

NEW REFERENCES FOR 1955 to 1957

1955

(874) "Cleaning and Maintenance," Aluminum Company of America, 12 pages (1955).

Various section headings are: aluminum finishes; care; applying waxes and lacquers; remodeling or moving; heavy duty cleaning; and list of products for the care of aluminum.

For ordinary care the mildest of cleaning systems is suggested, and a regular routine depending upon degree of soiling. For heavy duty cleaning it is recommended that the following be tried in sequence until one removes the dirt satisfactorily: Heavy duty cleaner; etching chemical cleaner; heavy duty abrasive and etching cleaner; rotary wire brush. Precautions and suggestions are given for each method.

(875) A. Arnold, "Degreasing Metal Parts with Solvent Vapors," *Metall.*, Vol. 9, pp. 483-486 (1955); *Chemical Abstracts*, Vol. 49, p. 13852 (1955).

Discussion of various patents covering these processes and description of the various methods for vapor degreasing.

(876) W. J. Barth and A. L. Field, Jr. (to E. I. duPont de Nemours & Co.), "Sodium Hydride Descaling of Titanium," *Metal Progress*, Vol. 68, No. 2, pp. 114-116 (1955); *Chemical Abstracts*, Vol. 49, p. 12243 (1955).

Excellent descaling accomplished with sodium hydride, but an optimum time-temperature cycle is necessary to prevent hydrogen absorption after the scale is removed. Low sodium hydride concentrations and minimum exposure are preferred.

(877) J. Birnbaum, "Electrolytic Cleaning and Descaling of Complex Castings," *Iron Age*, Vol. 176, No. 12, pp. 116-118 (1955); *Chemical Abstracts*, Vol. 49, p. 15564 (1955).

Castings for automatic automobile transmissions cleaned electrochemically in a salt bath. Details of equipment and operation are described.

(878) S. C. Britton and D. G. Michael, "Effects of Repeated Washing of Tinned Steel with Alkaline Solutions on its Resistance to Rusting," *Journal Applied Chemistry* (London), Vol. 5, pp. 402-413 (1955); *Chemical Abstracts*, Vol. 50, p. 11214 (1956).

By using solutions of equivalent alkalinity, caustic soda, trisodium phosphate and soda ash had similar corrosive action. Sodium silicate ($2\text{Na}_2\text{O} \cdot \text{SiO}_2$) was less corrosive and sodium silicate ($\text{Na}_2\text{O} \cdot 2\text{SiO}_2$) was almost non-corrosive. Additions of 0.1 per cent sodium chromate to the alkaline solutions preserved both tin and steel, while additions of sodium sulfite had a negligible effect. Addition of sodium hypochlorite accelerated corrosion, except when in the presence of the silicates.

(879) T. J. Bulat, "Evaluating Metal Cleaning Efficiency," *Metal Progress*, Vol. 68, No. 6, pp. 94-95 (Dec., 1955).

Used for evaluation were radioactive oil, buffing compound (chromium oxide), and radioactive metal chips. Stainless steel, brass and aluminum pieces treated with soils and comparison made between vapor degreaser, pressure wash, and ultrasonic cleaning. For parts of simple configuration ultrasonic method removed soil more effectively than the pressure wash, and this better than vapor degrease.

(880) R. E. Carter, "Descaling of Stainless-Steel Strip," U. S. Patent No. 2,717,845, Sept. 13, 1955; *Chemical Abstracts*, Vol. 50, p. 153 (1956).

Strip annealed and pickled continuously with removal of surface oxide by heating in radiant-heated furnace, immersion in molten caustic soda containing sodium hydride, reheating, spraying with high pressure water, and immersion in dilute mineral acid to remove any remaining sludge.

(881) F. E. Cook, H. S. Preiser and J. F. Mills, "Electrolytic Descaling. An Electrical Method of Rust Removal from Tanker Ship Compartments," *Corrosion*, Vol. 11, pp. 161t-181t (1955); *Chemical Abstracts*, Vol. 49, p. 6005 (1955).

See Reference No. 858B.

(882) L. L. Deer, "Cleaning Aluminum," U. S. Patent No. 2,705,500, April 5, 1955; *Chemical Abstracts*, Vol. 49, p. 10157 (1955).

Oxidized surfaces of aluminum and aluminum alloys are cleaned for welding by removing grease and dirt in the conventional manner; pickling in 2 to 5 per cent hydrofluoric acid solution at room temperature; rinsing in cold water; pickling in aqueous chromic acid solution, pH 1.2-1.5, at 185 to 195 F; and rinsing in water at 110 F maximum.

(883) W. Ehlert, G. Kauffman and G. Burrett, "Liquid Honing as a Surface Conditioning Operation," *Plating*, Vol. 42, pp. 1522-1524 (1955).

Liquid honing is meant to replace pickling, electrochemical cleaning and hand finishing except in case of heavy grease coats which makes degreasing advisable. Liquid blasting said to improve and chemically clean a good finish. Important with high carbon steels, malleable or cast iron, is cleaning without liberating carbon or graphite smuts. Heat treat scale is readily removed from plastic molding dies and also useful in removing plastic residues without harm to surface.

(884) Cleaning Compound, Platers' Electro-cleaning, for Steel, Federal Specification, P-C-535, May 4, 1955.

Compositional requirements are	Min per cent	Max per cent
Silicate as SiO_2	10.0	35.0
Complex anhydrous phosphates as P_2O_5	5.0	--
Organic detergent, 100 per cent basis as alkylaryl or alkyl sulfate.....	0.4	--
Caustic Soda.....		Remainder

Absence of ortho phosphate is required. Performance requirements include tarnishing of steel, conductivity and foam blanket.

(885) E. B. Fernaler and H. E. Tschop (to International Nickel Co. Inc.), "Annealing and Cleaning Oxidized Metals," U. S. Patent No. 2,710,271, June 7, 1955; Chemical Abstracts, Vol. 49, p. 12261 (1955).

Oxidized heat- and (or) corrosion-resistant alloys, such as high nickel, chrome, copper or molybdenum, can be simultaneously annealed and descaled with substantially no loss of base metal by immersing the oxidized metal in a salt bath containing 20 to 80 per cent sodium fluoride, rest soda ash, for at least 2 min at 1500 to 2000 F.

(886) D. J. Fishlock, "Sodium Hydride Descaling," Product Finishing (London), Vol. 8, No. 3, pp. 59-62 (1955); Chemical Abstracts, Vol. 49, p. 7482 (1955).

The three stages in sodium hydride descaling comprise preheating in an oven, descaling in the reaction vessel, and quenching in a cold water tank, with agitation. While operation of the process is generally straightforward, corrosion of some parts of the plant appears inevitable.

(887) C. W. Garrison (to Standard Oil Co. (Ohio)), "Cleaning Asphalt Tanks," U. S. Patent No. 2,715,594, Aug. 16, 1955; Chemical Abstracts, Vol. 49, p. 16425 (1955).

