

INSTRUCTION MANUAL

FOR

18'-0" BUTTERFLY VALVE

FOR

FOR PECK DAM

MANUFACTURED BY



FOR

CORPS OF ENGINEERS, U. S. ARMY

CONTRACT NO. DA-32-015-CIVENG-59-113

S. O. 5233

1960

18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERS

FORT PECK DAM
GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

TABLE OF CONTENTS

General Description

Operation

Adjustment and Maintenance

Numerical Drawing List

Drawings

Parts List

Spare Parts List

Vendor Data and Drawing List

Vendor Data and Drawings

18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERS
CONTRACT NO. DA-32-015-CIVENG-59-113

FORT PECK DAM
GARRISON DISTRICT
SALES ORDER NO. 5233

Description:

The 18 foot Butterfly Valves are of the vertical disc and trunnion type, with plate-steel transition sections for connection to the penstock and spiral case extension. The valves are operated by means of a hydraulic cylinder supplied with high pressure oil from the power unit.

Operation:

Automatic Sequence:

The sequence for automatic operation is shown by Willamette Iron and Steel Company Drawing No. 5233-0200.

Manual Operation:

The valve may also be operated manually by closing the appropriate solenoid with a screw driver and pumping by hand. Complete instructions are contained within the cabinet of the power unit.

Adjustment and Maintenance:

Servicing and Lubrication:

See Willamette Iron and Steel Company Drawing No. 5233-0200 and 5233-7000.

Adjustment:

Position indicator, switch and valve settings - See Willamette Iron and Steel Company Drawings Nos. 5233-4800 and 5233-0200.

Seal adjustment - See Willamette Iron and Steel Company Drawing No. 5233-9000.

Valve Assembly:

Procedure for valve assembly - See Willamette Iron and Steel Company Drawing No. 5233-9000.

NUMERICAL DRAWING LIST
18'-0" BUTTERFLY VALVE, FORT PECK DAM, GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

	DRAWING NO.	REV.	TITLE
* 5233-0100	4	General Arrangement	
* 0200	6	Operating and Wiring Diagrams and Instructions	
0300	1	Recommended Handling Procedure	
0400	1	Joint Detail and Procedure	
* 1000	5	Sectional Valve Assembly	
* 1100	7	Half Section and End View Assembly	
2100	6	Upper Half Body Weldment	
2200	8	Lower Half Body Weldment	
2300	5	Thrust Bearing Details	
2400	3	Valve Details	
2500	3	Miscellaneous Body Details	
* 3000	3	Disc Assembly	
3100	6	Disc Weldment Details	
3200	2	Disc Details	
3300	3	Disc Details	
* 4000	4	Operator Assembly	
4100	3	Operator Cover Housing Details	
4200	1	Operator Housing Details	
4300	1	Operator Cylinder Details	
4400	2	Operator Cylinder Details	
4500	3	Operator Details	
4600	2	Operator Miscellaneous Details	
4700	2	Operator Miscellaneous Details	
* 4800	1	Indicator Assembly and Miscellaneous Details	
* 5000	2	Transition Details and Piping	
* 5100	2	By Pass Valve Operator and Drain Valve Bracket	
* 6000	4	Hydraulic Piping Details	

(* INCLUDED IN THIS MANUAL)

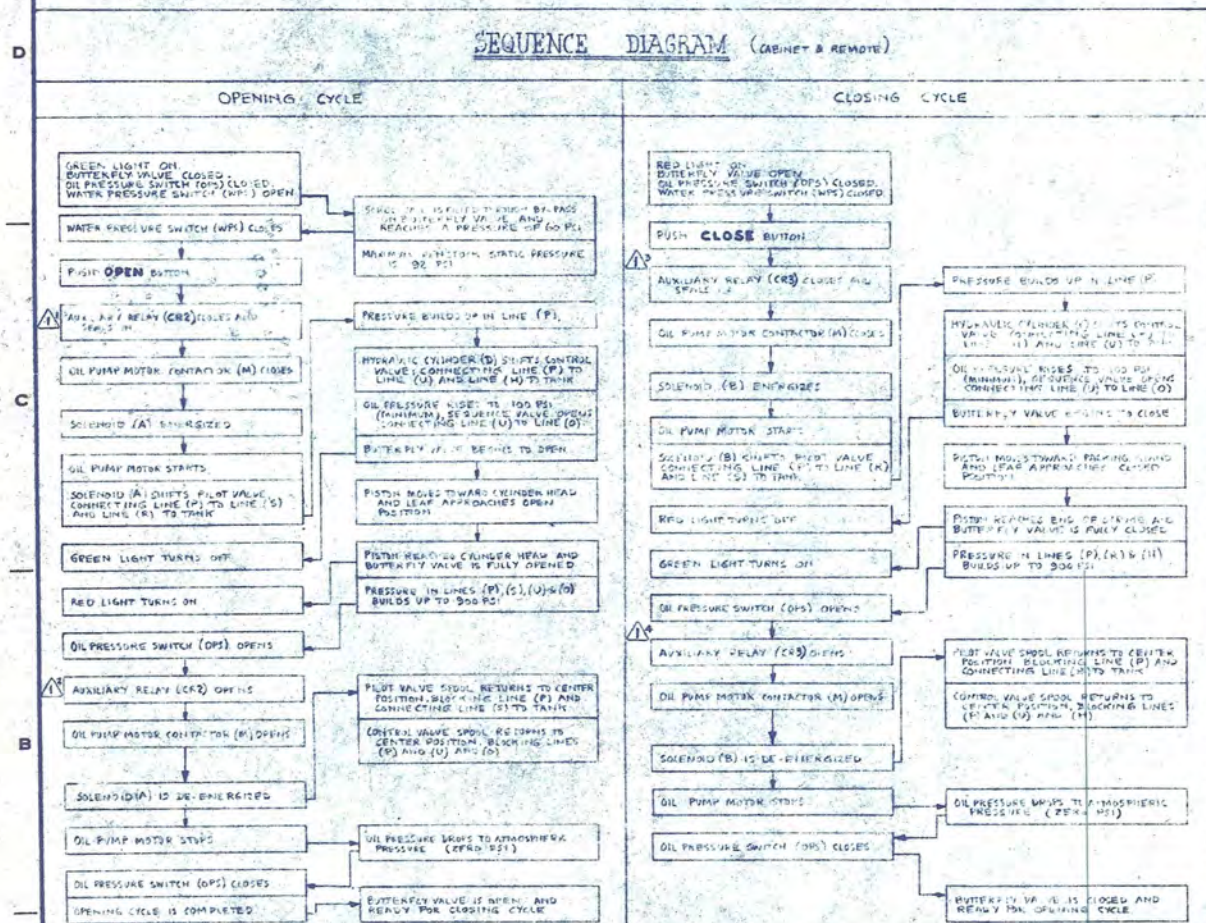
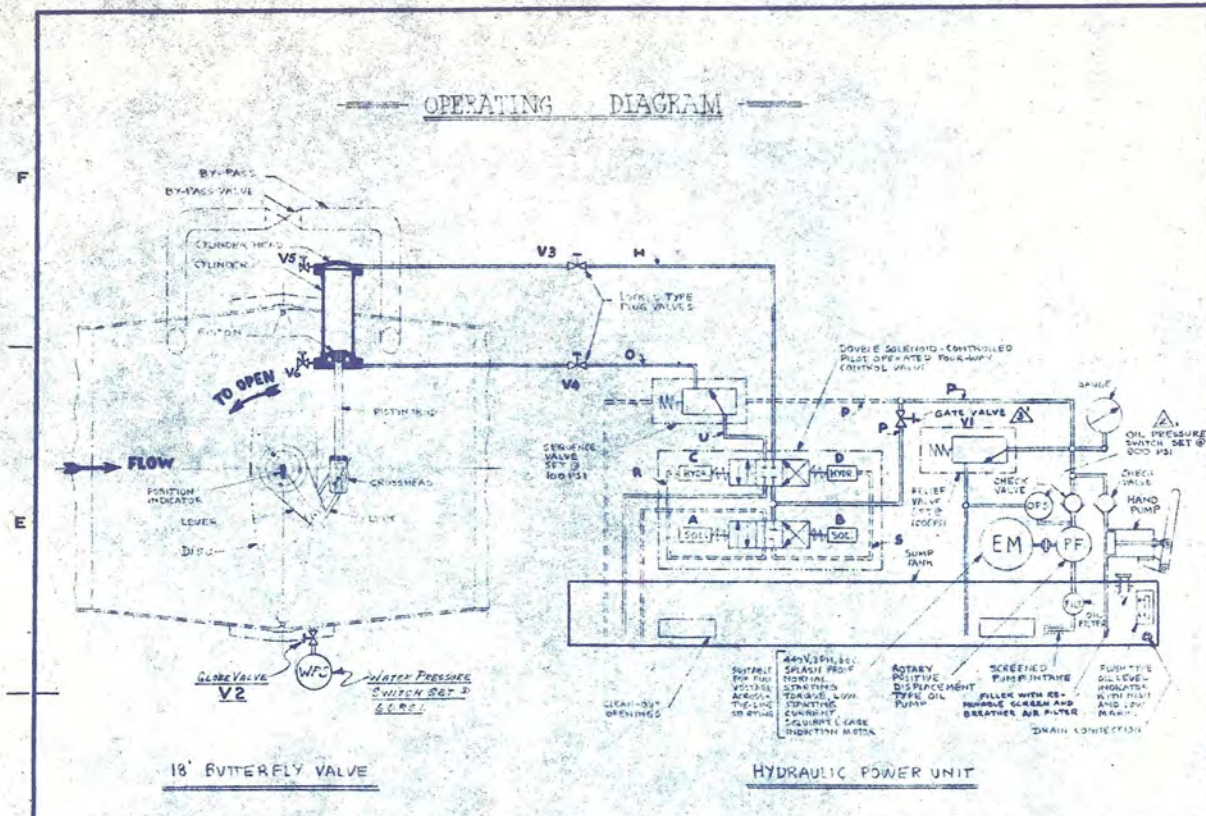
NUMERICAL DRAWING LIST

18'-0" BUTTERFLY VALVE, FORT PECK DAM, GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

	DRAWING NO.	REV.	TITLE
* 5233-7000	3	Lubrication System Details	
* 8000	4	Anchors Bolt Detail and Installation	
8100	1	Inspection Platform and Ladder	
* 9000	4	Seal Adjustment - Valve Assembly Instructions	
9100	1	Special Tools and Lifting Device	



