

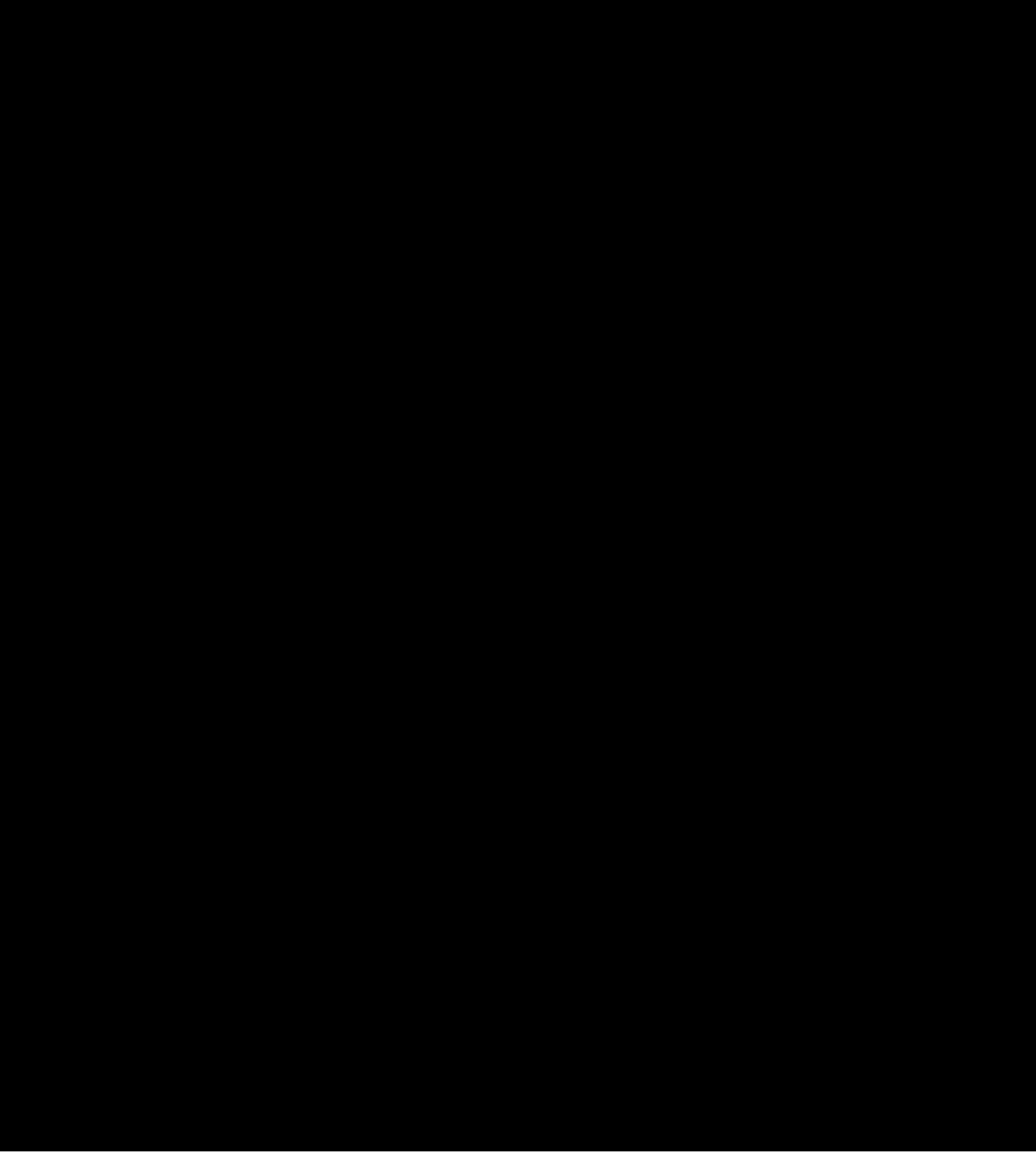
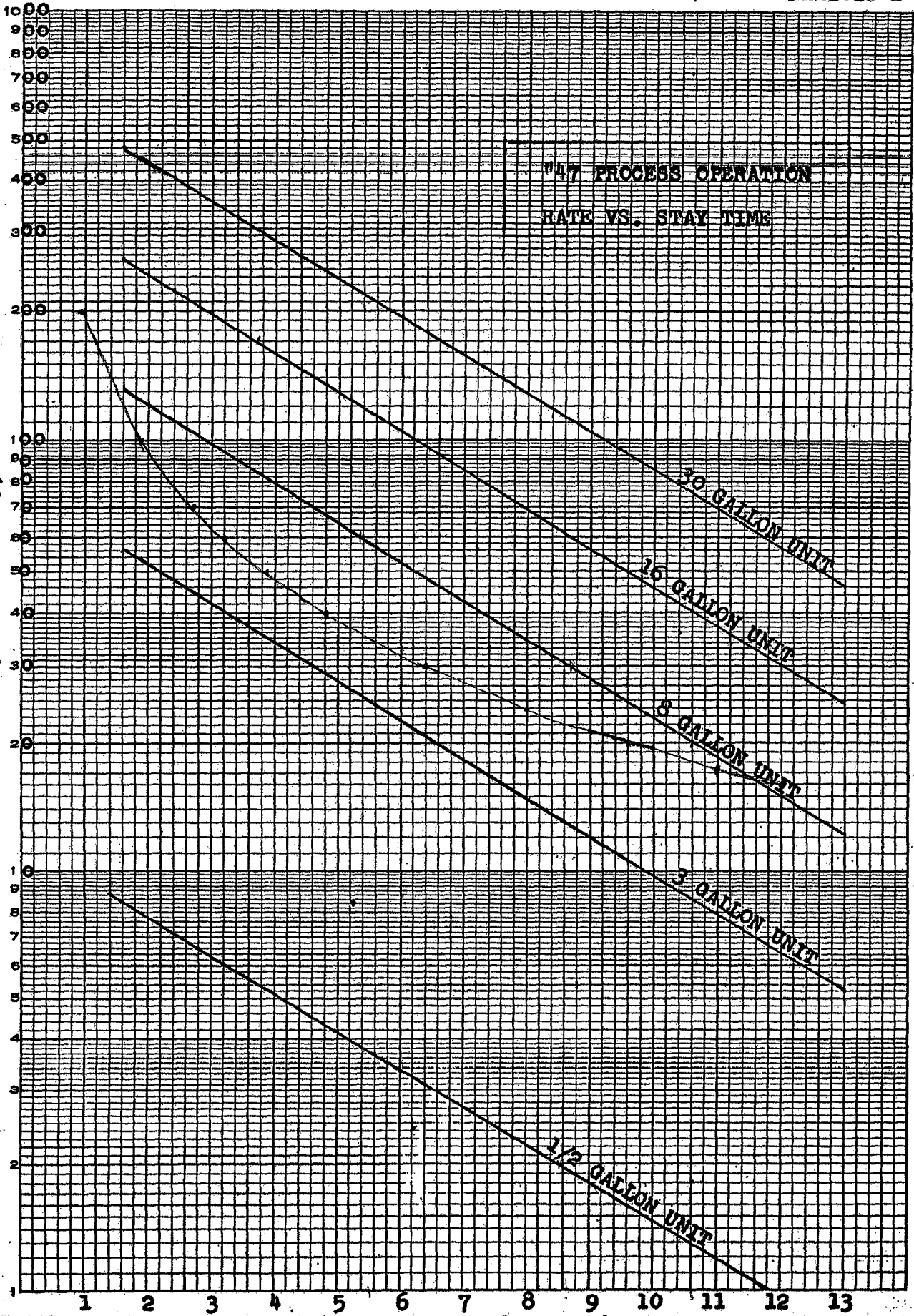


EXHIBIT E

MADE IN U.S.A.

SEMI-LOGARITHMIC—3 CYCLES X 70 DIVISIONS

GRINDING RATE (GALS. PER HR.)



TITLE OF PROJECT

CONVERSION CHART 8 GAL $\rightarrow$ $\frac{1}{2}$ GAL "47 PROL"

PROJECT NO.

WORK NO.

CIVIL ENGINEER

FAG

DATE 11-10-64

19

8 GAL UNIT		1/2 GAL UNIT							8 GAL UNIT	
GPH	GPH	SEC QT	SEC "9 OZ CUP"	SEC 1/2 PINT	SEC "4 OZ CUP"	SEC 100 ML	MIN GAL	GPH	GPH	
25	1.6	563	158	141	66	57	37.5	25		
30	1.9	474	133	118	56	48	31.6	30		
40	2.6	346	97	87	41	35	23.1	40		
50	3.2	281	79	70	33	28.5	18.8	50		
60	3.8	237	67	59	28	24	15.8	60		
90	5.8	155	44	39	18	15.7	10.3	90		
110	7.2	125	35	31	14.5		8.4	110		
125	8.1	111	31	28			7.4	125		
140	9.0	100	28				6.7	140		
150	9.6	94					6.4	150		

① THE ABOVE CHART CONVERTS 8 GAL "47 PROL" RATES INTO $\frac{1}{2}$ GAL "47 PROL" RATES & TIME TO

FILL A GIVEN CONTAINER

② SAMPLE

30 GPH $\cdot$ 8 GAL UNIT = 1.9 GPH $\cdot$ $\frac{1}{2}$ GAL UNIT = 474 SEC = 7.9 SEC = 13.3 SEC = 118.1 MIN

Philadelphia Plant
March 6, 1957

CONFIDENTIAL

J. S. ALLEN
D-8030
WILMINGTON

DUPONT
MARSHALL LABORATORY
LIBRARY

REFERENCE COPY

"47 PROCESS"
EQUIPMENT SPECIFICATIONS REVISIONS
PROCESS ENGINEERING

NOT FOR CIRCULATION

Over the past year several problems associated with the fabrication and operation of bottom feed "47 Process" equipment, have been brought to our attention. Solutions to these discrepancies have been worked out at various field installations, as well as in the Philadelphia Shop, the Tucker Plant and in the Process Engineering Pilot Plant. The attached revised and new copies of the specifications represent the latest knowledge available. These pages should immediately be incorporated in your specification booklets and the superceded copies destroyed. Also you will find attached, revised copies of the engineering drawings PM-11017 and PM-11018 dated 2/28/57 that supercede drawings of the same number dated 4/11/56 which are to be destroyed.

The only major revision shown in these changes is the inclusion of a feed check valve in the bottom plate to prevent sand back flow and start up difficulties. All existing "47 Process" bottom feed units should be equipped with this check valve feature. Contact T. F. Hobbs of the Philadelphia Plant to coordinate fabrication of all valves at one location, so that design will be standard and cost/unit minimized. All other modifications shown in these revisions should be incorporated in new equipment construction while existing installations may be revised as deemed advantageous.

A copy of the Tucker Plant Operating Instructions has also been attached to show an optional method of piping from the premix tanks when they are located below the "47 Process" vessel. It is advisable to refer to this write-up when laying out a piping diagram or outlining operating instructions even if the premix tanks are overhead, as it offers some pertinent suggestions.

PROCESS ENGINEERING
C. F. KALB, MANAGER

John Nikolich

BY: JOHN NIKOLICH

JN:tes

CONFIDENTIAL

Philadelphia No. P-21

E. I. DU PONT DE NEMOURS & COMPANY, INC.
FABRICS AND FINISHES DEPARTMENT
FINISHES DIVISION

APRIL - 1956

"47 PROCESS" EQUIPMENT SPECIFICATIONS

(Prepared by J. Nikolich)

A supplement to Philadelphia Process and Methods Group Report P-1 dated August, 1952, entitled, "47 Process" Development. Supercedes report of same title dated February, 1955.

PHILADELPHIA PROCESS AND METHODS GROUP

ABSTRACT

A compilation of up-to-date specifications for bottom feed, top discharge "47 Process" units. Specifications are systematically numbered for indexing and accounting purposes in order that revisions can be quickly disseminated and included. Material costs are estimated and certain specifications are discussed.

