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NATIONAL LEAD PRODUCTS

FOR THE

CHEMICAL INDUSTRY

"rely on LEAD to resist corrosion"

-f-71-53

142

NATIONAL LEAD COMPANY PRODUCTS

For Handling Corrosive Materials in

CHEMICAL PROCESSING

Lead Sheet

Lead, Lead Lined and Lead Covered Pipe and Coils

Hard Lead and Lead Lined Valves and Fittings

Hard Lead Pumps

Homogeneous Lead Lined Tanks and Vessels

Extruded, Cast, and Machined Lead Products

Acid Recovery Equipment

NATIONAL LEAD COMPANY

General Offices: 111 BROADWAY, NEW YORK 6, N. Y.

J-78-58

NATIONAL SALES and SERVICE

In common with most large chemical processing organizations with whom we do business, National Lead Company maintains sales and service centers in the principal cities of the country. It will expedite matters if all orders and inquiries are addressed, wired or phoned to the office nearest the customer.

BRANCH SALES AND SERVICE OFFICES

Atlanta Branch	National Lead Company, [illegible] St., N.W., Atlanta	[illegible]
Atlantic Branch	National Lead Company, 111 Broadway, New York 6	[illegible]
Baltimore Branch	National Lead Company, [illegible] West [illegible] St., Baltimore 1	[illegible]
Boston Branch	National Lead Company of Mass., [illegible] Albany St., Boston [illegible]	[illegible]
Chicago Branch	National Lead Company, [illegible] West [illegible] St., Chicago [illegible]	[illegible]
	National Lead Company, [illegible] West Fort St., Detroit 16	[illegible]
	National Lead Company, [illegible] North Third St., Milwaukee [illegible]	[illegible]
	National Lead Company, [illegible] West Fairfield Ave., St. Paul [illegible]	[illegible]
Cincinnati Branch	National Lead Company, [illegible] Freeman Ave., Cincinnati [illegible]	[illegible]
	National Lead Company, [illegible] Heyburn Building, Louisville 2	[illegible]
Cleveland Branch	National Lead Company, [illegible] Columbus Road, Cleveland 13	[illegible]
	National Lead Company, [illegible] St., Buffalo [illegible]	[illegible]
	National Lead Company, [illegible] Ave., Pittsburgh 12	[illegible]
Pacific Coast Branch	Morris P. Kirk & Son Inc., [illegible] South [illegible] St., Los Angeles [illegible]	[illegible]
	Morris P. Kirk & Son Inc., [illegible] St., [illegible] 8	[illegible]
	Morris P. Kirk & Son Inc., [illegible] N.W. [illegible] Ave., Portland [illegible]	[illegible]
	Morris P. Kirk & Son Inc., [illegible] Airport Way, Seattle [illegible]	[illegible]
	Morris P. Kirk & Son Inc., [illegible] South Sixth West St., Salt Lake City [illegible]	[illegible]
	Morris P. Kirk & Son Inc., [illegible] North [illegible] Ave., Phoenix	[illegible]
Philadelphia Branch	National Lead Company, [illegible] E. Cumberland Street, Philadelphia [illegible]	[illegible]
St. Louis Branch	National Lead Company, [illegible] Chestnut St., St. Louis [illegible]	[illegible]
	National Lead Company, [illegible] Terminal St., Dallas [illegible]	[illegible]
	National Lead Company, [illegible] West [illegible] St., Kansas City [illegible]	[illegible]
	National Lead Company, [illegible] Tchoupitoulas St., New Orleans [illegible]	[illegible]
	National Lead Company, [illegible] St., Omaha [illegible]	[illegible]
Canada	Canada Metal Company Ltd., [illegible] Fraser Ave., Toronto [illegible]	[illegible]
	Canada Metal Company Ltd., [illegible] Notre Dame St. East, Montreal	[illegible]
	Canada Metal Company Ltd., [illegible] Granville St., Vancouver [illegible], B.C.	[illegible]
	Canada Metal Company Ltd., [illegible] Chambers St., Winnipeg	[illegible]
South America	National Lead Company, S.A.	
	Avenida Presidente Roque Saenz Peña [illegible], Buenos Aires, Argentina	