NOTE: TO REVERSE BUTTERFLY VALVE DURING OPENING CYCLE
PUSH **STOP** BUTTON, THEN START CLOSING CYCLE

NOTE: TO REVERSE BUTTERFLY VALVE DURING CLOSING CYCLE
PUSH **STOP** BUTTON, THEN START OPENING CYCLE



CR2-AUX. RELAY FOR SNA

CP3-4-8 DELHI 500 21 B

GPS - On Pressure Switch

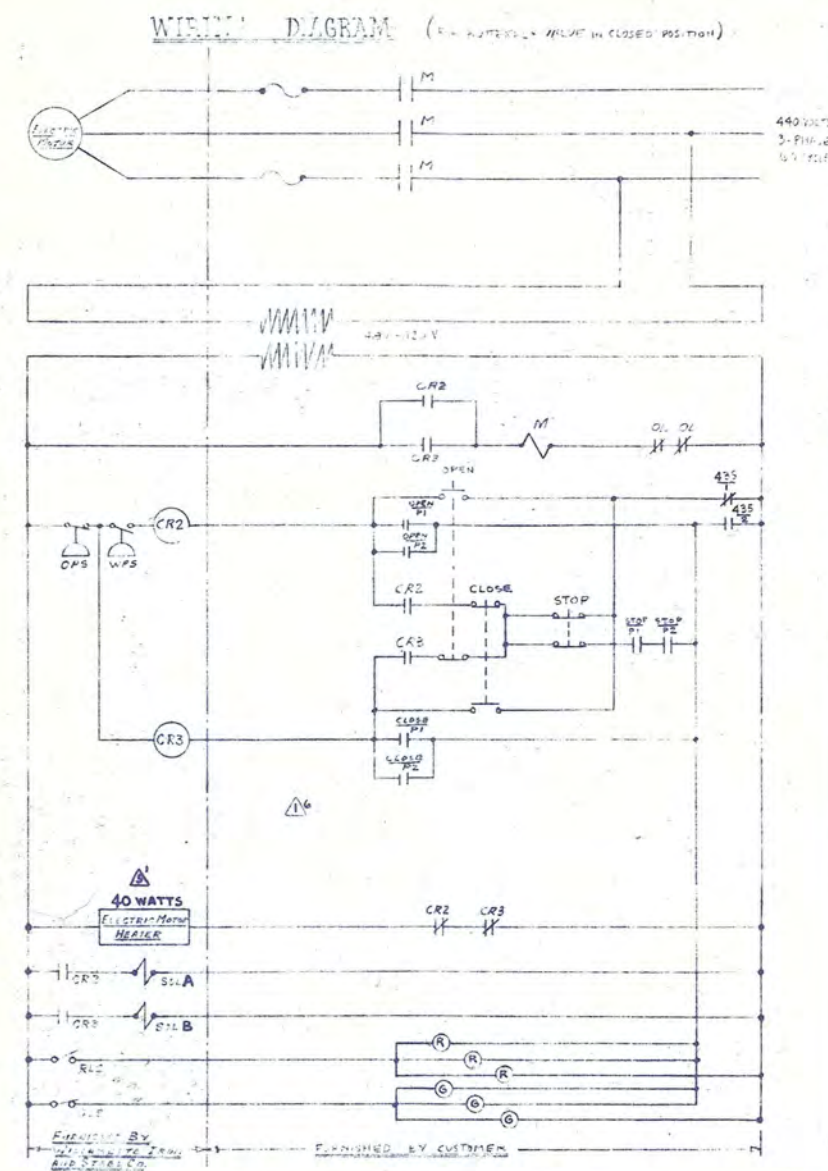
WPS- WATER PRESSURE SWITCH.

SOLA-SCLEND ON 4 WAY VALVE.

SOL B- SOLENOID ON 4 WAY VALVE

RLS-RED LIGHT LIMIT SWITCH

GLS - GREEN LIGHT LIMIT SWITCH



NOTE: 18
1. VALVE SELECTOR SWITCH SHOWN IN
"VALVE ROOM" POSITION AND MAIN
VALVE SWITCHES SHOWN IN "STOP"
POSITION

SERVICING AND OPERATING INSTRUCTIONS

I. SERVICING INSTRUCTIONS

A. SWITCH AND VALVE SETTINGS

1. SET OIL PRESSURE SWITCH (OPS) TO BREAK AT 90 PSI AND TO REPAIR AT 40 PSI
2. SET WATER PRESSURE SWITCH (WPS) AT ZERO PSI OR USE JUMPER ACROSS CONTACTS (BYPASSING ONLY)
3. SET OIL PRESSURE RELIEF VALVE TO 0 PSI AT 1000 PSI
4. SET SEQUENCE VALVE TO OPEN AT 100 PSI
5. FULLY OPEN VALVES V1, V2, V3 AND V4. CLOSE V5 & V6

B. FILLING SYSTEM WITH OIL

1. Fill OUTLINE IN CLEAN LIGHT HYDRAULIC OIL (SIMILAR TO SAE 10 W), CONTAINING A RUST PREVENTER. FILL UNTIL THE OIL REACHES THE TOP OF THE FILLING HOLE SYSTEM. (SEE FIG. 1) **DO NOT** OVERFILL. OIL MUST BE DRAINED OFF AFTER THE OIL REACHES THE TOP OF THE FILLING HOLE.
2. WITHIN 5 MINUTES, TURN THE **CLOSE** PUSH BUTTON ON THE OIL PUMP. THE OIL WILL FLOW INTO THE SYSTEM. THE OIL WILL FLOW INTO THE **OPEN** LINE. THE OIL WILL FLOW INTO THE **OPEN** LINE. THE OIL WILL FLOW INTO THE **OPEN** LINE.
3. WHEN PRESSURE RISES UP TO 200 PSI, OIL PRESSURE SWITCH (OPS) WILL OPEN AND STOP THE OIL PUMP. AFTER THE SYSTEM HAS RETURNED TO ATMOSPHERIC PRESSURE, AND THE OIL PRESSURE SWITCH INDICATES PRESSURE HAS BEEN RELEASED, OPEN THE OPEN LINE. CLOSE AND OPEN THE OIL LINE UNTIL A THIN FILM OF OIL IS ON THE OIL LINE.
4. OIL LEVEL IN TANK SHALL BE MAINTAINED BETWEEN THE LEVELS INDICATED ON THE OIL GAUGE.

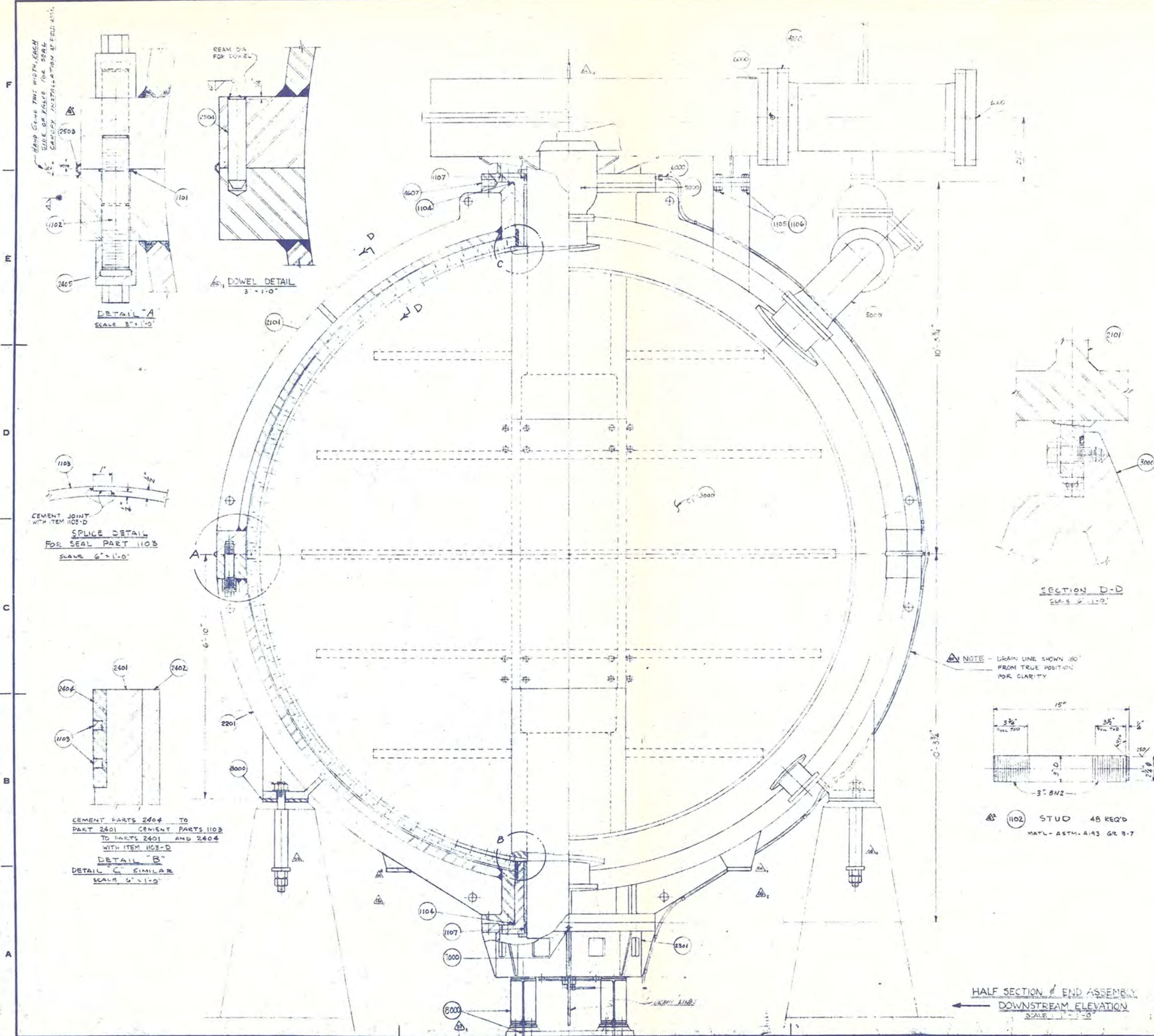
C. POSITION INDICATOR ADJUSTMENT

1. SET POWER ON POSITION INDICATOR TO CORRESPOND WITH THE POSITION OF THE BUTTERFLY LEAF.
2. SET INDICATING LIGHTS TO OPERATE AS FOLLOWS:
 VALVE CLOSED, GREEN LIGHT ON.
 VALVE OPEN, RED LIGHT ON.
 INTERMEDIATE VALVE POSITIONS, BOTH LIGHTS OFF.

D OPERATING & SERVICING GREASING SYSTEM

1. PULL SELECTOR OPERATION WITH SELECTOR
LEVER TO HAND PUMP IN THE "IN" POSITION
2. OPERATE HAND PUMP UNTIL ALL
VALVE INDICATORS ARE IN THE UP (DOWN)
POSITION
3. PULL SELECTOR LEVER TO THE "OUT" POSITION
AND OPERATE HAND PUMP UNTIL ALL
VALVE INDICATORS RETURN TO

[illegible]



PARTS LIST				
PART NO.	QTY	DESCRIPTION	MATERIAL	
1101	72	4" X 3/4" X 1/2" BRASS BRACKET	BRASS	NO. 200
1102	48	3/8" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
1103	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
1104	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
1105	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
1106	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
1107	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
2101	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
2201	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
2301	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
2401	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
2501	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
2601	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
2701	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
2801	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
2901	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
3001	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
3101	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
3201	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
3301	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
3401	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
3501	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
3601	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
3701	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
3801	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
3901	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
4001	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
4101	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
4201	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
4301	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
4401	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
4501	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
4601	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
4701	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
4801	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
4901	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
5001	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
5101	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
5201	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
5301	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
5401	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
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5601	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
5701	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
5801	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
5901	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
6001	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
6101	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
6201	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
6301	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
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6701	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
6801	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
6901	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
7001	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
7101	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
7201	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
7301	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
7401	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
7501	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
7601	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
7701	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
7801	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
7901	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
8001	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
8101	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
8201	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
8301	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
8401	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
8501	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
8601	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
8701	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
8801	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
8901	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
9001	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
9101	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
9201	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
9301	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
9401	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
9501	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
9601	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
9701	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
9801	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
9901	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200
1001	12	1/2" X 1/2" X 1/2" BRASS STUD	BRASS	NO. 200

NOTE:
1. FOR SECTIONAL VALVE ASSEMBLY
SEE DWG. 5233-1000

INSPECTION: BY WISCO AND C/B
CLEANING: BY WISCO
PAINTING: COAT ALL EXPOSED SURFACES WITH COARSE LINE 022
WELD PROCEDURE: SEE DETAIL DWG.
STRESS RELIEF: SEE DETAIL DWG.
TESTING: DWG. 5233-200, 5233-300, 5233-400
LUBRICATION: DWG. 5233-7000
TOLERANCES: SEE DETAIL DWG.

