NATIONAL

LEA

COMPANY

PRODUCTS

FOR THE PROCESS INDUSTRY

LEAD SHEET — LEAD PIPE

LEAD VALVES • LEAD FITTINGS

LEAD LINED & LEAD COVERED EQUIPMENT

ACID RECOVERY EQUIPMENT

HARD LEAD, LEAD-LINED AND LE

CONTROL THE FLOW OF CORROSIVE CHEMICALS WITH "UNITED" VALVES

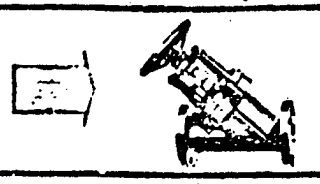
Many of the most important companies engaged in the process industries both here and abroad long have depended upon "United" Valves hard lead and lead lined for controlling the flow of destructive chemicals. And with good reason. "United" Valves are built to stand not merely the routine day to day service normally to be expected of valves, but also to stand up under severe stress, stresses, overloads and abuse.

Every valve is expertly engineered and sturdily made of materials best suited to render trouble-free service at the job for which the valve was designed.

Shown here are four valves that are representative of the well-balanced "United" line. Other types are lead-lined or hard lead Wedge Gate pattern, lead-lined or hard lead Diaphragm pattern and hard lead Foot valve. All are flanged.

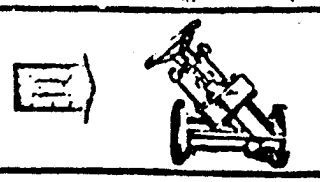
"UNITED" TYPE R SPLIT BODY FLANGED ACID VALVE

Available in hard lead or lead-lined. Sizes ¾" through 6". The outstanding feature of this valve is its split body—it can be installed either as a "Y" pattern or as an Angle. The design also permits the replacing of seats and plug discs to adapt the valve to various types of service.



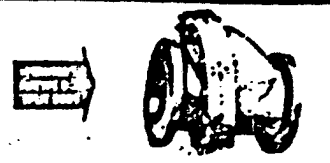
"UNITED" LEAD LINED TYPE C FLANGED ACID VALVE

Available in cast iron or cast steel heavily lined with lead, and in both "Y" and Angle patterns. Sizes ¾" through 8". Valve body is cast oversize to insure full flow area after lining. Furnished with removable plug discs of acid-resisting rubber or lead.



"UNITED" HARD LEAD CHEM RAYON FLANGED ACID VALVE

Available in hard lead in both "Y" and Angle patterns. Sizes ¾" through 8". Body is cast lead lined, reinforced with hard lead bars. Bonnet is reinforced with steel insert. Yoke consists of steel studs integral with bonnet insert. Furnished with removable plug discs of acid-resisting rubber or lead.



"UNITED" TYPE D SPLIT BODY FLANGED CHECK VALVE

Available in hard lead or lead-lined. Sizes 1" through 6". Designed on that elegant (of acid-resisting bronze, hard lead renewed) swings completely out of flow way. Split body prevents quick and easy replacement of disc and machining of seat to adapt the valve to various types of service

USE LEAD to blunt the teeth of hungry acids

D LEAD-COVERED EQUIPMENT

PROPEL CORROSIVE CHEMICALS WITH "UNITED" PUMPS

Where gravity flow of acid solutions is impractical here is the pump to do the conveying job. "United" hard lead centrifugal pumps are of the open impeller type, mounted on a heavy cast iron base. Available for either belt or direct drive. Hard lead casing and impeller, latter being cast around reinforcing spider. Self-lubricating, with large internal grease glands supplied by compression cups.

ROUTE CORROSIVE CHEMICALS THROUGH "UNITED" PIPE & FITTINGS

"United" flanged fittings are made of hard lead or of cast iron or steel heavily lined with lead. Produced by our special process, "United Tubond" pipe and fittings are strong and corrosion resistant. By the "Tubond" method, the lead lining is permanently bonded to the steel outer casing. The bore is smooth and seamless. "United Tubond" flanged pipe and "United" fittings are particularly well suited to chemical installations because the lead lining is carried over the face of the flange to ensure a positive lead-to-lead joint.

TREAT, HEAT OR STORE CORROSIVE CHEMICALS IN HOMOGENEOUS LEAD EQUIPMENT

The word "homogeneous" literally means "of the same composition or structure throughout." In the case of our Homogeneous Lead Equipment, the word is used to denote the close and inseparable union of the lead lining or covering (to give acid resistance) with the steel, copper or brass structure (to give strength and heat transfer). By bonding the lead to its companion metal without the use of tin or tin lead alloys, the equipment may be operated at extremely high temperatures, approaching the 621° melting point of lead. Examples of Homogeneous Lead Equipment in general use are autoclaves, steam separators, jacketed pressure vessels and storage tanks.