The hard rocklike layer of asphaltic material which forms on the inside of tanks for conversion of petroleum residuums to asphalt is removed by use of kerosene and steam. After drainage, kerosene sufficient to cover the adhering material is added and steam is blown against the tank bottoms by means of a special permanently installed pipe system.

(888) R. Getty, N. W. McCready and W. Stericker, "Silicates as Corrosion Inhibitors in Synthetic Detergent Mixtures," ASTM Bulletin, No. 205, pp. 50-59 (1955).

Tests made with aluminum, zinc, copper, brass, nickel silver, and several enamels. Disks were attached to a rod and a stirring machine and immersed at 60 C in solutions of a detergent for 2 hr. Various compositions of alkylaryl sulfonate with five silicates, sodium tripolyphosphate and tetrasodium pyrophosphate were tested. Increasing silicate content, generally of lower sodium

oxide to silica ratio indicated to reduce staining of brass, and nickel silver. Neither aluminum nor copper were affected when amounts of silicate normally present in household detergents was present. Difficult to prevent corrosion of zinc, but best with equal amounts of silicate and phosphate.

(889) J. C. Harris, W. Stericker and S. Spring, "Suggested Guide to Laboratory Metal Cleaning," ASTM Bulletin, No. 204, pp. 31-34 (1955).

Soils are listed and their removal characteristics described. The soils listed are 11 in number: mineral oils, fatty oils, sulfurized oils, buffing compounds, semi-solid rust preventives, grease, asphaltum, wax mixtures, burnt-on oil, graphite soil in heavy oil base, paints, and lacquers. The factors to be considered in a laboratory procedure are specifically outlined. Listed are 15 methods for determining metal cleanliness recording original reference, sensitivity and a brief description of the method. Also given are relative sensitivity ratings by radio-tracer method for six of these methods.

(890) J. W. Hensley and R. D. Ring, "Metal Cleaning Studies Using Radioactive Tagged Soil," Plating, Vol. 42, No. 9, pp. 1137-1143 (1955).

Application of the radiotracer method to electrocleaning studies. Used tagged stearic acid and number 30 lubricating oil plus radio-heneicosane (see reference 606). Provides graphs of both anodic and cathodic cleaning in alkalies and combination cleaners. Since the two soils were used at different initial levels no comparison could be made of the relative ease of removal, but differing test conditions affect cleaning results.

(891) F. W. Hightower, "Cleaning with Ultrasonics," Metal Progress, Vol. 68, No. 1, pp. 137-104 (July, 1955).

Ultrasonic cleaning especially recommended where surfaces to be cleaned are not readily accessible or when they must be scrupulously clean, as for plating or adhesive bonding. For effective cleaning a zone a few inches from the face of the transducer is desirable. Energy intensity imposed on the transducer is best held to a level at which only moderate cavitation occurs at the face, and undistorted wave front. Gives curves for minimum power to start cavitation and power required to remove nonsoluble soil completely from standard specimens under controlled conditions. Discusses transducer materials, what can be cleaned and with what liquid systems, and describes typical installation. Equipment and costs based on transducer area are described.

(892) E. R. Holman (to Turco Products, Inc.), "Cleaning Solution for Metallic

Surfaces," U. S. Patent No. 2,700,654, Jan. 25, 1955; Chemical Abstracts, Vol. 49, p. 9478 (1955).

Effective cleaning solutions for metallic surfaces, especially those inaccessible to usual cleaning methods, are composed of an amine soap with excess free amine (preferably a primary amine with 4 to 6 C atoms); a grease solvent such as coal-tar oil; and a neutral compound giving water and oil solubility, such as ethylene glycol monobutyl ether or pine oil. The metal to be cleaned is immersed in a cleaning solution at 40 to 45 for 25 min and then washed with water. A preferred composition is as follows: ethylenediamine 12, water 4, neutral coal-tar oil 68, oleic acid 6, and pine oil 10 per cent by weight.

(893) I. S. Kochetkov, "Cleaning of 'Drying Drums' Surface," *Tekstil. Prom.*, Vol. 15, No. 3, pp. 46-47 (1955); Chemical Abstracts, Vol. 49, p. 9934 (1955).

Surface of drying drums, used in the finishing industry is conveniently cleaned with a composition containing calcinated soda ash 5, freshly slaked paste lime 25, sifted slag ash 40 to 50, and water at 40 to 50 C 30 to 20 g. The composition is applied to the warm surface, rubbed in until all impurities are dissolved, and finally carefully wiped off.

(894) H. B. Linford, "A Test for Predicting Oil Removal Difficulty," *Products Finishing*, Vol. 19, No. 10, p. 60 (July, 1955).

Test is based upon the spreading rate of an oil on metal. Rate of spreading dependent upon roughness and kind of metal involved without need for knowledge concerning the oil constitution. Ease of cleaning found to correlate with rate of spreading using atomizer test for confirmation.

(895) H. B. Linford and P. E. Grubb, "Cleanability and Oil-Spreading Rates," *Plating*, Vol. 42, pp. 895-902 (1955).

Previous work had indicated correlation between ease of removal of oil by alkaline cleaning and the spreading rate. Present work is an extension, using the atomizer test to detect soil removal.

The spreading slopes were determined for a number of oily materials on a stainless steel surface. Chosen for further test were crude scale wax, microcrystalline wax and double pressed stearic acid.

Cleaning tests were made, substituting low carbon steel for stainless steel, and applying the three soils under controlled conditions for maximum uniformity. The atomizer test was used, applying a standardized precleaning and cleaning technic. Preliminary work indicated correlation between spreading slopes and cleaning, and subsequent work with the three solid soils indicated that correlation exists for these as well.

(896) G. A. Lux and H. B. Linford, "Metal Cleaning. Electroplating Engineering Handbook," pp. 128-151, edited by A. K. Graham, Reinhold Publishing Corp., New York City (1955).

Discuss types of metals to be cleaned, nature of soil to be removed, degree of cleanliness requirements, cleanliness test methods, methods of application of cleaning solutions, quality of water supply, selection of cleaning materials, concentration of cleaning materials, temperature of cleaning solutions, time of application, rinsing practices, specifications for rinse tanks or sprays. 78 references.

(897) F. Massa, "Ultrasonic Liquid Metal Degreaser," U. S. Patent No. 2,702,260, Feb. 15, 1955; Chemical Abstracts, Vol. 49, p. 7155 (1955).

The liquid degreaser of metal plate is equipped with an ultrasonic wave generator of 1 to 15 kc frequencies to effect sound vibrations in the liquid of 5 to 50 per sq in. of radiating area. The normal hot cleaning cycle of 15 min for greasy steel is thus reduced to a few seconds.

(898) A. B. McKee, "Cleaning Aluminum," Aluminum Company of America, 7 pages (1955).