REVISION	DATE	BY	APP.
1	3/22/53	WIS	WIS
2	3/22/53	WIS	WIS
3	3/22/53	WIS	WIS
4	3/22/53	WIS	WIS
5	3/22/53	WIS	WIS
6	3/22/53	WIS	WIS
7	3/22/53	WIS	WIS
8	3/22/53	WIS	WIS
9	3/22/53	WIS	WIS
10	3/22/53	WIS	WIS

FOR CONTRACT: DA-32-015-CIVENG-59-113

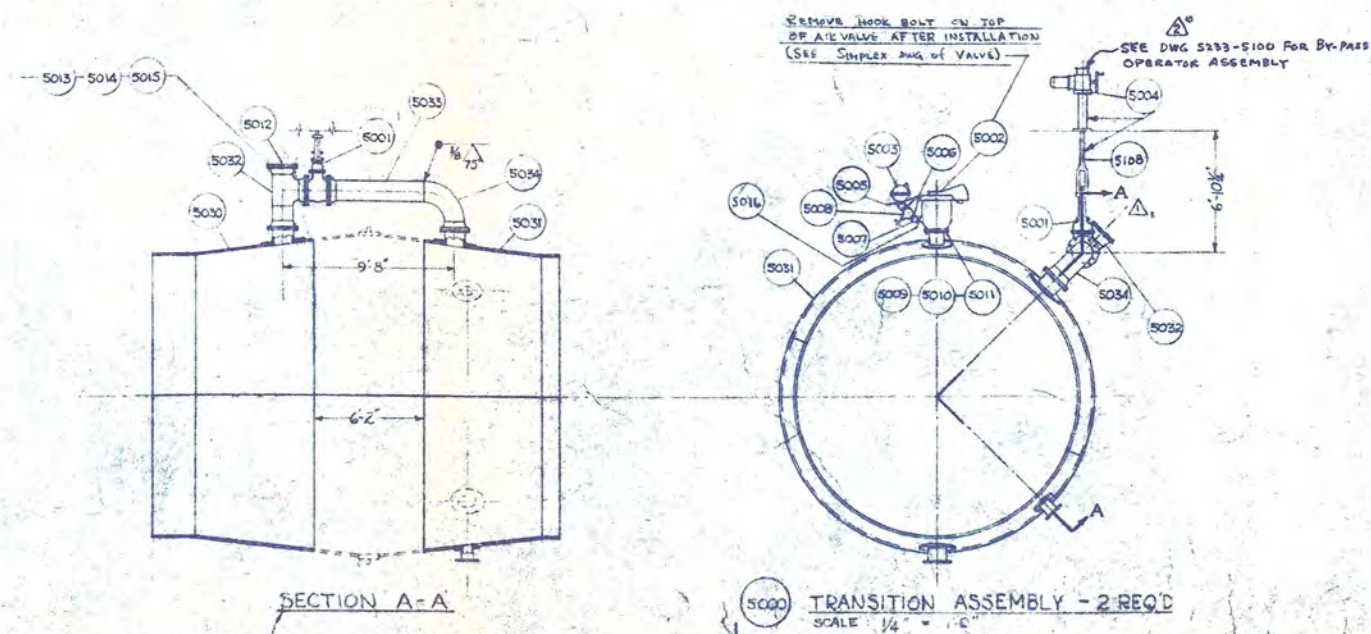
TITLE: FORT PECK DAM
18 IN. BUTTERFLY VALVE
HALF SECTION & END VIEW ASSEMBLY

WILLAMETTE IRON AND STEEL COMPANY
2000 N. W. FRONT AVENUE
PORTLAND 10, OREGON

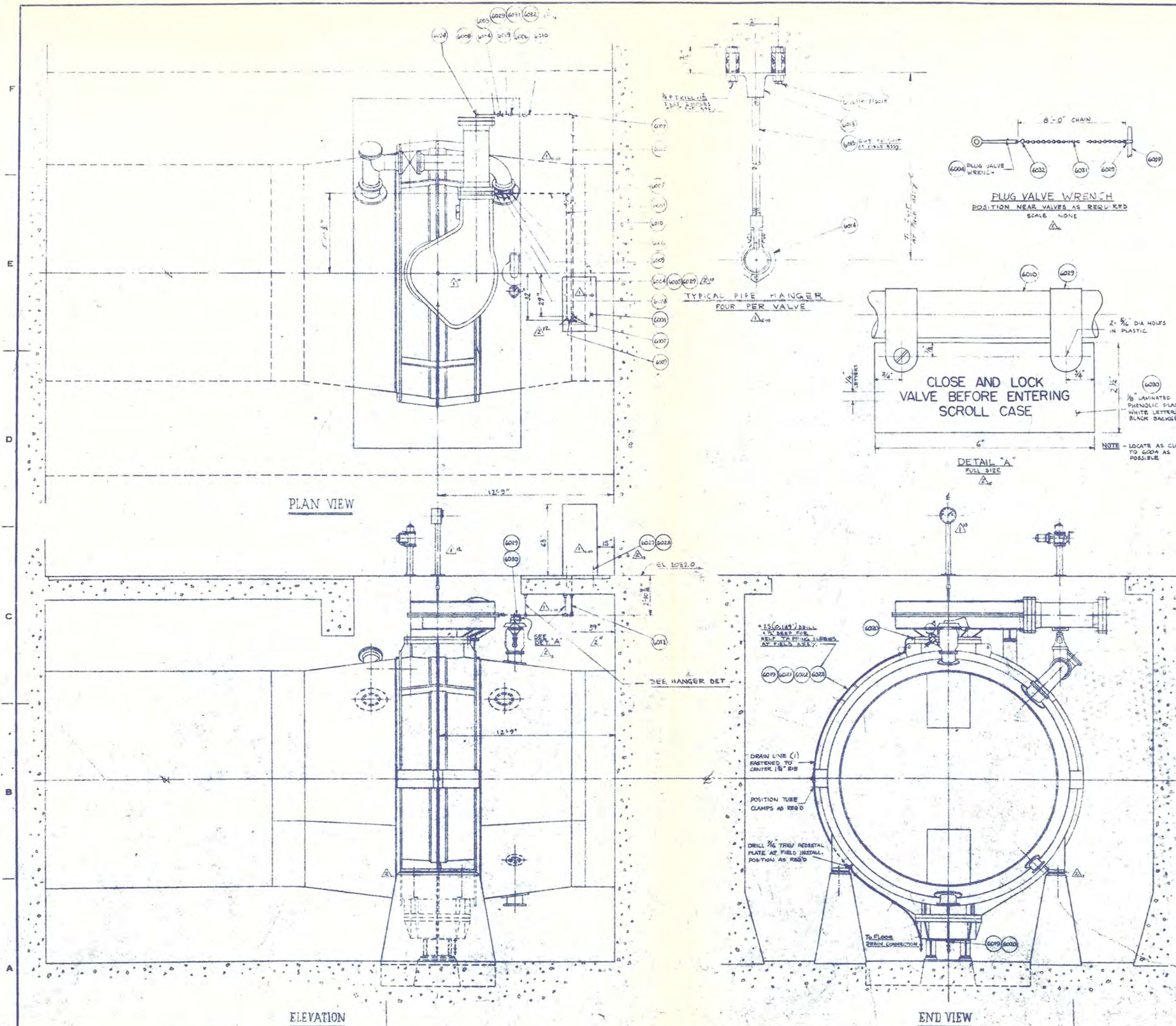
DATE ISSUED: 3/22/53
FILE NO.: H-4068
SCALE: 1" = 1'-0"

5233 1100 07

PARTS LIST					
PART NO.	QTY	PART NO.	DESCRIPTION	MATERIAL	
4000	2	OPERATOR	ASSEMBLY		
4001	32	1/4" DIA. x 7/8" L	SCREW	STEEL	
			32 MIN. L&G LENGTH		
4002	2	1/8" DIA. x 1/2" L	SCREW	STEEL	
4003	1/4"	1/8" DIA. x 1/2" L	SCREW	STEEL	
4004	2	1/8" DIA. x 1/2" L	SCREW	STEEL	
4005	10	1/4" DIA. x 3/4" L	SCREW	STEEL	
4006	17	1/4" DIA. x 1/2" L	SCREW	STEEL	
4007	4	1/2" x 1/8" DIA. x 1/8" L	SCREW	STEEL	
4008	56	1/4" DIA. x 1/2" L	SCREW	STEEL	
4009	56	1/4" DIA. x 1/2" L	SCREW	STEEL	
4010	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4011	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4012	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4013	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4014	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4015	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4016	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4017	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4018	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4019	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4020	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4021	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4022	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4023	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4024	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4025	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4026	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4027	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4028	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4029	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4030	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4031	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4032	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4033	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4034	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4035	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4036	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4037	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4038	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4039	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4040	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4041	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4042	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4043	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4044	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4045	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4046	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4047	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4048	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4049	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4050	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4051	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4052	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4053	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4054	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4055	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4056	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4057	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4058	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4059	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4060	2	1/4" DIA. x 1/2" L	SCREW	STEEL	
4061	2	1/4" DIA. x 1/2" L	SCREW	STEEL	



IS INCLUDES ONE EXTRA GASKET PER FLANGE															
INSPECTION: BY WISCO # 96															
CLEANING: MORGAN START AT MARK															
PAINTING: PER DWG 5233-1000 & 5233-1100															
WELD PROCEDURE: WISCO WELD P500															
STRESS RELIEVE: SECTIONS WITH NOZZLES PER ASME VIII, UW-40															
TESTING: APPROPRIATE PER DWG 5233-1000 & HYDRAULIC TEST AT JOBSITE BY OTHERS															
LUBRICATION: NONE															
TOLERANCES: SHOP STD. UNLESS SHOWN OTHERWISE															
CUSTOMER'S APPROVAL															
REFERENCE DRAWINGS 5233-1000 & 5233-1100															
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<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;"> DATE 10/1/84 BY J. J. J. </td> <td style="width: 50%;"> REVISED PER V&E LETTER DATED JAN 11 1987 REVISED PER V&E LETTER DATED 1/15/88 REVISIONS </td> <td style="width: 25%; text-align: center;"> RLD 10/1/84 BY DATE </td> </tr> </table>				DATE 10/1/84 BY J. J. J.	REVISED PER V&E LETTER DATED JAN 11 1987 REVISED PER V&E LETTER DATED 1/15/88 REVISIONS	RLD 10/1/84 BY DATE									
DATE 10/1/84 BY J. J. J.	REVISED PER V&E LETTER DATED JAN 11 1987 REVISED PER V&E LETTER DATED 1/15/88 REVISIONS	RLD 10/1/84 BY DATE													
FOR CONTRACT DA-32-015-Givens-59-113															
TITLE FORT PECK DAM 15'-0" BUTTERFLY VALVE TRANSITION DETAILS & PIPING															
WILLAMETTE IRON AND STEEL COMPANY 3000 N. W. TUSTY AVENUE PORTLAND 10, OREGON															
IN LIP TO DATE 22 SEP 1988 BY SKN APPR FEW		DATE ORDER FILE NO. M-4086													
Dwg No. 5233		Quantity 5000													



