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NATIONAL
LEAD
COMPANY
PRODUCTS
FOR THE PROCESS INDUSTRY

LEAD SHEET LEAD PIPE
LEAD VALVES • LEAD FITTINGS
LEAD LINED & LEAD COVERED
EQUIPMENT
ACID RECOVERY EQUIPMENT



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N13318

NLI 114672

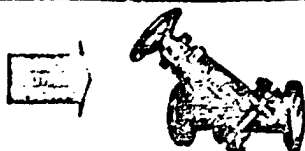
HARD LEAD, LEAD-LINED AND LE

CONTROL THE FLOW OF CORROSIVE CHEMICALS WITH "UNITED" VALVES

Many of the most important companies engaged in the process industries both here and abroad have depended upon "United" Valves hard lead and lead-lined for controlling the flow of corrosive chemicals. And with good reason. "United" Valves are built to stand not merely the normal day-to-day service normally to be expected of valves but also to stand up under severe strains, 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 "A" through "G". 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 "A" through "G". 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 "A" through "G". Body is cast hard lead, overlaid with hard lead flange. Bonnet is reinforced with steel insert. Valve 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 "F" through "G". Designed so that clapper (or acid-resisting bonnet, hard lead covered) swings completely out of flow way. Split body permits quick and easy replacement of disc and clapper without need to adapt the valve to various types of service.

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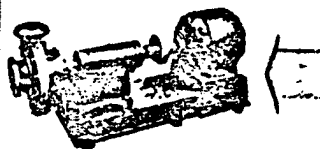
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D LEAD-COVERED EQUIPMENT

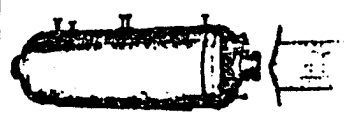
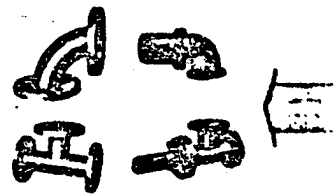
PROPEL CORROSIVE CHEMICALS WITH "UNITED" PUMPS

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 insure 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

operators, 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 vessels of all descriptions, is designed for use under operating conditions where high steam pressure and vacuum are encountered, or where heat transfer is of importance. 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 type of lead-lined apparatus.

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EQUIPMENT FOR THE RECOVERY OF ACIDS

The *Lucasium Motion Vacuum Process*, in which acids are recovered in a closed vessel under vacuum, has proved to overcome many of the difficulties associated with acid recovery by other methods. Numerous installations operated by oil and chemical companies, 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 sulphuric acid; (c) evaporators for weak solutions of sulphuric and phosphoric acid; (d) coolers and crystallizers for acid solutions; (e) separators, plants for sludge acid.

PLANT TYPE

In the *Lucasium Motion Vacuum Process*, patented in the United States and foreign countries, the acid is concentrated with steam at from 5 lbs. to 200 lbs. pressure under an absolute pressure of from 3 in. Hg to 25 in. Hg so that the boiling temperature of the treated acid will easily exceed 150° F. The high vacuum practically eliminates all foaming. The proper vapor speed and low heating power reduce losses due to entrainment and distillation to less than one per cent. No fumes are given off by any concentration.



200 CONCENTRATOR, SEPARATOR PLANT

Well separated sludge acid is usually concentrated to 78% to 85% or 91%. Spent acid and chamber acid are usually concentrated to 91.2% H₂SO₄ but can also be brought up to 95% H₂SO₄ at reasonable cost.

In all cases where the required final strength of the acid does not exceed 90%, the concentrators are equipped with counter-current condensers of the *Lucasium* type, but for higher strength acid it is necessary to add a vacuum tower which will operate at the equivalent of an absolute pressure on top of 25 in. Hg. To avoid contamination of the cooling water, surface condensers, instead of the *Lucasium* condenser, have also been used.