(Distribution list at the end of report)

TABLE OF CONTENTS

- I. DISCUSSION
- II. EQUIPMENT INSTALLATION COST ESTIMATE
- III. SPECIFICATION INDEX
- IV. EFFECTIVE SPECIFICATIONS IN NUMERICAL ORDER
- V. DISTRIBUTION LIST

"47 PROCESS" EQUIPMENT SPECIFICATIONS

I. DISCUSSION

This report is an up-to-date outline of the "47 Process" design specifications and operating "know-how" and is to be used in conjunction with engineering drawings PM-11017 and PM-11018 for purposes of fabrication, installation and operation of "47 Process" equipment. It should be noted that the report has been issued in loose leaf form to facilitate insertion of new or revised specification issues.

Information on suppliers contained in III Effective Specifications, may pertain to one of many available sources and should be altered to suit the individual needs of a particular installation.

The Equipment and Installation Cost Estimate (II) represents approximate cost figures derived from units installed at Philadelphia and Atlanta. These figures have been adjusted to reflect single rather than quantity purchases, but do not include any estimate for dismantling and rearrangement of existing facilities.

II. EQUIPMENT INSTALLATION COST ESTIMATE

ITEM	LABOR	MATERIAL (MILL)		
		30 GAL.	16 GAL.	8 GAL.
Installation of specification				
Item (as per IV Effective Specs)				
Premixers (2 - 500 Gal.Size)	\$ 740	\$4,160	\$4,160	\$4,160
Grinder Drive	430	1,580	1,215	965
Vessels	120	425	375	340
Pumps and Piping	320	970	970	970
Control (see Labor below)	-	495	425	425
Media	-	15	10	5
Drain Pan	30	15	10	5
Conduit, Wire, Condulets and wiring (Approx.100 Ft.Run)	800	200	180	160
Pipe and fittings for cooling water and drain lines	120	60	60	60
Structural iron to carry vessel, drive and pumps	350	180	180	140
Painting	120	20	20	20
Grounding	80	40	40	40
Miscellaneous	200	50	50	50
TOTALS	\$3,310	\$8,210	\$7,695	\$7,340
GRAND TOTALS		11,520	11,005	10,650

III. SPECIFICATION INDEX

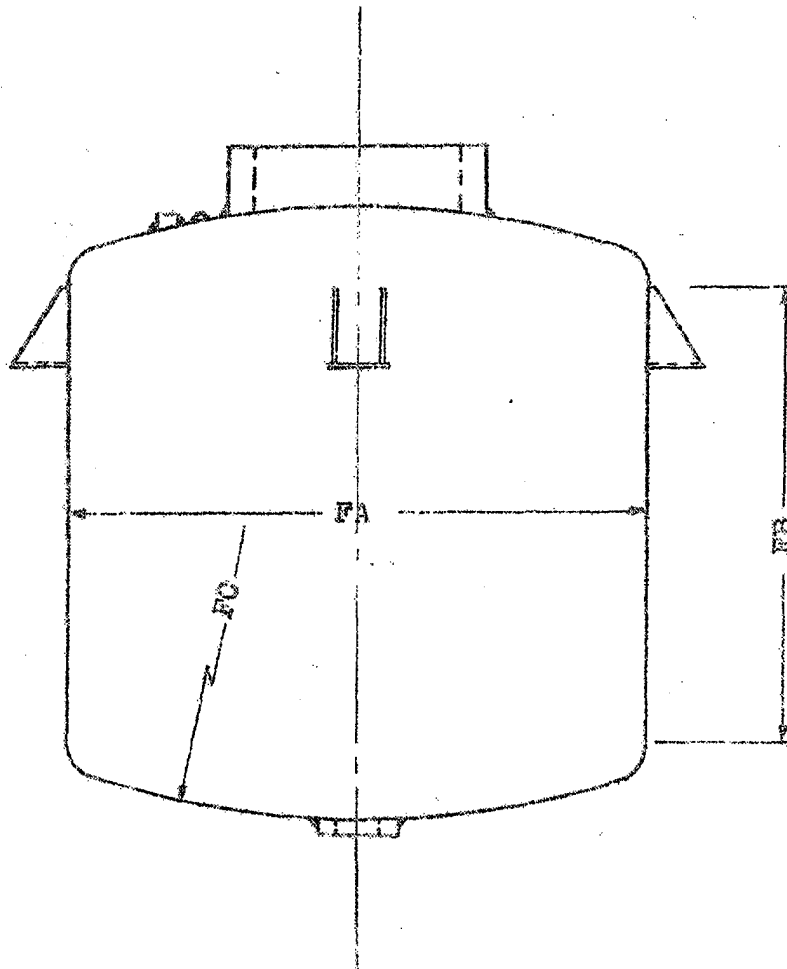
<u>No.</u>	<u>Classification</u>	<u>Spec.No.</u>	<u>Item</u>	<u>Page No.</u>
I	Pre-Mixers	I-A	Tanks	(1)
		I-B	Agitator	(2)
		I-C	Drive	(3)
		I-D	Flush Bottom Valve	(4)
II	Grinder	II-A	Motor	(5)
		II-B	Agitator	(6)
		II-C	Coupling	(7)
		II-D	Discs	(8)
		II-E	Stabilizer	(9)
III	Vessels	III-A	Vessel	(10)
		III-B	Pfaudler Nozzle	(11)
		III-C	Bottom Plate	(12)
		III-D	Discharge Screen	(13)
		III-E	Hopper	(14)
		III-F	Spillway Extension	(15)
		III-G	Fume Guards	(16)
IV	Materials Flow	IV-A	Pumps	(17)
		IV-B	Piping	(18)
		IV-C	Operating Instructions	(19-23)
V	Control	V-A	Electrical Functions	(24)
		V-B	Electrical Wiring Diagram	(25)
		V-C	Equipment Specifications	(26)
		V-D	Hopper Level Control	(27)
VI	Media	VI-A	Sand Charge	(28)
VII	Sand Unloading	VII-A	Drain Pan	(29)
		VII-B	Procedure	(30)

IV. EFFECTIVE SPECIFICATIONS IN NUMERICAL ORDER

DESCRIPTION: All welded standard duPont mixer with flanged bottom outlet CA steel shell and standard dished heads.

SPECIFICATION NO. I-A
 DATE OF ISSUE 4-4-56
 CLASSIFICATION PREMIXERS
 ITEM TANKS
 REMARKS

ENGR. DRAWING NO.	TANK SIZE	DIMENSIONS			EST. COST
		FA	FB	FC	
W-178894	165	3'6"	2'6"	3'6"	\$550.
W-97506	500	4'6"	5'	4'6"	\$650.
W-94550	1000	6'3"	5'	6'	\$850.



SUPPLIER: BETHLEHEM STEEL CO.

DESCRIPTION: Fast pigment blending "47 Process" premix agitator. This unit is to be used as standard for all new installations and, where practical, as a replacement for existing blades.

SPECIFICATION NO. I-B

DATE OF ISSUE 4-4-56

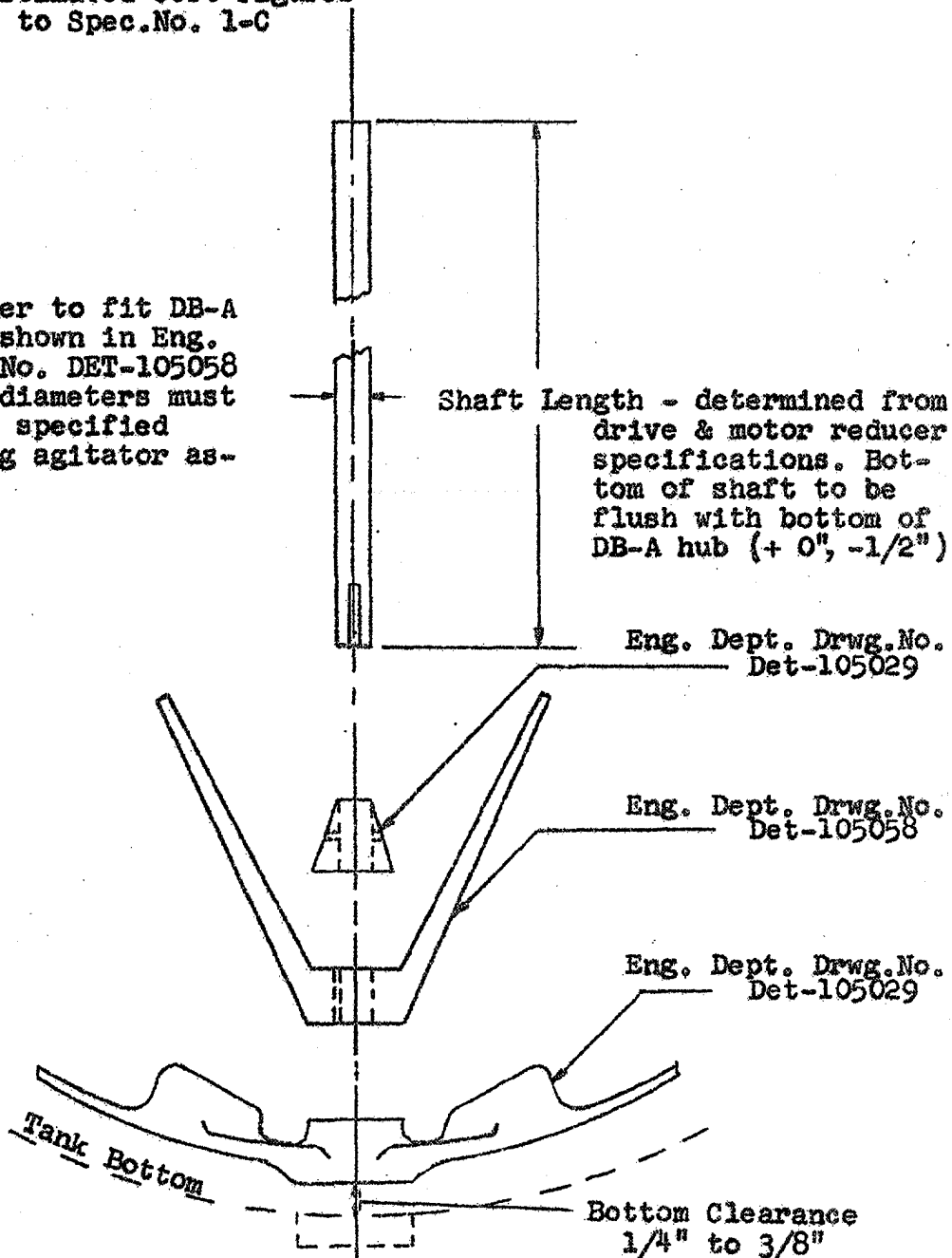
CLASSIFICATION PREMIXERS

ITEM AGITATOR

REMARKS

NOTE: For estimated cost figures refer to Spec.No. 1-C

Shaft diameter to fit DB-A hub bore as shown in Eng. Dept. Drwg. No. DET-105058. Other shaft diameters must be carefully specified when ordering agitator assemblies.



SUPPLIER: PHILA. GEAR WORKS
PHILADELPHIA 34, PA.

DESCRIPTION: Drive assembly for
"47PProcess" premixers.
Specifications are
shown in table below.

SPECIFICATION NO. I-C

DATE OF ISSUE 4-4-56

CLASSIFICATION PREMIXERS

ITEM DRIVE

REMARKS

AGITATOR ASSEMBLY:

Tank Size (Gals)	Tank I.D. (In.)	Sidewall Height (Ft. - In.)	DB-I Blade	DB-A Blade	Cap.	Est. Cost
165	42	2 - 6	*105029-A	*105058-A	*105029-H	\$120.
500	54	5 - 0	105029-B	105058-C	105029-K	145.
1000	75	5 - 0	105029-C	105058-D	105029-L	200.

* Component numbers refer to Engineering Dept. Drawings
DET 105029 - 105058, Revised 2/2/56.