CONTENTS

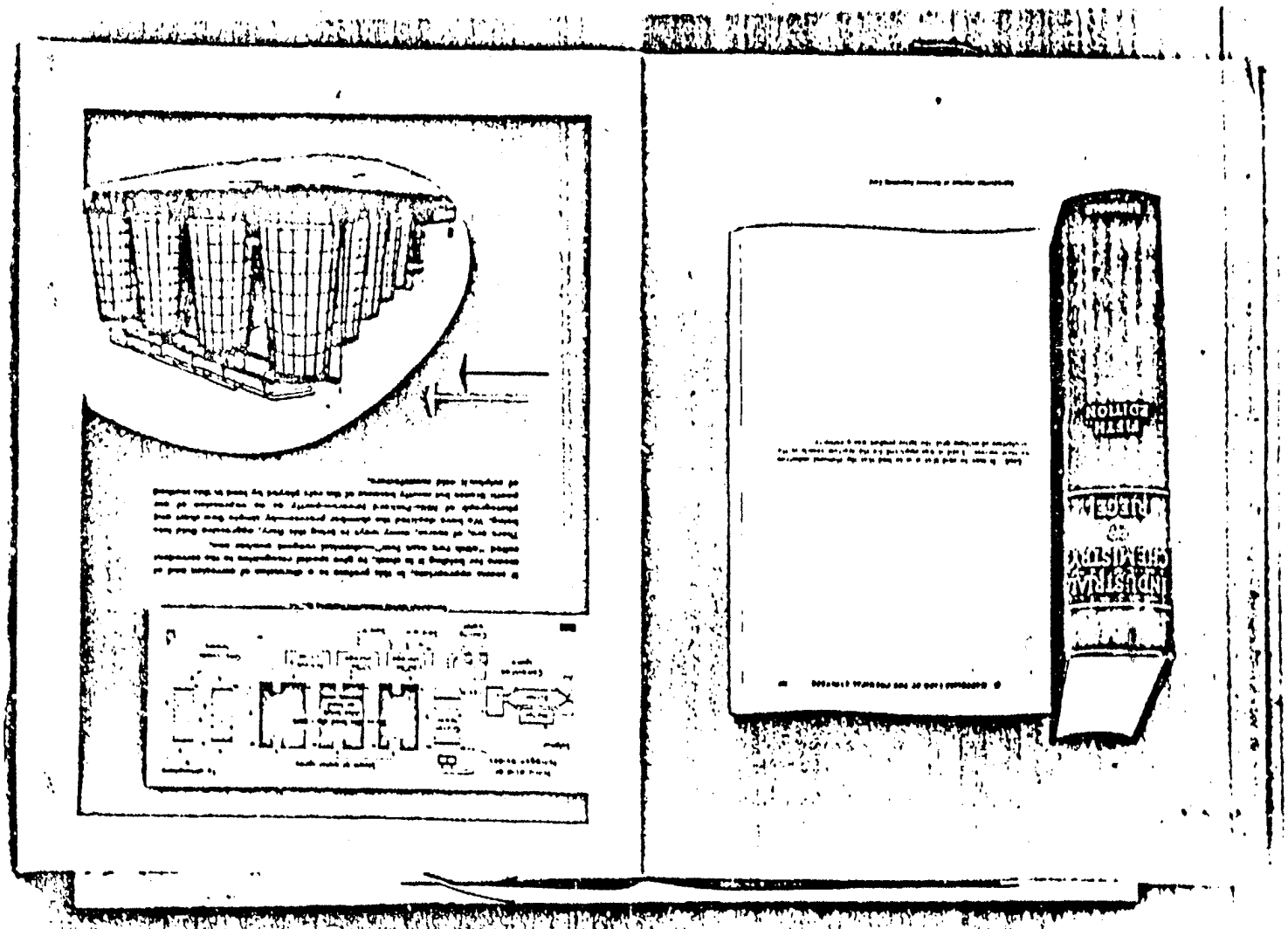
LOOK TO THE LEADER FOR LEAD

The formula for leadership in any industry varies about as often as the leader does. Believe the right goods at the right price at the right time. The pursuit of this policy has earned for National Lead Company leadership in the field of lead products.