Homogeneous lead-lined or lead-covered apparatus, including such equipment as storage tanks, autoclaves, heating coils, and jacketed pressure tanks of all descriptions, is designed for use under operating conditions where high steam pressure and vacuum are encountered, or where heat transfer is at temperatures. Equipment of this type made in our plants is being used successfully by many industrial concerns around the country and frequently has proved its superiority over the older types of lead-lined apparatus.

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EQUIPMENT FOR THE RECOVERY OF ACIDS

The [illegible] Vacuum Process, in which acids are [illegible] under vacuum, has [illegible] many if not all of the difficulties involved in acid recovery by older methods. Numerous installations operated [illegible] and by others in the process industries prove that the recovery of acid need not be a difficult or costly problem.

For the application of this process, the Acid Recovery Department of National Lead Company builds and sells (a) concentrators for spent sulphuric acid, chamber acid and sludge acid; (b) stills for the purification of [illegible] acid; (c) evaporators for weak solutions of sulphuric and phosphoric acid; (d) coolers and crystallizers for acid solutions; (e) separating plants for sludge acid.

[illegible]

In the [illegible] Vacuum Process, patented in the United States and foreign countries, the acid is concentrated with steam at from [illegible] lbs. to 300 lbs. pressure under an absolute pressure of from [illegible] Hg to 25" Hg so that the boiling temperature of the [illegible] acid will rarely exceed [illegible] F. The high vacuum practically eliminates all foaming. The proper vapor speed and low boiling point reduce losses due to entrainment and distillation to less than one per cent. No fumes are given off by our concentrators.

[illegible]

Well separated sludge acid is usually concentrated to 78%, 85% or 93%. Spent acid and chamber acid are usually concentrated to 93.2% H_2SO_4 but can also be brought up to 95% H_2SO_4 at reasonable cost.

In all cases where the required final strength of the acid does not exceed 80%, the concentrators are equipped with counter-current condensers of the barometric type, but for higher strength acid it is necessary to add a vacuum booster which will create in the concentrator an absolute pressure as low as 25" Hg. To avoid contamination of the cooling water, surface condensers, instead of the barometric condenser, have also been used.

CONSTRUCTION

All concentrators are of substantially the same design. The outside shell is made of cast iron for small sizes and steel plate for larger units. The inside is lined with sheets of chemical lead 5/16" to ½" thick. All vertical and horizontal joints are burned from the outside, facilitating inspection and repairs. The lead lining is protected by a heavy layer of acid proof bricks laid in suitable cement. Openings are protected by high-silicon iron sleeves. The heating surface consists of antimonial lead, chemical lead or lead covered copper tubing for steam pressures up to 45 lbs.; high silicon iron tubes for pressures up to 150 lbs.; and of Hastelloy "D" tubes for pressures up to 300 lbs., as well as for Dowtherm vapor. Condensers may be made of special bronze, rubber-lined steel, or hard lead. Boosters are usually made of carbon lined hard lead with single carbon steam nozzle. Concentrators may be equipped with electric level indicators.

All concentrators, crystallizers and evaporators are specially designed for the capacity and operating conditions for which they are to be used. No attempt is made to adapt one standard apparatus to all conditions.

APPLICATION OF PROCESS

Spent Acid. Large quantities of sulphuric acid are used in the chemical industry for the concentration of nitric acid and the absorption and drying of alcohols. [illegible] acids are concentrated to 93% and 95% in our Super Vacuum Concentrators at low cost and high efficiency. There are no difficulties due to organic or inorganic impurities. Capacities vary from 10 tons to 150 tons of H_2SO_4 handled in one unit. Multiple sets of two and three units have been built with capacities up to [illegible] tons H_2SO_4 per day when concentrating from 60% to 93%.

Some of the waste acids contain large quantities of sulphates which must be separated before the acid is fit to re-use. Sulphates of copper and nickel can be handled in our special Salting Out Concentrators without difficulty and are separated from the finished acid by centrifugals or vacuum filters.

