests run in duplicate. The initial amount of oil per panel averages 0.16 g per panel. Comparison compound is given for evaluation purposes.

(695E) J. P. Mortelliti, "Preparation of Metal Surfaces for Organic Finishes," Organic Finishing, Vol. 12, No. 8, pp. 12-14 (1951); Chemical Abstracts, Vol. 45, p. 9449 (1951).
Review of surface treatments for steel, aluminum, zinc, copper, and brass to prepare them for organic finishing. These include solvent washing, vapor degreasing, solvent emulsion cleaning, and acid and alkali cleaning.

(698A) G. Olson and B. Thordeman, "Cleaning (and Protection) of Silver Objects," Museums Journal, Vol. 50, pp. 250-251 (1951); Metal Abstracts, Vol. 19, p. 392 (1952); British Abstracts, BI-6, p. 709 (1952).
Articles cleaned and washed and dried, lacquered with Acryloil B7 and baked at 60-70 C for 1 to 2 hr.

(699A) P. Pignotti, "Rust Removing Mixture," Italian Patent No. 468,167, Dec. 29, 1951; Chemical Abstracts, Vol. 47, p. 6854 (1953).

A mixture of medium weight mineral oil 10, kerosene 20, dimethyl ketone 3 and a 20 per cent suspension of colloidal graphite in mineral oil 3 parts is suitable for removal of rust.

(700A) "Ultrasonic Cleaning Device," Plating, Vol. 38, p. 1255 (1951).

Ultrasonic cleaning device used to clean tiny openings in electric-shaver heads eliminating brushing and speeding operation and cutting expense. General Electric ultrasonic generator converts electric energy into sound through the cleaning solvent.

(702A) T. Rice, "Cleaning of Steel Test Panels for Paint," ASTM Bulletin No. 178, pp. 50-58 (December 1951).

Test panels should not be either partially or wholly sanded or abraded. Removal of oil and smut accomplished by solvent spray degreasing, and trichloroethylene vapor degreasing, and two modifications in which phosphoric acid dip is used. Wiping with rags saturated with solvent is said to be unreliable.

Best cleanliness test found to be water-break or spray water-break test (of Spring, Forman, and Peale) but more difficult to perform and offered no advantages. Morgan and Lankler fluorescent dye method not sensitive to 0.1 per cent soiled panels.

Rock Island Arsenal Drop Test (Hong) able to discern between surface with 0.01 per cent oil and clean surface not oiled. Contact angle apparatus able to distinguish oil on panels soiled with 0.1 per cent oil solution; limit of effectiveness seems to be 0.01 per cent oil. Contact angle method and drop test definitely detect 0.0001 ml oil per 100 sq cm surface. Also possible that contact angle would detect 0.00005 ml oil per 100 sq cm surface. Detailed procedure given in ASTM Method D 609, Reference No. 717.

(702B) D. M. Roberson, F. Seeley and O. H. Kobernik, "Chemical Cleaning of Boilers," Proceedings, Master Boiler Makers' Assoc., pp. 57-64 (1951); Chemical Abstracts, Vol. 46, p. 5751 (1952).

Use of proper chemical solvents can be used with considerable saving in time and expense over the mechanical methods formerly employed. Determination of type and amount of the deposits will indicate the most satisfactory type of solvent to be used. Experienced and trained personnel indicated for the job.

(702C) H. Rogner (Henkel & Cie., G.m.b.H.), "Scale and Rust Removal," German Patent No. 805,341, May 17, 1951; Chemical Abstracts, Vol. 46, p. 1428 (1952).

A nonhygroscopic powder suitable for scale and rust removal is prepared by mixing together sodium bisulfate 40, sodium sulfate 58, and sulfonated anthracene oil 2 parts by weight. A 5 to 10 per cent aqueous solution of the powder is used at room or elevated temperatures. Rust is removed without attack on the base metal.

(702D) G. Römpler, "Cleaning Agent for Galvanized Sheets," Swiss Patent No. 273,347, May 1, 1951; Chemical Abstracts, Vol. 47, p. 474 (1953).

A cleaning composition of only mildly abrasive properties contains 60 per cent pumice, 20 per cent stannous chloride, 17 per cent citric acid, and 3 per cent sulfated fatty alcohol.

(702E) G. Rossi-Landi, "Descaling Ferrous Metals," Metall. Constr., Mechan., Vol. 83, p. 544-555 (1951); Journal, Iron and Steel Inst., Vol. 170, p. 75 (1952); British Abstracts, BI-5, p. 703 (1952).

Concentration and temperature of descaling baths discussed in relation to period of immersion and role of attacking and residual acid explained. Notes on preparation of baths, and acid consumption figures given for several forms of steel.

(702F) G. Rossi-Landi, "Descaling of Stainless Steels," Metall. Constr. Mechan., Vol. 83, pp. 763-765 (1951); Journal, Iron and Steel Inst., Vol. 170, p. 391 (1952); British Abstracts, BI-5, p. 1128 (1952).

Discussion of austenitic, martensitic and ferritic stainless steels and use of inhibitors, accelerators and other additions to pickling baths.

(703A) H. Santi and Co., "Rust-Removing Composition," Swiss Patent No. 273,080, April 16, 1951; Chemical Abstracts, Vol. 46, p. 6529 (1952).

Phosphoric acid is claimed to have superior rust removing properties. The example describes a bath composition containing 60 per cent technical phosphoric acid 100, water 150, sodium sulfate 2, trisodium phosphate 4, and borax 2 kg in which the objects are processed electrolytically. For large objects the composition may comprise 60 per cent phosphoric acid 30, water 35, sulfuric acid 3, and filler 32 kg of the type of bentonite, kaolin, or the like, and this is applied to the object, later washed off together with the rust particles.

(703B) M. Saturnino, "Cleaning Preparation for Typewriter Bars," Italian Patent No. 466,269, Oct. 24, 1951; Chemical Abstracts, Vol. 47, p. 7138 (1953).

A mixture of 70 parts trichloroethylene and 30 parts of glycerol, with some essential oil is used to clean typewriter bars.

(704A) K. Schultze, "Wettability and Methods for its Measurement," Kolloid-Ztg., Vol. 121, pp. 57-65 (1951); Chemical Abstracts, Vol. 45, p. 6897 (1951).

Drop of water formed on ring of surface tension tester, then ring lowered to touch test surface. Process of repeatedly touching surface continued until all the water is transferred, and the number of contacts, called B number, used as a measure of wettability.

(704B) J. H. Secrist and W. H. Petering (to Detrex Corp.), "Cleaning Composition," U. S. Patent No. 2,576,419, November 27, 1951; Chemical Abstracts, Vol. 46, p. 4260 (1952).

Clear, free-flowing liquid comprises 100 ml trichloroethylene, 2 g triethanolamine oleate, 6 g monoethanolamine oleate, 1 g sodium oleate and 11 ml water.

(705A) J. C. Showalter (to Standard Oil Development Co.), "Cleaning Composition for Removing Asphaltic Coatings," U. S. Patent No. 2,571,956, October 16, 1951; Chemical Abstracts, Vol. 46, p. 2719 (1952).

Composition for removing protective asphaltic coatings from metal surfaces comprises an aromatic hydrocarbon solvent 25-27, a hydrophilic low-molecular weight alkali metal petroleum sulfonate 5-33, a hydrocarbon lubricating-oil fraction 5-50, and a hydrophobic, high molecular weight alkali metal petroleum sulfonate 5-12 per cent. This is sprayed on the coating and is dissolved readily and easily rinsed by use of hot water.

(706A) M. Smialowski, J. Foryst and A. Madjeski, "Testing the Efficacy of Various Methods of Cleaning Steel Surfaces from Mineral-oil Layers," Prace Glownego Inst. Metalurgii, Vol. 3, No. 1, pp. 55-63 (1951); Chemical Abstracts, Vol. 45, p. 9449 (1951).

Removal of machine oil from cleaned soft steel strip accomplished by chemical and electrolytic cleaning. Efficiency of oil removal determined by wetting with water, weighing, ultraviolet irradiation and plating with copper. Lists the various chemical cleaning baths, which included certain synthetic surface active agents, as well as sodium silicate and trisodium phosphate. The combination of silicate with surface active agents said to give best cleaning results. Neither method was successful in removing oil films left from cold rolling; these removed with trichloroethylene.

(708A) L. F. Spencer, "Scale-Removing Technique with Stainless Steels," Steel Process, Vol. 36, pp. 623-628, Vol. 37, pp. 28-30 (1951); Journal, Iron and Steel Inst., Vol. 169, p. 76 (1951); British Abstracts, BI-5, p. 96 (1952).

Complex oxides of stainless steel makes removal of scale more difficult than with plain carbon or low alloy grades. Chemical removal by pickling can be performed satisfactorily, outlining details of eleven processes. The ferric sulfate-hydrofluoric acid bath is discussed in detail and performance outlined.

(709A) J. Starr, "Cleaning with Sound Waves," Products Finishing, Vol. 16, No. 2, pp. 52, 54, 56 (1951).

Initial cleaning with piezoelectric quartz crystal, but improvement in size and shape achieved by fired-ceramic materials by Brush Development Co., of Cleveland, Ohio. Magnetostrictive generators are limited to ultrasonic-output frequencies of 100,000 cycles for most purposes, whereas electrostrictive generators are workable at frequencies of from 18,000 to 5 million cycles.

Manufacturers of electrostrictive generators suitable for difficult ultrasonic cleaning purposes include Brush Development, General Electric, and Fisher Scientific Co. of Pittsburgh, Pa. Magnetostrictive generators for ultrasonic cleaning developed by General Sound Co., of Burbank, Calif., and Massa Laboratories of Cleveland, Ohio.

Cleaning solutions are chosen for usual cleaning properties, but a few factors merit special consideration in certain circumstances. Gives data on ultrasonic properties of materials and solvents, indicating that proper choice of liquid medium and frequency is necessary, since a frequency of less than 50,000 cycles can be effectively dispersed in soapy water, but a fabric immersed could be completely disintegrated in a few seconds. Thermal characteristics of solution are important since sound waves may produce toxic vapors or a fire hazard.

Conventional cleaning tanks and magnetostrictive transducers have been used, but special tank with rock wool and equivalent insulator is used wherever higher frequency sound energy is used.

The volume of tanks is limited to one gallon or less due to currently available sound generators. A General Electric unit was designed to degrease an optimum load of 100 cu in. of metallic materials such as ball pen points, screw machine products and electric razor heads. Can degrease full load in 60 sec, a level attained only by a 30 gal cleaning tank without ultrasonic generator.

(709B) "The Market for Chemical Cleaners in the Metalworking Industry," Steel, Market Research Dept., Penton Bldg., Cleveland, 13, Ohio, 10 pages, 1951.

Industry is big, accounting for over 42 per cent of total U. S. industrial production; represents over 50,000 plants and over 6 million workers. Metalworking produced goods and services valued at more than 102 billion dollars. Survey made of 3,000 typical plants and the study was based on replies from 387.

The largest consumption in chemical cleaners was of the acid type (557,922 tons) and more than 60 per cent of all the solvent type cleaners produced was consumed by this industry. Alkaline type cleaners were used least by the metalworking industry (48,032 tons). Over 50 different companies were recognized as producers of chemical cleaners.

(711A) A. de Vleeschauwer, H. Hendrickx and J. Moulaert, "Properties of Detergents," Mededelingen van de Landbouwhogeschool en de Opzoekingsstasstations van de Staat Gent, Vol. 17, No. 1, 80 pages (1951); Chemical Abstracts, Vol. 47, p. 894 (1953).