Lists and describes factors influencing resistance of aluminum to corrosion; protective surface films, amphoteric nature, electrochemical nature of corrosion, and staining. Under staining mentions that a colorless film of alpha aluminum monohydrate is formed in boiling distilled water, whereas gray or black colored monohydrate films are formed during exposure to boiling tap water. Also describes effect of a superficial etch that results in an optical effect such that only a small portion of the incident light is reflected to the eye, giving the metal a dark appearance. Discusses cleaners under headings of "safe" or noncorrosive, surface renewing (etch) cleaners, abrasive, liquid or paste waxes, solvent or vapor degreasing, and electrolytic cleaners. Best criterion of cleaner effect upon aluminum is actual test over a concentration range. Mentions the effectiveness of sodium disilicate as inhibitor for alkaline systems.

(899) Cleaning Solution, And Rinsing Solution--Watch, Waterless, Military Specification, MIL-C-16553A, April 1, 1955.

Consists of either watch cleaning or rinsing solutions. Among requirements for cleaning solution are minimum water, minimum equivalents of ammonia, corrosion and foam stability. Rinsing solution requirements include miscibility with standard soap solution and corrosion.

(900) Cleaning Compound, Aircraft Surface, Military Specification, MIL-C-18687 (Aer), April 22, 1955. Superseding C-120, See reference No. 201B.

Of two types, I a free flowing powder and II a single phase liquid. Intended for use in solutions of water of any hardness for cleaning of painted or unpainted aircraft surfaces. Shall be free of inerts or abrasives. Property requirements include nontoxicity, nonflammability, pH of 5.5 to 10.0, surface tension no higher than 32 dynes per centimeter, storage and temperature stability, minimum corrosiveness, no effect on lacquer surfaces or acrylic base plastics, free rinsing. Cleaning performance in 0.4 per cent by weight of solution on standard panels not less than 80 per cent efficiency. The cleaning effectiveness test made in the straight line Hunter-Gardner Washability machine. Painted metal panels soiled by applying (by brush), suspension of soil ingredients and these panels baked under specified conditions prior to usage. Soiling mixture comprises nine components.

(901) Compound, Emulsion Cleaning (for Aircraft), Military Specification, MIL-C-25179 (USAF), May 24, 1955. Superseding MIL-20015E, See Reference No. 119.

Among requirements are solubility in water, stability of emulsion, controlled corrosion of aluminum, effect on plastic and cleaning power. The cleaning test is made by comparison with a standard formulation:

Butyl alcohol.....	12.0
Duponol G.....	33.0
Telcol.....	55.0

The compositions are comparatively tested on comparable metal surfaces of an airplane soiled in operational use.

(902) Cleaning and Protecting Interior Non-Machine Surfaces of Castings and Weldments, Military Specification, MIL-C-19052 (NORd), Oct. 26, 1955.

Covers methods of cleaning and protecting interior nonmachined surfaces of ferrous and non-ferrous castings and weldments which are to contain working parts and fluids or both, and whose contamination would adversely affect mechanism function. Mechanical methods used in preference to chemical methods such as pickling. Describes in principal of hydro-blasting, shot or grit blasting, tumbling, bobbing (air driven chisel); wire brushing, grinding, sand blasting, pickling. Describes adhesion test for cleanliness and readiness for subsequent coating. Gives suggested cleaning and pickling procedures for ferrous castings and weldments; copper, brass, bronze; removal of welding flux from aluminum castings or weldments. For copper, brass or bronze precleaning described by organic

solvent degreasing followed by immersion in alkaline cleaning solution at 180 to 200 F containing 3 to 8 oz per gallon of either

- (1) 85 per cent sodium orthosilicate
10 per cent sodium carbonate
5 per cent sodium resinate, or,
- (2) 46 percent anhydrous sodium carbonate
32 per cent trisodium phosphate
16 per cent caustic soda
6 per cent rosin

The alkaline cleaner is followed by rinsing and pickling.

(903) J. B. Mohler, "Alkaline Solutions: What to Use for Effective Cleaning," Iron Age, Vol. 176, No. 4, pp. 59-62 (July 28, 1955).

Review of cleaners. Hundreds of formulas exist, but relatively few chemicals are used in them. Parts may be cleaned in alkaline solutions electrolytically, by steam gun, by soaking, spraying, tumbling or scrubbing. Most cleaning consists of four steps: clean; rinse; hot rinse; and dry. Procedure may vary with base metal and contaminant present. Caustic soda, sodium metasilicate, trisodium phosphate and soda ash with wetting agent will do most cleaning jobs. Given are compositions for 13 alkaline cleaners. Effect of agitation and temperature on cathodic cleaning graphed. Conductivity and pH of alkaline solutions and pH range of hot alkaline solutions given in table form. Full scale test recommended. Control by conductivity method suggested for ease and speed.

(904) M. Morris, "Metal Cleaning with Ultrasonics," Metal Finishing, Vol. 53, pp. 63-64 (1955).

Discussion of ultrasonics and application to metal cleaning. Production of barium titanate flat transducers driven at high wattages per square inch at lower frequencies for application to larger pieces of work. Twenty inch length of transducer available. Combinations of degreasing, ultrasonic cleaning, followed by vapor degreasing suggested.

(905) Y. Nagai, H. Ishida, Y. Tamai, U. Wakatsuki and J. Kamiyama, "Oiliness of Palmitic Acid and Hexadecyl Alcohol on Steel-Steel Surfaces and the Effect of Atmospheres," Journal Chemical Soc. Japan, Industrial Chemical Sect., Vol. 58, pp. 874-878 (1955); Chemical Abstracts, Vol. 50, p. 13419 (1956).

Oiliness measured with pendulum-type tester at the steel-steel interface under a variety of conditions. The results showed that oiliness sharply decreases in any oxygen-free atmosphere because in this case the polar molecules are strongly adsorbed at the surfaces.

(906) K. P. W. Nitsche, "Metal Cleaning

Composition," Swedish Patent No. 149,348, March 22, 1955; Chemical Abstracts, Vol. 49, p. 16478 (1955).

Composition, used in form of a melt, consists of an alkali hydroxide 10, alkali metal carbonate 0.5 to 2, an alkali metal silicate 0.1 to 0.5, and borax 3 to 4 parts by weight. Useful for cleaning iron and steel objects.

(907) T. J. Nolan and G. E. Rowan, "Descaling Stainless-Steel Strip in Electrolytic Salt Baths," Iron Age, Vol. 175, No. 9, pp. 119-121 (1955); Chemical Abstracts, Vol. 49, p. 5246 (1955).

All grades of stainless strip (hot and cold-rolled) can be processed in a single continuous annealing and pickling line. One descaling pot oxidizes the scale, another dissolves the oxidized scale. Other details of the operation.

(908) R. M. Organ, "Washing of Treated Bronzes," Museums Journal (London), Vol. 55, pp. 112-119 (1955); Chemical Abstracts, Vol. 50, p. 5342 (1956).

Chemical and electrochemical treatment of ancient bronzes to remove corrosion products frequently leaves undesirable soluble chlorides in the porous interior that may stimulate subsequent corrosion. Use of surface-active agents undesirable, because of tenacious adsorption. Other details given.

(909) L. Osipow, H. Pine, C. T. Snell and F. D. Snell, "Comparative Cleaning by Diphasic Cleaners and Alkaline Salts," Industrial Engineering Chem., Vol. 47, pp. 845-847 (1955).