As may be seen by a glance at the map on the facing page, the Company maintains a network of plants across the nation, making it possible to meet the demand of time and place. These plants are geared to produce high grade lead goods in the volumes necessary to keep costs down. This makes it possible to meet the demand for top quality at a fair price.

Because of these established facilities and policies National Lead Company is looked upon as a headquarters by the chemical processing industry, from the buyer of a single keel sheet to the purchaser of a complete acid handling system.

NATIONAL LEAD COMPANY



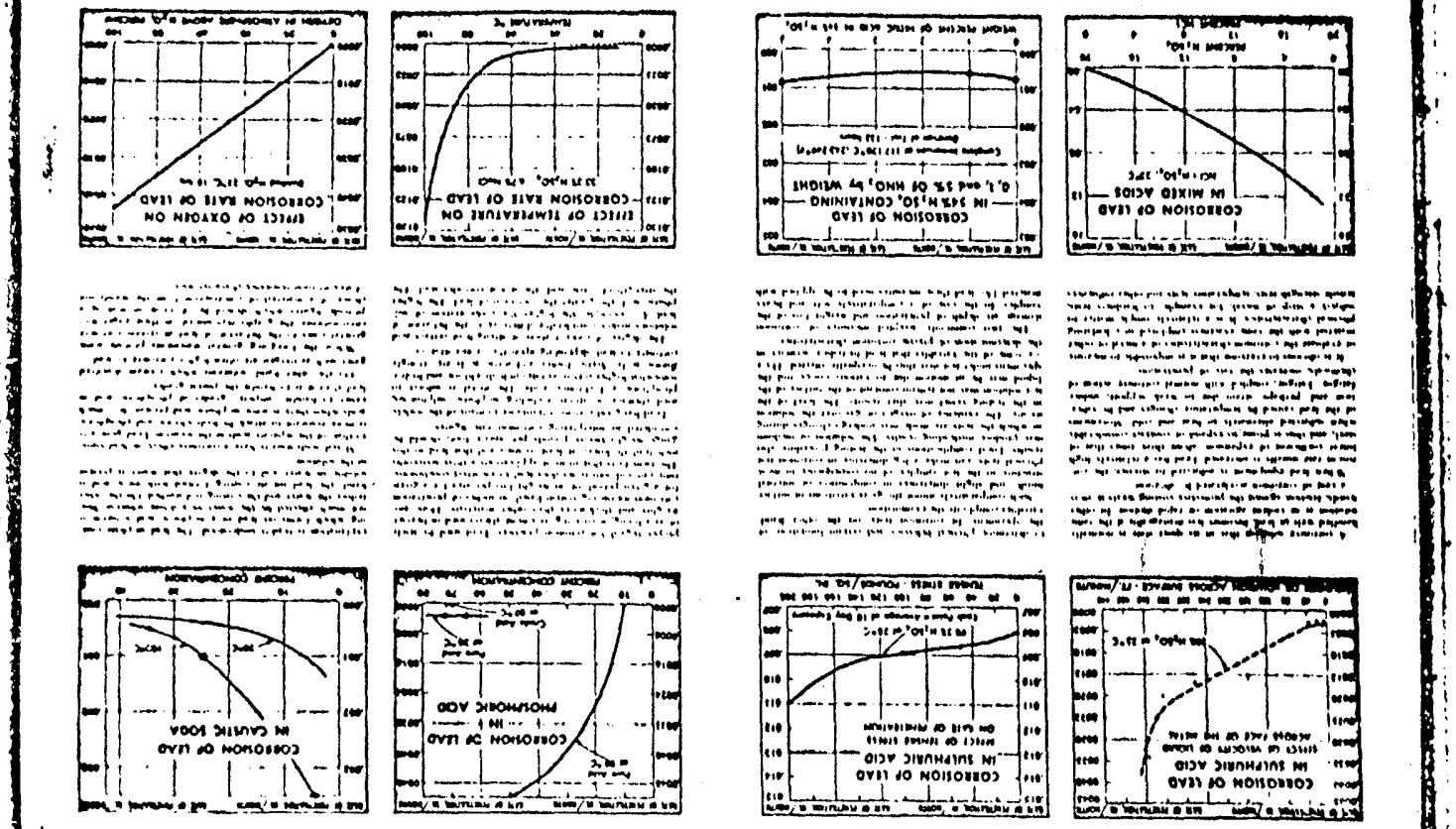
Choosing a Corrosion Resistant Material of Construction