DRIVE ASSEMBLY:

Tank Size (Gals)	Phila. Gear Unit Size No.	HP	**RPM	Est. Cost (With Shaft)
165	2224 VS	3	150	\$650.00
500	2284 VD	7.5	125	1025.00
1000	2326 VD	15	95	1490.00

** RPM tolerance $\pm$ 6 RPM

NOTE: For odd size tanks it will be necessary
to refer to Philadelphia Process and
Methods Group report on P-38 Mixer
Agitation or directly to the Philadelphia
P & M Group.

SUPPLIER: THE Wm. POWELL CO.
CINN. OHIO

DESCRIPTION: 3" Powell valve Fig.
2310 flush bottom
cast carbon steel
tank valve with
valve flanges faced
and drilled for std
6" pipe flange.

SPECIFICATION NO. I-D

DATE OF ISSUE 4-4-56

CLASSIFICATION PREMIXERS

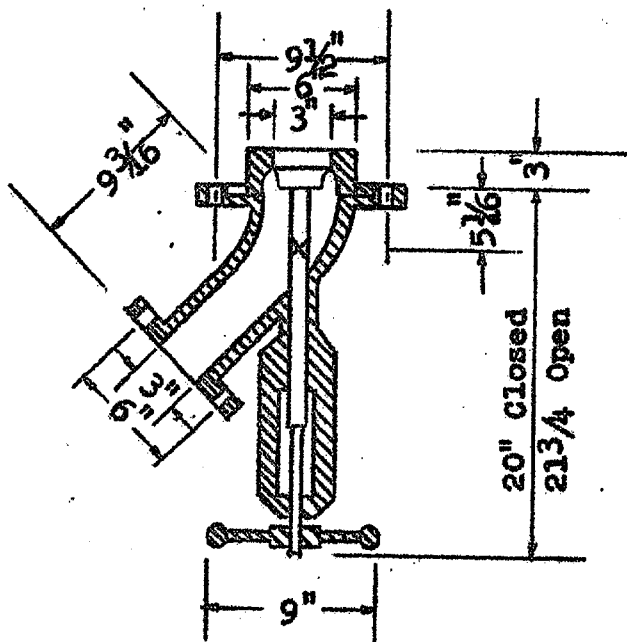
ITEM FLUSH BOTTOM VALVE

REMARKS

NOTE: For remaining piping specifications and
diagram see specification No. IV-B

3" flush bottom valve used for all three
(165, 500 and 1000 Gal.) tank sizes

EST. COST \$260.00



SUPPLIER: ALLIS-CHALMERS

SPECIFICATION NO II-A

DATE OF ISSUE 4-4-56

CLASSIFICATION GRINDER DRIVE

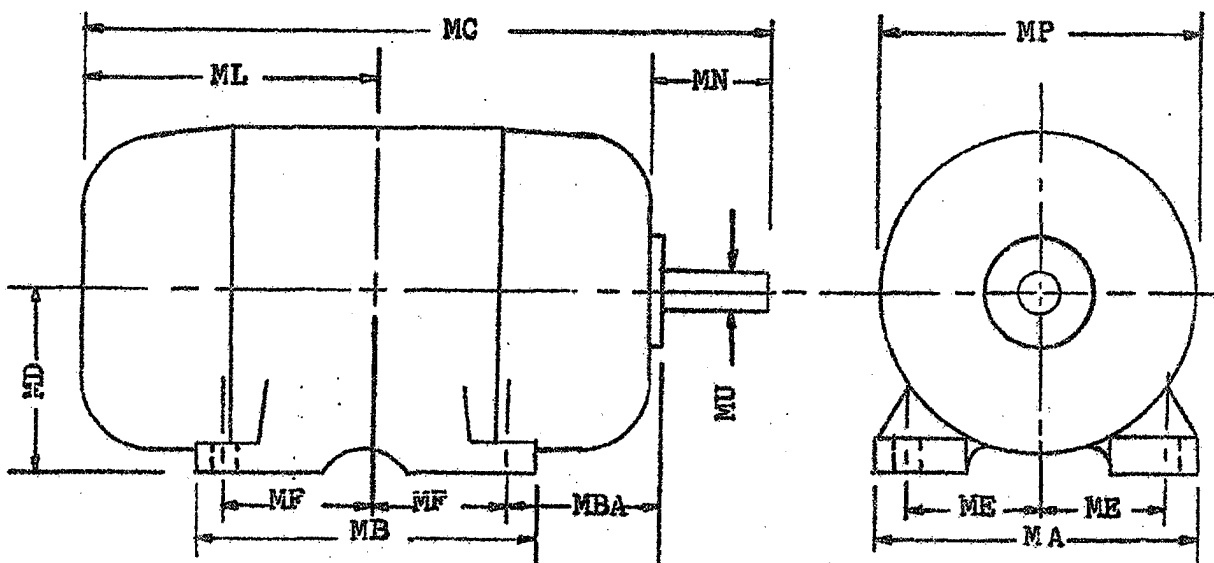
ITEM MOTOR

REMARKS

DESCRIPTION: High starting torque class 1, Group D Explosion proof squirrel cage induction motor for vertical wall mounting with shaft down.

MILL	HP	RPM	FRAME	DIMENSIONS							
				MA	MB	MC	MD	ME	MF	ML	MU
30	30	900	444	21 $\frac{1}{2}$	17 $\frac{1}{2}$	39 $\frac{5}{8}$	11	9	7 $\frac{1}{4}$	17 $\frac{3}{4}$	2.375
16	20	900	404	19 $\frac{1}{2}$	15 $\frac{1}{4}$	34 $\frac{3}{8}$	10	8	6 $\frac{1}{8}$	15 $\frac{1}{4}$	2.125
8	15	1200	364	17 $\frac{1}{2}$	14	31 $\frac{1}{8}$	9	7	5 $\frac{5}{8}$	14	1.875

MILL	DIMENSIONS			EST. COST
	MN	MP	MBA	
30	7 $\frac{5}{8}$	23 $\frac{3}{4}$	7 $\frac{1}{2}$	1,200
16	6 $\frac{5}{8}$	20 $\frac{5}{8}$	6 $\frac{5}{8}$	800
8	5 $\frac{7}{8}$	19	5 $\frac{7}{8}$	550



DESCRIPTION: Agitator consists of centerless ground and polished steel shaft, 11 discs (Spec. II-D) and 1 stabilizer pulley (Spec. II-E).

Agitator to be statically balanced during assembly and dynamically balanced only if excessive vibration results.

SPECIFICATION NO. II-B

DATE OF ISSUE 4-4-56

CLASSIFICATION GRINDER DRIVE

ITEM AGITATOR

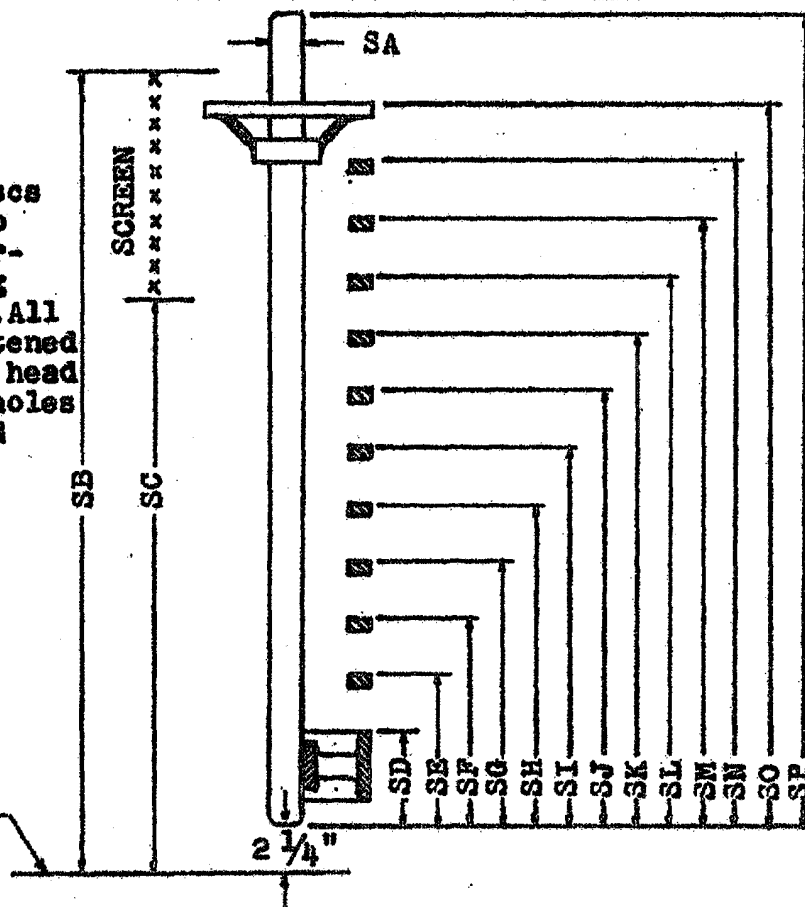
REMARKS REVISED 3/1/57

MILL	DIMENSIONS - INCHES																SHAFT EST. COST
	SA	SB	SC	SD	SE	SF	SG	SH	SI	SJ	SK	SL	SM	SN	SO	SP	
30	2 $\frac{3}{8}$	60 $\frac{1}{2}$	41 $\frac{1}{2}$	8 $\frac{3}{4}$	13 $\frac{3}{4}$	18 $\frac{1}{4}$	22 $\frac{3}{4}$	27 $\frac{1}{4}$	31 $\frac{3}{4}$	35 $\frac{1}{4}$	40 $\frac{3}{4}$	44 $\frac{3}{4}$	47 $\frac{3}{8}$	50	52 $\frac{5}{8}$	63 $\frac{3}{4}$	\$40.
16	2 $\frac{1}{8}$	50 $\frac{1}{2}$	36 $\frac{1}{2}$	6 $\frac{3}{4}$	11 $\frac{1}{8}$	14 $\frac{5}{8}$	18 $\frac{1}{8}$	21 $\frac{5}{8}$	25 $\frac{5}{8}$	28 $\frac{5}{8}$	32 $\frac{1}{8}$	35 $\frac{5}{8}$	38	40 $\frac{3}{8}$	42 $\frac{3}{4}$	53 $\frac{3}{8}$	40.
8	1 $\frac{5}{8}$	40 $\frac{1}{2}$	28 $\frac{1}{2}$	4 $\frac{3}{4}$	8 $\frac{1}{4}$	10 $\frac{3}{4}$	13 $\frac{1}{2}$	16 $\frac{1}{4}$	19	21 $\frac{3}{4}$	24 $\frac{1}{2}$	27 $\frac{1}{4}$	29 $\frac{1}{4}$	31 $\frac{1}{4}$	33 $\frac{1}{4}$	42 $\frac{5}{8}$	40.

DISC AND STABILIZER ARRANGEMENT

Note: Bottom 3 discs to be spotted to shaft by counter-sinking full dog type set screws. All discs to be fastened by double Allen head set screws and holes filled with lead wool.

Reference Line
Bottom of vessel
flange.



SUPPLIER: PHILADELPHIA GEAR CO.
PHILADELPHIA, PA.

DESCRIPTION: Phillie Gear Steel
flanged male and
female type coupling.