PARTS LIST				
PART NO.	QTY	DESCRIPTION	MATERIAL	
6001	2	HYDRAULIC POWER UNIT UNION SPECIAL CO. DIV.	SAE 1045 15 GPM	
6004	4	1" 1500 LB. SCREWED WRENCH OPERATED, LUBRICATED PLUG VALVE WITH LOCKING DEVICE, INCLUDING 2 WRENCHES, HAWORTH NPT 1601		
6005	4	PADLOCK, KEYS, WITH CHAIN	ASTM A 108 1/2" DIA.	
6006	4	1" NPT 1000 WOG BRASS 1/2" THICK GROUND JOINT SCREWED UNION	BRASS	
6007	10	1" NPT 1000 WOG SCREWED 70° 6-ROW	BRASS	
6008	4	1" NPT SCH 80 2'0"	ASTM A 108 1/2" DIA.	
6009	4	1" NPT SCH 80 1/2" NIPPLE	ASTM A 108 1/2" DIA.	
6010	4	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6011	2	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6012	4	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6013	8	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6014	8	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6015	8	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6016	16	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6017	16	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6018	16	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6019	85	3/4" O.D. X 0.01 WALL TUBING	304 STAINLESS STEEL	
6020	4	3/4" TUBE CONNECTOR - BRASS	BRASS	
6021	2	3/4" TUBE UNION - BRASS	BRASS	
6022	24	3/4" SINGLE TUBE CLAMP (1/2" DIA.)	304 STAINLESS STEEL	
6023	24	3/4" SINGLE TUBE CLAMP (1/2" DIA.)	304 STAINLESS STEEL	
6024	2	1" NPT 1000 WOG 1/2" THICK	BRASS	
6025	2	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6026	8	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6027	8	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6028	8	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6029	14	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6030	4	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6031	16	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	
6032	2	1" NPT SCH 80 1/2" PIPE	ASTM A 108 1/2" DIA.	

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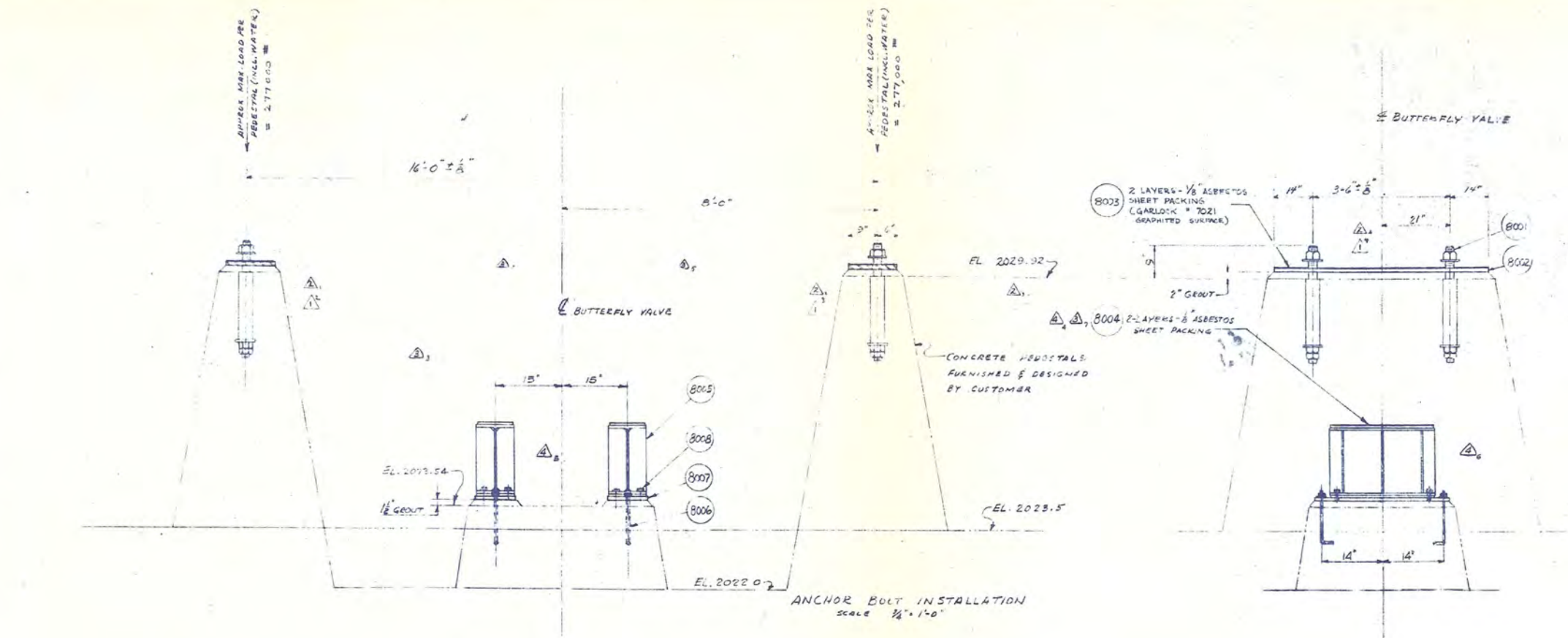
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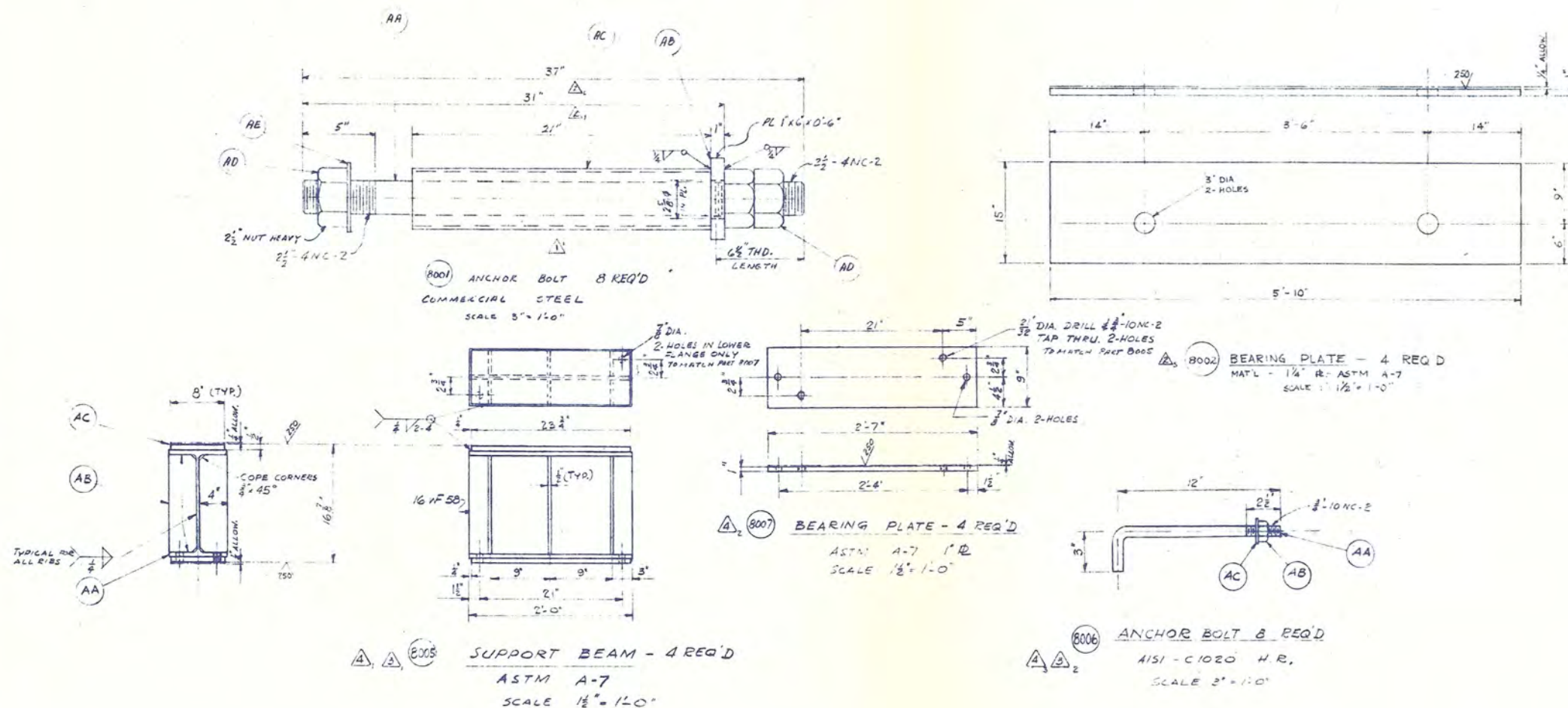
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A



ANCHOR BOLT INSTALLATION
SCALE 1/8" = 1'-0"



8001 ANCHOR BOLT 8 REQ'D
COMMERCIAL STEEL
SCALE 3/8" = 1'-0"

8002 BEARING PLATE - 4 REQ'D
ASTM A-7 1" R
SCALE 1/8" = 1'-0"

8003 SUPPORT BEAM - 4 REQ'D
ASTM A-7
SCALE 1/8" = 1'-0"

8006 ANCHOR BOLT 8 REQ'D
AISI-C1020 H.R.
SCALE 3/8" = 1'-0"

PARTS LIST

PART NO.	QTY	DESCRIPTION	MATERIAL
8001	8	ANCHOR BOLT ASSEMBLY	
AA	8	2 1/2" BAR X 3'-1" LG	AISI-C1020
AB	8	PL 1" X 6" X 5'-6"	ASTM A7
AC	8	4" STD BLACK STL PIPE	COMM
AD	24	2 1/2" 4NC-2 HEX HD NUT NYT	STEEL
AE	8	2 1/2" STD PLAIN WASHER NYT	STEEL
8002	4	1 1/2" PL X 15" X 5'-10"	STEEL
8003	8	1/8" ASBESTOS SHEET PACKING 15" X 5'-10"	ASBESTOS
8004	8	1/8" ASBESTOS SHEET PACKING 8" X 2'-0"	ASBESTOS
8005	4	SUPPORT BEAM	
AA	4	16" HFSB X 2'-0" LG	AISI-C1020
AB	24	2 1/2" X 4" X 1/2" LG	STEEL
AC	8	4" X 8" X 23 1/2" LG (FIN)	STEEL
8006	8	ANCHOR BOLT ASSEMBLY	
AA	8	2 1/2" BAR X 3'-1" LG	AISI-C1020
AB	8	1" X 6" X 5'-6" PL	ASTM A7
AC	8	4" STD. PLAIN WASHER	STEEL
8007	4	1 1/2" X 9" X 2'-7" (FIN)	ASTM A7
8008	8	1" X 10" X 2' LG, HEX, HD, CAD SCREW	STEEL

INSPECTION: 1/15/50 & 5/8
CLEANING: NONE
PAINTING: NONE - COAT THREADED SURFACES WITH GALVALUME 1872 FOR SHIPPING
WELD PROCEDURE: NONE
STRESS RELIEVE: NONE
TESTING: NONE