The study of the influence of detergents at several temperatures upon metals and alloys, removing of dried milk by detergents and bacteriological examination of milk bottles. Corrosion test data given, showing aluminum most affected. Agents tested up to 2 per cent were caustic soda, trisodium phosphate, soda ash, sodium metasilicate, sodium hypochlorite, and several detergents.

(712A) C. F. Weber (to General Electric Co.), "Metal Cleaning and Plating Process," U. S. Patent No. 2,570,174, Oct. 2, 1951; Chemical Abstracts, Vol. 46, p. 1893 (1952).

Nickel plated objects are replated after stripping in an electrolytic alkaline bath containing sodium silicate, caustic soda, and trisodium phosphate, by passing a current through the objects in a strong hydrochloric acid solution for 1 min.

(713A) H. G. Webster (to J. H. Shoemaker), "Metal Cleaning Composition," U. S. Patent No. 2,567,456, September 11, 1951; Chemical Abstracts, Vol. 45, p. 10186 (1951).

Castings descaled and degreased by placing in a molten nonelectrolytic bath containing a mixture of an alkali metal hydroxide, approximately 19, an alkali metal nitrate approximately 19, and an alkali metal chloride 1 part by weight. The part is immersed next in a second bath such as hydrochloric acid or sulfuric acid, for a very short time so as not to etch the surface of the metal part. Next the part is rinsed in water by immersion.

(713B) O. Wennerholm, "Cleaning and Etching of Aluminum Alloys," Färg och Fernissa, Vol. 15, pp. 137, 138 (1951); British Abstracts, BI-6, p. 544 (1952).

Stresses importance of degreasing with solvents prior to etching to prevent etch pattern.

(713C) C. H. Williams, Jr., "Patenting (Wire) with Continuous Cleaning and Coating," Wire and Wire Products, Vol. 26, pp. 881-883 (1951); Journal, Iron and Steel Inst., Vol. 170, p. 391 (1952); British Abstracts, BI-5, p. 1128 (1952).

Continuous plant for patenting tire bead wire and rate of 30 ft per min described.

(713D) Shizuhiro Yamada (to Toyoda Automobile Industries Co.), "Removal of Rust from Steel," Japanese Patent No. 5311, September 15, 1951; Chemical Abstracts, Vol. 47, p. 2677 (1953).

The steel is washed with alkali, incompletely washed with water, then treated with 30 per cent phosphoric acid for three hours. The phosphoric acid solution is prepared from 400 ml acid (density 1.87), 120 g. starch and 960 g. magnesium chloride; this diluted with water.

NEW REFERENCES FOR 1952 TO 1954

1952

(716) W. Ahlstrom, "Cleaned-in-Place (Dairy) Pipe Lines," Rept. Proc. 48th Ann. Convention Internatl. Assoc. of Ice Cream Manufacturers, Production and Lab. Council, 1952, pp. 76-77; Chemical Abstracts, Vol. 47, p. 11587 (1953).

Both alkaline and acid detergent solutions may find use for cleaning of dairy pipe lines, the acid solution overrunning any deficiency in the alkaline material. Rapid flow of 3 ft per sec of detergent through the lines is necessary.

(717) "Standard Method of Preparation of Steel Panels for Testing Paint, Varnish, Lacquer and Related Products," ASTM Standards, D 609-52, Part 4, pp. 509-511 (1952).

Describes panel and cleaning technique which consists either of solvent spray cleaning with a spray gun with naphtha and xylene or naphtha and Cellosolve, followed with methyl alcohol; or vapor degreasing with stabilized trichloroethylene followed by methyl alcohol. Panels tested for lack of water break.

Also given are procedures for phosphate coated steel and chemically treated panels.

(718) L. R. Bacon and E. G. Nutting, Jr., "Metallic Staining of Silverware," Industrial Engineering Chem., Vol. 44, pp. 150-155 (1952).

Tarnishing of silverware in mechanical dishwashing is accounted for by the electrodeposition of copper dissolved in the detergent solution. More electronegative metals such as aluminum or zinc in contact with silverware cause tarnish. Sources of copper are machine parts and imperfections in the silver plate. Methods for minimizing tarnish are suggested.

(719) W. M. Baldridge, E. T. Miller, F. M. Hauger and D. Harvey, "Mechanical Cleaning of Rods and Wire," Wire and Wire Products, Vol. 27, pp. 672-675, 709-711 (1952); Chemical Abstracts, Vol. 46, p. 9048 (1952).

A symposium held at a meeting of the Wire Association where results were reported on various experiments of mechanical cleaning of rods and wire in place of pickling prior to wire drawing.

(720) H. A. Barbian, "Preparation of Magnesium Surfaces for Plating," American Paint Journal, Vol. 36, No. 33, pp. 31, 34 (1952).

Cleaning required prior to finishing. Suggested are solvent, solvent-emulsion or heavy duty alkaline cleaners followed by acid pickle such as hydrofluoric or chromic.

(721) J. M. Bash, "Degreasing Steel Scrap," U. S. Patent No. 2,618,577, Nov. 18, 1952.

Machine tool shavings or chips in large masses conveyed from a hopper onto a vibrating conveyor enclosed in a tank in which vaporized tetrachlorethane or trichloroethylene is circulated.

(722) G. Batta, L. Scheepers and H. Bouillon, "Cleaning of 18-8 Steels," Industrie chimique belge, Vol. 17, pp. 471-477 (1952); Chemical Abstracts, Vol. 46, p. 9492 (1952).

Attack in g per sq cm at different normalities of hydrochloric acid and nitric acid is graphed; there is an extensive tabulation of results in amount of oxide detached or dissolved with aqua regia, hydrochloric acid alone, and nitric acid at various temperatures and times and by various heating methods. Hydrochloric acid alone is insufficient, and nitric acid adequate only with some 50 min at temperatures above 20 C at 2.8 N or more.

(723) D. M. Brashear and E. R. Stove, "The Use of Radioactive Tracers in the Study of the Mechanism of Action of Corrosion Inhibitors," Chemistry & Industry, pp. 171-172 (1952); Chemical Abstracts, Vol. 46, p. 4983 (1952).

Radioactive chromium and the benzoate radical remain on mild steel after washing. A preliminary note.

(724) G. E. Brissey and H. H. Young (to Swift & Co.), "Acid Cleaner and Detergent," U. S. Patent No. 2,593,259, April 15, 1952.

Concentrate for dissolving a film of coagulated milk protein and cleaning dairy equipment is comprised of 10 to 30 per cent organic acid stronger than acetic, such as citric, hydroxy-acetic, lactic or tartaric, 3 to 10 per cent phosphoric acid, 3 to 10 per cent acid salt of an alkali metal, such as sodium bisulfate and 2 to 10 per cent wetting agent such as sodium dodecylbenzene sulfonate. The concentrate adjusted to give a pH below 1.8 when diluted to 7 per cent.

(725) C. A. Campbell (to Solventol Chemical Products, Inc.), "Cleaning Composition," U. S. Patent No. 2,583,165, Jan. 22, 1952; Chemical Abstracts, Vol. 46, p. 3304 (1952).

Metal parts prior to plating, rustproofing, painting, or inspection are cleaned by dip or spray cleaning in warm rust proofing mixture containing 36 to 250 parts of a refined petroleum solvent and 15 parts of a pine oil or terpinyl glycol ether solvent. Part of this solvent is emulsified in water containing an oleate, the water being in an amount having 8 to 150 times the volume of all other ingredients. Ethanolamine or triethanolamine emulsifiers are recommended.

(726) P. H. Cardwell, L. H. Eilers and B. P. Robinson (to Dow Chemical Co.), "Removing Scale Deposits from Ferrous Metal Surfaces," U. S. Patent No. 2,606,873, August 12, 1952.

Scale removing composition made by combining hydrochloric acid, formaldehyde, an aromatic or a heterocyclic nitrogen base as inhibitor, and a wetting agent.

(727) A. A. G. Chapman, "Electrolytic Removal of Rust from Metals," U. S. Patent No. 2,615,840, October 28, 1952.

A typical electrolyte contains sodium hydroxide 3 lb per gal, sodium silicate 3, sodium cyanide 7, sodium chloride 5, sodium fluoride 7/8, sulfated fatty alcohol 1/8, and sodium stannate 1 oz per gal. The stannate is added to provide protective coating to the cleaned metal surface.

(728) G. C. Close, "Fitting Vapor Degreasers to the Job," Product Finishing, Vol. 16, No. 4, pp. 32-34, 36, 38 (1952).

Three basic types of degreasers available; vapor immersion only, solvent immersion-vapor, solvent spray preceded by or followed by solvent immersion with final cleaning in vapor.

A cleaning action by vapor degreasing depends upon gage or metal thickness of parts, since cleaning ceases when condensation of vapor ceases because part becomes too hot. Frequently satisfactory to preclean with alkaline immersion followed by vapor degreasing since gross contamination of degreasing bath is thus reduced.

Operation limits for maximum effectiveness given.

(729) J. B. Delaney, "Shot-Blasting Speeds Stainless Strip Cleaning," Iron Age, Vol. 169, No. 25, pp. 133-135 (1952); British Abstracts, BI-5, p. 1415 (1952).

Costs of cleaning hot-rolled stainless steel strip drastically reduced using Wheelabrator shot-blasting unit in strip pickling line. Main saving is elimination of scale breaking with plain chromium steels.

(730) A. Douty, "Pickling and Pickling Acid Inhibitors," Metal Industry (London), Vol. 80, pp. 108-110 (1952); British Abstracts, BI-4, p. 1107 (1952).

Especial reference to reduced rate of attack by nonoxidizing acids on metals. Mention of three relatively new methods for descaling.

(731) J. L. Everhart, "Wet Blasting Performs Many Cleaning and Finishing Operations," Materials and Methods, Vol. 35, No. 4, pp. 98-100 (1952).

Advantages of liquid impact blasting are ability to greatly vary abrasive particle size, adjust hardness, air pressure, vary distance from work to gun and liquid-to-abrasive ratio. Large variety of surfaces can be cleaned by this procedure.

(732) Steam Cleaning Compound, Interim Federal Specification, P-S-00751 (GSA-FSS), August 15, 1952.

Alkaline steam cleaning compound intended for use in steam cleaning machines for various ferrous and non-ferrous surfaces.

With the exception of minimum content of phosphoric acid of 15 per cent calculated as P_2O_5, no definite chemical composition requirements are given. Performance must equal or better comparison formula comprising:

Sodium metasilicate,pentahydrate .	35 per cent by weight
Monosodium phosphate	10.5 per cent by weight
Sodium triphosphate	52.5 per cent by weight
Nonionic agent (Triton X-100)	2.0 per cent by weight

Performance test utilizes cleaned cold-rolled steel panels soiled with Military symbol oil 3065 conforming to Specification MIL-L-15016 by dipping and draining at 26 ± 1 C and draining 30 min. 600 ml of 0.25 per cent cleaning solution in a 2 liter beaker in distilled water brought to boil and panels cleaned by treatment in specified manner for 5 min, rinsed in special manner, dried at 50 C for 20 min, cooled and weighed. Then washed with acetone, then absolute alcohol and dried with paper toweling and reweighed. Difference in weight is amount of residual soil for tests run in duplicate.

(733) A. G. Gray, "Evaluating Surface Cleanliness," Product Finishing, Vol. 17, No. 1, pp. 56, 60, 64, 66, 68, 70, 74, 76, 78, 80 (1952).