SPECIFICATION NO..... II-C

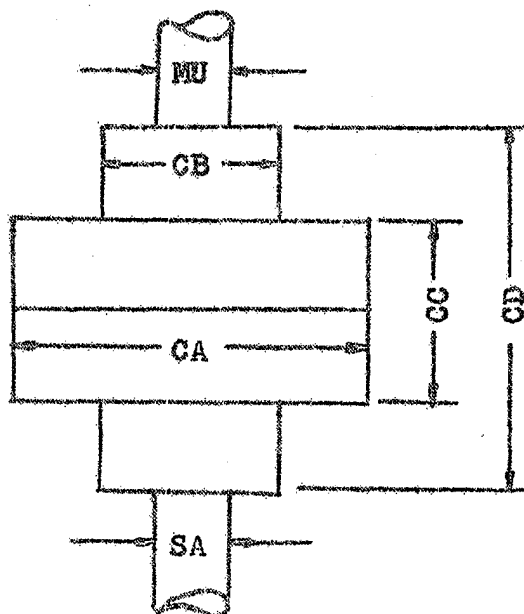
DATE OF ISSUE 4-4-56

CLASSIFICATION ... GRINDER DRIVE

ITEM COUPLING

REMARKS

MILL	PHILA. GEAR SIZE NO.	DIMENSIONS							EST. COST
		MU	SA	CA	CB	CC	CD	KEY	
30	2535	2 3/8	2 3/8	9	4 5/8	3 1/2	7 1/2	5/8 x 5/8	\$62.00
16	2534	2 1/8	2 1/8	8 1/4	4 1/4	3 1/8	6 3/4	1/2 x 1/2	48.00
8	2532	1 7/8	1 5/8	6 1/2	3 1/4	2 3/4	5 1/4	3/8 x 3/8	43.00



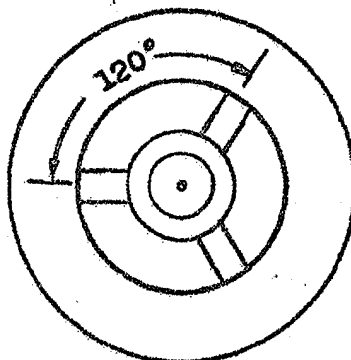
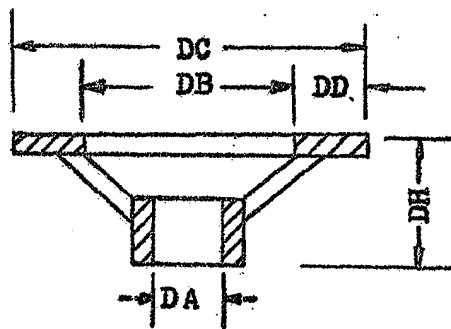
SUPPLIER: AMERICAN BRAKE SHOE CO.
 10 MT. READ BLVD.
 ROCHESTER, N. Y.
 (CASTINGS)
 A. B. LANDIS SONS, INC.
 IVY HILL RD. & QUEEN ST.
 CHESTNUT HILL
 PHILADELPHIA, PA.
 (MACHINING)

SPECIFICATION NO. II-D
 DATE OF ISSUE 4-4-56
 CLASSIFICATION ... GRINDER DRIVE
 ITEM DISC
 REMARKS

DESCRIPTION: High chrome iron
 cast slotted discs
 (10 req'd).
 (Bores $\pm .002"$ $-.000"$)

NOTE: Plants may order discs from Philadelphia Plant

MILL	DIMENSIONS					EST. COST
	DA	DB	DC	DD	DH	
8	1 $\frac{3}{8}$	4	6 $\frac{1}{2}$	1 $\frac{1}{4}$	2 $\frac{3}{4}$	\$32.00
16	2 $\frac{1}{8}$	5 $\frac{1}{4}$	8 $\frac{1}{4}$	1 $\frac{1}{2}$	3 $\frac{3}{8}$	31.00
30	2 $\frac{3}{8}$	6 $\frac{1}{4}$	10	1 $\frac{7}{8}$	4	25.00



For complete dimensions
 refer to Dwg. No. PM 11018

SUPPLIER: T. B. WOODS SONS
CHAMBERSBURG, PA.

DESCRIPTION: Solid Cast Iron
flat belt pulley
with spokes and
flat face

SPECIFICATION NO..... II-E

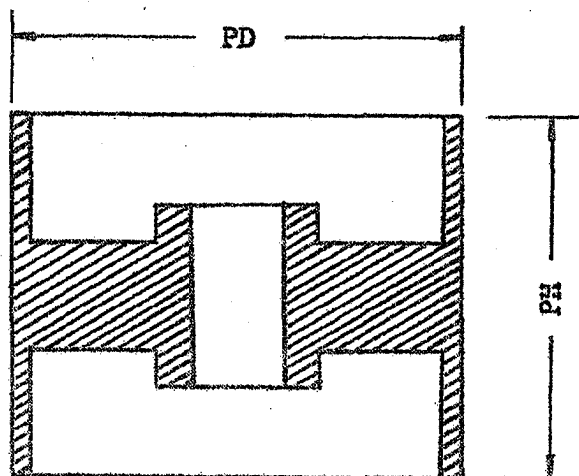
DATE OF ISSUE 4-4-56

CLASSIFICATION ... GRINDER DRIVE

ITEM STABILIZER

REMARKS

SIZE	DIMENSIONS		EST. COST
	PD	PH	
8	6	4	\$12.00
16	8	6	17.00
30	10	8	27.00



SUPPLIER: W. H. THOMSON & CO.
3613 POWELTON AVE.
PHILADELPHIA 4, PA.

DESCRIPTION: Bottom feed top
discharge vessel
of seamless tube
construction

SPECIFICATION NO. III-A

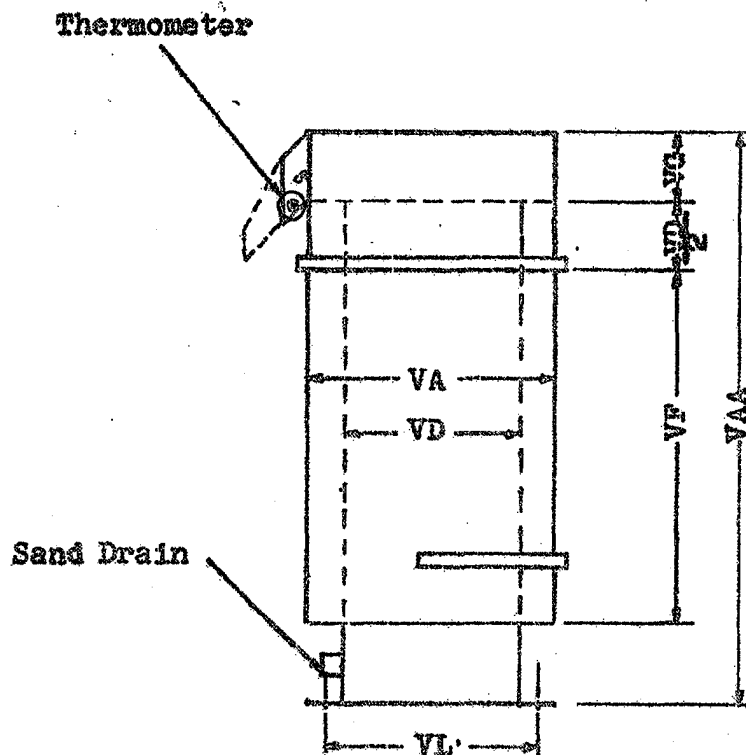
DATE OF ISSUE 4-4-56

CLASSIFICATION VESSELS

ITEM VESSEL

REMARKS: REVISED 3/1/57

MILL	Dimensions						EST. COST
	VA	VAA	VL	VD	VF	VG	
30	20	50 $\frac{1}{2}$	13 $\frac{3}{4}$	12	33	6	\$210.00
16	18	41 $\frac{1}{2}$	11 $\frac{3}{4}$	10	26	5	170.00
8	14	32 $\frac{1}{2}$	9 $\frac{3}{4}$	8	19	4	150.00



For complete dimensions
refer to Dwg. No. PM 11018

SUPPLIER: PFAUDLER CO.
ROCHESTER 3, N. Y.

DESCRIPTION: 1" Pfaudler agit-
ating nozzle with
3/8" throat, for
all size units.
Dwg. No. 130001

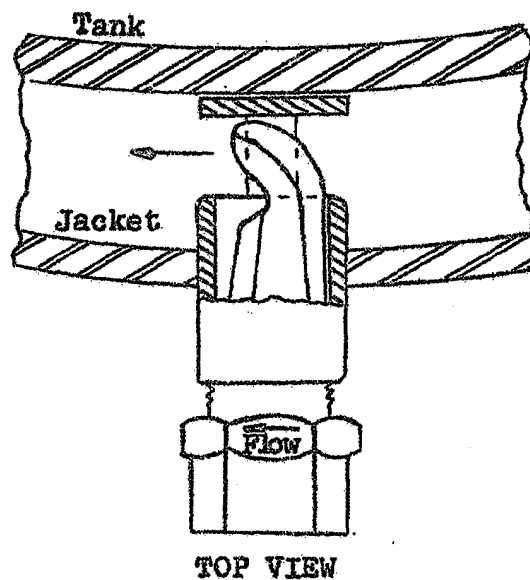
SPECIFICATION NO. III-B

DATE OF ISSUE 4-4-56

CLASSIFICATIONVESSELS

ITEM PFAUDLER NOZZLE

REMARKS



SUPPLIER: (Currently the feed check valves are being made at the Phila. Shop to pool fabrication at one location.)

DESCRIPTION: Removable bottom plate with integral spring loaded check valve. Premix is fed to unit through check valve which prevents backflow of sand. Solvent can be removed through screened drain port.

SPECIFICATION NO. III-C

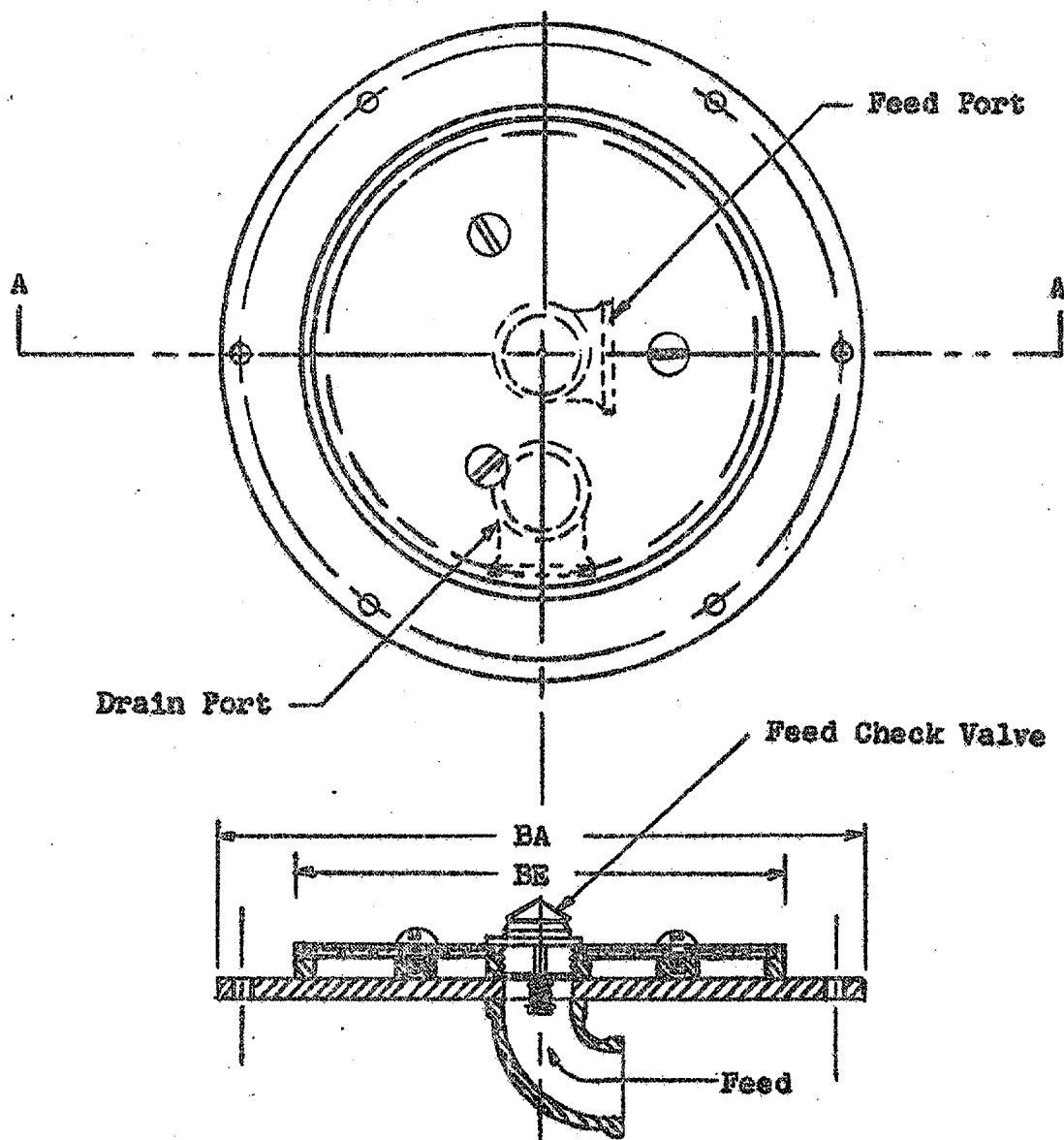
DATE OF ISSUE 4-4-56

CLASSIFICATION VESSELS

ITEM BOTTOM PLATE

REMARKS REVISED - 3-1-57

MILL	DIMENSION		EST. COST
	BA	BE	
30	14 3/4	10	\$75.
16	12 3/4	8	50.
8	10 3/4	7	50.