LUBRICATION: NONE
TOLERANCES: AS SHOWN

CUSTOMER'S APPROVAL

REFERENCE DRAWINGS: 5-233-1100

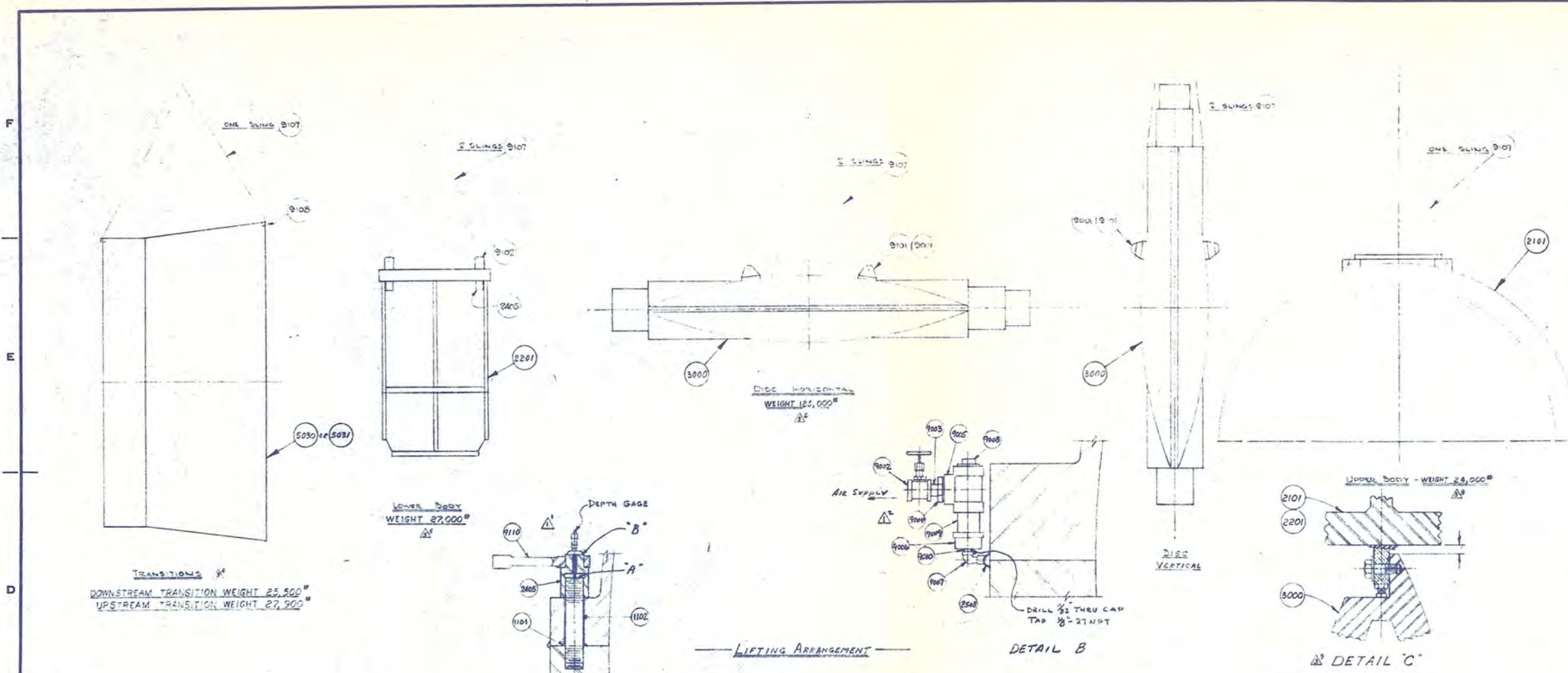
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FOR CONTRACT: CA-32-015-CIV-46-59-113

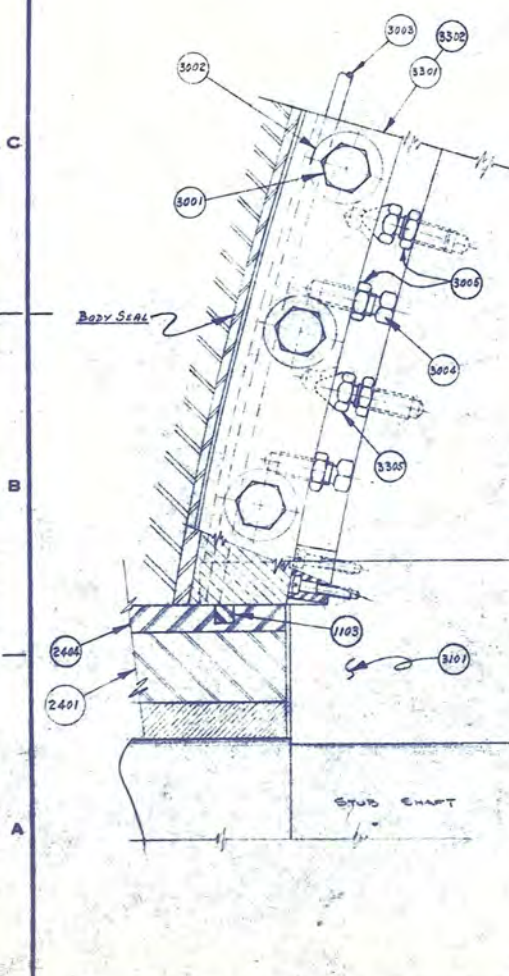
TITLE: FORT PELK DAM
18FT BUTTERFLY VALVE
ANCHOR BOLT DETAIL & INSTALLATION

WILLAMETTE IRON AND STEEL COMPANY
2800 N. W. FRONT AVENUE
PORTLAND 10, OREGON

DATE ISSUED: 11-59
FILE NO: 4089
SCALE: 1/8" = 1'-0"
BY: FEW
CHECKED: H.P. JAMES
SALES ORDER: 5233
COMPONENT: 8000
REV: 04



PARTS LIST				DESCRIPTION	MATERIAL
9001	1	1/2"	1/2"	1/2" GNE-2 x 3/4" HEX CAP SCREW	STC COMB
9101	4			DISC LIFTING EYE	STC
9102	4			LOWER BODY LIFTING EYE	STC
9103	2			SLING	
9104	2			1/2" ST 14000#	
9105	2			1/2" ST 14000#	
9106	2			1/2" ST 14000#	
9107	2			1/2" ST 14000#	
9108	2			1/2" ST 14000#	
9109	2			1/2" ST 14000#	
9110	2			1/2" ST 14000#	
9111	2			1/2" ST 14000#	
9112	2			1/2" ST 14000#	
9113	2			1/2" ST 14000#	
9114	2			1/2" ST 14000#	
9115	2			1/2" ST 14000#	
9116	2			1/2" ST 14000#	
9117	2			1/2" ST 14000#	
9118	2			1/2" ST 14000#	
9119	2			1/2" ST 14000#	
9120	2			1/2" ST 14000#	
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9122	2			1/2" ST 14000#	
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9196	2			1/2" ST 14000#	
9197	2			1/2" ST 14000#	
9198	2			1/2" ST 14000#	
9199	2			1/2" ST 14000#	
9200	2			1/2" ST 14000#	



SEAL ADJUSTMENT

1. Loosen Jam Nuts 3305, Adjusting Screws 3304, Wedge Screws 3305 and Cap Screws 3301 Slightly.

2. Turn Disc 3101 to Fully Closed Position. Make Preliminary Seal Adjustments as Required.

3. With the Wedge Screw 3305, Adjust the Vertical Center Line of the Valve. Adjust Seal 3301 until it is Firmly Against the Bearing Carrier 2401 and the Body Seal. Tighten the Adjusting Wedge by Using a 1" Open End Wrench. After the Adjustment is Made Tighten Jam Nut 3305 with 1" Open End Wrench.

4. Tighten all Adjusting Screws 3304 until Seal 3301 Seats Firmly Against the Body Seal. Working from Adjusting Screw Nearest the Hub to the Horizontal Center Line of the Valve and Continuing in this Order Around the Circumference of the Valve in Each Quadrant, Adjusting Screw Nearest the Horizontal Center Line will be Tightened Last. Tighten Adjusting Screws Using a 1" Open End Wrench. After Adjustment is Made Tighten Jam Nut 3305 with a 1" Open End Wrench. Blue and Scrape Seals at Field Assembly if Required.

5. With Disc in the Closed Position and Under Pressure, Make Final Adjustments.

6. LEAKAGE RATE PERMISSIBLE AT 213 FT. HEAD IS 20 G.P.M.

GENERAL

1. Carefully inspect all parts of valve at unloading to determine if any damage has been incurred in shipment.

2. Before assembling any part, remove protective coating from all machined areas with petroleum kerosene, or solvent.

3. Use slings and lifting aids as shown on the drawing.

4. See Drawing 5233-0300 for recommended handling procedure.

ASSEMBLY PROCEDURE OF VALVE SECTION ONLY

1. Install carrier seal 2405, packing 1103 and seal 1101 on bearing carriers 2401. (See Drawing 5233-1100 for splice detail of packing 1103)

2. Install bearing carriers 2401 into the upper body half 2101 and lower body half 2201. Care should be taken to avoid damage to packing and seals and to orient the bearing carrier 2401 so that the carrier seals 2405 are at 90° to the flow thru the valve and grease connection is on downstream side. Coat mating fits and surfaces with white lead and graphite prior to assembly.

3. Lay chevron packing 1107 and gland 2403 loose into thrust bearing assembly. (Around thrust bearing carrier 2302)

IMPORTANT

4. Adjust thrust bearing carrier 2302 to dimension shown on Drawing 5233-1000.

5. Coat mating parts of 2301 with white lead and graphite and bolt this assembly with loose packing 1107 and gland 2403 into place.

6. Place lower half body 2201 in position and support at jacking pads and under thrust bearing support.

7. Support with jacks a place wedges under valve feet for additional support. Grease thrust bearing 1001 and install on shaft as shown on Drawing 5233-1000.

8. Lower disc assembly 3000 into lower body half, disc to be in open position. Use extreme care to avoid damage to disc seal surfaces, bearing carrier seals and thrust bearing 1001.

NOTES: Clean and grease bearing surfaces before installation.

9. Working thru access openings in thrust bearing support 2301, install chevron packing 1107 and bolt gland 2403 in place.

10. Install miscellaneous fittings and valves on bearing carrier support 2301.

11. Center disc in body half by adjusting thrust bearing carrier 2302 with wrench 9109 and grease gun 9111. Use pressure gauge with this grease gun. Approximately 600 PSI required.

NOTE: Too much pressure will lock 2302. Use valve 1011 to relieve pressure in grease chamber.

12. Install upper body half, clean and grease bearing surfaces. Coat mating machine surfaces with white lead and graphite prior to assembly. Use caution to prevent damage to disc seal surfaces and bearing carrier seals. Use gasket 1101 at each body halves stud.

13. Install chevron packing 1107 and gland 2403 into bearing carrier as assembled into upper body half.

14. Install body half studs 1102 and prestress as follows: Coat all threads with white lead and graphite. Use wrench 9110 with nuts 2405.

a. All studs in flanges to be bottomed and turned tight.

b. Tighten nuts 2405 so that they are seated tight and firm. (One light sledge blow)

c. Measure distance from 1/4" to 1/8", shown in Det. A above, with micrometer depth gauge supplied by erecting engineer record measurement.

d. Tighten nuts 2405 (except the four (4) outboard nuts, one each corner) diagonally in pairs with striking wrench 9110 until the difference between the before and after dimension is ".022"

15. With disc in open position, begin assembly of operator.

16. Using (4) lifting eye bolts 9105 screwed into the flange, install operator housing 4201. Insert (4) shear pins 4207 bolt housing to body.

17. Assemble crank 4701 on to shaft 3203 and insert (3) taper keys 4703.

18. Make sub-assembly of cross head 4501, link 4502, pin 4503, crosshead shoe 4505, stem 4302, diaphragm 4401, cylinder 4301, head 4402 and related parts. All drilling for set screws in piston stem and pin were made at shop assembly. Field erector need only to locate holes and tighten set screws.