See Rice, Reference No. 702A and Linford and Saubestre, Reference Nos. 624 et seq. A resume of the work of the foregoing reference authors. Variation of Mear's hydrogen peroxide surface active method tested, but did not detect difference between clean, unsoiled or oil-soiled panels. Water break did not show presence of 0.01 per cent oil on surface, while the spray water-break method offered no advantages, and the fluorescent dye method was insensitive to 0.1 per cent oiled panels. The Rock Island drop test was used which consists of dropping approximately 0.05 ml (one drop) of distilled water 12 in. from a 10 ml burette, and the diameter of the droplet measured. On clean surfaces the drop is almost perfectly circular with scalloped edge, but on slightly oily surface drops are smaller in diameter and usually without scalloped edge. On very clean surface the drops are not round. The test distinguished between 0.01 per cent oiled surface and one perfectly clean. The contact angle apparatus of Langmuir and Shaefer, Reference No. 113A, was used to give contact angle measurements. Both this and the Rock Island Arsenal methods would detect 0.0001 ml oil per 100 sq cm of surface. Possible sensitivity of 0.00005 ml of oil per sq cm indicated. Atomizer test of Linford and Saubestre described.

(734) W. Heinicke, "Amines for Cleaning Type Matrixes," U. S. Patent No. 2,615,825, October 28, 1952; Chemical Abstracts, Vol. 47, p. 2520 (1953).

Graphite and grime are removed from type matrixes by washing with alkyl or alkylol amines, the amine then removed with an air blast or with chlorinated solvent.

(735) J. W. Hensley, "Measuring Effectiveness of Metal Cleaners with Radioactive Tracers," Iron Age, Vol. 170, No. 20, pp. 151-154 (1952); Chemical Abstracts, Vol. 47, p. 892 (1953).

See Reference No. 681A.

(736) J. W. Hensley, H. A. Skinner and H. R. Suter, "Metal Cleaning Test Using Radioactive Stearic Acid as Soil," Metal Finishing, Vol. 50, No. 7, pp. 49-52 (1952).

See Reference No. 681A.

(737) W. H. Hill (to Koppers Co., Inc.), "Cleaning and Pickling Composition for Metals," U. S. Patent No. 2,606,155, August 5, 1952, Chemical Abstracts, Vol. 46, p. 11090 (1952).

Removal by an acid pickling solution is improved and accelerated by dissolving in the acid an inhibitor which is prepared by the reaction between an aldehyde and a preformed thiocyanate of a basic amine compound of the formula NR_4X in which the R atoms are organic radicals and at least two are linked together to form a heterocycle with the N atom, such as pyridine, etc.

(738) A. F. Holden, "Composition for and Method of Descaling Metal Parts," U. S. Patent No. 2,601,864, July 1, 1952.

Oxide scale removed from ferrous metal parts by placing them in a molten bath containing alkali metal and alkaline earth metal chlorides, 2 to 10 per cent fluoride of sodium, potassium or barium, and 0.5 to 5 per cent silicon carbide until the scale is dissolved; then transferring them immediately to a molten bath containing 70 per cent zinc chloride and alkali metal and alkaline earth metal chlorides. The parts are quenched in water.

(739) E. R. Holman and J. L. Mathis (to Turco Products, Inc.), "Composition for Cleaning Aluminum and Aluminum-alloy Surfaces Preparatory to Spot Welding," U. S. Patent No. 2,585,127, Feb. 12, 1952, Chemical Abstracts, Vol. 46, p. 3486 (1952).

Improved cleaning bath which prevents deposition of copper, manganese and iron upon the aluminum surface has a pH of 1.2 and contains 200 ml orthophosphoric acid (75 per cent) and 50 ml tetrasodium pyrophosphate dissolved in one liter water; an oleaginous loosening agent (20 ml ethylene glycol monobutyl ether, or 5 to 10 ml dodecyl- or hexadecyldimethyl benzylammonium sulfate) may be added. The bath is used at room temperature.

(740) "Descaling by Induction-Heating," Journal, Iron and Steel Inst., Vol. 25, p. 312 (1952); British Abstracts, BI-5, p. 1405 (1952).

Bars were cleaned of scale in an inductor operating at 9600 cycles per sec and 15-25 kw per sq in. Scale temperature raised so rapidly that it separates from metal base by expansion.

(741) E. J. Jahn (to Shell Development Co.), "Metal-Working Lubricant," U. S. Patent No. 2,605,224, July 29, 1952, Chemical Abstracts, Vol. 46, p. 10086 (1952).

A roll lubricant, which is stable, noncorrosive, and resists the washing action of water sprayed under pressure, nonstaining and easily removed from the surface is made by adding to a sulfuric acid treated light liquid hydrocarbon 3 to 10 per cent lanolin, oleyl alcohol, or olein, or a mixture of these. Staining can be prevented by adding 0.01 to 0.10 per cent of several metallic naphthenates or oleates, or by adding an alkylated phenol or an organic amine. These lubricants can be fortified by adding to them less than 1 per cent of a list of vegetable, animal and marine oils, naturally occurring high molecular weight fatty acids, their esters, or sulfur containing materials.

(742) V. A. Lamb, "Metal Cleaning and Finishing," Metal Progress, Vol. 61, No. 1, pp. 76-80 (1952); British Abstracts, BI-4, p. 835 (1952).
Post war developments reviewed. Possible future developments described.

(743) M. A. Lesser, "Steam Cleaners," Soap, Vol. 28, No. 4, pp. 50-53, 71 (1952).
Review of the detergents used for this purpose, and typical formulations.

(744) M. A. Lesser, "Metal Cleaners. I," Soap, Vol. 28, No. 10, pp. 42-45, 169 (1952).
Review of cleaning test methods, radioactive tracer technique, classified compounds as alkaline cleaners, solvents, emulsion cleaners, and acidic cleaners. Remarks on substitution of synthetic detergents for soap in alkaline compositions. For soak type cleaners lists 10 formulas.

(745) M. A. Lesser, "Metal Cleaners. II," Soap, Vol. 28, No. 11, pp. 46-49, 98 (1952).
Lists cleaners for mechanical spray type washers, electro-cleaners, chlorinated hydrocarbons, diphase cleaners, acids as to metals best cleaned and specific cleaners. Under special cleaners lists acid gel types and finger print removers.

(746) W. Letfuss, "Electrolytic Descaling," Austrian Patent No. 172,954, Nov. 10, 1952; Chemical Abstracts, Vol. 47, p. 58 (1953).
Ferrous parts to be descaled are first pretreated in acid pickling baths, then treated in an alkali bath until a dark-colored, loosely adherent surface layer is formed, then cathodically until this layer has dissolved. The parts are then subjected to an aftertreatment in pickling solutions containing oxidizing metal compounds or oxygen containing chlorine compounds to remove the graphite formed on the ferrous surfaces.

(747) Compound, Rust Remover (Phosphoric Acid Base) (For Use on Ferrous Metal Surfaces), Military Specification, P-R-791 (Navy, Ships), March 31, 1952.
Requirements include content of not less than 68 per cent free orthophosphoric acid on a weight to volume basis, minimum of 5 per cent by volume of water-soluble organic solvents, and removal of greasy films equal to, or better than a control formula.
Grease removal test made by cleaning 3 by 6-in. test panels of cold-rolled steel with trichloroethylene. General purpose grease applied to lower one inch surface of panel by spatula or finger. Excess grease removed by repeatedly drawing straight edge of spatula downward over greased surface. Outer edge of panels wiped clean with a rag. Cleaning formula and control diluted with three volumes of distilled water and transferred to beakers so that solutions have depth of at least two inches. Panels immersed for 30 min then removed and rinsed thoroughly in distilled water. Panels suspended vertically and observed for water-break. Control formula:

Phosphoric acid 85 per cent	118 ml
Triton X-100	5 ml
Butyl cellosolve	12.5 ml

Water is added sufficient to bring total volume in milliliters to 250. Absence of inhibitor required.

(748) Cleaning Compound, Decontaminating (For Soiled and Radioactive Surfaces), Military Specification, MIL-C-7907(Aer), July 31, 1952.
Detail requirements include solubility in hard and sea water, pH maximum of 10, surface tension and interfacial tension requirement, suspending power, soil removal by tracer technique, cleaning and rinsing efficiency, corrosiveness and attack on painted surfaces and plastics.
Suspending power determined on 1.5 oz per 1.5 gal of solution in hard and sea water, by shaking in described manner with 0.5 g Norit AC and comparing with standards. Soil removal technique first requires soiling with 15 oxides representing potential fission products and uranium nitrate. These applied as specially prepared slurry to prepared plugs which are then rinsed free from water removable material, then dried and radioactivity determined. Plugs then washed in prescribed manner with distilled water solution of detergent, rinsed and the count remade. The per cent removal of radioactivity then calculated.

(749) Compound; Corrosion Preventive, Fingerprint Remover, Military Specification, MIL-C-15074A, Oct. 1, 1952.
See Reference No. 493.

(750) Compound; Cleaning, Steam, Military Specification, MIL-C-6135(Aer), Dec. 20, 1952.
Composition to be free from fatty acid, rosin, starch, abrasives or inert filler; moisture not to exceed 18 per cent by weight. Total alkalinity as Na_2O 31 per cent maximum; phosphate as P_2O_5 minimum of 15 per cent. Also given are requirement for pH and buffer capacity, surface tension, cleaning efficiency, corrosiveness, stability, rinsing and dust forming properties.
Cleaning test consists of removal of a soil comprising asphalt, lanolin, 1100 oil, turpentine and activated carbon baked on an aluminum panel for one hour at 125 C. A specialized apparatus is used for removal and is illustrated, which simulates a steam gun in

operation. Effectiveness of removal is based upon weight of soil removed.

(751) A. V. Moore, "In-Place Cleaning of Sanitary Pipe Lines," Milk Dealer, Vol. 41, No. 12, pp. 146-151 (1952); Chemical Abstracts, Vol. 46, p. 11479 (1952).
The cleaning in place of steel milk lines, by employing acid and alkaline rinses, and sanitizing them with chlorine, is a satisfactory procedure. The critical part of the system is the preheater, as observed in this study, where the temperature gradient was high enough to deposit milkstone.

(752) P. N. Murphy (to United States Steel Co.), "Cleaning Hot-Dip Tin Plate," U. S. Patent No. 2,601,863, July 1, 1952.
Tin plated strip after coming from the palm-oil tank is passed thru a solution containing 0.5 to 1.5 per cent soda ash at 180 to 200 F. to remove most of the oil. A second bath containing 0.10 to 0.25 per cent soda ash removes the remaining oil, after which the sheet is rinsed in hot-water sprays. The correct amount of palm oil is then transferred to the tin plate by rollers and wipers, the whole technique eliminating discoloration.

(753) Kasaku Nakayama and Keiichi Shimizu (to Furukawa Electro-Industries Co.), "Electrolytic Cleaning of Copper Wire," Japanese Patent No. 1906, May 30, 1952; Chemical Abstracts, Vol. 57, p. 6283 (1953).
Copper wire is passed through an electrolytic bath of one meter length and containing 10 per cent of a 1:2 ratio silicate, 0.1 to 0.7 per cent sodium oleate, and 1 to 3 per cent sodium cyanide while alternating current is passed with current density of 160 amp per sq cm.

(754) H. Narcus, "The Role of Chelating Agents in the Plating Industry," Metal Finishing, Vol. 50, No. 3, pp. 54-62 (1952).
Use in cleaner baths recommended for usage at high temperature and alkalinity where there is limited stability of polyphosphates. Effective in removing metal soaps, preventing hard water precipitates. Particularly effective in stabilizing metasilicate baths to prevent deposition of colloidal precipitate on prolonged heating. In neutral or alkaline solution will remove rust and varnish.