For complete dimensions refer to Dwg. No. PM-11018.

SECTION AA

SUPPLIER: PYRAMID SCREEN CO.

45 RADNOR RD.
BRIGHTON 35, MASS.

DESCRIPTION: Type No. 20/5;
Letter S Electrolytic plate
slotted venturi openings
0.0138" x 0.140"; Code 55-82
Alternate - 35 mesh S/S screen
cut on bias 0.015" wire dia.,
0.0136" holes

SPECIFICATION NO. III-D

DATE OF ISSUE 4-4-56

CLASSIFICATION VESSELS

ITEM DISCHARGE SCREEN

REMARKS REV. 3-1-57

191 Harvard St
Brookline 4c
Boston Massachusetts

MILL	DIMENSIONS				EST. COST:
	VE	VD	VO	VQ	
30	16	12	14 $\frac{7}{8}$	14	\$75.00
16	14	10	12 $\frac{7}{8}$	12	66.00
8	12	8	10 $\frac{7}{8}$	10	60.00

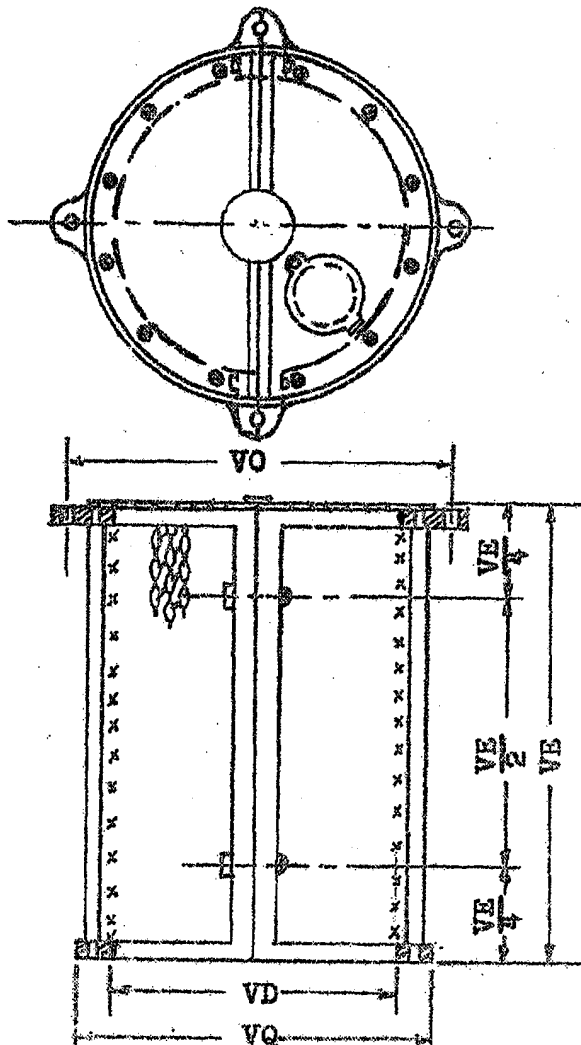
NOTE: When ordering plate
purchase by sheets cut to
size with slots vertical
(parallel to VE dimension
respectively)

30 Gal. - 16" x 19"
16 Gal. - 14" x 16"
8 Gal. - 12" x 13"

2 required per screen

Screen inside of frame
and soldered all around

For complete dimensions
refer to Dwg.No. PM-11018



DESCRIPTION: Sheet metal hopper with basket insert containing S/S 35 mesh wire screen - 0.015" wire size; 0.0136" holes.

Note: Plugged hopper screen will result in operation of float switch to shut off pumps and drive. This condition may be caused by vessel overflow or a screen break.

SPECIFICATION NO. III-E

DATE OF ISSUE 4-4-56

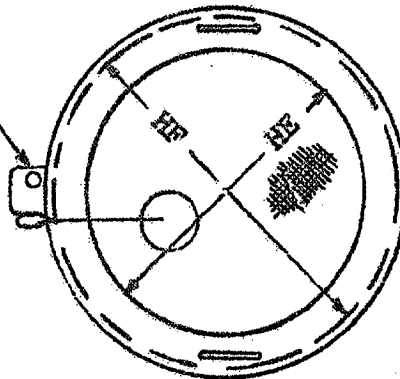
CLASSIFICATION VESSELS

ITEM HOPPER

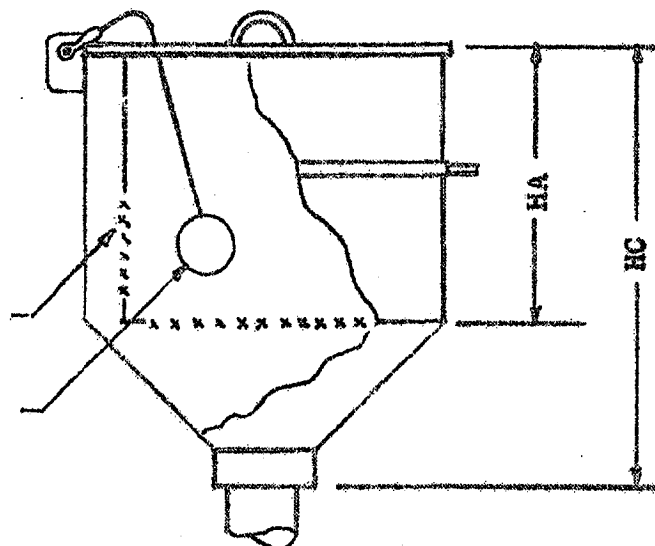
REMARKS REVISED 3/1/57

MILL	DIMENSIONS				EST. COST
	HA	HE	HC	HF	
30	12	14 ⁵ / ₈	17	15 ³ / ₄	\$60.00
16	10	11 ⁵ / ₈	14	12 ¹ / ₄	60.00
8	8	9 ⁵ / ₈	11	10 ¹ / ₄	60.00

Micro Switch
(Spec. V-D)



Screen
4"
Float
Ball



For complete dimensions
refer to Dwg. No. PM 11018

DESCRIPTION: Sheet metal spill-way extension - detachable to allow removal of hopper basket.

SPECIFICATION NO. III-F

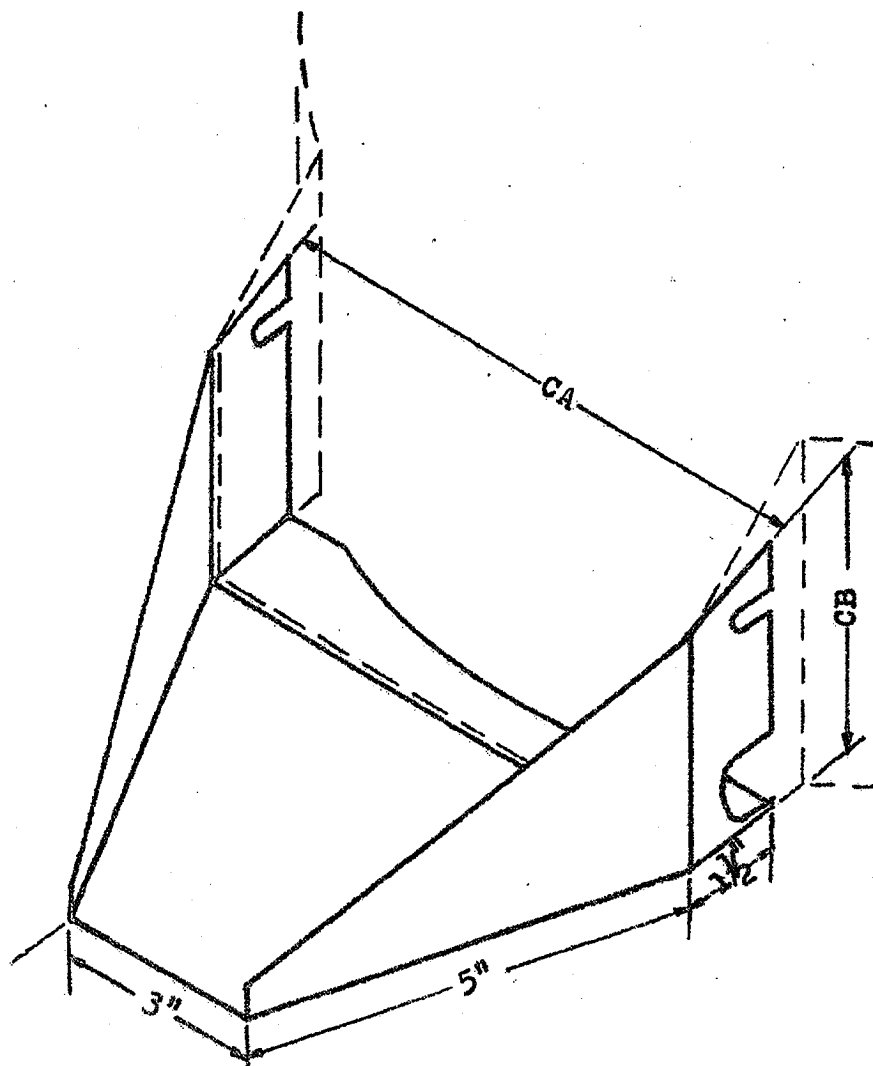
DATE OF ISSUE 4-4-56

CLASSIFICATION VESSELS

ITEM SPILL WAY EXTENSION

REMARKS

MILL	Dimension		EST. COST
	CA	CB	
30	10 $\frac{1}{4}$	5	7.00
16	8 $\frac{1}{4}$	4	7.00
8	6 $\frac{1}{4}$	3	7.00



For complete dimensions refer to Dwg.No.PM 11018

DESCRIPTION: Sheet metal fume guards which reduce rate of dry on discharge screens and prevent batted sand particles from leaving unit.

SPECIFICATION NO. III-C

DATE OF ISSUE 4-4-56

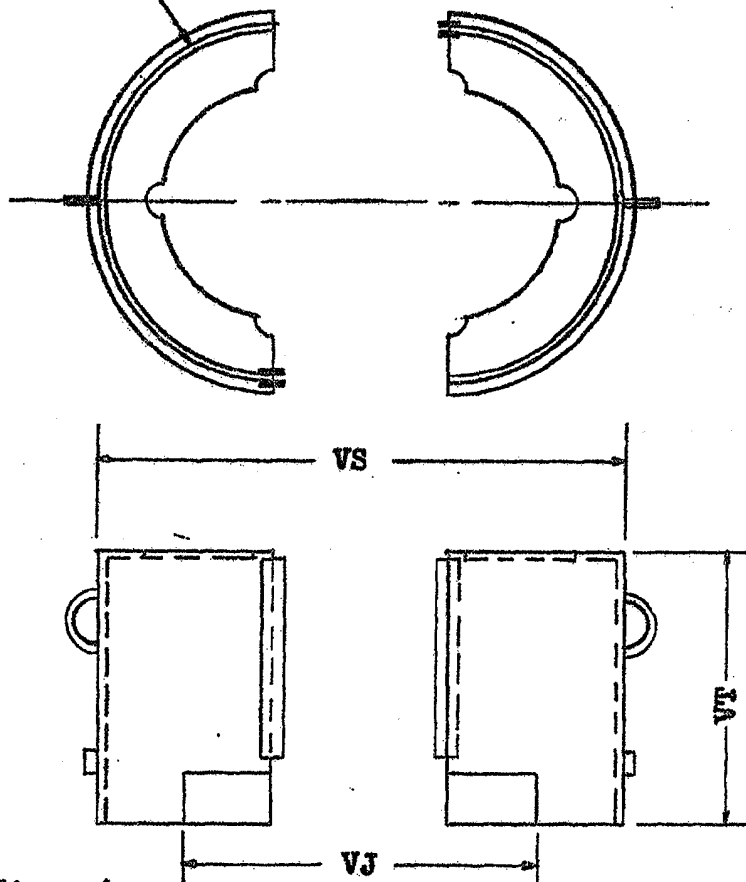
CLASSIFICATION VESSELS

ITEM FUME GUARDS

REMARKS REVISED 3/1/57

MILL	DIMENSIONS			EST COST
	VJ	VS	VT	
30	10	19 $\frac{1}{2}$	11	\$18.00
16	8	17 $\frac{1}{2}$	10	18.00
8	6	13 $\frac{1}{2}$	9	18.00

18 gage sheet steel



For complete dimensions refer to Dwg.No.PM 11018

SUPPLIER: U.S. ELECTRICAL
MOTORS INC.
Millford, Conn.