CONSTRUCTION

All concentrations 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 3/16" to 1/2" thick. All vertical and horizontal joints are lapped from the outside, facilitating inspection and repairs. The lead lining is protected by a heavy layer of acid proof tar or lead on outside cover. The heating surface consists of anti-sulfurized 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 "C" tubes for pressures up to 300 lbs., as well as for Densitron vapor. Condensers may be made of special bronze, rubber-lined steel, or hard lead. Bunters are usually made of carbon lined hard lead with single carbon steam nozzles. Concentrators may be equipped with electric level indicators.

All concentrations, 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 sulfur acid and the absorption and drying of alcohols. Sulfuric acids are concentrated to 91% and 95% in our *Super Vacuum Concentrators* of low cost and high efficiency. There are no difficulties due to organic or inorganic impurities. Capacities vary from 10 tons to 150 tons of 11.5% acid handled in one unit. Multiple sets of two and three units have been built with capacities up to 600 tons 11.5% acid per day when concentrating from 60% to 92%.

Some of the waste acids contain large quantities of substances which must be separated before the acid is fit to reuse. Sulphates of copper and nickel can be handled in our special *Sulfate Chasing Concentrators* without difficulty and are separated from the treated acid by centrifuging in vacuum filters.

Freezing sulphate must be separated from the acid under strict control of concentration and temperature so otherwise the sulphate will be precipitated in the form of a sludge which cannot

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be separated from the acid efficiently. However, a process has been developed whereby such waste acids are concentrated under vacuum to an acidity of about 56% H. SO₄ so that ferrous sulphate is separated in a granular form. The 56% acid, which now contains only about 1% of sulphates, is further concentrated to 80% or 93% and the precipitated sulphate is removed by settling or by centrifuging in a continuous solid bowl centrifuge. This sulphate residue is mixed with the granular sulphate precipitate of the 56% acid, and after being washed, the ferrous sulphate can be used for the production of sulphuric acid in a chamber or contact plant.

Waste pickling acid can be recovered by concentration in single or double effect to about 30% acidity and the ferrous sulphate is recovered in the form of copperas or monohydrate. All the acid in the waste liquor is again returned to the pickling tanks which makes it possible to maintain a uniform acidity in the pickling vats and reduce the time of pickling. This process can be used economically even in smaller mills and will show a profit if the copperas can be sold.

Rayon and Cellophane Bath Acid - Our Type "A" Rapid Circulation Evaporators are handling more than 5000 tons of bath acid per day. The construction is such that very little evaporation occurs on the heating surface which, if necessary, is readily cleaned without entering the evaporator. Efficiency losses are less than 5%.

Sludge Acid is concentrated in same refractory from about 35% to 78% and then recombined with fuming acid or sulphur trioxide to the proper strength for treating oil; in other refineries the 78% acid is further concentrated to 85% or 93%. In our Super Vacuum Type Concentrator a well-separated acid can be concentrated to 93% without intermediate settling, and losses due to foaming are negligible.

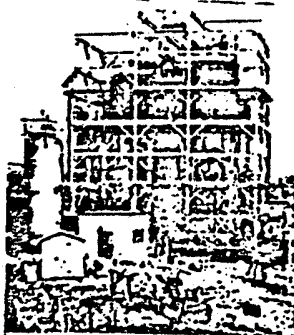
Separating Plants for Sludge Acid - We have designed and installed complete plants for the separation of sludge acid; where necessary, these plants are equipped with absorption towers to eliminate fumes.

Acid Solts - If the concentrated spent acid contains inorganic salts in solution and a technically pure acid is required for the process, the impure acid can be distilled under vacuum at reasonable cost. The distillate will be absolutely free from these salts.