Detergent efficiencies of alkaline detergent salts compared with those of a diphasic cleaner for removing greasy soil from steel. The diphasic cleaner was comprised of 67.0 parts by weight of mineral spirits, 22.5 of pine oil, 5.4 of oleic acid, 3.6 of triethanolamine, and 1.5 of butyl Cellosolve, and water added to this. Seven experimental soils used, based on mineral oil and petrolatum with a small amount of carbon black. Variations were made by adding different amounts of fat acid to the soil base. The difference in the weights of the panels before and after washing taken as the criterion of cleanliness. The diphasic cleaner was most effective in the removal of soil under all test conditions of time, temperature and concentration. The effectiveness of the alkaline cleaners rose rapidly with an increase in temperature and not affected by a difference in pH from 9.1 to 11.7 at a 2 per cent concentration. The soils containing oleic acid were more readily removed by the alkaline salts than those containing saturated fat acids, and these more easily removed than those which did not contain fat acids. Suggested that the polarity of the double bond in oleic acid promoted the ease of removal of soils containing it.

(910) "Washing Steel Drums Automatically," Products Finishing, Vol. 19, No. 10, pp. 83-84 (1955).

Short description of a drum washing machine which automatically upends, washes and rights the cleaned drums, at the rate of 120 drums per hr.

(911) "Laboratory Degreaser," Products Finishing, Vol. 20, No. 3, pp. 93-94 (1955).

Unit is described as duplicate of standard commercial degreasers, with solvent recovery system. Working area is 18 by 12 by 12 in. with a capacity of 100 lb per hr.

(912) J. D. Ristroph, "Cleaning and Water Conditioning for Initial Operation of High-Pressure Boilers," Combustion, Vol. 27, No. 1, pp. 38-42 (1955); Chemical Abstracts, Vol. 49, p. 15131 (1955).

Cleaning technics given for removing mill scale and construction debris from boilers before start-up.

(913) W. S. Russell (to Parker Rust Proof Co.), "Combination Cleaning and Coating Process and Solution for Metallic Surfaces," U. S. Patent No. 2,724,668, Nov. 22, 1955; Chemical Abstracts, Vol. 50, p. 6285 (1956).

Alkali metal phosphate solutions applied by spraying to metallic surfaces, especially steel, iron, zinc, and aluminum, contain 0.02 to 0.20 per cent alkali metal lignosulfonate and have a preferred pH of 4.2 to 6.0. Improved corrosion resistance of the coatings is obtained by addition of an oxidizing agent, such as chlorate, bromate, nitrite, sulfite or m-nitrobenzene-sulfonate. Such solutions are practically nonfoaming and also have good cleaning and dispersing properties.

(914) J. R. Sloan, et al., American Society for Metals Committee on Cost of Metal Cleaning, "Metal Cleaning Costs," Metal Progress, Vol. 68, No. 2-A, pp. 169-173 (Aug. 15, 1955).

Principal items of expense are direct labor, labor for disposal of cleaning wastes, water, other material, energy, and maintenance. Direct labor comparisons made for vapor degreasing, solvent cleaning, hot tank alkaline cleaning, cold spray alkaline cleaning, hot spray alkaline cleaning, electrolytic alkaline cleaning, hot tank emulsion cleaning, hot spray emulsion cleaning, acid cleaning, and abrasive cleaning. Table given for costs of removal of soil and of scale by methods given above, for total of labor, material, water, energy, maintenance, and overhead and initial equipment cost. Cost for pickling on flat rolled steel 0.200 in. thick broken down with total at \$2.884 per ton. Tables given for preplating costs, equipment, maintenance. Comparisons of vapor degreasing, and emulsion cleaning against

alkaline cleaning. Includes section on health and fire hazards.

(915) J. Starr, "Descaling and Pickling of Titanium," *Metal Finishing*, Vol. 53, p. 65 (1955).

Mill stencil markings removed by solvent soaked rag before hot forming, since these can cause etching. Vapor degreasing of parts before hot processing to avoid scale formation to reduce surface roughness. Descaling with (1) sodium hydride in conventional manner, immersion in pickling solution of 40 per cent nitric acid by volume and 3 per cent by weight of sodium fluoride, (2) proprietary molten bath process at 800 F for 20 min and pickling, and (3) 30 min in a water bath comprising 47 per cent caustic soda by weight, 9 per cent sodium nitrate, 6 per cent sodium nitrite and 38 per cent water at temperature of about 300 F followed by pickling. Light oxide coatings removed by pickling alone.

(916) R. E. Tschupp, "Efficient Equipment Means Increased Production," *Paper Mill News*, Vol. 78, No. 13, p. 102 (March 26, 1955); *Chemical Abstracts*, Vol. 49, p. 7853 (1955).

Scale from heat-exchange equipment is removed by flushing with cold water 1/2 hr and circulating a cleaning compound especially chosen for the type of scale involved, through the heater tubes 1 to 1-1/2 hr, and flushing with cold water.

(917) B. Wenderott, "Chemical Process of Descaling Stainless and Heat-Resisting Steel Without the Use of Acids," *Stahl u. Eisen*, Vol. 75, pp. 141-144 (1955); *Chemical Abstracts*, Vol. 49, p. 8768 (1955).

Steel treated in a molten bath of caustic soda and sodium nitrate. Excess salts removed and the steel piece annealed in a reducing atmosphere. The iron or nickel-iron films formed on the surface during the reducing anneal are useful in additional cold-working of the metal.

(918) G. Westhoff, "The Cleaning of Hot Surfaces with a Water-Stream Treatment," *Brennstoff-Warme-Kraft*, Vol. 7, pp. 453-455 (1955); *Chemical Abstracts*, Vol. 50, p. 8951 (1956).

Boilers can be kept in continuous service by regularly spraying the gas-heated surfaces with water or a water-steam mixture. Fly-ash is most readily removed when it forms a porous deposit. Treatment not satisfactory when the gas in the heating chamber is below 800 to 850 deg, since the reaction with bituminous ash leads to cementation.

1956

(919) G. Amici, "Antioxidant and Oxide Remover for Metals," U. S. Patent No. 2,743,202, April 24, 1956; *Chemical Abstracts*, Vol. 50, p. 14499 (1956).

Mixture contains liquid paraffin or gasoline and a liquid terpenic hydrocarbon such as alpha-pinene. The hydrocarbons are included to dissolve the oxides already formed and to purify the surface. The pinene absorbs oxygen from the dissolved oxides and from the atmosphere forming a peroxide, which then acts as an oxidizing agent. The released activated oxygen produces an oxide on the surface of the metal similar to the one obtained by electrolytic action, thus protecting the metal from further attack by atmospheric oxygen. Useful for cleaning and maintenance of firearms, and for silver polishing.

(920) B. Baer, "Applications for Cold Solvent Degreasing," *Products Finishing*, Vol. 20, No. 5, pp. 76, 78 (1956).

Advantages of formulated cold degreasing solvents are increased efficiency and decreased toxicity hazard. Can be used for considerable time without clean-outs and with good solvent recovery on reclamation. Further advantage of use on large objects difficult to handle in tanks where wiping can be accomplished.