LEAD KEEPS PACE WITH Chemical Progress

1-CORROSION RESISTANCE

EFFECT OF CONCENTRATION ON CORROSION OF LEAD IN SULPHURIC ACID

EFFECT OF TEMPERATURE ON CORROSION OF LEAD IN SULPHURIC ACID



2 - PHYSICAL AND MECHANICAL PROPERTIES

PHYSICAL PROPERTIES

TENSILE STRENGTH AND ELONGATION

CREEP RESISTANCE

HARDNESS

FATIGUE RESISTANCE

3 - AVAILABILITY

4 - COST

Chemicals WITH WHICH LEAD MAY BE USED

Grades of Lead

TYPICAL CHEMICAL ANALYSIS OF CHEMICAL LEAD OF THE GRADE MADE BY NATIONAL LEAD CO.

Lead Sheet

SHEET LEAD SIZES AND WEIGHTS

APPLICATION OF SHEET LEAD LININGS

LOOSE LEAD LININGS

LEAD WELDING OR BURNING

BONDED OR HOMOGENEOUS LININGS

TYPICAL INSTALLATIONS OF HOMOGENEOUS EQUIPMENT

Lead Pipe

CHEMICAL LEAD PIPE

NOMINAL SIZES AND WEIGHTS

Lead Pipe Coils

SPECIFIC GRAVITY DEGREES BAUME TABLE

FOR THREE COMMON ACID SOLUTIONS

PHOSPHORIC ACID			ZINC CHLORIDE			SULPHURIC ACID		
$\%H_3PO_4$	Specific Gravity	°Baumé	$\%ZnCl_2$	Specific Gravity	°Baumé	$\%H_2SO_4$	Specific Gravity	°Baumé
1	1.0038	0.6	2	1.0167	2.4	1	1.0051	0.7
10	1.0532	7.3	10	1.0819	11.0	10	1.0661	9.0
20	1.1134	14.8	20	1.1866	22.8	20	1.1394	17.7
30	1.1805	22.2	30	1.2928	32.8	30	1.2185	26.0
40	1.254	29.4	40	1.4173	42.7	40	1.3028	33.7
50	1.335	36.4	50	1.5681	52.5	50	1.3951	41.1
60	1.426	43.3	60	1.749	62.1	60	1.4983	48.2
70	1.526	50.0	70	1.962	71.1	70	1.6105	55.0
80	1.633	56.2				80	1.7272	61.1
90	1.746	62.0				90	1.8144	65.1
100	1.870	67.5				97	1.8364	66.0
						100	1.8305	65.8

Approximate Boiling Points of H_2SO_4 at Atmospheric Pressure

50 °Bé—295F	63 °Bé—432 F
60 °Bé—386 F	64 °Bé—451 F
61 °Bé—400 F	65 °Bé—485 F
62 °Bé—415 F	66 °Bé—538 F