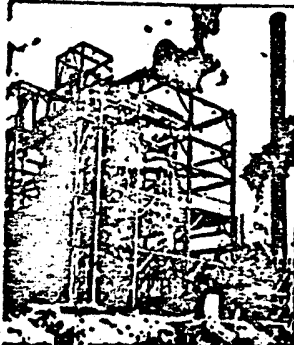
Vacuum Coolers and Crystallizers - We build vacuum coolers of large capacity for sulphuric acids to avoid troublesome incrustation of the cooling surface, and also furnish complete Vacuum Crystallizing Plants for the removal of copperas, Glauber salt and other salts from waste acids.

Distillations - More than 200 Essmann-Matsumi Concentrators have been installed in the United States and foreign countries.

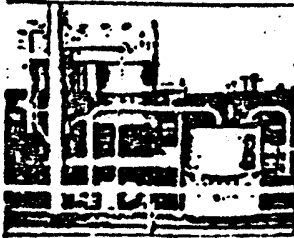
Engineers - National Lead Company has the exclusive rights to build and sell concentrating plants and give licenses for the Essmann-Matsumi Vacuum Process. Inquiries should be directed to National Lead Company, Acid Recovery Department, 111 Broadway, New York 6, New York.



ACID CONCENTRATORS (ALCOHOL PLANT)



ACID CONCENTRATORS (OIL REFINERY)



ACID CONCENTRATORS (SULFURIC PLANT)

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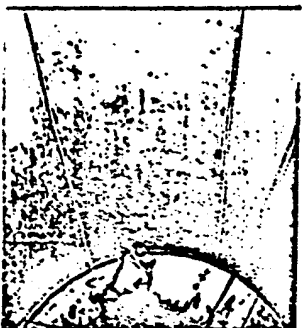
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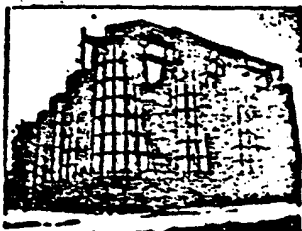
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COTTRELL DUST SEPARATOR



BARRIER OF LEAD-LINED TANK



BALLPACED ACID CHARGE

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 .01137" 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, an reluctance to submit to corrosion; second, its properties of plasticity and malleability; third, an low-sealing point which facilitates "burning" to joint sections; and fourth, its relatively low metal 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 called from "chemical lead," a term used to designate a type of lead produced from southwest Missouri ore. Chemical lead is a practically pure lead, free from bismuth and containing about 50% of copper. The presence of which increases lead's natural corrosion resistance, raises its recrystallization temperature, and increases tensile strength and fatigue strength.

TELLURIDE LEAD SHEET

This sheet is called from primary chemical lead in which has been introduced 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.

ANTIMONYAL LEAD SHEET

This grade of sheet is regular chemical lead with which has been alloyed a certain percentage of antimony. The alloy 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 250° F. The tensile strength of 6% antimonyal lead, at room temperature, is about twice that of chemical lead.

TELLURIDE-ANTIMONYAL LEAD SHEET

This grade of sheet is tellurium lead alloyed with specified percentage 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 long subject to erosion.

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VALLEY

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NLI 114677

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 undersilvered 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 conform to Grade 11 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 5% of antimony, although as high as 10% is sometimes ordered.

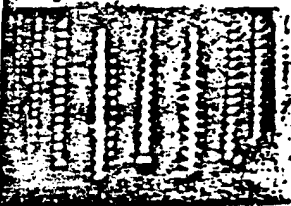
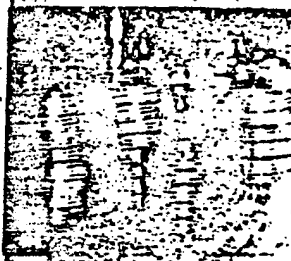
Tellurium-Antimonial Lead Pipe This grade is made from prime chemical lead to which has been added small amounts of both tellurium and antimony.

LEAD PIPE COILS

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



RAID LEAD PIPE COILS



CHROMIUM TELLURIDE LEAD PIPE COILS

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