(921) W. J. Barth (to E. I. du Pont de Nemours & Co. Inc.), "Descaling Titanium Sheet," *Steel*, Vol. 139, No. 27, pp. 62-63 (1956); *Chemical Abstracts*, Vol. 51, p. 2492 (1957).

Fused salt baths containing various amounts of caustic soda, sodium nitrite, and sodium nitrate were used to remove tough, hard scale when forming titanium sheet at high temperatures. Descaling time at 450 C takes from 45 sec to 10 min. Base metal attack is low. Hydrogen absorption is minute and firing tendencies can be minimized if the concentrations of oxidizing agents is kept above 8 per cent.

(922) B. Berkeley and D. Schoenholz, "Development and Testing of Engine Degreasers," *Soap*, Vol. 32, No. 9, pp. 47-50, 173 (1956).

Engine soil chemically comprises predominant quantity of paraffinic and naphthenic hydrocarbons, organic acids and partially oxidized hydrocarbons, some alkaline earth metal and/or alkali soaps, metallo organic sulfonates, carbonized particles, siliceous matter, water soluble salts and dust motes. Degreaser selection depends on type of film and the heavier, the more difficult to accomplish. Discussed solvent selection, self-emulsifying systems and performance evaluation. Described synthetic soils for laboratory evaluation and the preparation

of test pieces. Preferred immersion method with measurement of soil removal gravimetrically.

(923) B. Berkeley and D. Schoenholz, "Development and Testing of Engine Degreasers," Proceedings, 42nd Mid Year Meeting, Chemical Specialties Manufacturers' Assn., pp. 70-73 (1956).
See Reference No. 922.

(924) J. J. Bikerman, "Drainage of Liquid from Surfaces of Different Rugosities," Journal Colloid Science, Vol. 11, pp. 299-307 (1956).

Stainless steel plates with six standard finishes coated with oil and suspended vertically. Amount of oil remaining was measured after suitable intervals and the relationships between this amount and the average height of the surface hills on the metal ascertained. Thickness of the oil layer nearly equal to average height of the hills on the solid surface. This refutes one of the proofs of long-range molecular forces and confirms hypothesis that magnitude of electrokinetic phenomena is reduced by rugosity, shows the necessity for considering roughness in adhesion measurements.

(925) A. L. Bisio, H. B. Linford and E. B. Saubestre, "Cleanability and Oil-Spreading Rates," Industrial Engineering Chemistry, Vol. 48, pp. 798-801 (1956).

The faster an oil will spread, the relatively shorter will be the time to achieve a cleaning index of 100. An oil forming orientated monolayers will have a low spreading rate and will be difficult to remove from metal. The more randomized and disordered the monolayers, the higher the spreading rate and the easier the oil is removed. A chart of spreading slope versus time of cleaning is given and this indicates that a small drop in temperature from optimum will prevent complete cleaning in reasonable period of time. Reduction in cleaning time with an increase in temperature is specific for each oil-metal system, reduction being proportional to oil-spreading rate, and this is easily measured.

(926) P. W. Bonewitz, E. H. Fuhs, G. S. Edwards and S. W. Hockett (Esther D. Hockett, administratrix estate of S. W. Hockett, deceased) (to Bonewitz Chemicals, Inc.), "Cleaning Compositions," U. S. Patent No. 2,767,146, Oct. 16, 1956; Chemical Abstracts, Vol. 51, p. 4034 (1957).

Powdered, flaked or granular products useful in treating water and for cleaning food containers, food processing equipment and metals, prepared by spraying dry sodium hydroxide with an aqueous 25 to 75 per cent gluconic acid solution.

(927) "Auto Goes to the Cleaners," Chemical & Engineering News, Vol. 34, p. 2056, April 23, 1956.

Estimates based on 8 million car output in 1955. Trichloroethylene at 5 lb per car or truck totals 50 million lb. Average weight of aluminum on cars will be 36 lb for a total of 288 million lb. To clean an engine, 0.3 lb cleaner is needed. To clean an automatic transmission 0.5 lb cleaner required. To remove sand from each transmission casting, 1 lb of caustic soda is used. Body and assembly plant usage figures based on 375 sq ft painted surface are: Metal cleaner 300,000 lb, paint remover, alkaline type 2,400,000 lb, zinc phosphating chemicals 7,500,000 lb, for bumper estimated that about 4 million lb of cleaner required.

(928) G. C. Close, "Automatic Cleaning and Anodizing of Aluminum at Douglas Aircraft," Products Finishing, Vol. 21, No. 3, pp. 36-39 (1956).

Space economy achieved by automation of cleaning, surface treating and anodizing baths to 600 sq ft from 2000 sq ft formerly used, and only two tanks where ten were formerly used. The automatic cycles and high velocity impeller in the tank gives more rapid and complete coverage.

(929) W. E. Combs, "Cleaning Compositions," U. S. Patent No. 2,739,130, March 20, 1956; Chemical Abstracts, Vol. 50, p. 9043 (1956).

Various materials including painted surfaces and chromium plate, or stainless steel can be cleaned without damage by means of 0.007 per cent of an aqueous 33 per cent solution of nicotine. The incorporation of blue indigo in the range of 0.0005 to 0.50 per cent by weight of the total solution increases the cleaning properties. Cleaning properties of detergent also increased when nicotine is added.

(930) J. W. Condon (to Westinghouse Electric Corp.), "Treating Metal Surfaces before Phosphating," U. S. Patent No. 2,743,205, April 24, 1956; Chemical Abstracts, Vol. 50, p. 11223 (1956).

Phosphate coatings on metals can be produced much faster when, before subjecting them to the treatment, they are immersed in a solution made by dissolving separately 1.52 parts lithium chloride and 25 parts disodium phosphate-7 mols water, in water, mixing, evaporating to dryness, and dissolving 3 parts of this in 400 parts of water. To this solution caustic soda 3, and trisodium phosphate 3, with soda ash 1 oz per gallon are added. The proportions of lithium chloride and disodium phosphate can be varied. The activating compositions alone or combined with detergents may be applied to many other metals.

(931) C. F. Dinley, Jr., and I. J. Duncan (to Detrex Corp.), "Cleaning Baking Pans and the Like," U. S. Patent No. 2,740,734, April 3, 1956; Chemical Abstracts, Vol. 50, p. 11694 (1956).

Process for rapid cleaning of greasy and carbonized incrustations from bread-baking pans. The stacked utensils are degreased by exposure to the heated vapors of a chlorinated solvent such as trichloro- or perchloroethylene. They are then immersed for 1 hr in a boiling aqueous alkaline cleaning solution, preferably consisting of alkali metal triphosphosphate 10 to 20, alkali metal carbonate 10 to 20, alkali metal phosphate 40 to 70, alkali metal chromate 5 to 15, and wetting agent 0 to 5 per cent.

(932) E. F. Duffek and D. S. McKinney, "New Method of Studying Corrosion Inhibition of Iron with Sodium Silicate," Journal Electrochemical Society, Vol. 103, pp. 645-648 (1956).