VIKING PUMP CO.
Cedar Falls, Iowa

DESCRIPTION: 1-1/2 HP, type VEV-
GW, frame 13-224-10, assembly
F-5, angle drive & pumps are
specified below.

SPECIFICATION NO. IV-A

DATE OF ISSUE 4-4-56

CLASSIFICATION .. MATERIALS FLOW

ITEM PUMPS

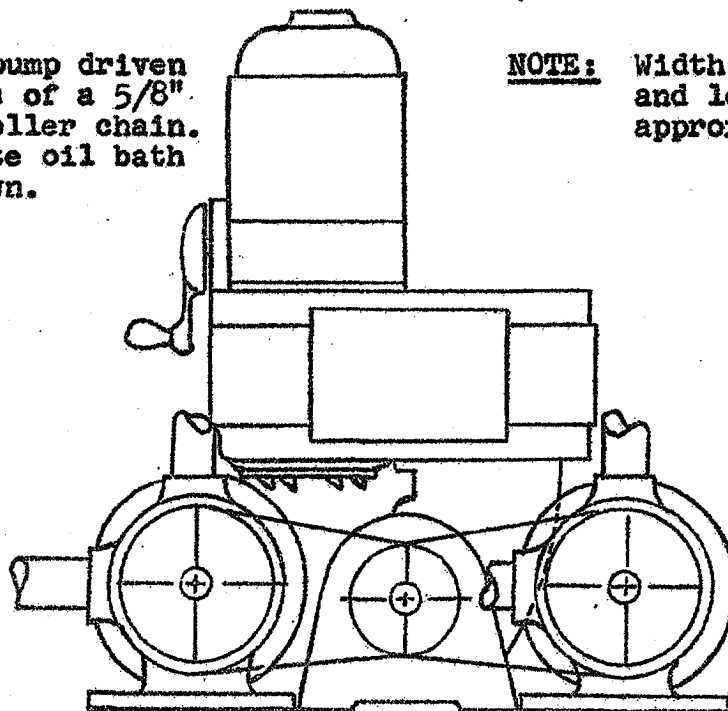
REMARKS

NOTE: Selection of a combination depends on type products to be
ground as well as unit size. Suggested examples are shown below.

Comb No.	Use	GPH		PUMP Model	GPH/RPM	#Teeth in 5/8" Pitch Sprocket		RPM	
		Min.	Max.			Driver	Driven	Min.	Max.
1	Product	104	737	K124	5.25	21	48	45	320
	Premix	84	599	"	"	17	48	45	320
2	Product	90	640	J124	2.66	24	32	45	320
	Premix	71	507	"	"	19	32	45	320
3	Product	70	498	"	"	21	36	45	320
	Premix	57	403	"	"	17	36	45	320
4	Product	52	373	"	"	21	48	45	320
	Premix	43	303	"	"	17	48	45	320
5	Product	34	244	HL124	.9	27	32	45	320
	Premix	28	199	"	"	22	32	45	320
6	Product	18	126	"	"	21	48	45	320
	Premix	14	102	"	"	17	48	45	320
7	Product	10	73	"	"	21	36	19	138
	Premix	8	59	"	"	17	36	19	138

NOTE: Each pump driven
by means of a 5/8"
pitch roller chain.
Requisite oil bath
not shown.

NOTE: Width of assembly
and length of pump
approx. 19 inches.



DESCRIPTION: Feed and take-away
piping system

SPECIFICATION NO. IV-3

DATE OF ISSUE 4-4-56

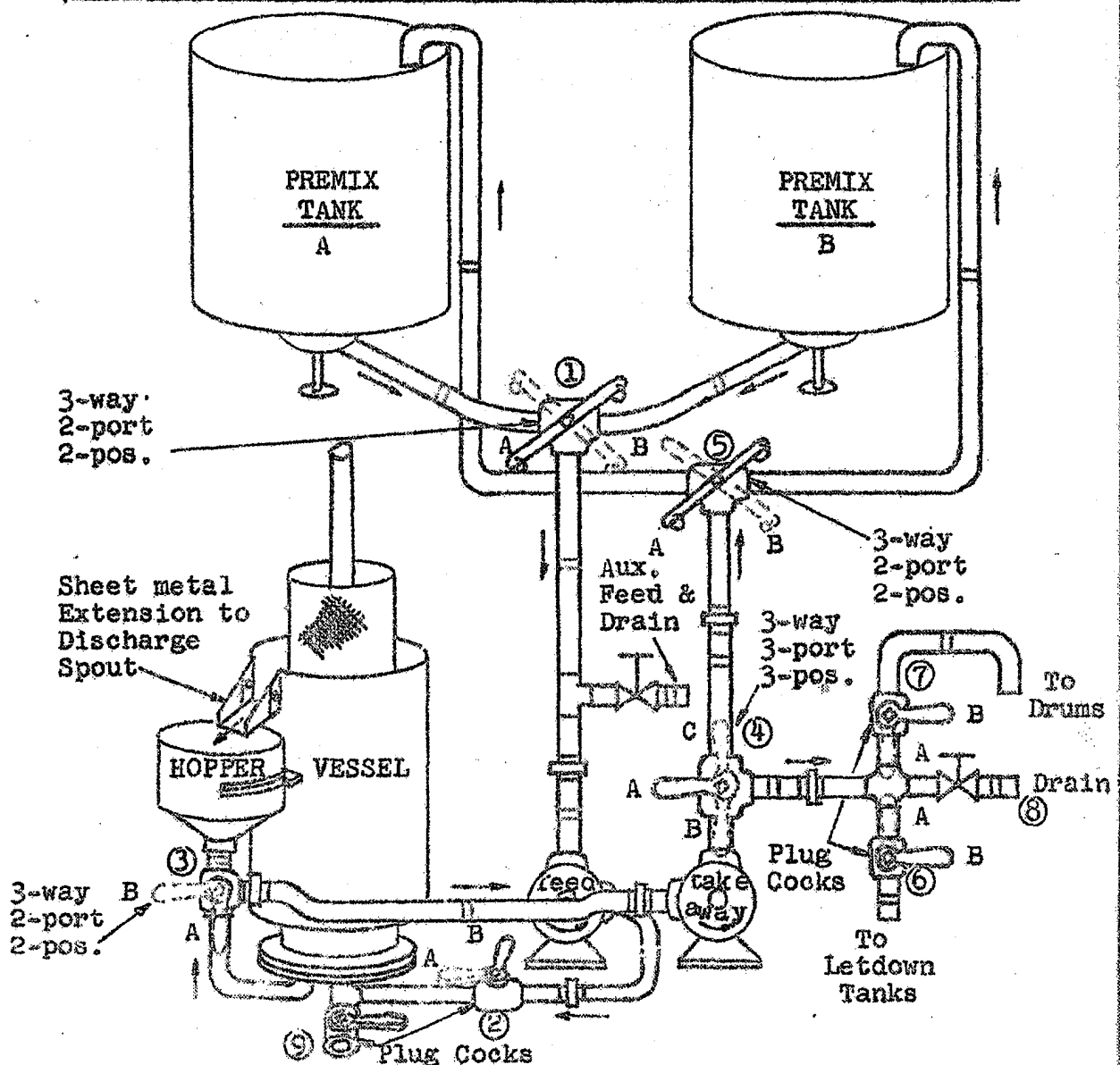
CLASSIFICATION ... MATERIALS FLOW

ITEM PIPING

REMARKS

NOTE: Walworth threaded three
way valves fig's. B-1730,
B-1731-sizes to be same
as pipe size.

FUNCTION OF PIPELINE	COLOR CODE	MILL		
		30	16	8
Premix and ground base suction	---	2	2	1 1/2
Premix pressure and bottom suction	---	1 1/4	1 1/4	1 1/4
Ground base pressure	==	1 1/2	1 1/2	1 1/4



SPECIFICATION NO IV-0
 DATE OF ISSUE 4-4-56
 CLASSIFICATION... MATERIALS FLOW
 ITEM OPERATING INSTRUCTIONS
 REMARKS PAGE 1 OF 5

I. INTRODUCTION:

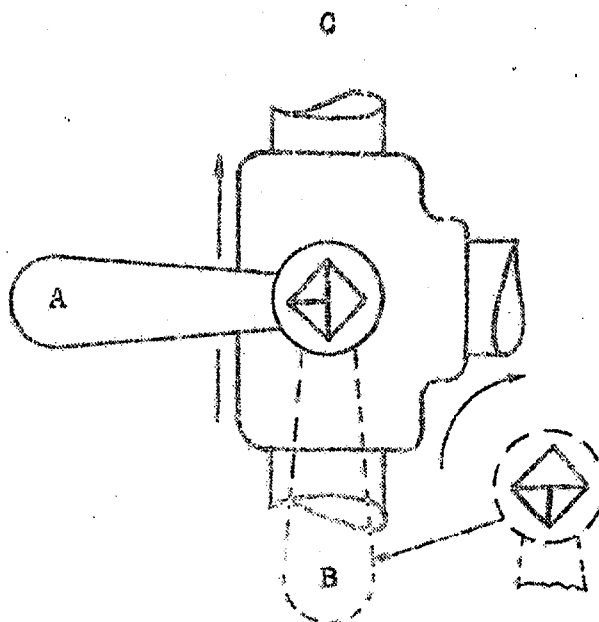
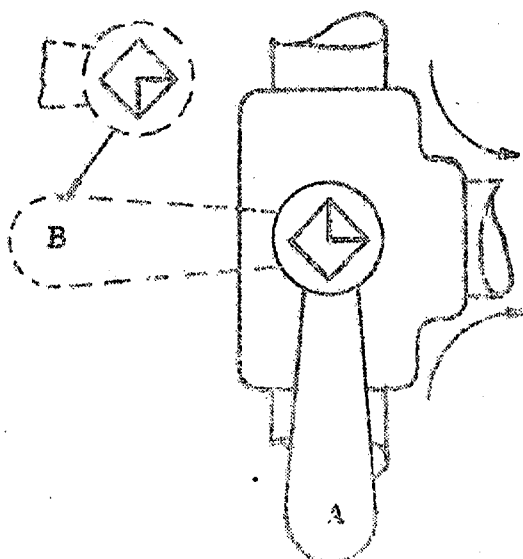
The following list of operating instructions are the basic manipulations necessary for making a complete production run (including wash cycle) starting with the grinding vessel full of moist (solvent wet) sand. Modifications for other conditions i.e. a new sand load, are included under Section III, Special Operating Instructions.

For simplification purposes, we will adopt the following valve nomenclature system:

Valve #1-A denotes valve #1 in the "A" position. The direction of the valve handle for the plug cocks will indicate whether they are open or closed (open when parallel to line, closed when perpendicular to the line). Valves #1 and #5 are lettered corresponding to the premix tank letters, valve position "A" going to tank A. The flow directions through the remaining three-way valves are shown in the sketches below.