19. Retract stem into cylinder until piston is against head 4402, attach cylinder assembly to housing 4501.

20. Connect link to lever with pin 4303, locate hole in pin and tighten set screw 4013.

21. Normal piston travel to closed position is 56-1/2". (This is 7/16" less than the full stroke of the cylinder)

22. Install 1/2" O-ring 4019 and then bolt indicator shaft 4604 onto valve shaft 3203.

23. Using (4) lifting eye bolts 9105 screwed into the cover, lift operator housing cover 4101 onto housing 4201. Engage crosshead shoe 4505 into the slot in the cover and bolt cover in place.

24. Check valve location with reference to scroll case and penstock and relocate if necessary. Jack and shim as required. Relieve load on jacks under the four jacking pads.

25. Check for centering of the disc in the valve body and the out-of-roundness of the assembled valve at the disc seating surfaces.

a. To center disc, adjust as indicated by Paragraph 11 above.

b. To remove out-of-roundness of body, adjust jacks at thrust bearing support and measure as shown in detail "C" above until all values are approximately the same.

26. Connect all miscellaneous fittings and all operating lines.

27. Lubricate valve per instructions on 5233-0200.

28. Operate valve and check and adjust seals per seal adjustment procedure on Drawing 5233-0300.

29. Operate valve thru several cycles to assure smooth and free operation.

BUTTERFLY VALVE, ASSEMBLY PROCEDURE

30. Install indicator assembly 4801. Be sure to engage slip-joint of universal 4803 over the indicator shaft 4604.

31. With disc on closed position, set tripper 4502 as shown on Drawing 5233-4800.

32. Drill shaft 4810 for pin 4813 maintaining 1/2" engagement of slip joint.

33. Adjust screws 4824 and 4825 in indicator assembly for open and closed positions.

34. After all transition welding has been completed and cooled to ambient temperature, tighten the four (4) outboard nuts to the dimension indicated in (d) above.

35. Install body halves canopy seals 2503, weld per detail A, Drawing 5233-1100.

36. Install seal filler "Poly" Urethane series 1300 into canopy seal as follows:

a. Mix and pour according to American Latex Products Corporation bulletin for 1300 series Poly Urethane included in each kit.

b. Components should be approximately 70° to 90° F when mixing.

c. The canopy seal should be warmed to 90° to 120° F before pouring.

d. Use apparatus as shown in Detail "B" for inserting Poly Urethane.

37. Check body for out-of-roundness and adjust disc seals as described under "Seal Adjustment".

38. Grout under valve feet.

39. After watering-up, (aluminum pressure in penstock 50 PSI) install beam supports under thrust bearing support and grout. Remove jacks.

TRANSITION ASSEMBLY PRIOR TO ASSEMBLY TO VALVE BODY

1. Fit transition half sections together. See Drawing 5233-5000 for dimensions and tolerance.

2. Weld transition section longitudinal joints using welders qualified under procedure approved by Corps of Engineers.

3. X-Ray longitudinal welds completed above and repair as necessary.

4. Check circumference of both ends and compare with dimensions and tolerance on Drawing 5233-5000.

5. Install tension spider and round up transition pieces ready for assembly to valve.

TRANSITION SECTIONS TO BODY AND TRANSITIONS TO PIPE

1. Lower transition section into cribbing using slings similar to those shown on Drawing 5233-0300.

2. Pull transition pieces into place and fit to body using shop fitup logs or equal.

3. With the disc in fully closed position, tack transition pieces to valve body.

4. Check fitup and fairness of mating surfaces.

5. Follow procedure for keyhole crack stopper per Drawing 5233-0600 and details on Drawing 5233-1000.

6. Weld girth joint (body to transition) using welders qualified under procedure approved by Corps of Engineers. Keep welding equal from root outward as far as practical. Check roundness of joint and mating surfaces at approximately halfway point in welding. Complete welding as above (valve disc to be in closed position during all welding).

7. X-Ray girth welds completed in above procedure and repair as required.

8. Fitup transition piece to pipe round up using tension spiders and fitup clips as required.

9. Weld using procedure per 60 above.

INSPECTION BY: WISCO & Co

CLEANING: NAME

PAINTING: COAT MACHINING SURFACES WITH CARBORUNDUM 1072 FOR SHIPPING

WELD PROCEDURE: NAME

STRESS RELIEVE: NAME

TESTING: NAME

AUTOMATIC: NAME

TOLERANCES: NAME

CUSTOMER'S APPROVAL

REFERENCE DRAWINGS

DATE: 05-05-59

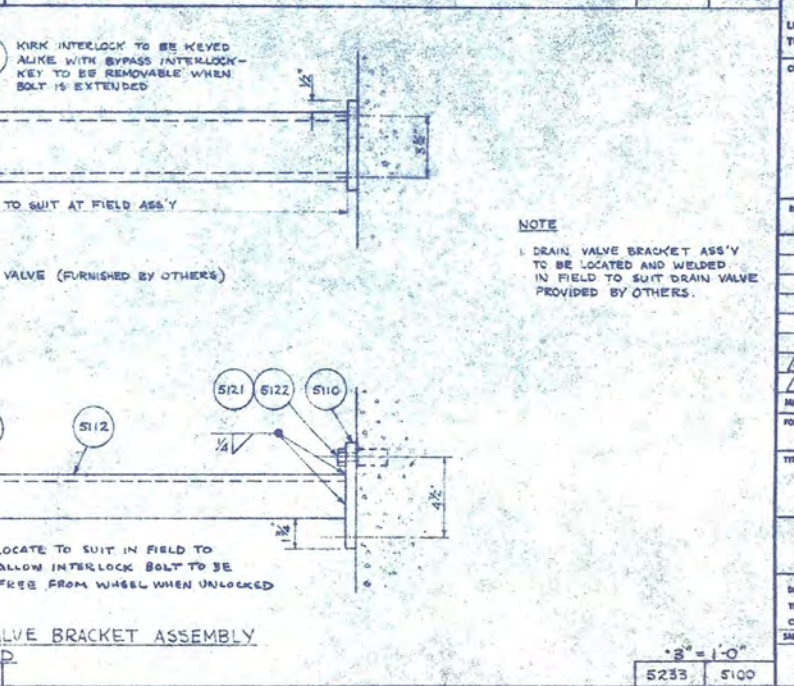
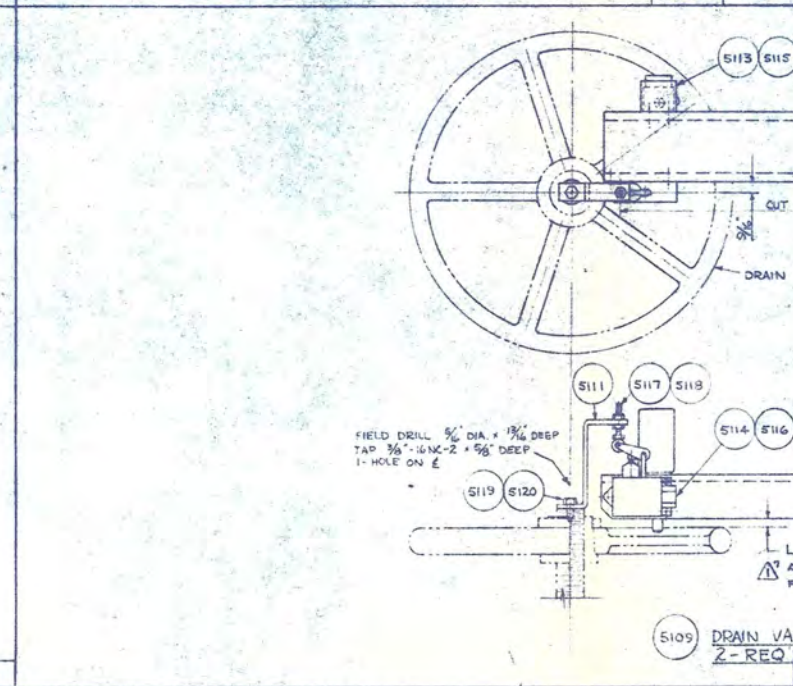
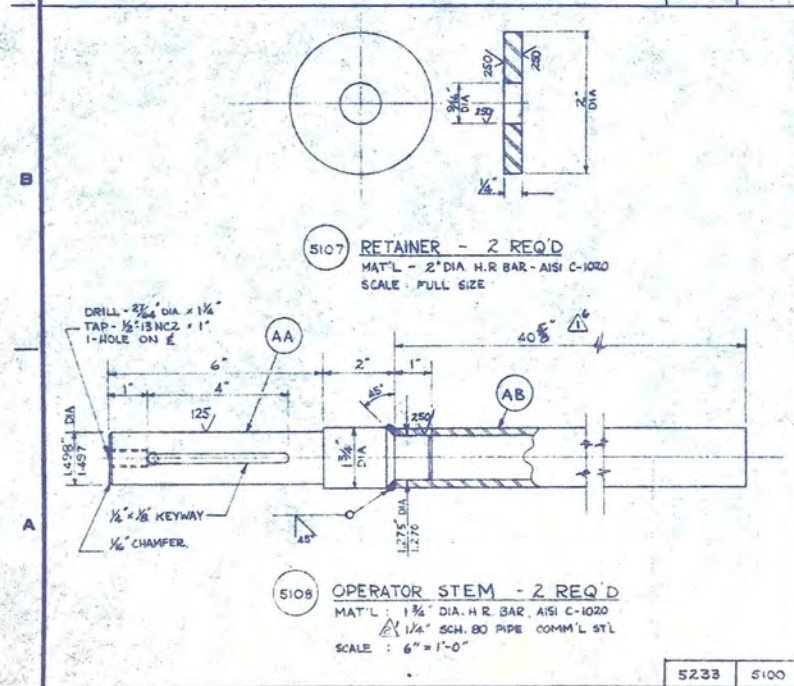
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WILLAMETTE IRON AND STEEL COMPANY

2000 N. W. FRONT AVENUE

PORTLAND 16, OREGON

5233 9000

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PARTS LIST

18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERS

FORT PECK DAM
GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

	ITEM NO.	QUANT.	DESCRIPTIVE DATA	DRAWING NO.
*	1001	2	Thrust Roller Bearing	5233-1000
*	1002	2	Pressure Switch	5233-1000
	1003	50	Hex Head Capscrew	5233-1000
	1004	48	Hex Head Capscrew	5233-1000
	1005	65	Hex Head Bolt	5233-1000
	1006	65	Hex Nut	5233-1000
	1007	2	Button Head Grease Fitting	5233-1000
	1008	4	Hex Head Capscrew	5233-1000
	1009	2	Pipe Nipple	5233-1000
	1010	2	Pipe Nipple	5233-1000
	1011	2	Globe Valve	5233-1000
	1012	2	Globe Valve	5233-1000
	1013	3	Grease Seal	5233-1000
	1014	3	"O" Ring	5233-1000
	1015	3	"O" Ring	5233-1000
	1016	8	Pipe	5233-1000
	1017	8	Hex Head Tap Bolt	5233-1000
	1018	1	Perma Tex	5233-1000
	1101	60	Gasket	5233-1100
	1102	50	Studs	5233-1100
	1103	12	Seal Rings	5233-1100
	1104	6	"O" Ring	5233-1100
	1105	12	Hex Head Capscrew	5233-1100
	1106	12	Hex Nut	5233-1100
	1107	6 sets	Chevron Packing	5233-1100

(* SEE VENDOR LITERATURE)