(755) I. Niiya (to Hidachi Mfg. Co.), "Removal of Tin or Solder Coatings from Copper Wire," Japanese Patent No. 4857 (1952), Nov. 21; Chemical Abstracts, Vol. 48, p. 104 (1954).
Tin is removed from wire by heating at 100 C in solution containing copper sulfate and concentrated sulfuric acid plus water. A solution of hydrochloric acid and copper chloride used for removal of solder coatings.

(756) "Some Good Things to Know About Metal Cleaning," Oakite Products, Inc., 42 pages, (1952).
Though illustrated by reference to proprietary compounds, booklet is useful in indicating satisfactory tank cleaning methods, depending upon the soils to be removed. Listed are general data for machine cleaning methods; electro-cleaning steel, brass, and nonferrous metals; pickling, prepaint treatment in machines, or by hand; steam detergent cleaning; barrel cleaning.

(757) L. M. Peters (to Ferro-Glo Corp.), "Composition for Removing Corrosion Reaction Products from Metals," U. S. Patent No. 2,585,165, February 12, 1952; Chemical Abstracts, Vol. 46, p. 3486 (1952).
Material to work rapidly and well, which gives off no offensive fumes, and which is harmless to workmen. Comprised of water 93.08, potassium hydroxide solution 11.64, ammonium hydroxide (26 Be.) 11.64, sulfuric acid (66 Be.) 11.64 oz.

(758) C. F. Pickett and M. Rosenfeld, "Cleaning Composition," U. S. Patent No. 2,613,186, Oct. 7, 1952; Chemical Abstracts, Vol. 47, p. 2404 (1953).
Oil, grease or asphalt or mixtures thereof are removed from metal surfaces by contact with a liquid composition containing high-flash naphtha 35 to 90, kerosine 7 to 57 and diacetone alcohol (or tert-butyl alcohol) 1 to 13 per cent.

(759) A. Pollack, "Surface-Active Raw Materials for Industrial Cleaners," Seifen-Öle-Fette-Wachse, Vol. 78, pp. 318-320 (1952); Chemical Abstracts, Vol. 47, p. 7241 (1953).
Synthetic surface-active agents replacing inorganic cleaners in the metal industry.

(760) A. Pollack, "Modern Electrolytic Degreasing," Metalloberfläche, Vol. 6, A27-28 (1952); Chemical Abstracts, Vol. 46, p. 5460 (1952).
A discussion.

(761) A. Pollack, "Modern Metal Cleaning Methods and Installations," Metalloberfläche, Vol. B6, pp. 145-152 (1952); Chemical Abstracts, Vol. 47, p. 2656 (1953).
A review with 50 references.

(762) A. Pollack, "Metal Cleaning with Emulsions," Chem. Ztg., Vol. 76, pp. 141-142 (1952); Chemical Abstracts, Vol. 46, p. 7014 (1952).
Metals can be economically cleaned with

dilute emulsions of petroleum solvents. Emulsifiers may be soaps or nonionic agents. Acids may be used with the emulsions for simultaneous cleaning and rust removal.

(763) C. A. M. Ripoche, "Removing Oxides, Oils, and Grease from Uncoated Metal," U. S. Patent No. 2,595,411, May 6, 1952; Chemical Abstracts, Vol. 46, p. 9508 (1952).
Metals prepared for enamelling by burning fats and oils on the surface in an oxidizing atmosphere, then reducing the metallic oxides formed by heating in a reducing atmosphere.

(764) M. Rosenfeld and C. F. Pickett, "Diacetone Alcohol-Ethylene triamine Condensation Product in Detergent Compositions," U. S. Patent No. 2,616,856, Nov. 4, 1952.
Condensation product of diacetone alcohol and diethylene triamine enhances the detergent properties of diethylene triamine oleate. Details of preparation of the condensation product given. Detergent compositions containing these materials prepared in the usual cleaning solvents of which the total solids may consist of 29 to 60 per cent.

(765) J. H. Secrist (to Detrex Corp.), "Noncorrosive Metal-Cleaning Composition," U. S. Patent No. 2,599,729, June 10, 1952.
Corrosion of zinc and ferrous alloys during degreasing with chlorinated hydrocarbons is prevented by adding to the cleaning liquid 0.1 to 5 per cent of benzylthiocyanate. Such liquid compounds which are actually subemulsions, may contain 100 ml trichloroethylene (stabilized), 2 g triethanolamine, 6 g ethanolamine, 1 g sodium oleate, 11 ml water and 3 g benzyl thiocyanate.

(766) R. Seligman, "Milk and Metals," Journal, Soc. Dairy Technology, Vol. 5, pp. 170-176 (1952); Chemical Abstracts, Vol. 46, p. 11480 (1952).
Mentions that some stainless steels may be harmed if cleaning solutions used for dairy cleaning are not sufficiently alkaline.

(767) Yosamatsu Shimizu (to Scientific Research Institute, Ltd.) "Removing an Oxidized Film of Silicon Steel," Japanese Patent No. 2408, July 1, 1952; Chemical Abstracts, Vol. 47, p. 6283 (1953).
Film removed by the electrolysis of the steel in an electrolyte consisting of acid with either alternating or direct current, as the anode.

(768) C. W. Smith (to Detrex Corp.), "Cleaning and Rustproofing Composition," U. S. Patent No. 2,587,777, March 4, 1952.
Metal salts of oleic, naphthenic, lauric, palmitic or linoleic acids added to kerosine, naphtha, toluene, chlorinated hydrocarbons, and emulsifying the solvent and soap with a suitable emulsifier. The soaps of the metal salts act to protect the surfaces.

(769) C. J. Snyder and W. G. MacLelland (to Anaconda Wire and Cable Co.), "Cleaning Copper Articles," U. S. Patent No. 2,608,980, Sept. 2, 1952; Chemical Abstracts, Vol. 47, p. 1030 (1953).
Scale removed by heating the article in halogen-bearing atmosphere and then cooling. After furnace treatment, the articles are quenched in water. From 2 to 20 g of halide per 100 lb of copper articles are usually sufficient for the cleaning operation. The process is suitable for preparing copper rods for wiredrawing.

(770) S. Spring, "Evaluating Metal Cleaning Efficiency," Metal Finishing, Vol. 50, No. 2, pp. 65-68 (1952).
While the water-spray pattern offers a useful procedure for evaluation of partially soiled surfaces, it cannot properly be used for very heavily soiled or hydrophobic surfaces. Certain precautions must be observed in applying the test, among which are that uniform metal surfaces must be used for laboratory tests, care should be taken to rinse off the last traces of surface active agent, and loosely adherent oil picked up from the surface of the rinse water should not be permitted to dry onto the metal.

(771) "Surface Preparation Specification, No. 1, Solvent Cleaning," SSPC-Sp 1-52T, Steel Structure Painting Council, 4400 5th Ave., Pittsburgh, Pa., 4 pages, August 28, 1952.
Intent to use solvent cleaning prior to application of paint, for removal of detrimental foreign matter by use of solvents, emulsions, cleaning compounds, or steam cleaning. Sequence of operations given, consisting of mechanical removal of rough material, removal of grease or oil, wiping with solvent, spraying, vapor degreasing, immersion. Describes methods for accomplishing these ends. List of safety precautions and inspection. Appendix lists and describes solvents, alkaline and emulsion cleaners and steam cleaning. Also gives safety threshold limits for solvents.

(772) "Surface Preparation Specifications, No. 2, Hand Cleaning," SSPC-SP 2-52T, Steel Structure Painting Council, Pittsburgh, Pa. 2 pages, August 28, 1952.
Removal of loose mill scale and loose paint by hand brushing, sanding, scraping, chipping or other impact tools. Procedures listed as well as safety precautions and inspection.

(773) "Surface Preparation Specifications, No. 3, Power Tool Cleaning," SSPC-SP 3-52T, Steel Structure Painting Council, Pittsburgh, Pa., 2 pages, August 28, 1952.
Use of power tools for removal of loose mill scale and paint.

(774) "Surface Preparation Specifications, No. 4, Flame Cleaning of New Steel," SSPC-SP 4-52T, Steel Structure Painting Council, Pittsburgh, Pa., 2 pages, August 28, 1952.
Cleaning and preparing unpainted metal surfaces by passing high temperature, high velocity oxy-acetylene flames over the entire surface, then wire brushing to remove loosened scale. Procedures, safety precautions, and inspection details listed.

(775) "Surface Preparation Specifications, No. 5, Blast Cleaning of 'White' Metal," SSPC-SP 5-52T, Steel Structure Painting Council, Pittsburgh, Pa., 3 pages, August 28, 1952.
Abrasives propelled against surfaces to remove mill scale, paint, rust, or foreign matter. "White" metal defined as surface of gray white, uniform metallic color, slightly roughened as suitable anchor pattern for coatings. Procedures and safety precautions and inspection details given. Appendix includes maximum height profile produced by a number of different abrasives.

(776) "Surface Preparation Specifications, No. 6, Commercial Blast Cleaning," SSPC-SP 6-52T, Steel Structure Painting Council, Pittsburgh, Pa., 3 pages, August 28, 1952.
Commercial blast cleaning for general purposes where high but not perfect degree of blast cleaning is required. Procedures include removal of oil and grease by solvent cleaning, rust and scale by impact tools then blast cleaning by dry sandblasting, wet or water vapor, grit, shot, closed recirculated nozzle, grit or shot with centrifugal wheels. Other details of procedure follow specific types of blasting given.

(777) "Surface Preparation Specifications, No. 7, Brush-off Blast Cleaning," SSPC-SP 7-52T, Steel Structure Painting Council, Pittsburgh, Pa., 3 pages, August 28, 1952.
Differs from commercial blast cleaning by not requiring complete freedom from all mill scale, rust and paint, but that they shall be tight and sufficiently abraded to provide good adhesion and bonding of paint. Procedures are given.

(778) "Surface Preparation Specifications, No. 8, Pickling," SSPC-SP 8-52T, Steel Structure Painting Council, Pittsburgh, Pa., 2 pages, August 28, 1952.
Preparation of metal surfaces by removal of all mill scale rust by chemical reaction or by electrochemical action or both. Sequence of procedures includes first oil removal, then scale removal by acid pickling with sufficient inhibitor, electrolytic pickling, "hydride" descaling, proper rinsing procedures, freedom from smut and then primed. Safety precautions are given.

(779) Haruo Takahashi (to Hidachi Manufacturing Co.), "Metal Washing Agent," Japanese Patent No. 3085, August 14, 1952; Chemical Abstracts, Vol. 47, p. 6855 (1953).
Hydrochloric, sulfuric or phosphoric acid (5 per cent) containing 0.1 per cent hexamethylene tetramine is used to dissolve the boiler scale and prevent corrosion of boilers.

(780) H. H. Uhlig, "Metal Surface Phenomena," Offic. Dig. Federation Paint & Varnish Production Clubs, No. 333, pp. 650-670 (1952); Chemical Abstracts, Vol. 47, p. 3774 (1953).
Unsatisfied valence forces at the surface of a metal lead to a state of tension of the surface atoms, and these also account for adsorbed films of substances bonded to the metal surface in varying degrees. Films of low energies of bonding are so-called physically adsorbed, and with energies of bonding are said to be chemisorbed.

(781) J. van Hinte, "Degreasing of Objects made of Aluminum Alloys by Trichlorethylene is Hazardous," Veiligheid (Amsterdam), Vol. 28, pp. 121-123 (1952); Chemical Abstracts, Vol. 47, p. 10152 (1953).
Spontaneous ignition of clothing occurred in a bicycle parts factory, caused by spontaneous decomposition of trichloroethylene by aluminum.