Passivity curves prepared by a rapid laboratory method, show that sodium silicate as an anodic inhibitor owes its effectiveness to a film of silica, and not to any increase in pH as caustic soda in no case prevented corrosion.

(933) I. J. Duncan (to Detrex Corp.), "Cleaning Compositions for Baking Pans Containing Aluminum and Tin," U. S. Patent No. 2,748,035, May 29, 1956; Chemical Abstracts, Vol. 50, p. 16141 (1956).

Corrosion of baking pans containing both aluminum and tin by cleaning solutions containing 3 to 8 per cent chromates and 4 to 20 per cent silicates is prevented by addition of 2 to 8 per cent ferricyanide. The pans are often made of tin-coated steel, but aluminized steel is also used for the reinforcing bands, hence aluminum and tin are often encountered in the same pan, resulting in galvanic action.

(934) C. Duval, "Cleaning of Mercury-Plated Cathodes," Mikrochim. Acta, 1956, p. 1433; Chemical Abstracts, Vol. 50, p. 11857 (1956).

When a solution of mercury was electrolyzed with gold or platinum cathodes, it was common practice to remove the deposited mercury by heating over a Bunsen burner. This could result in some deformation of the electrode. It was found that heating 45 min at 261 C was sufficient to remove all mercury.

(935) L. H. Eldredge, "Ultrasonic Cleaning Units," Industrial Finishing (London), Vol. 9, pp. 101, 103, 105, 106 (1956); Chemical Abstracts, Vol. 51, p. 111 (1957).

Several types of ultrasonic cleaning units are described and finishing processes enumerated. Full efficiency can only develop within the framework of a complete degreasing

system. A pre-washing stage is necessary for the removal of heavier and easily removable deposits, with adequate rinsing and drying essential prior to the application of ultrasonics.

(936) E. Engel, "Notes on the Use of Water for Cleaning and Electroplating," Products Finishing, Vol. 20, No. 4, pp. 38, 40, 42, 44, 46, 48, 50 (Jan. 1956).

Describes water impurities and methods for overcoming them, describing five commercial methods of softening: precipitation, zeolite softening, ion exchange, sequestration, and chelation.

(937) N. L. Evans, "The Sodium Hydride Process for Descaling Metals," Corrosion Technology, Vol. 3, pp. 47-51 (1956); Chemical Abstracts, Vol. 50, p. 12776 (1956).

The sodium hydride process is non-electrolytic and operates at 350 to 370 C. There is no attack on the underlying metal, no risk of hydrogen embrittlement, and can be made continuous. The principal use is in the treatment of metals which are not attacked by molten caustic soda in the temperature range mentioned.

(938) C. F. Gurnham, "Sodium Hydride Descaling," Products Finishing, Vol. 20, No. 9, pp. 86, 88, 90, 92, 94, 96, 98, 100 (1956).

General review of the subject. Enumerates metals which can be descaled, process and equipment.

(939) C. Guss, "Liquid Cleaner and Polisher," U. S. Patent No. 2,757,094, July 31, 1956; Chemical Abstracts, Vol. 50, p. 14247 (1956).

Cleaner and polisher for nonadsorbent surfaces such as glass, chromium, stainless steel, and certain plastics consists of the following: An emulsion of equal parts of glycerol stearate and polyoxyethylene stearate and mixing 4 parts by weight of this blend with 35 parts of dimethylpolysiloxane, followed by 25 per cent lukewarm water and subsequently diluting with water to obtain an emulsion containing 35 per cent dimethylpolysiloxane. This emulsion in the amount of 1.74 per cent is finally mixed with 0.2 per cent polyethyleneglycol tert-dodecyl thioether and 98.06 per cent water.

(940) W. M. Halliday, "Wetting Agents in Metal-Finishing Processes," Product Finishing (London), Vol. 9, No. 3, pp. 50-56 (1956); Chemical Abstracts, Vol. 50, p. 11036 (1956).

Application of anionic and cationic wetting agents in metal-cleaning solutions is discussed, and some information is given on methods for evaluating the detergent efficiency of a cleaning solution.

(941) J. J. Heger and M. Orehsoki (to United States Steel Corp.), "Descaling of Steel," U. S. Patent No. 2,757,107, July 31, 1956; Chemical Abstracts, Vol. 50, p. 13710 (1956).

The scale formed on carbon, alloy, and stainless steels during heating for extrusion, rolling, forging, piercing, and so on, removed or conditioned by immersion of the steel in a slag bath prior to hot-working. The slag comprises 20 to 93 per cent of a mixture of at least two metal oxides from the group consisting of lime, silica, alumina and magnesia, and 80 to 7 per cent of a flux selected from the group consisting of borax, soda ash, fluorspar, cryolite, and lead and zinc oxides. Two or three minute immersion removes the scale or converts it to a softened condition which is not detrimental in hot-working. Examples of bath constitution given.

(942) Henkel & Cie. G. m. b. H., "Sulfonated Polyethers," British Patent No. 748,570, May 2, 1956; Chemical Abstracts, Vol. 51, p. 477 (1957).

Sulfonating agents react with organic compounds which contain hydroxyl groups at the end of polyether chains and convert these hydroxyl groups into sulfuric acid semi-ester groups. An example is the sulfonation of polyethyleneglycol with chlorosulfonic acid, which on adding to water forms a solution of the the sulfonated polyglycol ether, which in certain cases after the addition of acid inhibitors, can be used as a pickling or metal cleaning agent.

(943) W. F. Higgins (to Magnesium Electron Ltd.), "Anodic Cleaning of Magnesium-Alloy Castings," U. S. Patent No. 2,766,199, Oct. 9, 1956; Chemical Abstracts, Vol. 51, p. 3330 (1957).

The alloy castings are made anodic in a solution containing 2 per cent ammonium fluoride or ammonium acid fluoride and 5 to 15 percent ammonium hydroxide. The castings are clean when the voltage reaches its peak and the current drops to a few microamps.

(944) F. Hightower, "Ultrasonic Cleaning," Plating, Vol. 43, pp. 359-362 (1956).

Transducers designed to work in aqueous solution generally of 316 stainless encasing the piezo-electric ceramic. These are of standardized units assembled in suitable groups. Generators available to drive banks ranging in area from 30 sq in. to 10 sq ft. Details of construction for maximum utilization of energy. Ultrasonic cleaning said to be more effective at proper temperature than cleaning with same solution at higher temperature without ultrasonics. Best used in final cleaning stage and rinsing should be thorough.

(945) "How to Get More for Your Metal Working Dollar," The Iron Age, No. 5 of a Series, Plating, Metal Cleaning and Finishing Handbook, 32 pages (1956).

Gives 23 tables of data. Included are tables on metal condition (surface cleaning); typical electrolytic cleaning operation; typical immersion cleaning operations; typical spray cleaning; comparison of pickling, degreasing, cleaning, and descaling; properties and uses of cleaning solvents; deburring. Listed are pertinent government specifications concerning cleaning. Typical electrolytic cleaning operations are given for six metals by 17 different cleaning solutions. Ten different cleaning compositions are given for seven metals for immersion cleaning. Nine spray cleaning formulations are given for seven metals. The table comparing pickling, degreasing, cleaning and descaling is extensive and complete. Comparison data are given for seven chlorinated solvents.