PARTS LIST

18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERS

FORT PECK DAM
GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

ITEM NO.	QUANT.	DESCRIPTIVE DATA	DRAWING NO.
2101	2	Valve Body Upper Half Weldment	5233-2100
2201	2	Valve Body Lower Half Weldment	5233-2200
2301	2	Bearing Housing Weldment	5233-2300
2302	2	Bearing Carrier	5233-2300
2303	2	Lock Plate	5233-2300
2401	4	Bearing Carrier	5233-2400
2402	4	Bearing	5233-2400
2403	4	Gland	5233-2400
2404	12	Seal Carrier	5233-2400
2405	48	Nut	5233-2400
2406	8	Hex Socket Pipe Plug	5233-2400
2501	8	Body Bolting Flange	5233-2500
2502	4	Flange Hub	5233-2500
2503	6	Canopy Seals	5233-2500
2504	8	Dowel	5233-2500
2505	12	Pipe Plug	5233-2500
2506	2 lbs	Poly - Ureathene	5233-2500
3001	250	Hex Head Capscrew	5233-3000
3002	250	Flat Washer	5233-3000
3003	6	"O" Ring	5233-3000
3004	250	Set Screw	5233-3000
3005	260	Hex Jam Nut	5233-3000
3006	18	Machine Screw	5233-3000
3101	2	Disc Weldment	5233-3100
3102	4	Pipe Plug	5233-3100

PARTS LIST18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERSFORT PECK DAM
GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

ITEM NO.	QUANT.	DESCRIPTIVE DATA	DRAWING NO.
3201	4	Disc Hub	5233-3200
3202	2	Lower Stub Shaft	5233-3200
3203	2	Upper Stub Shaft	5233-3200
3204	2	Key	5233-3200
3205	10	Dowel	5233-3200
3301	2	Disc Seal	5233-3300
3302	2	Disc Seal	5233-3300
3303	12	Disc Seat End Seal	5233-3300
3304	6	Disc Seat Joint Seal	5233-3300
3305	16	Disc Seal Wedge	5233-3300
4001	33	Hex Head Capscrew	5233-4000
4002	33	Stud Bolt	5233-4000
4003	66	Hex Nut	5233-4000
4004	16	Hex Socket Head Capscrew	5233-4000
4005	16	Hex Socket Head Capscrew	5233-4000
4006	12	Hex Head Capscrew	5233-4000
4007	5	Hex Head Capscrew	5233-4000
4009	60	Shoulder Bolt	5233-4000
4011	60	Hex Nut	5233-4000
4013	6	Set Screw	5233-4000
4015	2	Set Screw	5233-4000
4016	6	Piston Ring	5233-4000
4017	6	"O" Ring	5233-4000
4018	16	Capscrew	5233-4000
4019	3	"O" Ring	5233-4000
4020	3 sets	Chevron Packing	5233-4000

PARTS LIST

18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERS

FORT PECK DAM
GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

ITEM NO.	QUANT.	DESCRIPTIVE DATA	DRAWING NO.
4023	16	Hex Head Capscrew	5233-4000
4024	8	Pipe Plug	5233-4000
4101	2	Operator Housing Cover Weldment	5233-4100
4201	2	Lower Operator Housing Weldment	5233-4200
4301	2	Cylinder Weldment	5233-4300
4302	2	Stem	5233-4300
4303	4	Pin	5233-4300
4401	2	Diaphragm	5233-4400
4402	2	Head Weldment	5233-4400
4403	2	Piston	5233-4400
4404	2	Packing Gland	5233-4400
4405	2	Bushing	5233-4400
4501	2	Crosshead	5233-4500
4502	2	Link	5233-4500
4503	4	Shoe	5233-4500
4504	8	Bushing	5233-4500
4601	2	Indicator Cover	5233-4600
4602	2	Tripper	5233-4600
4603	2	Pointer	5233-4600
4604	2	Indicator Shaft	5233-4600
4605	2	Dial	5233-4600
4606	2	Inspection Plate	5233-4600
4607	16	Shear Pin	5233-4600
4701	2	Crank	5233-4700
4702	8	Washer	5233-4700
4703	6	Taper Pin	5233-4700

PARTS LIST

18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERS

FORT PECK DAM
GARFISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

ITEM NO.	QUANT.	DESCRIPTIVE DATA	DRAWING NO.
4801	2	Indicator	5233-4800
4802	2	Indicator Stand	5233-4800
4803	2	Universal and Slip Joint	5233-4800
4804	2	Universal Joint	5233-4800
4805	2	Flanged Bearings	5233-4800
4806	2	Bracket	5233-4800
4807	4	Miter Gears	5233-4800
4808	2	Shaft	5233-4800
4809	2	Shaft	5233-4800
4810	2	Shaft	5233-4800
4811	4	Flanged Bearing	5233-4800
4812	2	Bearing	5233-4800
4813	12	Roll Pin	5233-4800
4814	4	Shim	5233-4800
4815	8	Cap Screw	5233-4800
4816	8	Washer	5233-4800
4817	8	Hex Nut	5233-4800
4818	8	Hex Bolt	5233-4800
4819	8	Washer	5233-4800
4820	8	Hex Nut	5233-4800
4821	12	Cap Screw	5233-4800
4822	12	Self - Tapping Screw	5233-4800
4823	2	Set Screw	5233-4800
4824	4	Cap Screw	5233-4800
4825	4	Jam Nut	5233-4800
4826		Pad	5233-4800

PARTS LIST

18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERS

FORT PECK DAM
GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

ITEM NO.	QUANT.	DESCRIPTIVE DATA	DRAWING NO.
4827	4	Microswitch	5233-4800 ^{OK}
4828	2	Junction Box	5233-4800
4829	4	Condulet Union	5233-4800 ^{OK}
4830	3 ft.	Pipe	5233-4800
4831	2	Flat Bar	5233-4800
4832	2	Terminal Block	5233-4800 ^{OK}
4833	4	Screws	5233-4800
4834	4	Screw	5233-4800
4835	5 ft.	Wire	5233-4800
* 5001	2	Gate Valve	5233-5000
* 5002	2	Vaccum Breaking Valve	5233-5000
* 5003	2	Air Release Valve	5233-5000
* 5004	2	Motor - Operator Valve Operator	5233-5000
5005	2	Hex Bushing	5233-5000
5006	6	Nipple	5233-5000
5007	4	Elbow	5233-5000
5008	2	Gate Valve	5233-5000
5009	25	Hex Head Bolt	5233-5000
5010	26	Hex Nut	5233-5000
5011	3	Ring Gasket	5233-5000
5012	2	Blind Flanged	5233-5000
5013	122	Hex Head Bolt	5233-5000
5014	124	Hex Nut	5233-5000
5015	15	Ring Gasket	5233-5000
5016	2	Nipple	5233-5000

(* SEE VENDOR LITERATURE)

PARTS LIST

18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERS

FORT PECK DAM
GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

ITEM NO.	QUANT.	DESCRIPTIVE DATA	DRAWING NO.
5030	2	Upstream Transition	5233-5000
5031	2	Downstream Transition	5233-5000
5032	2	By Pass Tee	5233-5000
5033	2	By Pass Piping	5233-5000
5034	2	By Pass Elbow	5233-5000
5101	2	Pipe Plug	5233-5100
5102	2	Hex Head Capscrew	5233-5100
5103	2	Key	5233-5100
5104	4	Hex Head Capscrew	5233-5100
5105	4	Lockwasher	5233-5100
5106	4	Hex Nut	5233-5100
5107	2	Retainer	5233-5100
5108	2	Operator Stem	5233-5100
5109	2	Drain Valve Bracket	5233-5100
5110	2	Bracket Base	5233-5100
5111	2	Stem Bracket	5233-5100
5112	2	Bracket	5233-5100
5113	2	Kirk Interlock and Switch	5233-5100
5114	2	Microswitch	5233-5100
5115	4	Fillister Head Screw	5233-5100
5116	6	Round Head Screw	5233-5100
5117	2	Hex Head Tap Bolt	5233-5100
5118	4	Reg Hex Nut	5233-5100
5119	2	Hex Head Screw	5233-5100
5120	2	Lockwasher	5233-5100
5121	8	Hex Head Bolt	5233-5100

PARTS LIST

18'-0" BUTTERFLY VALVE

CORPS OF ENGINEERS

Contract No. DA-32-015-CIVENG-59-113

FORT PECK DAM

GARRISON DISTRICT

Sales Order 5233

ITEM NO.	QUANT.	DESCRIPTIVE DATA	DRAWING NO.
5122	8	Cinch Anchor	5233-5100
5123	8	Hex Head Bolt	5233-5100
5124	8	Hex Nut	5233-5100
5125	8	Lockwasher	5233-5100
* 6001	2	Hydraulic Power Unit	5233-6000
* 6004	4	Plug Valve	5233-6000
6005	4	Pad Lock	5233-6000
6006	4	Union	5233-6000
6007	10	Elbow	5233-6000
6008	4	Nipple	5233-6000
6009	6	Nipple	5233-6000
6010	4	Pipe	5233-6000
6011	2	Pipe	5233-6000
6012	4	Pipe	5233-6000
6013	8	Pipe Hanger Flange	5233-6000
6014	8	Pipe Hanger Ring and Socket	5233-6000
6015	8	Threaded Rod	5233-6000
6016	16	Cinch Anchor	5233-6000
6017	16	Hex Head Bolt	5233-6000
6018	16	Hex Nut	5233-6000
6019	2	Tubing	5233-6000
6020	4	Male Pipe Tube Connector	5233-6000
6021	2	Tube Union	5233-6000
6022	26	Tube Clamp	5233-6000
6023	26	Hex Head Self Tapping Screw	5233-6000

(* SEE VENDOR LITERATURE)

PARTS LIST

18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERS

FORT PECK DAM
GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

ITEM NO.	QUANT.	DESCRIPTIVE DATA	DRAWING NO.
6024	2	Street Elbow	5233-6000
6025	2	Pipe	5233-6000
6026	400 gl.	SAE LOW Rust Inhibiting Oil	5233-6000
6027	8	Hex Head Capscrew	5233-6000
6028	8	Cinch Anchor	5233-6000
6029	14	Pipe Hanger	5233-6000
6030	4	Laminated Phenolic Plastic	5233-6000
6031	16 ft.	Jack Chain	5233-6000
6032	2	"S" Hooks	5233-6000
7001	2	Mounting Plate	5233-7000
* 7002	8	Clamp Bracket	5233-7000
* 7003	2	Manuel Grease Pump	5233-7000
* 7004	14	Metering Valves	5233-7000
* 7005	300 ft.	Tubing	5233-7000
* 7006	40	Tube Connector	5233-7000
* 7007	6	Line Check	5233-7000
* 7008	6	Line Check	5233-7000
* 7009	52	Tube Connector	5233-7000
* 7010	4	Pipe Plug	5233-7000
* 7011	8	Pipe Tee	5233-7000
* 7012	1	Barrel Transfer Pump	5233-7000
7013	2	Pipe	5233-7000
7014	30	Double Tube Clamp	5233-7000
7015	20	Single Tube Clamp	5233-7000
7016	18	Anchor Cinch	5233-7000
7018	18	Hex Head Bolt	5233-7000

(* SEE VENDOR LITERATURE)