③
 3-way
 2-port
 2-position

④
 3-way
 3-port
 3-position



SPECIFICATION NO. IV-C
DATE OF ISSUE 4-4-56
CLASSIFICATION ... MATERIALS FLOW
ITEM OPERATING INSTRUCTIONS
REMARKS PAGE 2 OF 5

II. NORMAL OPERATING INSTRUCTIONS:

1. Following completion of the premix cycle, set valve: #1-A and open flush bottom valve on Tank A.
2. Set valves: #3-A; #4-A; and #5-A.
3. Then set valve #2-A and start feed pump immediately with high setting on vari-drive. Turn the agitator on and off until it turns over.
4. When the liquid begins to flow through the top screen, cut pump setting back to normal operating range. (Depending on the product being processed).
5. Recycle approximately the first 20 gallons of base back to premix tank. Then set valve #6-A or #7-A depending on whether it is desired to pump to the let-down tanks or to drums. Then set valve #4-B and grind batch.
6. When the batch is nearly completed, have a drum of solvent that is to go into the finished product let-down ready at Tank A. When Tank A is out of pre-mix, add 20-25 gallons of solvent.
7. Observe discharge spout on grinding vessel for change in viscosity and color (denoting that the solvent has forced remaining base from vessel). Then change valve #4-A and "recycle-wash" the unit and lines approximately 10 minutes.
8. Change valve #4-B and pump solvent to the let-down tank or drums.
9. When solvent throughput rate drops down indicating that the premix tank is empty, change #2-B and turn off agitator drive. Then change #3-B and suck the unit dry with the take-away pump.
10. Stop pumps, change #3-A; #4-C and drain residual solvent to the let-down tank or use #8 and drain to waste.

SPECIFICATION NO. IV-C
DATE OF ISSUE 4-4-56
CLASSIFICATION ... MATERIALS FLOW
ITEM OPERATING INSTRUCTIONS
REMARKS PAGE 3 OF 5

For normal operation there are actually just three groups of valve settings: recycle, grind and drain.

OPERATION

(in order of occurrence)

VALVE SETTING

1. Recycle

Flush bottom open
#1-A; #2-A; #3-A;
#4-A; and #5-A

2. Grind

Flush bottom open
#1-A; #2-A; #3-A;
#4-B; #6-A or #7-A

3. Wash-Recycle

Same as 1. above

4. Drain

#4-B; #6-A or #7-A
Then - #3-B
Then - #4-C; and #8

III. SPECIAL OPERATING INSTRUCTIONS:

A. New Sand Load:

When loading the unit with a fresh sand load, (virgin sand) it is necessary to follow this special operating procedure:

1. Have the correct sand load weighed out ready to add to the unit.
2. Add mill base by pumping with the feed pump (see valve arrangement under Section II) until grinding vessel is approximately 1/3 full.
3. Add approximately 1/3 the sand load into the top of the unit and turn over the agitator several revolutions until the sand is wet.
4. Continue this procedure of liquid addition followed by sand addition with intermediate agitation until the unit is completely loaded.
5. Since a new sand charge will contain a small amount (less than 0.1%) of undersize sand particles, grit in the discharge stream should be ignored. The unit will soon purge itself of these "fines" which can be removed in the normal filtration step prior to finished product filling.

SPECIFICATION NO. IV-6
DATE OF ISSUE 4-4-56
CLASSIFICATION ... MATERIALS FLOW
ITEM OPERATING INSTRUCTIONS
REMARKS
PAGE 4 OF 5

B. Multiple-Pass Processing:

If the desired dispersion cannot be obtained in one-pass, even at very low rates, it may be necessary to go to multi-pass processing. This is easily accomplished by:

1. Follow normal procedure in startup (see II-1 to 4).
2. After recycle is completed, then change valve #5-B and pump first pass base to premix Tank B.
3. When Tank A is out of premix switch valve #1-B and recycle 20 gallons.
4. Then set valve #6-A or #7-A depending on whether it is desired to pump to the let-down tanks or to drums and set #4-B.
5. When the batch is nearly completed, have a drum of solvent that is to go into the finished product ready at Tank B. When Tank B is out of material, add 25 gallons of solvent.
6. Observe discharge spout on the grinding vessel for change in viscosity and color (denoting that the solvent has forced the remaining base from the vessel). Then change valve #4-A and "recycle-wash" the unit and lines approximately 10 minutes changing valve #5-A and #1-A in order to flush Tank A also.
7. Then follow procedure outlined in Section II-8 to 10.

C. Use of Wash Solvent Instead of Let-Down Solvent:

In some operations, it may be advantageous to use a wash solvent that is reclaimed or sold instead of the thin-down solvent from the finished product for washing the unit, tank and lines. This can be accomplished readily by the following procedure:

1. Follow instructions Section II-1 to 7 using wash solvent instead of let-down solvent in Step #6.
2. Change valve #6-B and #7-A and pump solvent to drums.
3. Then follow Section II-9 and 10.

SPECIFICATION NO.....IV-C
DATE OF ISSUE 4-4-56
CLASSIFICATION .. MATERIALS FLOW
ITEM OPERATING INSTRUCTIONS
REMARKS REV.3/1/57

D. Unusual Operating Conditions:

1. Heavy mill bases - when bases of high viscosity and/or high pigment concentration are processed, it becomes necessary to "start-up" at low vari-drive settings and allow sufficient time to elapse before starting the agitator drive. This permits gradual wetting of the sand. High pump rates would cause excessive pressure and result in gasket leaking and pump overloading.
2. Long Periods of shut-down - after long periods of shut down with a drained unit, it may be necessary to "start-up" by adding solvent at high pump rates from the auxiliary feed inlet or other premix tank. This procedure will break the sand free and permit easy addition of mill base and can be used whenever start-up is difficult.
3. Flooded unit - if the vessel becomes flooded due to improper operation (i.e. running the feed pump with the agitator drive off) it will be necessary to purge the excess base from the unit by "on-off" operation of the drive (using the momentary start switch, see Control V-A). Normal "start-up" would cause the sand base mixture to vortex over the top of the unit. When the vessel has been purged sufficiently to permit continuous operation without overflow, the pumps and normal drive control can be started.

E. General

It should be noted that in order to obtain the best start-up results following a period of shut down, the vessel should never be allowed to stand when full of dirty solvent. Solvent containing any appreciable amount of pigment will cause difficult start-up because the pigment settles through the sand bed forming a cake of varying densities at the bottom; this in turn makes inlet feed difficult and acts to retard agitator rotation. The recommended procedure is to either solvent wash and drain or allow the unit to remain full of mill base.

SPECIFICATION NO. V-A

DATE OF ISSUE 4-4-56

CLASSIFICATION CONTROL

ITEM ELECTRICAL FUNCTIONS

REMARKS

The electrical wiring system as outlined in the diagram, Spec. No. V-B (see next page), was designed to give ease of operation yet insure the maximum safety margin against making errors. A brief resume' of the functions that can be performed by this circuitry follows:

1. The feed pump can be operated independent of the agitator drive (as in "start-up", Spec. No. IV-C)
2. The agitator drive cannot be operated independent of the feed pump unless the momentary start switch (2 CR) is operated in conjunction with the drive start switch (as is necessary when purging a flooded vessel - Spec. No. IV-C)
3. When the feed pump shuts off due to overload, the agitator drive shuts off.
4. When the agitator drive shuts off due to overload, the feed pump shuts off.
5. When the level in the hopper rises to operate the Magnetrol Mercury switch (Spec. No. V-D) both the feed pump and the agitator drive shut off.

NOTE: It is important that the pump, drive and momentary start switches be located in close proximity for ease of operation.

DESCRIPTION: Electrical wiring
diagram for pump,
drive and hopper
level control system

NOTE: See next page for
Equipment Description

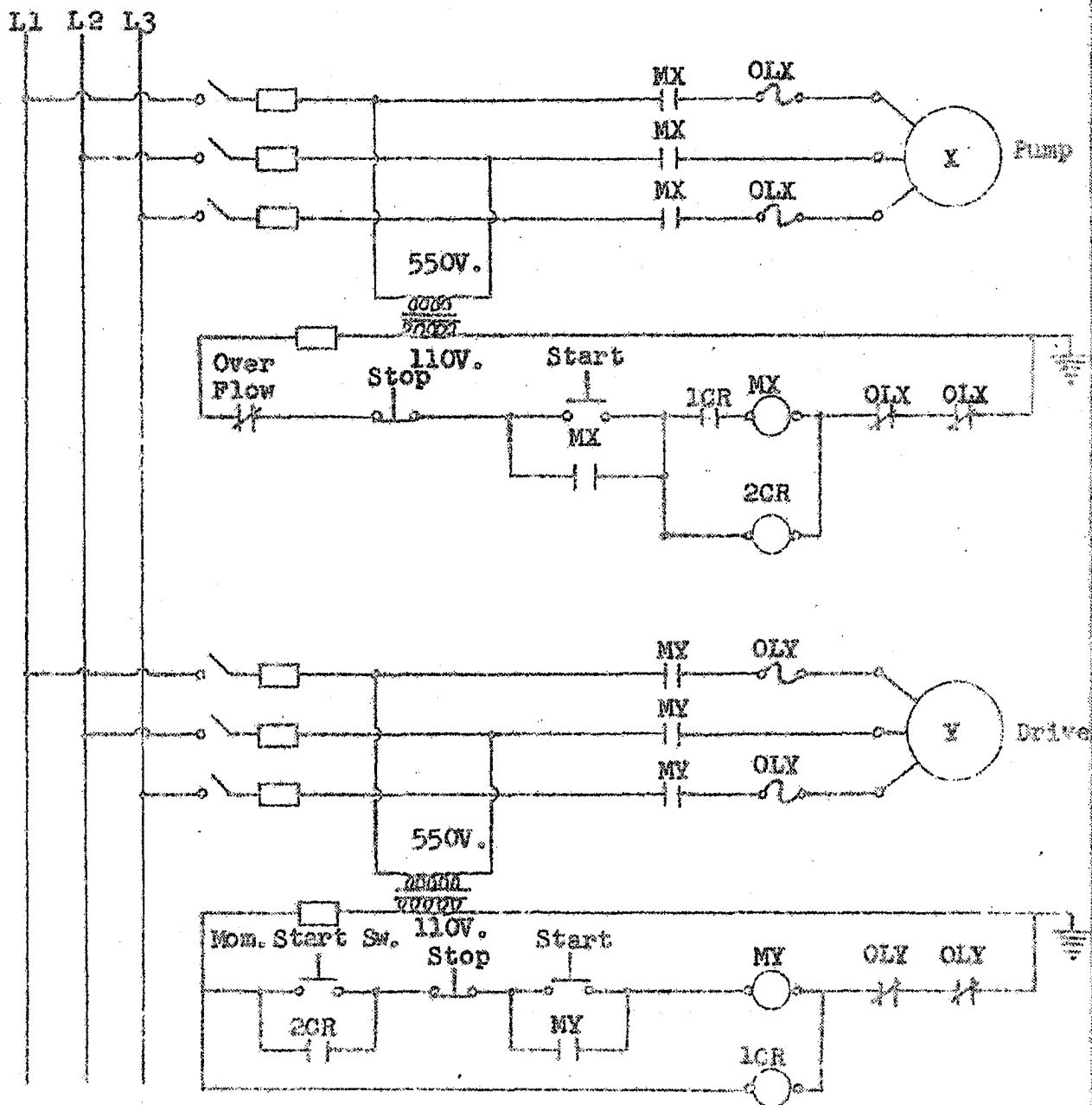
SPECIFICATION NO. V-8

DATE OF ISSUE 4-4-56

CLASSIFICATION CONTROL

ITEM...ELECTRICAL WIRING DIAGRAM

REMARKS



SUPPLIER: SQUARE "D" CO.

DESCRIPTION: Specifications on
main control equip-
ment needed for pro-
cess wiring.