TEMPERATURE CONVERSION

To convert from	To	Substitute in Formula
Degrees Centigrade	Degrees Fahrenheit	(°C. × 9/5) + 32
Degrees Centigrade	Degrees Absolute	(°C. + 273.18)
Degrees Centigrade	Degrees Reaumur	(°C. × 4/5)
Degrees Fahrenheit	Degrees Centigrade	(°F. − 32) × 5/9
Degrees Fahrenheit	Degrees Reaumur	(°F. − 32) × 4/9
Degrees Reaumur	Degrees Centigrade	(°Reaumur × 5/4)
Degrees Reaumur	Degrees Fahrenheit	(°Reaumur × 9/4) + 32

COMPARISON OF BAUME SCALE AND SPECIFIC GRAVITY

LIQUIDS HEAVIER THAN WATER[1]

Degrees Baumé	Specific Gravity	Pounds Per Gallon
0	1.000	8.328
5	1.036	8.625
10	1.074	8.945
15	1.115	9.289
20	1.160	9.660
25	1.208	10.063
30	1.261	10.501
35	1.318	10.978
40	1.381	11.501
45	1.450	12.076
50	1.526	12.711
55	1.611	13.417
60	1.706	14.207
65	1.813	15.094
66	1.835	15.285

[1]Degrees Baumé $= 145 - \frac{145}{\text{sp. gr.}}$

ENGINEERING DATA

LEAD PIPE FOR HEATING COILS

Inside Diameter of Pipe in Inches	Wall Thickness in Inches	Outside Diameter in Inches	Weight per Ft. lbs.	Sq. Ft. Outside Surface Area per 100 Ft. Length	Maximum Steam Pressure Lbs. per Sq. In.	Corresponding Temperature in °F
3/4	1/8	1	1.69	26.18	30	274
3/4	3/16	1 1/8	2.72	29.48	40	287
3/4	1/4	1 1/4	3.87	32.73	50	298
1	3/16	1 3/8	3.44	36.01	30	274
1	1/4	1 1/2	4.83	39.28	40	287
1	5/16	1 5/8	6.34	42.81	50	298
1 1/4	3/16	1 5/8	4.17	42.81	30	274
1 1/4	5/16	1 7/8	7.54	49.12	40	287
1 1/4	3/8	2	9.42	52.36	50	298

HEATING COIL FORMULA

For Calculating Length of Lead Pipe Needed for Heating Solutions—Time 1 Hour

$$\text{Mean temperature difference °F.} = \frac{(T-T_1)-(T-T_2)}{2.3 \log_{10} \frac{(T-T_1)}{(T-T_2)}}$$

where T = Temperature of steam or heating medium in °F.

T_1 = Initial temperature of solution in °F.

T_2 = Final temperature of solution in °F.

$$\text{Length of pipe required} = \frac{V \times W \times (T_2-T_1) \times Sp \times 12}{H \times M \times D \times 3.1416}$$

where V = Volume of solution in gallons

W = Weight of solution in lbs. per gal.

T_2 = Temperature to which solution is to be heated in °F.

T_1 = Initial temperature of solution in °F.

Sp = Specific heat of solution.

H = Heat transfer in B.t.u./sq. ft./°F./hr. Varies from 50 to 150. See note below.

M = Mean temperature difference °F.

D = Outside diameter of lead pipe in inches

NOTE: H varies with the outside film conductivity of solution, the inside film conductivity of heating medium, the lead pipe wall thickness, the agitation outside the coil, and the speed of flow inside the coil. For a thorough consideration of heat transfer problems, consult engineering books on the subject.