(782) D. I. Walker and E. A. Dieman (to Standard Oil Co. of Indiana), "Fingerprint Corrosion-Inhibiting Composition," U. S. Patent No. 2,598,949, June 3, 1952.
Composition contains 30 to 80 per cent hydrocarbon solvent, 5 to 15 per cent water soluble oxygenated organic solvent, such as an aliphatic alcohol or an aliphatic ketone, 3 to 15 per cent oil-soluble detergent comprising synthetic alkylaryl sulfonates having at least 18 carbon atoms to a mole, preferably mahogany soaps of the alkaline earth metals, 2 to 6 per cent water and 0.1 to 2 per cent of a coupling agent composed of water-solubilized sulfonated vegetable or animal oil.

1953

(783) "Tentative Method of Test for Buffering Action of Metal Cleaners," ASTM Standard D 1279-53T, one page, (1953).
Procedure for determining buffering action

of metal cleaners which defines buffer action as resistance of a solution to change in pH; buffering capacity as the ability of an alkaline solution to absorb acidic material without marked change in pH; and the buffer index which is defined as the milliliters of 0.5 N hydrochloric acid required to decrease initial pH of the solution either one pH unit, or some definite change in pH, as agreed upon by purchaser and seller. Method fully outlined.

(784) "Tentative Method of Total Immersion Corrosion Test for Soak Tank Metal Cleaners," ASTM Standard D 1280-53T, 4 pages (1953).
Complete method for evaluation of metal cleaners intended for use in soak tank cleaners and for metals other than aluminum.

(785) "Tentative Method of Test for Rinsing Properties of Metal Cleaners," ASTM Standard D 1281-53T (1953).
Test designed to provide reproducible laboratory means for determining ease and thoroughness of rinsing of cleaning compounds, when applied to metal surfaces. Method consists of precleaning, application of solution to panel, drying, testing of dried surface with alcohol for residual cleaner, and with water break test.

(786) W. C. Atkin, "Chemical Cleaning in Pulp and Paper Mills," Southern Pulp Paper Mfr., Vol. 16, No. 9, pp. 54, 56 (1953); Chemical Abstracts, Vol. 47, p. 11734 (1953).
Several examples given of paper-mill equipment successfully cleaned by chemical methods.

(787) N. V. de Bataafsche Petroleum Maatschappij, "Cleaning Cargo Tanks of Vessels," Dutch Patent No. 71,770, Feb. 16, 1953; Chemical Abstracts, Vol. 47, p. 9641 (1953).
Cargo tanks, particularly those of oil tankers cleaned with an alkaline aqueous solution at ambient temperature containing a water soluble inorganic nitrite, in an amount from 0.003 to 10 per cent by weight calculated on the nitrite ion. The necessary akalinity is obtained using alkali metal oxides, hydroxide, ammonia or salts of strong bases and weak acids, controlled to pH 8 to 12.

(788) G. Batta, "Scouring (Pickling) of Steel," Industrie chimique belge, Vol. 18, pp. 111-123 (1953); Chemical Abstracts, Vol. 47, p. 5338 (1953).
Pickling of ordinary steel with sulfuric acid and of rustproof steel 18/8, inhibition of pickling and its evaluation, effect of addition of surfactants on pickling and determination of the end of the pickling process.

(789) D. E. Beischer, "Radioactive Monolayers: A New Approach to Surface Research," Journal, Physical Chemistry, Vol. 57, pp. 134-138 (1953); Chemical Abstracts, Vol. 47, p. 6725 (1953).
The carbon 14 tagged stearic acid monolayers on metals and the systems heated to react the monolayer, and the excess or unreacted stearic acid is removed. The remaining chemisorbed acid can act as a radio-autographing medium as a sensitive measure of the activity of the surface.

(790) L. Brannan, "Electrolytic Tarnish Removal from Silver," U. S. Patent No. 2,632,730, March 24, 1953; Chemical Abstracts, Vol. 47, p. 6284 (1953).
Silver articles are immersed in a revolving zinc lined drum which contains a solution of 5 tablespoons of sodium chloride and 5 tablespoons of soap per gal of water. The presence of insoluble soap acts as a polishing aid.

(791) H. Brenner, "Tarnish-Removing Dips for Silver, Gold and Copper," Electroplating and Metal Finishing, Vol. 6, pp. 371-373 (1953); Chemical Abstracts, Vol. 48, p. 2552 (1954).
A typical tarnish-removing dip contains by weight the following: thiourea 8, hydrochloric acid (37.5 per cent concn.) 5.1, water soluble perfume 0.3, detergent and/or wetting agent 0.5, and water 86.1 per cent. Equation for action and the capacity to dissolve silver sulfide are given.

(792) H. Brenner, "Silver Dips," Soap, Vol., 29, No. 5, pp. 161, 163, 165, 167, 183 (1953).
Compositions comprising thiourea, hydrochloric or sulfuric acid, and a wetting agent or detergent, are used to remove tarnish. Discussed are their toxicity, chemistry involved in cleaning silver, and their limitations. Formulas are given.

(793) N. H. Brodell (to Wm. Isler), "Descaling Ferrous Metals," U. S. Patent No. 2,632,718, March 24, 1953; Chemical Abstracts, Vol. 47, p. 6334 (1953).
Ferrous metals descaled inexpensively by using ferric chloride or other completely oxidized multivalent metallic solutions or organic halides such as carbon tetrachloride below the boiling point and then heating above 1200 F for annealing period. The article at 800 to 1100 F is quenched in water or a 10 per cent caustic soda, or soda ash or sodium chloride solution at the boiling point or lower by immersing.

(794) "Ultrasonic Waves to Clean Metals," Chemical and Engineering News, Vol. 31, No. 15, p. 1581 (April 13, 1953).
Detrex Corporation and Brush Electronic Co., using ceramic transducer have overcome limitations caused by size and properties of quartz. Detrex Soniclean process produces ultrasonic sound energy transmitted through trichloroethylene at frequencies of 430 kc per sec. Part to be cleaned is immersed in the solvent in the focus of intensity for cleaning. Ceramic transducer is curved, 6-in. long pipe cut in half along the longitudinal axis. Individual pieces can be connected in series and arranged to give wide range of focusing at only 40 v requirement to transducer.

(795) "Sequestering Agents Best for Decontaminating Surfaces," Chemical and Engineering News, Vol. 31, p. 2601 (1953).
Nature of fission products resulting from the explosion of an atomic bomb depends upon the elapsed time, type of an atom bomb; most the atoms are rare earth group. The Foster D. Snell group used actual fission products incorporated into synthetic soil representative of the dirt in the air over industrial cities. Surfaces coated with the soil were tin, glass, cement, plaster, etc. After drying, the surfaces were cleaned by a standard technique. Heavy duty detergent was found more effective than either soap or light duty detergents. A modified form of sodium hexametaphosphate was found most economical of the sequestering agents, and they used two parts to one part of soap or synthetic detergent, and removed most of the soil from most of the surfaces almost completely.

(796) C. Cone and J. Huebler (to Surface Combustion Corp.), "Cleaning Ferrous Metal," U. S. Patent No. 2,625,495, Jan. 13, 1953; Chemical Abstracts, Vol. 47, p. 5868 (1953).
Strip steel is cleaned by preheating in an inert media to 670 to 1700 F, passing through an atmosphere that is oxidizing to carbon and deoxidizing to iron oxides and cooling in the inert media. Examples of atmospheres are given, and the inert media may be an inert gas, a molten metal or a salt bath.

(797) G. C. Cox, "Cathodic-Descaling Process and Electrode," U. S. Patent No. 2,643,222, June 23, 1953; Chemical Abstracts, Vol. 47, p. 9191 (1953).
Scale removal from ship hulls, metal tanks or tank cars accomplished in an electrolyte of sea water or dilute sulfates or chlorides, the sacrificial rods of aluminum, magnesium or zinc being connected by a flexible copper conductor to the metal to be descaled. When an external power source is used, the rods may be made of steel.

(798) E. S. Criddle, "Removing Rust from Metal Surfaces," U. S. Patent No. 2,661,314, Dec. 1, 1953, Official Gazette.
The rusted metal is soaked for at least six days in a solution containing one part by volume of black-strap molasses and 40 parts of water. The rust-free metal is then cleaned in a solution of sodium bicarbonate and water.

(799) E. D. Dilling and G. L. Frederic (to the United States of America), "Removal of Scale from Zirconium," U. S. Patent No. 2,653,134, September 22, 1953; Chemical Abstracts, Vol. 48, p. 537 (1954).
Zirconium metal pickled in a solution comprising 60 per cent hydrofluoric acid 3, 70 per cent nitric acid 3, lead nitrate 3, and the rest water with free lead, about 10 per cent by weight of the zirconium, in contact with the solution. The spongy precipitate is easily removed from the bright smooth surface.

(800) S. R. Dodd and E. J. Ainsley (to Oakite Products, Inc.), "Essentially Nonaqueous, Acid Emulsion Cleaning Composition," U. S. Patent No. 2,629,696, Feb. 24, 1953, Official Gazette.
A phosphoric acid emulsion cleaner in the form of a gel. Also contains organic solvent, wetting agent, solid organic acid, and can be shipped in ordinary steel without appreciably attacking steel. Example three comprises citric acid 10 per cent, glycerine 10 per cent, 100 per cent ortho phosphoric acid 40 per cent, kerosene 37 per cent, water 0.2 per cent, glyceryl monoricinoleate 1.8 per cent, wetting agent 1.0 per cent.

(801) R. Dunlevy, H. Frick and J. H. Shoemaker (to Kolene Corp.), "Continuous Cleaning of Steel Strip," U. S. Patent No. 2,635,063, April 14, 1953; Chemical Abstracts, Vol. 47, p. 6334 (1953).
Molten salt eats out graphite flakes of polished stainless steel strip in fused alkali metal hydroxide baths and leaves holes which retain the molten salt which acts as a lubricant.

(802) S. L. Eisler, "Radiometric Study of the Adsorption Characteristics of Stearic Acid," Corrosion, Vol. 9, pp. 91-94 (1953); Chemical Abstracts, Vol. 47, p. 3781 (1953).
Adsorption of polar rust inhibitors measured radiometrically. The several variables involved were studied, and it is indicated that the method may be applied to measurement of the adsorption characteristics of petroleum sulfonates and other corrosion inhibitors.

(803) N. L. Evans, "The Sodium Hydride Process-A New Method of Descaling Metals," Journal, Inst. Production Engineers, Vol. 32, p. 280 (1953); Chemical Abstracts, Vol. 47, p. 11117 (1953).

Review of this process and some of its characteristics.

(804) G. L. Farrar, "Chemical Cleaning of Refining Equipment," Oil Gas Journal, Vol. 51, No. 46, pp. 211-212, 215, 219, 223-224, 230, 232, 235 (1953); Chemical Abstracts, Vol. 47, p. 7769 (1953).

A review with case histories.

(805) J. de Feher, "Surface Cleaning Techniques," Technical Aids for Small Business, Small Defense Plants Administration, No. 18, 4 pp., Feb. 1953.

Discussion of the general techniques for cleaning surfaces. These are discussed under the headings of steels before painting and according to types, precleaning copper alloy surfaces, stainless steel, nickel-alloy, aluminum, magnesium, alkaline cleaning, solvent cleaning, petroleum, acid pickling, electrolytic pickling, and a short section on ultrasonic cleaning.

(806) M. N. Fineman, "Nonionics. The All-surface Cleaners," Soap, Vol. 29, No. 3, pp. 50-53, 114 (1953).