(946) C. E. Kircher, "Solvent Degreasing--What Every User Should Know," ASTM Bulletin, No. 219, pp. 44-49 (1956).

Estimates of 20,000 degreasing units in operation and annual sales of trichloroethylene at 250 million lb. Discusses character of solvent degreasing, production of trichloroethylene and much on stabilizer. For degreasing operations necessary to use more acid accepting stabilizer (alkaline stabilized), than the small amount of amine required to make the solvent alkaline (neutral stabilized). Gives table of types and examples of stabilizer and gives patent references. Discusses degreasing tests which include physical measurements, pH, moisture, color, titration for alkalinity and specific tests for stabilizers.

(947) J. J. Maguire, "Boilers Require Chemical Boil-Out when Contaminated with Oil. Oil Removal from Heating Surfaces," Southern Power and Industry, Vol. 74, No. 8, pp. 52, 54, 64, 67 (1956); Chemical Abstracts, Vol. 50, p. 13342 (1956).

The recommended inorganic boil-out solution contains 3 lb caustic soda, three pounds anhydrous disodium phosphate, and 1 lb sodium nitrate for each 1000 lb water required to fill the boiler to the operating level. A wetting agent desirable to keep any oil removed from the surfaces in suspension, but it should be nonfoaming or a foam-suppression agent should be added to the mixture. Details of operation given.

(948) L. McDonald and A. E. Hawler (to Kelite Corp.), "Composition for Cleaning and Stripping Paint from Aluminum," U. S. Patent No. 2,741,599, April 10, 1956; Chemical Abstracts, Vol. 50, p. 11568 (1956).

Composition of soda ash 4 to 12 and

trisodium phosphatemonohydrate 40 to 65 as activators, sodium silicate 15 to 25 as corrosion inhibiting agent, sodium gluconate 2 to 6 as sequestering agent, polymeric tetramethylene phenyl sodium sulfonate 1 to 5 as dispersing agent, and potassium oleate 3 to 7 per cent as wetting agent. Solution of this composition in water at 1 to 20 oz per gal has a pH of 11.45 to 11.75 and may be used at 160 to 180 F without corrosion of aluminum and without "throw down" of aluminum or other metal salts or insoluble silicates.

(949) Compound, Metal Conditioner and Brightener (for Use on Aluminum Surfaces), Military Specification, MIL-C-25378(USAF), April 3, 1956.

Requirements include composition of non-flammable phosphoric acid base, free flowing nonlayered colloidal suspension, free of sediment or abrasives, emulsifiable, with a viscosity of not less than 550 centipoises at 20 C, minimum corrosion, producing specified difference in reflectance, not causing crazing of acrylic base plastics, and in practical cleaning not have rapid run-off or cause streaking, spotting or discoloration of treated area, and shall rinse freely. The practical cleaning test is applied to routinely soiled airplane and the results examined visually.

(950) Compound, Emulsion Cleaning (for Aircraft), Military Specification, MIL-C-25179A(USAF), July 26, 1956. Superseding MIL-C-25179(USAF), See Reference No. 901.

Instead of service soiled surfaces for comparison test, uses a staining technic. Stain comprises a solution of:

Oleic acid USP.....	0.7 ml
Triethanolamine.....	0.2 ml
Trisox X-100.....	0.5 ml
Drycleaning solvent to make 100 ml	

Standardly cleaned and marked aluminum panels (2) are spotted with 3 ml of the stain. Then 3 ± 0.2 ml of distilled water are atomized from 12 in height onto them. This is repeated by substitution of 10 per cent by volume solution of reference cleaning solution. Panels retained in a horizontal position at room temperature for 1-1/2 hr, then washed in tap water, rinsed with distilled water, rinsed with methanol and air dried. Intensity of stain to be no greater than that from comparison panel.

(951) A. Nicholson and C. F. Wilkinson (to Parker Rust Proof Co.), "Simultaneous Phosphating and Cleaning of Ferrous and Zinc Surfaces," U. S. Patent No. 2,744,555 May 8, 1956; Chemical Abstracts, Vol. 50, p. 11930 (1956).

These surfaces may be cleaned and phosphated simultaneously by spraying with an emulsion, rinsing, and immersing for 1/2 min in chromic acid (10 oz per 100 gal) at 160 F. The emulsion is prepared by addition to a solution containing 1.4 per cent monosodium phosphate and 0.5 per cent sodium chlorate of 2 per cent by weight of kerosine containing 5 per cent of a p-isooctylphenyl ether polyoxyethylene glycol. The number of polyoxyethylene groups in the emulsifier is 3 to 25 and the pH of the emulsion 3.5 to 5.8. The emulsion is heated to 160 to 170 F and sprayed for 1 min onto the metal surface.

(952) "Process Control Chart," Products Finishing, Vol. 21, No. 1, pp. 90, 92 (1956).

A test kit is described to give simple, non-technical but accurate procedure for controlling solutions of soak cleaners, electrocleaning, phosphating cleaners, rust removers, metal etchants.

(953) A. N. Pullen and E. D. Swann (to British Aluminum Co. Ltd.), "Cleaning of Aluminum and Aluminum Alloys," U. S. Patent No. 2,750,309, June 12, 1956; Chemical Abstracts, Vol. 50, p. 12802 (1956).

Cleaned of oil and grease as well as fine particles of foreign metals in order to provide surfaces suitable for anodizing, electropolishing, or welding. The cleaning solution is made up of 1.8 to 3.5 per cent by weight of caustic soda, 1 to 5 per cent soda ash, dissolved aluminum approximately half the total weight of the sodium compounds, 0.01 to 0.03 per cent of the trans form of dinitrotetramine cobaltic chloride, and 0.25 per cent of a nonionic wetting agent such as a sulfonated glycol. The solution is used at 30 to 50 C and the immersion time is 45 sec to 2 min.

(954) E. T. Relf, "Chemical Cleaning of Locomotive Boilers with Molasses as the Inhibiting Agent," Proceedings 23rd Conference Queensland Soc. Sugar Cane Technology pp. 90-97 (1956); Chemical Abstracts, Vol. 51, p. 3886 (1957).

Addition of molasses to hydrochloric acid used in removing boiler scale greatly reduced attack on metal. Acid solutions were effective when tried on locomotive boilers, and temperatures up to 160 F could be used without adversely affecting the metal loss.

(955) H. Roderig, L. F. L. Clegg, H. R. Chapman, J. A. F. Rook and W. A. Hoy, "Experiments on Descaling Farm Dairy Utensils," Journal Soc. Dairy Technology, Vol. 9, pp. 75-80 (1956); Chemical Abstracts, Vol. 50, p. 14136 (1956).