Ferrous sulphate must be separated from the acid under strict control of concentration and temperature as otherwise the sulphate will be precipitated in the form of a slime which cannot

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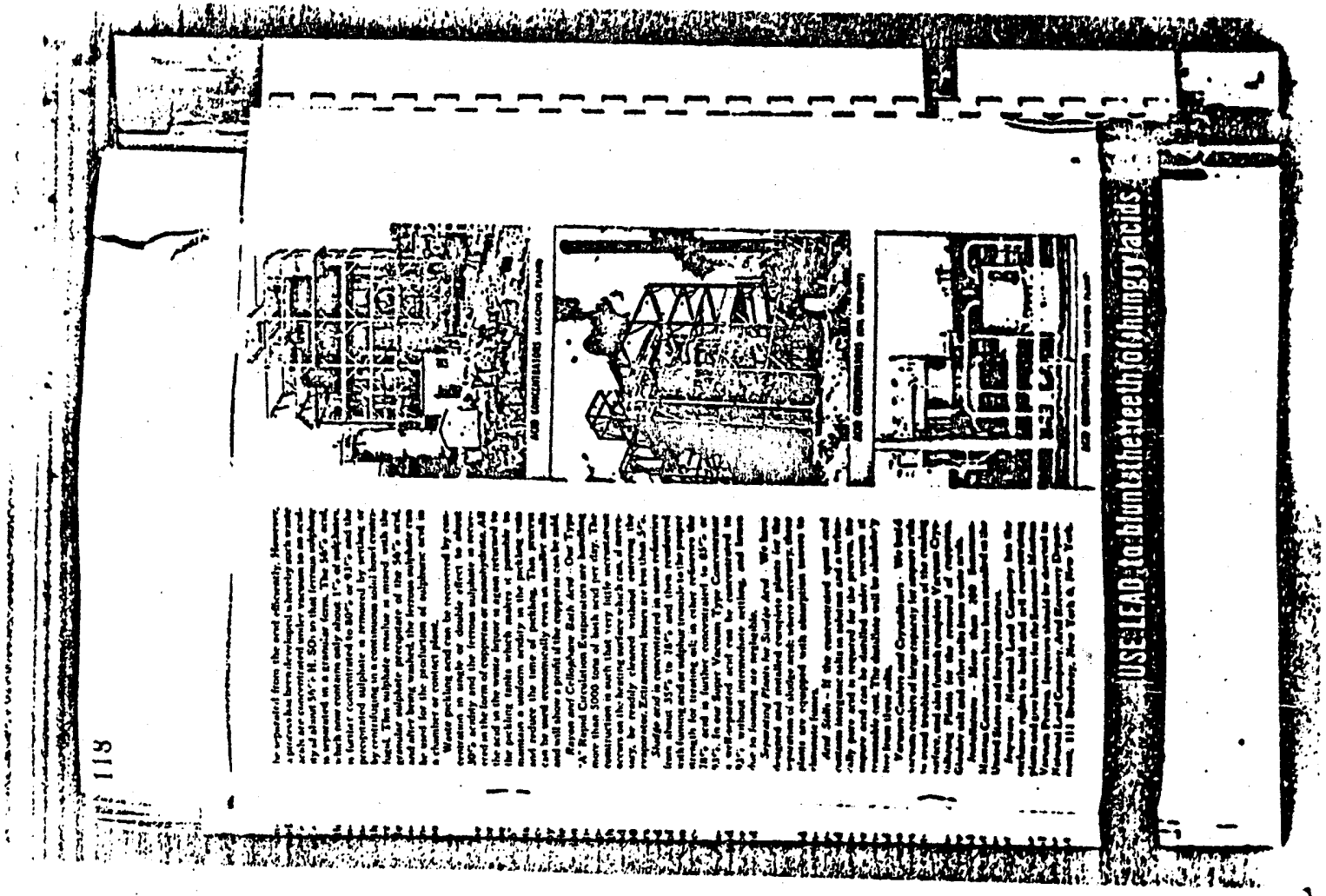
USE LEAD to blunt the teeth of hungry acids



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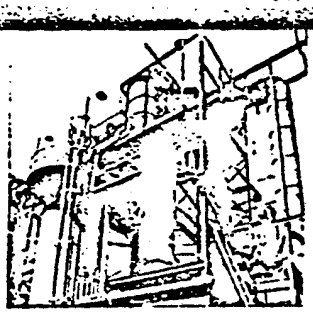
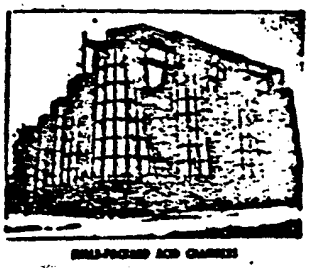


CUTTING BEST SEPARATORS



ROLLED LEAD SHEET

Of the numerous forms in which lead meets the challenge of chemicals in the process industries, it finds its most widespread use in the shape of sheets. Rolled in powerful mills, from bulky slabs to smooth, flawless sheets which gauge from 1" to .0117" in thickness, lead sheet of our manufacture is depended upon for long, hard service as a corrosion-resistant lining for tanks, vats, drums, flues, agitators and numerous other types of apparatus common to the processing and storage of chemicals.