A modification of a Launder-Ometer test which involves the use of clean and soiled metal washers as the substrates and also applying soil on the inside surface of the glass caps used. Detersive efficiency, soil redeposition, and soil suspending action are rated. Anionic surfactants generally clean glass well, but are ineffective on metals; the cationics promoted soil redeposition on glass; and nonionics are effective in cleaning both kinds of substrates. Alkaline salts are effective in cleaning soiled metal or glass and in protecting these surfaces from soil redeposition. Other data concerning blends, and the mechanisms involved in the removal, and other properties are discussed.

(807) C. B. Francis, "Method of Cleaning and Descaling Ferrous Bodies," U. S. Patent No. 2,630,393, March 3, 1953, Official Gazette.

Immersion in fused bath composed almost entirely of a mixture of alkali metal nitrate and alkali metal hydroxide with addition of from 0.1 to 3 per cent alkali metal oxide containing at least two atoms of oxygen per mole and effective as an oxidizing agent below 800 F.

(808) J. Frasch, "Chemical Descaling of Large Metallic Structures," Corrosion et anti-corrosion, Vol. 1, No. 3, pp. 98-108 (1953); Chemical Abstracts, Vol. 48, p. 3881 (1954).

Structures such as bridges, gasoline tanks, and ships can be descaled rapidly by a newly developed paste. This is essentially an emulsion of colloidal charges, mineral acids, and oxidizing anions, and consists of an active agent and an expandable mineral. Ferrous salts are oxidized to rust, which mechanically detaches the scale. A paste containing potassium permanganate and ammonium sulfate seems to give the best results.

(809) "G-E Ultrasonic Generator Cuts Cleaning Time of Small Bearings," G-E Special Products Digest, Vol. 11, No. 1, January 1953.

Installation replaced dipping process to increase speed 10 time and cleanliness as well. Fifty parts now cleaned simultaneously in less than one minute by one operator. Frequency of 300 kc, 500 kc, 750 kc and one megacycle available in a standard operating unit at 115 v 60 cycle service.

(810) S. F. Gillette, "Cleaning Mercury," Chemist Analyst, Vol. 42, pp. 44-46 (1953); Chemical Abstracts, Vol. 47, p. 7262 (1953).

A piece of apparatus used in conjunction with 10 per cent nitric acid, to clean and wash mercury.

(811) A. G. Gray, "Alkaline Cleaning for Metal Finishing," Metal Progress, Vol. 63, No. 2, pp. 84-87 (1953); Chemical Abstracts, Vol. 47, p. 3207 (1953).

Sixteen formulas for cleaning steel are given.

(812) T. N. Griswold and J. O. Thoen, "Chemical Cleaning is a Versatile Tool," Oil Gas Journal, Vol. 51, No. 46, pp. 236, 239-240, 242 (1953); Chemical Abstracts, Vol. 47, p. 7769 (1953).

Discussion of the use of portable and permanent chemical cleaning systems for refinery equipment. Shown that permanent system is more economical to operate than is the portable type for cleaning heat-exchanger equipment.

(813) J. W. Hensley, "Radioactive Tracers Track Metal-Cleaning Effectiveness," Plating, Vol. 40, pp. 366-368 (1953).

See Reference No. 681A.

Film of tagged stearic acid spread on metal and the degree of removal by cleaning procedures determined.

(814) R. D. Howard and R. E. Samuelson (to Beech Aircraft Corp.), "Etching and Cleaning of Aluminum," U. S. Patent No. 2,637,634, May 5, 1953; Chemical Abstracts, Vol. 47, p. 7997 (1953).

Aluminum and alloys etched and cleaned by dipping for four minutes in a solution containing nitric acid 20, hydrofluoric acid (50 per cent) 3 per cent by volume, boric acid 1 per cent by weight and water to make 100 per cent by volume. This solution can be used from room temperature to 130 F.

(815) "New Cleaning Process Uses Ultrasonic Waves," Industrial Laboratories, Vol. 4, No. 5, pp. 18-19 (1953).

Detrex Soniclean Process, see Reference No. 794. Largest commercial ultrasonic equipment produced to date purchased by Remington Rand Inc., for cleaning shaver heads. Unit conveyorized and added to cycle for maximum cleaning efficiency.

(816) S. S. Johnston and J. E. Elswick, "Method of Cleaning Strip," U. S. Patent No. 2,628,924, February 17, 1953, Official Gazette.

Consists of mechanical set-up to thoroughly rinse electrolyte salts from metal strip.

(817) W. Kaufmann, "Problems of Exchange of Wetting Films in Technology," Zeitschrift für Elektrochemie, Vol. 57, pp. 530-533 (1953); Chemical Abstracts, Vol. 48, p. 2947 (1954).

Replacement of a film of one liquid on a solid by another is important, as in "flushing" of dyes, de-ashing of coal, ore concentration by flotation, and pumping of water into oil beds. Not mentioned, but important is replacement of water from metal surfaces, and some of the theory mentioned may be applicable.

(818) M. A. Lesser, "Modern Metal Polishes," Soap, Vol. 29, No. 3, pp. 157, 159, 161, 165, 171, 173 (1953).

A review, with discussion of polish requirements, chemical action, odor and types of polishes. Formulas are given.

(819) M. A. Levesque, "Cleaning Oxide from Oxidized Molybdenum Wire," U. S. Patent No. 2,626,224, Jan. 20, 1953; Chemical Abstracts, Vol. 47, p. 3216 (1953).

Oxide film removed without appreciable amount of metal by dipping first in a hot solution of 8 parts nitric acid and 3 parts water for about 10 sec. While still wet dipped into 3 parts hot hydrochloric acid and 8 parts water. Process then repeated if necessary.

(820) A. J. Liebman, et al, "Surface preparation of Steel for Organic and Other Protective Coatings. Second Interim Report of Committee TP-6G on Surface Preparation for Organic Coatings," Corrosion, Vol. 9, pp. 173-185 (1953); Chemical Abstracts, Vol. 47, p. 5859 (1953).

Critical discussion and merits of the following methods of surface preparation: surface oxidation by weathering, wire brushing, impact tool cleaning, grinding, flame conditioning, nozzle blast cleaning, wheel blasting, chemical pickling, and surface conditioners. Discussion also of surface preparation of zinc and galvanized steel surfaces, maintenance and repair jobs and the assembly of dissimilar metals.

(821) V. I. Likhtman and P. A. Rebinder, "The Influence of Adsorption-Active Media on the Mechanical Properties of Metals," Izvestiya Akademii Nauk S. S. S. R., Ser. Fiz., Vol. 17, pp. 313-332 (1953); Chemical Abstracts, Vol. 48, p. 1758 (1954).

Resistance of solids to stress and rupture is lowered by adsorbed surface-active layers which lower the surface tension and penetrate into microcracks preventing the interlocking at this spot. The limit of plastic flow of monocrystals of lead and tin was lowered by solutions of palmitic or oleic acid and cetyl alcohol. Similar lowering of resistance to stress and rupture of polycrystals of copper and aluminum wires was observed. Adsorption also reduces resistance to fatigue.

(822) H. B. Linford and E. B. Saubestre, "A New Degreasing Evaluation Test: The Atomizer Test," ASTM Bulletin, No. 190, pp. 47-50 (1953).

An atomizer is used to spray a dilute dye onto metal surfaces being evaluated for degreasing prior to plating. Test said to have better sensitivity than does the water break test and is less expensive than the radioactive test.

(823) H. B. Linford, "A New Degreasing Evaluation Test: The Atomizer Test," Nat. Bureau of Standards (U. S.), Circular No. 529, pp. 125-129 (1953); Chemical Abstracts, Vol. 47, p. 12203 (1953).

See Reference No. 812.

(824) H. B. Linford and E. B. Saubestre, "Cleaning and Preparation of Metals for Electroplating. V. Oil Spreading Rates," Plating, Vol. 40, pp. 379-386 (1953).

Oils which adsorb strongly (oleic acid) spread least while non-adsorbing oils (mineral oil) spread rapidly. Fatty oils (lard) are intermediate in behavior. Spreading rates are higher on matte than on polished surfaces. Films of stearic acid render total surfaces oleophobic, while oleic acid renders them oleophilic.

(825) H. B. Linford and E. B. Saubestre, "Cleaning and Preparation of Metals for

Electroplating. VI. Sensitivity of Degreasing Evaluation Tests,'' Plating, Vol. 40, pp. 489-496, 633-634, 639-645 (1953).

Degreasing evaluation tests in order of decreasing sensitivity are: Atomizer; spray-pattern; fluorescent dye; potassium ferricyanide paper; copper sulfate dip. Sensitivity said to correlate with oil spreading rates, wetting determined by the number of molecules present rather than mass or thickness of film. Mineral oil-fatty acid mixtures do not have additive property in wetting.

(826) H. B. Linford and E. B. Saubestre, ''Cleaning and Preparation of Metals for Electroplating. VI. Sensitivity of Degreasing Evaluation Tests,'' Plating, Vol. 40, pp. 1269-1271 (1953).

Collected data for sensitivity of several cleanliness tests for polished and matte surfaces with fatty acids, fatty esters, medium oils and paraffin oils. Average values in grams per square centimeter follow:

Spray pattern	1×10^{-6}
Atomizer	8×10^{-8}
Fluorescent dye	1×10^{-5}
Radiotracer	1.7×10^{-7}
Potassium ferricyanide paper	6×10^{-5}
Copper sulfate dip	9×10^{-6}

(827) H. E. Lloyd, ''Removal of Mercury from Metal Surfaces,'' Chemist Analyst, Vol. 42, pp. 23-24 (1953).

To remove mercury from stainless steel washers, rub with powdered sulfur and wipe off with paper the black mercuric sulfide formed. Rinse in water, dry, oil, and replace in service. Procedure works with copper, brass, and bronze if the surface is smooth and not rough, so that mercury may collect in depressions.

(828) F. A. Lowenheim, ''Tarnish Remover,'' U. S. Patent No. 2,628,199, Feb. 10, 1953; Chemical Abstracts, Vol. 47, p. 5868 (1953).

Metals such as silver, silver plate, copper and copper alloys are cleaned by the application of an aqueous solution of a composition containing 4 parts by weight of thiourea and one part by weight of an organic acid having pK of 1 to 5 (negative log of the dissociation constant K). Suitable acids are citric, oxalic, tartaric, phthalic, and succinic. A wetting agent can also be added to improve the action.

(829) T. G. McDougal, E. W. Pierce, and W. A. Bychinsky (to General Motors Corp.), ''Cleaning Spark Plugs,'' U. S. Patent No. 2,627,148, Feb. 3, 1953; Chemical Abstracts, Vol. 47, p. 4526 (1953).

Cleaned with a composition consisting of a mixture of bentonite 0.25 - 2.0, water 2.8-3, powdered feldspar 40-65 per cent by weight and the rest diethylene glycol monobutyl ether. The bentonite and water form a gelatinous suspension agent for the feldspar abrasive and the solvent, and the solvent softens the varnish and gum in the deposit while the abrasive removes it. The particle size dimensions of the feldspar are given.

(830) A. M. Mankowich, ''Total Phosphates in Metal Cleaning Compositions,'' ASTM Bulletin, No. 194, pp. 50-51 (1953).

A more rapid and accurate method is based upon perchloric acid oxidation of the alcohol insoluble portion of the cleaner. The procedure is outlined.

(831) Marshall Sittig, ''Descaling Titanium with Sodium Hydride,'' Iron Age, Vol. 172, No. 25, pp. 137-139 (1953); Chemical Abstracts, Vol. 48, p. 1916 (1954).