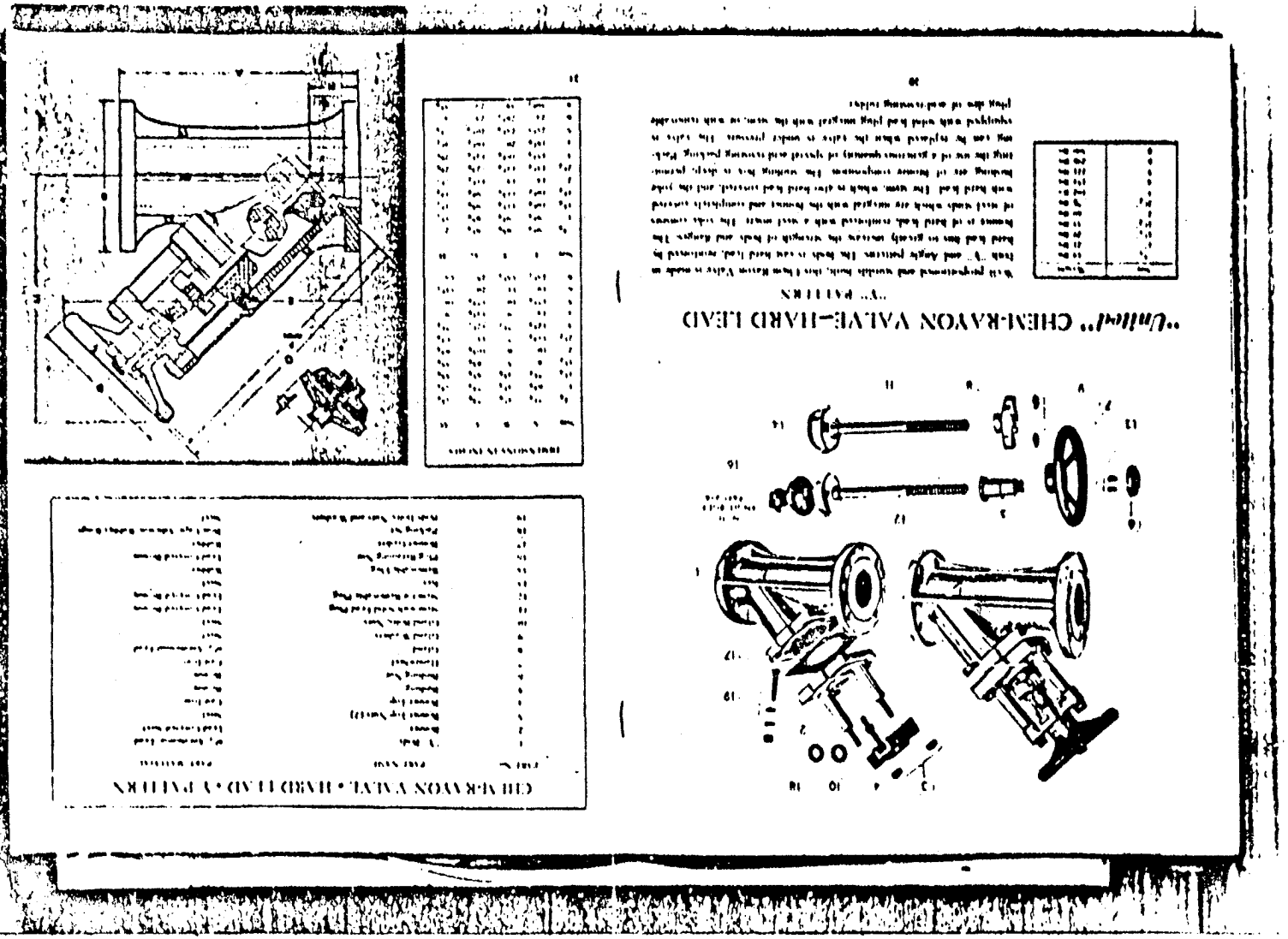
ACID HANDLING

Valves · Fittings · Pumps · Lined Pipe

ENGINEERING DATA

SAFE WORKING PRESSURES

FEET OF PIPE REQUIRED TO HEAT AQUEOUS SOLUTIONS



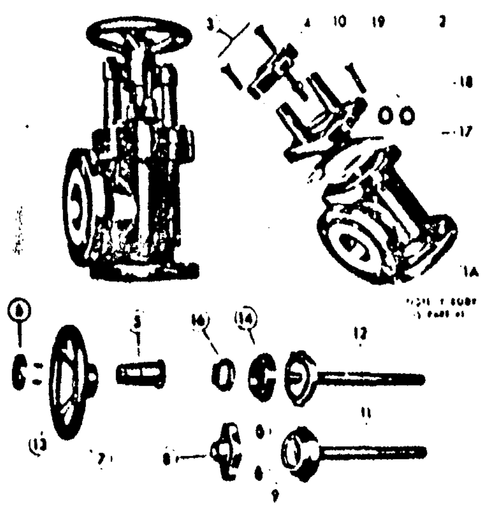
CHEM-RAYON VALVE • HARD LEAD • ANGLE PATTERN

"United" CHEM-RAYON VALVE—HARD LEAD

ANGLE PATTERN

TYPE C VALVE • LEAD LINED • PATTERN

"United" TYPE C VALVE—LEAD LINED



"United" TYPE C VALVE—LEAD LINED

ANGLE PATTERN

Size	Weight
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

This pattern of the Type C Valve has the same details of construction as the "Y" pattern except, of course, for the shape of the body. Both Type C valves are engineered to combine the acid resistance of lead with the strength of iron or steel. Operation is simple and action positive. Continuous lead facing on flanges insures maximum lead-to-lead contact when bolted to flanged pipe or fittings.

TYPE C VALVE • LEAD LINED • ANGLE PATTERN

PART No.	PART NAME	PART MATERIAL
1A	Angle Body	Cast Iron or Steel Lead Lined