Because of, first, its reluctance to submit to corrosion; second, its properties of pliability and malleability; third, its low-melting point which facilitates "burning" to join sections; and fourth, its relatively low annual cost and eventual high salvage value, sheet lead is standard in most plants which handle sulphuric, phosphoric and hydrofluoric acids and sulphate solutions. To meet the diversified needs of the process industries, several grades of sheet lead are available.

CHEMICAL LEAD SHEET

This sheet is rolled from "chemical lead," a term used to designate a type of lead produced from southeast Missouri ores. Chemical lead is a practically pure lead, *free from* bismuth and containing about .06% of copper, the presence of which increases lead's natural corrosion resistance, raises its recrystallization temperature, and increases tensile strength and fatigue strength.

TELLURIUM LEAD SHEET

This sheet is rolled from primary chemical lead in which has been smelted a very small quantity (less than 0.1%) of tellurium. The addition of the tellurium raises the corrosion resistance of the sheet, particularly where high temperatures, vibration and mechanical stress are involved. Tellurium develops in lead a capacity to work-harden.

ANTIMONIAL LEAD SHEET

This grade of sheet is regular chemical lead with which has been alloyed a certain percentage of antimony. The other term for this grade is "hard lead." The antimony gives the sheet greater mechanical strength but also lowers its melting point from pure lead's 621° F to about 477° F. This grade is not recommended for use with temperatures above 320° F-340° F. The tensile strength of 6% antimonial lead, at room temperature, is about twice that of chemical lead.

TELLURIUM ANTIMONIAL LEAD SHEET

This grade of sheet is tellurium lead alloyed with specified percentages of antimony, the usual amount being 6%. Harder and stiffer than straight tellurium lead, this grade has better resistance to abrasion, hence is suitable for linings subject to erosion.

USE LEAD to blunt the teeth of hungry acids

LEAD PIPE AND COILS

The special property of lead pipe which makes it virtually indispensable in industrial installations is corrosion resistance. Its outstanding use, because of this property, is in the manufacture and conveyance of sulphuric acid. However, lead pipe has been and is being used successfully in handling a large number of other industrial chemicals and gases, often under severe service and temperature conditions. In addition to its resistance to corrosion, the pliability of lead pipe is an advantage in chemical equipment.

GRADES OF LEAD PIPE

Several types of lead pipe are available for industrial use. All are made either of chemical lead or of chemical lead, to which small amounts of other metals have been added to achieve hardness, higher acid-resistance under certain conditions, or some other desirable characteristic. The term "chemical lead" refers to a grade of undervarnished lead containing small amounts of copper and silver which experience has proved possesses unusual anti-corrosive properties.

The various types of lead pipe produced for the industrial market differ considerably in mechanical strength and corrosion resistance. For this reason it is important that precisely the proper type of pipe be specified for the job in hand.

Chemical Lead Pipe. This grade is made only from accepted standard brands of prime lead which conforms to Grade II of the A.S.T.M. standard specifications (B29-43).

Tellurium Lead Pipe. This grade is made from prime chemical lead to which a small amount of tellurium has been added. Advantages of this grade of pipe are (a) improved corrosion resistance, particularly at higher temperatures; (b) the capacity to work-harden, to become stronger after bending, stretching, or hammering; (c) improved resistance to failure under vibratory stresses.

Antimonial Lead Pipe. This grade is made from prime chemical lead to which has been added specified amounts of antimony. Most pipe of this grade contains 6% of antimony, although as high as 10% is sometimes ordered.

Tellurium-Antimonial Lead Pipe. This grade is made from prime chemical lead to which has been added small amounts of both tellurium and antimony.

LEAD PIPE COILS

All of the grades of lead pipe above described may be formed into coils constructed in our plants in accordance with the customers' specifications. Or the coils may be erected on the field, using not only pipe of our manufacture but also the necessary spacer blocks and rod supports. Coils formed from special corrugated surface pipe are available.

HARD LEAD PIPE COILS

USE LEAD to plant the teeth of hungry acids