Oxide scale on hot-rolled titanium is successfully removed in a bath of sodium hydride. The low operating temperature of 680-720 F eliminates the danger of hydrogen embrittlement. After the hydride bath, the sheet is given a water quench where residue from the descaling bath is removed, to be followed by two acid washes of 6 per cent nitric acid containing 1/2 to 1 per cent hydrofluoric acid, and a final water rinse.

(832) P. Melchior, ''Corrosion of Aluminum Utensils,'' Z. Metallkunde, Vol. 44, pp. 83-84 (1953); Chemical Abstracts, Vol. 47, p. 5332 (1953).

The black pitting in aluminum kitchen utensils is ascribed to carbonized carbohydrates and is not caused by the material. Mechanical cleaning of the surfaces is the best procedure to prevent such pitting.

(833) Solvent, Degreasing, Self-Emulsifying, Military Specification MIL-S-11090 (Ord), March 3, 1953.

Detailed requirements which exclude phenolic or cresylic type acids or their salts, chlorine compounds, benzene or toluene. Emulsion stability of 10 parts solvent to 90 parts water must exceed 6 hr. The solvent shall show no water break and shall remove soda base grease, tar and asphalt. Effectiveness shall be not less than that of a comparison formula given.

(834) Detergent, Synthetic, Nonionic (Polyethyleneglycol Monoalkylaryl Ether), Military Specification MIL-D-16791B, Dec. 9, 1953.

Detailed requirements are compatibility with anionic and nonionic detergents, minimum interfacial tension, stability to acid and oxidation, with certain chemical constitution requirements.

(835) A. Miller and E. A. Hedman, ''A Simple Reproducible Method for Determining

Metal Cleaning Efficiency," ASTM Bulletin, No. 194, pp. 51-52 (1953).

Method developed for evaluation of compositions in perspiration removal efficiency, free rinsing characteristics and possible corrosion-prevention properties. Method applied to investigation of deterioration of fine instruments in storage. Perspiration and residual cleaner deposits are especially obnoxious.

Selected for test were 1 by 1 by 1/2-in. high-leaded clock brass blocks, which were carefully surface ground and pre-cleaned. The precleaning schedule comprised removal of surface grinding contaminants in warm detergent solution with mechanical abrasion followed by two methanol baths, and trichloroethylene degreasings for 10 min. Following this is a 10 min soak at 180 F in a trisodium phosphate, metasilicate, detergent solution followed by two bright dips in a sulfuric-nitric acid mixture to remove surface oxide. Specimens then dried in hot absolute methanol and stored in dried benzene.

Test surfaces then abraded to reproduce uniformly activated surface using wet 400-grit silicon carbide paper. This operation critical since nonuniformity of surfaces leads to invalid conclusions.

After polishing, specimens are oiled in carbon treated di (2-ethylhexyl)sebacate and drained specified time under specified conditions.

Duplicate specimens were cleaned with the oiled surface soiled with one fingermark, and then submitted to cleaning cycle under investigation. At the end of the cleaning cycle samples were preheated one hour to a temperature of 65 C then placed in storage container at 65 C and 100 per cent relative humidity. At the end of 12 hr the blocks are removed and examined.

It was observed that kerosene emulsion cleaners and proprietary horological cleaners were poor in fingerprint removal efficiency and ease of rinsability. Ammonium oleate solutions are effective cleaners but poor fingerprint removers necessitating methanol rinses.

(836) L. Osipow, G. Segura, Jr., C. T. Snell, and F. D. Snell, "Comparative Cleaning of Diphase and Emulsion Systems, Measured by Radioactive Tracers," Industrial and Engineering Chem., Vol. 45, pp. 2779-2782 (1953).

Comparison of diphase and emulsion cleaning systems based upon removal of synthetic soil from steel panels. Soil composed of white petrolatum 35, Kaydol mineral oil 50, palmitic acid 5, barium carbonate 5 and Excelsior carbon black 5. The barium carbonate and palmitic acid were tagged with carbon 14, the carbon black contained carbon 14, and fission products from Oak Ridge National Laboratory were used as tracer compounds. Soil was painted onto panels with small brush, then weighed and activity determined. The concentrated cleaner base contained in parts by weight the following:

Kerosene	67.0
Pine oil (Yarmor 302)	22.5
Oleic acid	5.4
Triethanolamine	3.6
Butyl cellosolve	1.5

These were used for both diphase and emulsion cleaners with the following modifications: The diphase cleaner consisted of 1.6 ml of the above added to 48.4 ml of deionized water, and the emulsion cleaner was made by combining the ingredients except that the triethanolamine was added to 50 parts of deionized water and then combined to form the emulsion, which consisted of 2.4 ml of this emulsion to 47.6 ml deionized water.

Rate cleaning was much greater with diphase than the emulsion cleaner, the former removing in one minute what required the emulsion cleaner 5 min to remove. The diphase cleaner removed fission products and palmitic acid preferentially while palmitic acid was also removed preferentially by the emulsion cleaner.

Difference in behavior between two systems explained on the basis of wetting tendencies of components of the system and by energy of activation required for desorption of surfactant anions from emulsified solvent droplets present in the emulsion cleaner.

(837) E. F. Ottens, "Practical Aspects of Zinc and Cadmium Plating," Products Finishing, Vol. 17, No. 7, pp. 24-26, 28, 30, 33, 34, 36, 38, 40, 42, 44 (1953).

For excellent plating, steel surfaces are prepared in two separate cleaning stages: (1) Removal of grease, oil and dirt from parts. Here visual cleanliness is ample. Commonly used methods are vapor degreasing, solvent washing, emulsion cleaning, diphase cleaning and spray power washing. (2) Second stage requires use of alkaline soak cleaners and electro cleaners. Discusses components of alkaline cleaners. Scale and rust are removed by pickling with inhibited acids. Smut with hot rolled or high carbon steel best removed by barrel tumbling with a mild abrasive or by brushing and wiping. New alkaline electrolytic derusting processes found beneficial. Nitric acid pickling also helpful, in smut removal with certain grades of steel.

(838) M. H. Pakkala and F. J. Phillips (to United States Steel Corp.), "Cleaning and Descaling Ferrous Articles," U. S. Patent No. 2,641,559, June 9, 1953; Chemical Abstracts, Vol. 47, p. 7430 (1953).

Iron and alloy steels are descaled by immersion at 650-900 F for 10 to 20 min in a molten salt bath containing alkali nitrate 40 to 99.9, alkali metal nitrite 0 to 60, and alkali metal peroxide 0.1 to 5 per cent, and then dipped in dilute sulfuric acid.

(839) F. J. Prescott, J. K. Shaw, and J. Lilker, "Sequestering Agents in Aluminum Etching," Metal Finishing, Vol. 51, No. 10, pp. 65-67 (1953).

Scale produced in baths containing polyhydroxy acids was removed by simple rinsing. Gluconic acid was found to be the most efficient additive for preventing the formation of adherent nonrinsable scale and in reducing the amount of scale formed. Tartaric and glucoheptonic acids were next in effectiveness. Alkylaryl sulfonates at higher concentrations were satisfactory but caused foaming.

(840) "Cleaning Stubborn Deposits from Stainless Fabrications-Oily Stains," Products Finishing, Vol. 17, No. 7, pp. 83-85 (1953).

Armco Research Laboratories recommend removal of fingerprints, oil, grease, wax, greasy dirt and other oily stains from stainless steel by making sudsy solution of Tide or other similar detergent, adding about 1/4 as much carbon tetrachloride or similar chlorinated solvent. The mixture is shaken thoroughly to emulsify. Using rubber gloves and good ventilation, the emulsion is rubbed lightly over the stain then rinsed with clean water. Colored trademark stencils can similarly be removed. Cleansing powders known not to scratch can be used, but not on mill-rolled finishes. Rub or wipe in the direction of the scratches and not across them.

(841) "Electric Shavers Degreased by Ultrasonic Process," Products Finishing, Vol. 17, No. 8, p. 76 (1953).

Largest unit ever built for commercial usage, and is conveyorized. Said to be exceptionally useful for high cleaning quality or for removal of soil from fine openings.

(842) "Soniclean Process," Products Finishing, Vol. 17, No. 8, p. 112 (1953).

Use of special transducer elements overcomes size limitations. Element is curved 6 in. length, and can be arranged in series for larger size, the converging sound waves focusing to a straight line as long as the transducer. These are used in a trichloroethylene solvent medium. Only 40 v is required to operate the elements.

(843) "Caustic Soda Cleans Dimpling Dies in Aircraft Plant," Products Finishing, Vol. 17, No. 12, pp. 78, 82 (1953).

Time for cleaning shortened from 8 hr per week to an easy 10 min job. Abrasives had been used to clean burrs, burned grease and paint off chromed die faces and this associated with the 600 F heat of the dimpling operation caused cakes which ruined the die configuration and caused marred and misshaped dimples. Caustic soda at a cup to the gallon of water, at 200 F was used as a soak for 2 to 10 min, rinsed with water and dried, comprised the treatment. Solution said not to damage chrome, iron or steel from which the dies are made.

(844) R. J. Rieckhoff (to Sinclair Refining Co.), "Solvent Cleaning of Spark Plugs," U. S. Patent No. 2,660,544, Nov. 24, 1953; Chemical Abstracts, Vol. 48, p. 2951 (1954).

Oxide deposits are removed by immersing the spark plugs in boiling ammonium citrate solution for periods of 20 min. Concentration of the solution varies between 10 and 20 per cent.

(845) M. Rosenfeld and C. F. Pickett, "Method of and Composition for Removing Rust and Scale," U. S. Patent No. 2,631,950, March 17, 1953.

Composition and process for removing iron and rust scale comprising oxalic acid and hydrolyzable chloride of a trivalent metal from either iron or aluminum, the mole ratio of oxalic and salt lying within the range 96.5 to 3.5, and not less than 83.6 and 16.4.

(846) T. K. Ross, "Influence of Organic Detergents on Metal Corrosion," Metal Treatment and Drop Forging, Vol. 20, pp. 183-187 (1953); Chemical Abstracts, Vol. 47, p. 9035 (1953).

Corrosion in presence of a detergent takes the form of wetting, reaction with the metal, adsorption on the metal, breakdown of adsorbed film, reaction of adsorbed film with metal, and action of detergent upon corrosion products. Typical examples reviewed.

(847) J. H. Rusch, "Clean Your Condensers Chemically," Power Engineering, Vol. 57, No. 9, pp. 76-78 (1953); Chemical Abstracts, Vol. 47, p. 11601 (1953).

Chemical cleaning is faster, more complete, gives better metal protection, and can be used on the outside. The composition of the deposit must be known. Solvent used apparently inhibited 5 per cent hydrochloric acid.

(848) N. Saito (to Mitsubishi Electro-Engineering Co.), "Oxide-Film Removal from Silicon-Steel Plates," Japanese Patent No. 318('53), Jan. 27; Chemical Abstracts, Vol. 48, p. 1230 (1954).

Oxide films removed by immersion for 10 min at 50 C in a solution containing phosphoric acid (d. 1.7) 1, nitric acid 0.2, hydrofluoric acid 0.05 and acetic acid 0.1 part by volume.

(849) C. B. Shepherd, "Trichloroethylene," Chemical and Engineering News, Vol. 31, No. 3, pp. 234-237 (1953).