2	Bonnet	Cast Iron or Steel Lead Lined
3	Bonnet Top Cap Screws	Steel
4	Bonnet Top	Cast Iron
5	Bushing	Bronze
6	Bushing Nut	Bronze
7	Handwheel	Cast Iron
8	Gland	[illegible] Antimonial Lead
9	Gland Washers	Steel
10	Gland Bolts Nuts	Steel
11	Stem with Solid Lead Plug	Lead Covered Bronze
12	Stem for Removable Plug	Lead Covered Bronze
13	Key	Steel
14	Removable Plug	Rubber
16	Plug Retaining Nut	Lead Covered Bronze
17	Bonnet Gasket	Rubber
18	Packing	[illegible]
19	Body Cap Screws	Steel

DIMENSIONS IN INCHES

Size	A	B	C	D	E
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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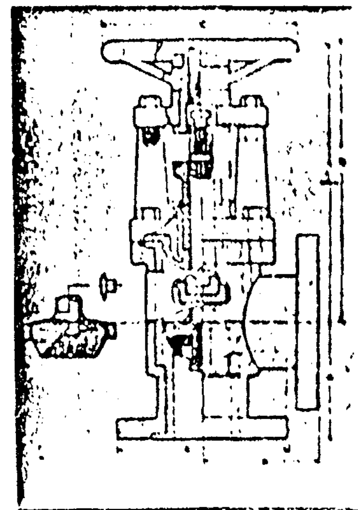

"Apollo" TYPE D CHECK VALVE—HARD LEAD

TYPE D CHECK VALVE
HARD LEAD

"Unlined" DIAPHRAGM VALVE
LEAD LINED or HARD LEAD

"United" Lead Lined Pipe

Corrosion Resistant Die Castings

"United"
FLANGED FITTINGS
HARD LEAD and LEAD LINED

Acid Recovery

SIMONSON-MANTIUS VACUUM PROCESS

INDEX

Lead for Radiation Protection

PRODUCTS OF NATIONAL LEAD COMPANY

METAL DIVISION