SPECIFICATION No. V-C

DATE OF ISSUE 4-4-56

CLASSIFICATION CONTROL

ITEM EQUIP. SPECIFICATIONS

REMARK

NO	ITEM	MILL			APPROX. COST
		30	16	8	
1	Size #1, fusible combination motor starter with *550/110 V control transformer 1-1/2 HP, 550/110 V 3 PH, 60 cyc. Square "D", Class 8538, Type CAG-4 Form FT.	X	X	X	\$ 84.00
2	Size #3 fusible combination motor starter with 550/110 V control transformer 30 HP, 550/110 V, 3 PH, 60 cyc. Square "D", Class 8538, Type EAG-3 Form FT.	X			197.00
3	Size #2 fusible combination motor starter with 550/110 V control transformer 20 HP, 550/110 V 3 PH, 60 cyc. Square "D", Class 5838, Type DAG-4, Form FT.		X		128.00
4	Size #2 fusible combination motor starter with 550/110 V control transformer 15 HP, 550/110 V, 3 PH, 60 cyc. Square "D", Class 8538, Type DAG-4, Form FT.			X	128.00
5	2 - control relays (1CR and 2CR) 110 V, 60 cyc., Square "D", Class 8501 AG-20	X	X	X	23.00
TOTAL COST PER MILL		\$304.	\$235.	\$235.	

* NOTE: 550 V system is used at Philadelphia Plant - use value that corresponds to particular installation in question.

SUPPLIER: MICRO SWITCH
DIV. OF FIRST
INDUSTRIAL CORP.
FREEPORT, ILL.

DESCRIPTION: Micro Switch
high level shut off
control for ground
base hopper (see
Spec. No. III-E)

SPECIFICATION NO. V-D
DATE OF ISSUE 4-4-56
CLASSIFICATION CONTROL
ITEM HOPPER LEVEL CONTROL
REMARKS REV. 3-1-57

SPECIFICATIONS

The Ex-AR Micro-switch explosion proof
with adjustable roller arm and type B2-2R 82
basic switch.

SUPPLIER: ROCHESTER MANU. CO. INC.
ROCHESTER, 10, N.Y.

DESCRIPTION: Dial thermometer
to determine temperature
of mill base discharge
stream (see Spec. III-A
for location)

SPECIFICATION NO. V-E

DATE OF ISSUE 1-3-57

CLASS CONTROL

ITEM DISCHARGE THERMOMETER

REMARKS

SPECIFICATIONS

Rochester 2" dial thermometer Model 1750

with: connection nut - 3/8" S.P.T.

stem - 6"

Range - 30 to 240°F

Crystal - either std. or plexiglass
as per individual choice

For installation details
see Dwg. No. PM-11018

SUPPLIER: FULTON SYLPHON DIV.
ROBERTSHAW-FULTON
CONTROLS CO.
KNOXVILLE 4, TENN.

DESCRIPTION: Temperature regulator
to control cooling
water feed to vessel jacket.

SPECIFICATION NO. V-F
DATE OF ISSUE 3-1-57
CLASSIFICATION CONTROL
ITEM TEMPERATURE REGULATOR
REMARKS

SPECIFICATION:

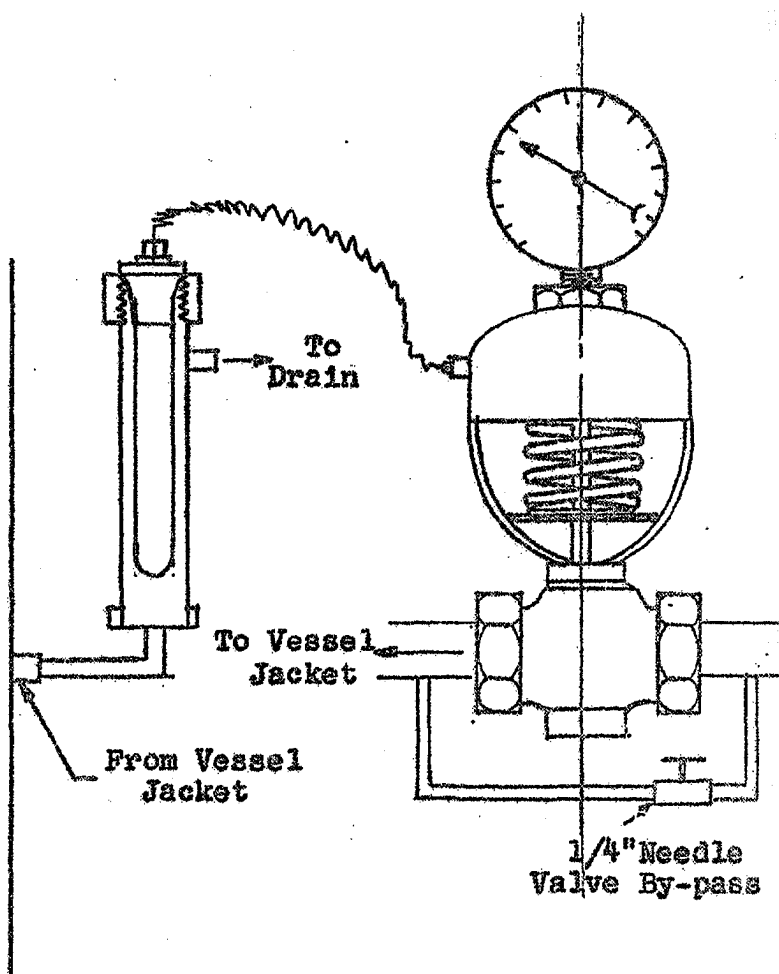
Temperature regulator

No. 999 - T 1

Temperature Range

60° - 120°F

(Additional information
depending on individual
installation require-
ments i.e. line press.,
valve size, etc... will
need to be specified
when ordering - see
Sylphon Catalog)



SUPPLIER: OTTAWA SILICA CO.
OTTAWA, ILLINOIS

DESCRIPTION: 20-30 mesh Ottawa
Silica, standard ASTM
sand. Cost - Approx.
\$0.05/lb.

SPECIFICATION NO. VI-A

DATE OF ISSUE 4-4-56

CLASSIFICATION MEDIA

ITEM SAND CHARGE

REMARKS

The required sand charges for standard operating conditions, with a 50/50 sand to base ratio and the level 3" from the top of the screen, are as follows:

<u>SIZE MILL</u>	<u>STD. SAND CHARGE</u>
30	270 lbs.
16	145 lbs.
8	70 lbs.

To facilitate measure of the sand charge in the unit at any given time, the following table has been calculated:

<u>MILL SIZE</u>					
<u>8 GAL.</u>		<u>16 GAL.</u>		<u>30 GAL.</u>	
<u>*Sand Level (Inches)</u>	<u>Approx. Sand Charge (Lbs.)</u>	<u>*Sand Level (Inches)</u>	<u>Approx. Sand Charge (Lbs.)</u>	<u>*Sand Level (Inches)</u>	<u>Approx. Sand Charge (Lbs.)</u>
10 1/2	75	12 1/8	160	13	298
13 1/4	68	15 5/8	145	17	273
16	60	19 1/8	130	21 1/2	243
18 3/4	53	22 5/8	115	26	215
21 1/4	45	26 1/8	100	30 1/2	185

* It is very important to note that (1) the sand level must be measured as the distance down from the top of the screen; and (2) that the sand must be solvent washed, settled and preferably drained (as in Spec. No. IV-C, Section II - Step 9).

DESCRIPTION: Sheet Metal drain
pan used to remove
sand charge.

SPECIFICATION NO. VII-A

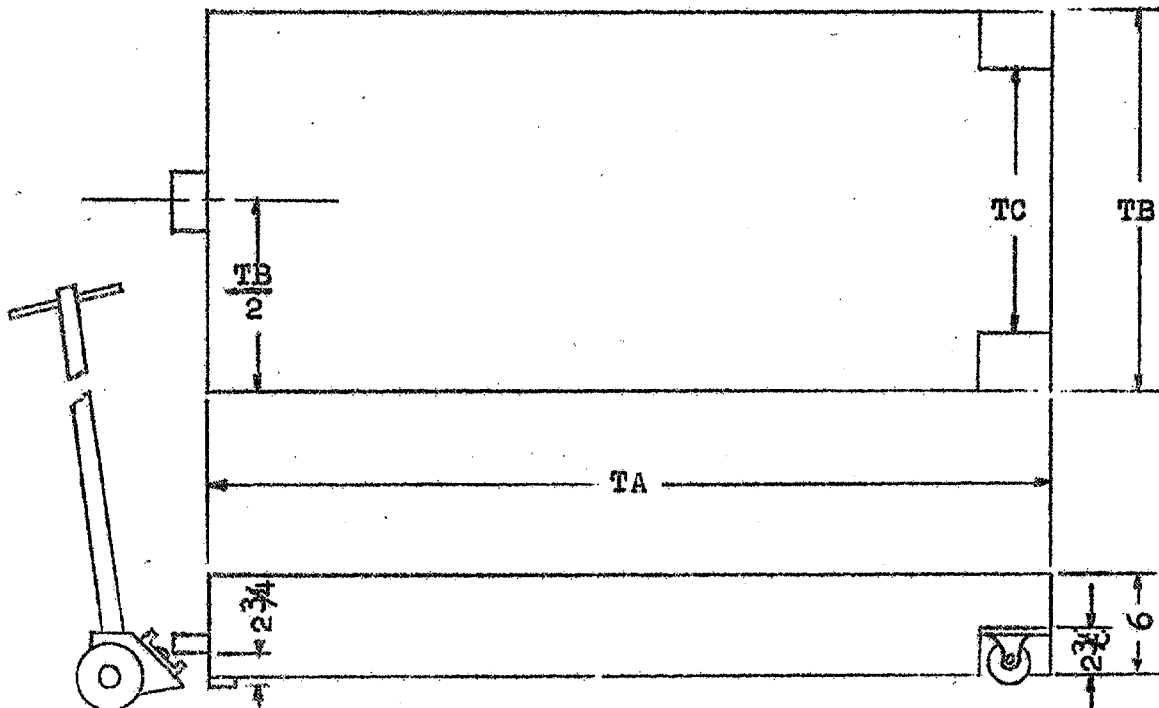
DATE OF ISSUE 4-4-56

CLASSIFICATION... SAND UNLOADING

ITEM DRAIN PAN

REMARKS

MILL	DIMENSIONS			EST. COST
	TA	TB	TC	
30	50	22	15 ⁷ / ₈	\$45.
16	36	21	14 ⁷ / ₈	40.
8	30	18	11 ⁷ / ₈	35.



DESCRIPTION: The following instructions outline the recommended procedure for unloading the sand charge. It is important to point out that a drain port and lubricated plug cock have been added to the bottom of the vessel (see Spec. III-A) specifically for the removal of sand from the unit.

SPECIFICATION NO. VII-B
DATE OF ISSUE 4-4-56
CLASSIFICATION ... SAND UNLOADING
ITEM PROCEDURE
REMARKS 3 -1-57

SAND LOAD ADJUSTMENT:

Sand can easily be removed from the unit during its operation to adjust the sand load. Adjustment is accomplished by opening the sand drain valve while the charge is being agitated with any liquid (i.e. solvent or mill base) and taking out a measured quantity. This operation should be carefully supervised to prevent indiscriminate changes in sand/base ratio by the operator. (1 gal. of sand and voids = approx. 15 lbs.)

SAND UNLOADING PROCEDURE:

- A. Before unloading the sand charge the unit should be solvent washed, but not drained as this liquid will serve to "fluidize" the sand bed.
- B. Position the drain pan (see Spec. VII-A) under the drain valve.
- C. Open plug cock and use momentary start switch to turn over agitator. Since the discs are arranged hub down, a few revolutions will aid in forcing sand/solvent charge from the vessel.
- D. When the flow rate decreases appreciably, close the sand drain valve and move the pan under the vessel.
- E. Break the unions connecting the feed and suction lines to the bottom plate.
- F. Unbolt the bottom plate and drop into the drain pan.
- G. Once again, use the momentary start switch to just "kick" over the agitator and discharge the residual sand.

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