Of the trichloroethylene produced 90 per cent goes into vapor degreasing. Increase in the rate of solvent degreasing equipment manufacture sales in 1951 about four times that in 1947 which was estimated at about 15,000 units. Trichloroethylene accounts for nearly 93 per cent of all vapor degreasing solvent consumed in the U. S., the remaining 7 per cent composed largely of perchloroethylene which is useful for higher temperature degreasing. Estimated proportion of cleaning as follows:

Alkali washing	40-45 per cent
Vapor degreasing	15-20 per cent
Emulsion cleaning	5-10 per cent
Miscellaneous	25-40 per cent

Diagrams of four cleaning systems are given: vapor, vapor-spray-vapor, warm liquid-vapor, boiling liquid-warm liquid-vapor.

(850) Y. Shimizu and K. Haga "Electrolytic Descaling of Silicon-Steel Sheets. II. Influence of Electrolytic Solutions," Reports Science Research Inst. (Japan), Vol. 29, pp. 194-202 (1953); Chemical Abstracts, Vol. 48, p. 470 (1954).

Electrolytic polishing accomplished, with a descaling effect accompanied at times by spontaneous dropping of the scale assisted by silicon and silica in the films.

(851) C. J. Snyder and W. G. MacLelland (to Anaconda Wire & Cable Co.), "Cleaning Copper Articles," U. S. Patent No. 2,643,961, June 30, 1953; Chemical Abstracts, Vol. 47, p. 8630 (1953).

Copper articles cleaned from scale by heating them with 2 to 5 lb per ton of any chlorinated, brominated, or iodated organic compound for 2 to 5 min at 300 F, then to 1250 F, and finally water-quenching. The scale is peeled easily and completely. Excellent results were obtained with the use of iodoform, ethyl iodide, etc. Koroseal and similar insulating compounds were suitable for the purpose.

(852) E. G. Stroud and J. E. Rhoades-Brown, "Mild Steel Rust Prevention," Journal, Applied Chem. (London), Vol. 3, pp. 287-288 (1953); Chemical Abstracts, Vol. 47, p. 11117 (1953).

Mild steel specimens were dip-coated in a solution of lanolin and exposed under sheltered outdoor conditions for a 6 month period. Adequate protection of the metal surface resulted when the lanolin concentrations in white spirit were over 12.5 per cent by weight.

(853) A. T. Thibadeau, "How to Clean Zinc Base Die Castings before Plating," Products Finishing, Vol. 17, No. 12, pp. 68-70 (1953).

Buffed die castings react more rapidly with cleaning solutions than unbuffed pieces. Oxidation of the surface may cause difficulties, while bath may etch surface excessively. Preliminary cleaning with solvent, emulsified solvent or soap-type soak is necessary for removal of heavy soil, followed by mildly alkaline cleaning solution.

Aluminum bearing zinc alloys may show blistering which results from adsorption of hydrogen from the action of strong alkali and pickling baths. Anodic cleaning has been proven superior provided that a mild acid treatment is given to reactivate the parts. Following cleaning an acid dip is used, but this must be thoroughly rinsed followed by a copper strike. Castings should be plated immediately following buffing to prevent hard setting of buffing compound and oxidation and contact with acid and alkali fumes which accompany aging.

(854) A. Thomassen, Sr., "Necessity of Chemical Pretreatment of Metal Surfaces Before Application of Lacquers and Paints," Verfkroniek, Vol. 26, pp. 14-17 (1953); Chemical Abstracts, Vol. 47, p. 8388 (1953).

Mechanical and chemical ways of cleaning of surfaces before application of paint, etc., or anticorrosive, for the removal of all grease, fats, oxides, and mill scale, were compared. The chemical methods proved preferable.

The Colarit process, a new system for carrying out the necessary cleaning, pickling, phosphating, and drying with a gas-heated flame pistol, which also allows spraying of paints and other protective coats, not containing any of the common solvents or thinners is described in detail.

(855) R. S. Treslder (to Shell Development Co.), "Cleaning and Inhibiting Corrosion of Metal Tanks of Ships," U. S. Patent No. 2,653,882, Sept. 29, 1953; Chemical Abstracts, Vol. 48, p. 540 (1954).

Process comprises spraying the inner walls of the tanks which contain petroleum residues with an alkaline solution of pH greater than 7.8. The resulting mixture is allowed to settle, the petroleum residues discarded and the aqueous solution reused.

(856) A. Walcher (to American Steel Foundries), "Cleaning of Hollow Steel Castings," U. S. Patent No. 2,654,682, Oct. 6, 1953; Chemical Abstracts, Vol. 48, p. 102 (1954).

To remove foundry sand from large, hollow steel castings, the still hot castings, preferable at 600 F or more, are immersed in water several times. The resulting "explosions" blast all cores, chills, and sand from the castings.

(857) R. S. Wise, F. M. Watkings, et al, "List of Corrosion Inhibitors Compiled. Report of Committee TP-9 on Corrosion Inhibitors," Corrosion, Vol. 9, p. 151 (1953); Chemical Abstracts, Vol. 47, p. 5860 (1953).

An alphabetical compilation consisting of about fifty names and a literature reference for each inhibitor. Further information required on the less-known inhibitors.

1954

(858) P. H. Cardwell, "Chemical Cleaning in Central Stations," Transactions, Am. Soc. Mechanical Engineers, Vol. 76, pp. 47-59 (1954); Chemical Abstracts, Vol. 48, p. 2551 (1954).

Removal of scale deposits in central-station equipment found necessary to use acid solvents, alkaline solutions, emulsions of organic liquids in an aqueous alkaline medium and thickened acid solvents. Treating techniques which must be used are the filling and soaking method, jetting at high pressures to break up deposits mechanically, spraying of thin or thick solvents onto the scale when it is present in large vessels or tanks, the circulating technique to remove organic material, and when possible cleaning the equipment while in service. Mentions improved acid inhibitors.

(859) H. C. De Hoff (to Standard Oil Development Co.), "Cleaning Composition for Automobile Radiators," U. S. Patent No. 2,666,000, Jan. 12, 1954; Chemical Abstracts, Vol. 48, p. 4150 (1954).

A mixture of equal parts of oxalic acid and ammonium oxalate is more effective in removing iron rust from radiators than either compound used alone. One pound of the mixture plus about 5 per cent detergent is dissolved in water contained in a 14 to 16 quart radiator. After boiling out and rinsing the radiator is neutralized with a mixture of one ounce each of soda ash and tetrasodium pyrophosphate.

(860) C. C. Flora, C. J. Arnold, and E. J. Finnegan, "Conventional Lines Cleaned in Place," Milk Plant Monthly, Vol. 43, No. 1, pp. 21-26, 48 (1954); Chemical Abstracts, Vol. 48, p. 4233 (1954).

Detergent and sanitizer compounds with temperature for use in dairy pipe lines given.

(861) C. F. Gurnham, "Ultrasonic Cleaning," Products Finishing, Vol. 18, No. 5, pp. 54, 56, 58, 60, 62, 64, 66, 68 (1954).

Review of ultrasonic application to metal cleaning, including means for producing, that is, electromagnetic, magnetostrictive and piezoelectric. Because of energy dissipated in fluid medium, generation must be near point of use.

Mentions three installations: Schick, Inc., for cleaning shaver heads, Fairchild Camera and Instrument Corp., for cleaning small precision wound rotary slidewire potentiometer and a multiple crystal installation at the Refrigerating Unit Mfg. Division, of General Electric Co. This latter uses four transducers, each separately driven, and vibrators located twelve in. apart in the floor of the cleaning tank, the work passing over them in conveyorized system, so indexed that each piece of work is positioned over the center of each crystal.

The Soniclean System by Detrex Corp., utilized the barium titanate ceramic transducer. Only 120 v power is required for an ultrasonic frequency of 430 kc per sec and solvent currently used is trichloroethylene, though the process is not limited to these conditions. System involves conveyorized work passing thru boiling soak tank, rinse, and ultrasonic cleaner section with distillate spray for final rinse.

(862) H. B. Linford and D. O. Fader, "Cleaning and Preparation of Metals for Electroplating. VIII. Effect of Oxide Films. A Survey of the Literature," Plating, Vol. 41, No. 3, pp. 279-286 (1954).

A "clean" surface will have surface atoms with unsatisfied valence forces extending outward and these are those which account for chemisorption of foreign atoms and Van der Waals forces which permit metal surfaces to adsorb by "physical" means.

Oxide films may be determined by contact resistance, adsorption methods including contact potential, photoelectric effect, accomodation coefficient and vacuum microbalance; electrochemical reduction; adhesion and friction methods; optical methods; electron diffraction; solution potential; wettability methods. In certain cases, the plating bath removes oxide films by chemical solution of the films in electrolyte or chemically or electrochemically by reduction of oxide or mechanical removal by vigorous hydrogen evolution.

(863) W. A. Marshall (to Pure Oil Co.), "Chemical Method for Removing Residual Sand from Metal Castings Formed in Sand-Type Molds," U. S. Patent No. 2,666,001, Jan. 12, 1954; Chemical Abstracts, Vol. 48, p. 4414 (1954).

Commercial mono-, di-, and hexafluorophosphoric acids containing corrosion inhibitors used to remove adherent sand from ferrous and nonferrous castings. A two to one ratio of mono- to difluorophosphoric acids by weight preferred, and the acids, anhydrides and salts of tri- and quinquevalent arsenic are among the more suitable inhibitors. Residual acids must be rinsed off, preferably with hot water.

(864) B. F. H. Scheifele, "Cleaning of Metal Before Coating," Deutsche Farben-Zeitschrift, Vol. 8, pp. 8-18 (1954); Chemical Abstracts, Vol. 48, p. 4397 (1954).
Review of mechanical and chemical methods with 22 references.

(865) I. E. Shafer and S. L. Terry, "Condenser-Cleaning Problem," Southern Power and Industry, Vol. 72, No. 1, pp. 52-53 (1954); Chemical Abstracts, Vol. 48, p. 1733 (1954).
A heavily calcium carbonate coated condenser had the scale removed by the addition of sulfuric acid under controlled conditions.

(866) B. J. Sherwood, "Emulsifiable Solvent Cleaning," Metal Finishing, Vol. 52, No. 3, pp. 70-72 (1954).
Review of cleaning processes. Emulsifiable solvent cleaning has solvent and penetrating ability, easily emulsifiable, physiologically harmless, harmless to alkaline cleaners and high soil capacity. Outlines operating technique.

(867) L. W. Sockman and E. W. Brady (to Northrop Aircraft, Inc.), "Detecting Surface Flaws by use of Dyes," U. S. Patent No. 2,667,070, Jan 26, 1954; Chemical Abstracts, Vol. 48, p. 5065 (1954).
Minute flaws in surface of metals detected by use of an alizarin base dye dissolved in a penetrant solution.
Dye dissolved in a solution composed of 50-75 per cent ethylene glycol monobutyl ether and 50-25 per cent dibutyl phthalate, the dye being added to saturate and known as Mefford No. 322 red dye. Polished parts are dipped into the dye, then cleaned in stoddard solvent, flushed with water and allowed to dry. The parts then dipped into a developer solution composed of 25 per cent precipitated chalk by volume and 75 per cent alcohol and again allowed to dry. Flaws visible as bleeding onto developer coat.

(868) L. F. Spencer, "Descaling Stainless Steels," Metal Finishing, Vol. 52, No. 2, pp. 54-59 (1954).
Mechanical and chemical methods described. In furnace treatment the scale can be kept low by use of an endothermic atmosphere. This combined with a ferric sulfate-hydrofluoric acid bath gives good results.

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213	ES-431b	August 7, 1942
264	TAC ES-645a	March 17, 1943
265	TAC ES-542b	May 1, 1943
315E	TAC ES-734b	February 22, 1945

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