

## 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 Mouillabilité 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 de-rusting 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. Frasci, "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, flash-point, 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  $75 \pm 3$  F with maximum humidity of 55 per cent. Panels soaked 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  $220 \pm 2$  F for 5 min and cooled. After 10 min panels transferred to slushing machine with length of stroke 4 in. and a speed of  $40 \pm 5$  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 química industrial y agrícola*, 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 non-ferrous 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 therefore 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 sulfurocinoleate 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 Norrhammars 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  $4 \times 10^{-9}$  g per sq cm.

Stearic acid is very sensitive to surface finish. With five common alkalis 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  $26 \pm 1$  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  $23 \pm 3$  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 Acryloll 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 18, 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 Głównego 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 Opzoekingsstatistieken 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 Toyota 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.