Artificial films of milkstone were prepared on glass with 10 drops of a mixture of 35

parts milk with 65 parts of freshly prepared tricalcium phosphate dispersion, drying, dipping the film in 1 per cent sodium carbonate, drying for 2 hr, at 98 C, washing 3 min in 1 per cent sodium carbonate solution at 40 C, drying, then repeating the treatment four times. A number of acids in 2 per cent concentration removed only the mineral matter, leaving the protein on the glass. Sodium polyphosphate or ethylenediaminetetraacetic acid (EDTA) softened the protein film. Natural milkstone in aluminum milking machine buckets was not completely removed by repeated treatments with hot 1 percent solutions of several organic acids, or by urea nitrate, but 3 per cent solution of polyphosphate and a 0.5 per cent solution of EDTA were effective at room temperature. Phosphoric acid at 2 percent concentration used at 50 C was the most effective in stainless steel buckets. Analysis of milkstone given.

(1956) E. E. Ruff (to Lever Brothers Co.), "Cleaning Compositions Containing Tarnish Inhibitors," U. S. Patent No. 2,733,215, January 31, 1956; Chemical Abstracts, Vol. 50, p. 6821 (1956).

Tarnishing of copper and copper-nickel alloys such as German silver, by anionic and nonionic synthetic detergent compositions containing polyphosphates is prevented by the presence of about 0.13 per cent sodium, potassium, or ammonium salt of a hydroxamic acid of 9 to 15 carbon atoms.

(1957) K. Schumann, H. W. Thoenes and G. Wiesenack, "Evaluation of Antiscale and Scale-Dissolving Agents," Brennstoff-Wärme-Kraft, Vol. 8, No. 1, pp. 31-36 (1956); Chemical Abstracts, Vol. 51, p. 644 (1957).

Discussion of legal regulations in Germany. Given are evaluation methods for the following groups of antiscale agents: Mixtures of organic substances of colloidal nature mixtures of predominantly alkaline salts; mixtures of foregoing two, with added inhibitors. Application methods for several German products given.

(1958) K. O. Seiler (to International Standard Electric Corp.), "Cleaning and (or) Etching Semiconducting Materials, Especially Germanium and Silicon," U. S. Patent No. 2,744,000, May 1, 1956; Chemical Abstracts, Vol. 50, p. 16483 (1956).

Cleaning, reduction in size, or cutting of the materials accomplished by etching with a gas like chlorine or hydrochloric acid to etch a recess into a germanium crystal. Other details of physical set-up described.

(1959) J. J. Singer, "Problems in Scale Removal," Soap, Vol. 32, No. 9, pp. 43-44, 173 (1956).

Automotive cooling systems cleaned of

scale either by solution of scale or removal by physical means. Acidic materials require flushing and are not selective in action on iron oxide scale. Of the acids, oxalic is most effective, but still requires flushing and neutralization. Polyphosphates and ethylenediaminetetraacetate have been tried unsuccessfully as solvents. Indicated that proper choice of chelating agent will solubilize the iron oxide and this subsequently by internally dehydration, caused a precipitate which is suspended and effectively removed from radiator surfaces.

(1960) J. J. Singer, "Problems in Scale Removal," Proceedings, 42nd Mid Year Meeting, Chemical Specialties Manufacturers' Assn., pp. 79-80 (1956).
See Reference No. 959.

(1961) R. B. Snow (to United States Steel Corp.), "Removal of Scale from Steel," U. S. Patent No. 2,762,729, Sept. 11, 1956; Chemical Abstracts, Vol. 51, p. 2518 (1957).

Scale removed from steel by bringing solid calcium oxide into contact with the hot surface of the metal. Thus, the temperature of the steel is kept between 1080 and 1400 F while powdered lime is blown onto the surface. The scale liquefies and either flows or is blown off.

(1962) W. F. S. Taylor, "Sodium Hydride Descaling Process," Metal Treatment and Drop Forging, Vol. 23, pp. 465-468 (1956); Chemical Abstracts, Vol. 51, p. 2492 (1957).

A review of the principles and applications of sodium hydride descaling equipment.

(1963) E. Van Zandt, "Properly Formulated Buffing Compounds Can Make Cleaning Easier," Products Finishing, Vol. 21, No. 3, pp. 41-44 (1956).

Compounds should be formulated so that greases which act as binders can be readily removed from work. Mineral oils or greases which do not saponify can cause difficulty. Presence of saponifiable compounds can retard cleaning where reaction with the metal (zinc, aluminum or magnesium) to be buffed occurs. Surfactants added to improve performance. Alkali soluble materials added to grease binder where electrolytic cleaning follows; nonionics where solvent degreasing ensues; sulfonated oils for oil-base liquid buffing compounds.

(1964) L. B. Wilson, "Maintenance Cleaning With Chemicals," TAPPI, Vol. 39, No. 3, pp. 190-192 (1956).

Chemical cleaning application to large variety of paper mill equipment described.

Solvents are discussed and these include acids, alkalis, oxidizing solutions, reducing solutions, chlorinated solvents, hydrocarbon solvents and emulsions. Application of cleaning to specific pieces of equipment described. Use of high-pressure jets with cleaning solution discussed.

(1965) W. A. Wright, "Cleaners for Aluminum Dairy Equipment," Dairy Eng., Vol. 73, pp. 167-171 (1956); Chemical Abstracts, Vol. 50, p. 14245 (1956).

Rate of corrosion of various aluminum alloys in 1 to 4 per cent solutions of sodium metasilicate pentahydrate at 140 and 180 F investigated. Metasilicate satisfactory under these conditions on sheet alloys used in the dairy industry. A mixture of metasilicate 40 per cent, soda ash 40 per cent sodium bicarbonate 10 per cent, sodium polyphosphate 5 per cent, and synthetic detergent 5 per cent is recommended as a general detergent for dairy equipment. For automatic washing of aluminum and tinned metal milk cans metasilicate 75 per cent, sodium sulfite 20 per cent, sodium polyphosphate 5 per cent is suggested.

1957

(1966) E. Engel, "Wetting Agents and

Buffers in Cleaning and Electroplating," Products Finishing, Vol. 21, No. 5, pp. 32-35 (1957).

A discussion of surface tension and implications in cleaning. Describes types of wetting agents. Indicates deficiencies of soap, and methods to minimize their failings. Discusses polarity and stability and gives a few general criteria for selection. Usage is indicated in plating baths and pickling solutions. A table of pH buffering compositions is given.

(1967) H. F. Patin, "Facts About Vapor Blasting," Products Finishing, Vol. 21, No. 5, pp. 66, 68, 70, 72, 74, 76 (1957).

Abrasive slurried in water and delivered to work by pump and blasting gun using compressed air. Details of operation given. Abrasives mentioned are organics (walnut, shells, etc.), Novaculite stone (99 per cent pure silica), silica, quartz, garnet, aluminum oxide, other refractive abrasives and "Brite Shot" an artificial abrasive used for matte effects. Applications of vapor blasting given. Advantages given are rapid scale removal, surface metal cleaning without hydrogen embrittlement, burr removal or finish required in very short time, internal burrs removed, and also treats multi-tooth cutting tools and dies.