PARTS LIST

18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERS

FORT PECK DAM
GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

ITEM NO.	QUANT.	DESCRIPTIVE DATA	DRAWING NO.
7020	50	Hex Head Self Tapping Screw	5233-7000
7021	18	Hex Nut	5233-7000
7023	8	Hex Head Capscrew	5233-7000
7024	4	Pipe Coupling	5233-7000
8001	8	Anchor Bolt Assy	5233-8000
8002	4	Bearing Plate	5233-8000
8003	8	Asbestos Sheet	5233-8000
8004	12	Asbestos Sheet	5233-8000
8005	4	Support Beam	5233-8000
8006	8	Anchor Bolt Assy	5233-8000
8007	4	Bearing Plate	5233-8000
8008	8	Hex Head Capscrew	5233-8000
8101	2	Platform Weldment	5233-8100
8102	2	Platform Brace Weldment	5233-8100
8103	2	Platform Brace Weldment	5233-8100
8104	2	Ladder Weldment	5233-8100
8105	16	Hex Head Bolt	5233-8100
8106	16	Cinch Anchor	5233-8100
8107	14	Hex Head Bolt	5233-8100
8108	14	Cinch Anchor	5233-8100
8109	8	Hex Head Bolt	5233-8100
8110	8	Bevel Washer	5233-8100
8111	8	Reg Hex Nut	5233-8100
9001	16	Hex Head Capscrew	5233-8100

PARTS LIST18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERSFORT PECK DAM
GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

ITEM NO.	QUANT.	DESCRIPTIVE DATA	DRAWING NO.
9002	1	Globe Valve	5233-9000
9003	1	Nipple	5233-9000
9004	1	Hex Bushing	5233-9000
9005	1	Tee	5233-9000
9006	1	Cap	5233-9000
9007	1	Street Ell	5233-9000
9008	1	Pipe Plug	5233-9000
9009	1	Nipple	5233-9000
9010	1	Close Nipple	5233-9000
9101	4	Disc Lifting Eye	5233-9100
9102	4	Lower Body Lifting Eye	5233-9100
9105	10	Eye Bolt	5233-9100
9106	1	Adjustable Hool Spanner Wrench	5233-9100
9107	2	Double Part 2-Leg Sling	5233-9100
9108	2	Eye Hoist Hooks	5233-9100
9109	1	Hex Box Wrench	5233-9100
9110	2	Striking Wrench	5233-9100
9111	1	Grease Gun	5233-9100

18'-0" BUTTERFLY VALVE
CORPS OF ENGINEERS

FORT PECK DAM
GARRISON DISTRICT

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

SPARE PARTS LIST

1. One (1) set each of packing as shown on drawings 5233-1100, 2400, 2500,
3000, 3300, 4000, ~~15000~~, *1000*.

VENDOR DRAWINGS AND DATA LIST

18'-0" BUTTERFLY VALVE

FORT PECK DAM

Contract No. DA-32-015-CIVENG-59-113

Sales Order 5233

DRAWING OR DATA NUMBER	TITLE	VENDOR
I.182413	Four-Way Valve	Union Steel Mfg.
I.89298	Filter Cap	Union Steel Mfg.
292-S	Oil Filter Elements	Union Steel Mfg.
Data Sheet	Hand Pump	Union Steel Mfg. ✓
Data Sheet	Hydraulic Gauge	Union Steel Mfg. ✓
2010H3B1	Pump	Union Steel Mfg.
Data Sheet	Motor ✓	Union Steel Mfg.
4160.2-4507	Plug Valve	Gilmore Steel Company
47.03	Manual Grease Pump	Farval Corporation
47.06	Metering Valves	Farval Corporation
GEH-2385C	Relays	General Electric

115-511-A-RTS-511

UNLESS OTHERWISE SPECIFIED

16 RAD.

- 1 - DO NOT SCALE DRAWINGS
- 2 - REMOVE ALL BURRS AND SHARP CORNERS
- 3 - ALLOW $\pm .010$ ON FINISHED FRACTIONAL DIMENSIONS

17 ROLLER POCKETS

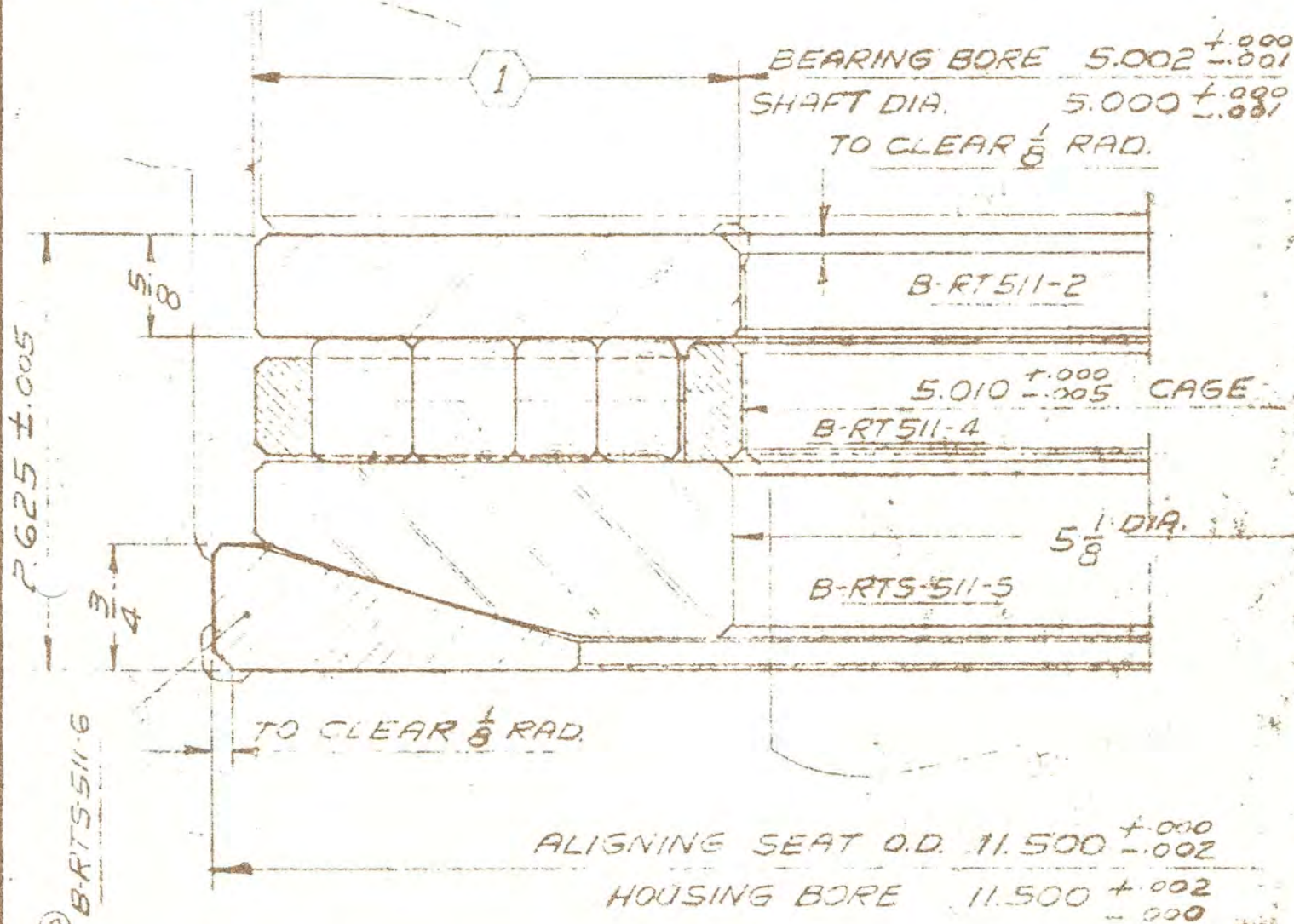
34 ROLLERS $\frac{3}{4}$ DIA. $\times \frac{1}{2}$ LONG - RT- $\frac{3}{4} \times \frac{1}{2}$

24 ROLLERS $\frac{3}{4}$ DIA. $\times \frac{5}{8}$ LONG - RT- $\frac{3}{4} \times \frac{5}{8}$

11,600# CAP. @ 100 R.P.M.

10.985 MAX. COLLAR O.D.

Static Cap. 547,000*



* 1) .015 MAX. VARIATION IN WALL THICKNESS

THE KAYDON ENGINEERING CORP.			
MUSKEGON, MICHIGAN			
PART NAME		SELF ALIGNING RT. BEARING	
MACHINE		MODEL	
MATERIAL		SCALE 1/2"	
DR. E.N.	CK. L.D.C.	APVD.	
DATE 11-1-45	DATE 11-5-45	DATE	
SYM.	CHANGES	DATE	CHK.

A-RTS-511

MERCOID SERIES "D" PRESSURE CONTROLS

FOR INDOOR, OUTDOOR OR HAZARDOUS LOCATIONS



GENERAL PURPOSE

NEMA 1. For indoor service and other general purpose applications where atmospheric conditions are normal. This type of construction serves as a protection against dust, and light indirect splashing. Furnished standard with plain case, bottom connection, designated as Types DA, DS, DR and DL. Can also be furnished on special order with plain case back connection, or flange case back or bottom connection.



WEATHER RESISTANT

NEMA 1A, 2, 3, 4. For outdoor service and other applications. This type of construction is semi-dust tight; drip tight; weather resistant; weather proof; splash proof; steel proof; moisture resistant; rain tight; water tight; hose test. Furnished only with flanged case bottom connection, surface mounting. Designated as Types DAW, DSW, and DRW. Not available in any other style case.



EXPLOSION PROOF

Class 1 Group 1 and 2; NEMA 7: Atmospheres containing gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvents, vapors and natural gas. Class 2 Group E, F, and G; NEMA 9, 9A. For atmospheres containing metal dust, carbon black, coal or coke dust and grain dust. Designated as Types DAE, DRE and DSE. Standard with bottom connection and mounting lugs as illustrated.

THREE SERIES TO MEET EVERY OPERATING REQUIREMENT

(Illustrations show case removed—all types available with case styles noted above)



SERIES D-20 AND D-30

This series incorporates the Mercoid 9-51 sealed (tilting type) mercury contact switch, rated at 10 amperes 115 volts, 5 amperes 230 volts A.C. or D.C. Available on special order for 440V. service or for multiple circuit control.

Standard with outside adjustments (designated as Type DA) for individual setting of both "high" and "low" (on-off) operating points. Can also be furnished as Semi-automatic control with hand reset (Type DR); Lock Type Reset Control (Type DL) or for Single Adjustment Control (Type DS) listed on page 14.

Available in pressure ranges from 0-30" vacuum to 2,500 psig. with differentials varying from 2" vacuum to 150 psig. For complete description of Series D-20 and D-30 see page 6.



SERIES D-500

Has same adjustable operating ranges and surge pressures as Series D-20 and D-30, but provides closer operating differentials. The sealed mercury contact switch is of the magnetic type and is rated at 5A, 115V., 2½A, 230V., AC; 2A, 115V., 1A, 230V., DC. For single pole single throw operation only. Not available for 440V. service or for multiple circuit control. Where higher electrical ratings are required use with Mercoid Relay.

Standard with outside adjustments (designated as Type DA) for individual setting of both "high" and "low" (on-off) operating points. Can be furnished for semi-automatic control with hand reset (Type DR) see page 14. Available in pressure ranges from 0-30" vacuum to 2,500 psig. with differentials varying from 1" vacuum to 100 psig. For complete description see page 7.



SERIES D-200

All Series D-200 controls use the low amperage, magnet operated sealed mercury contact switch rated as follows: AC-115V., 0.3A., 230V., 0.15A., 0.9A., at 24 volts; DC-115V., 0.15A., 230V., 0.07A.

This is the most sensitive control in the "D" series. It is available in pressure ranges from 0-30" vacuum to 2,500 psig. with differentials varying from 2 10" vacuum to 15 psig.

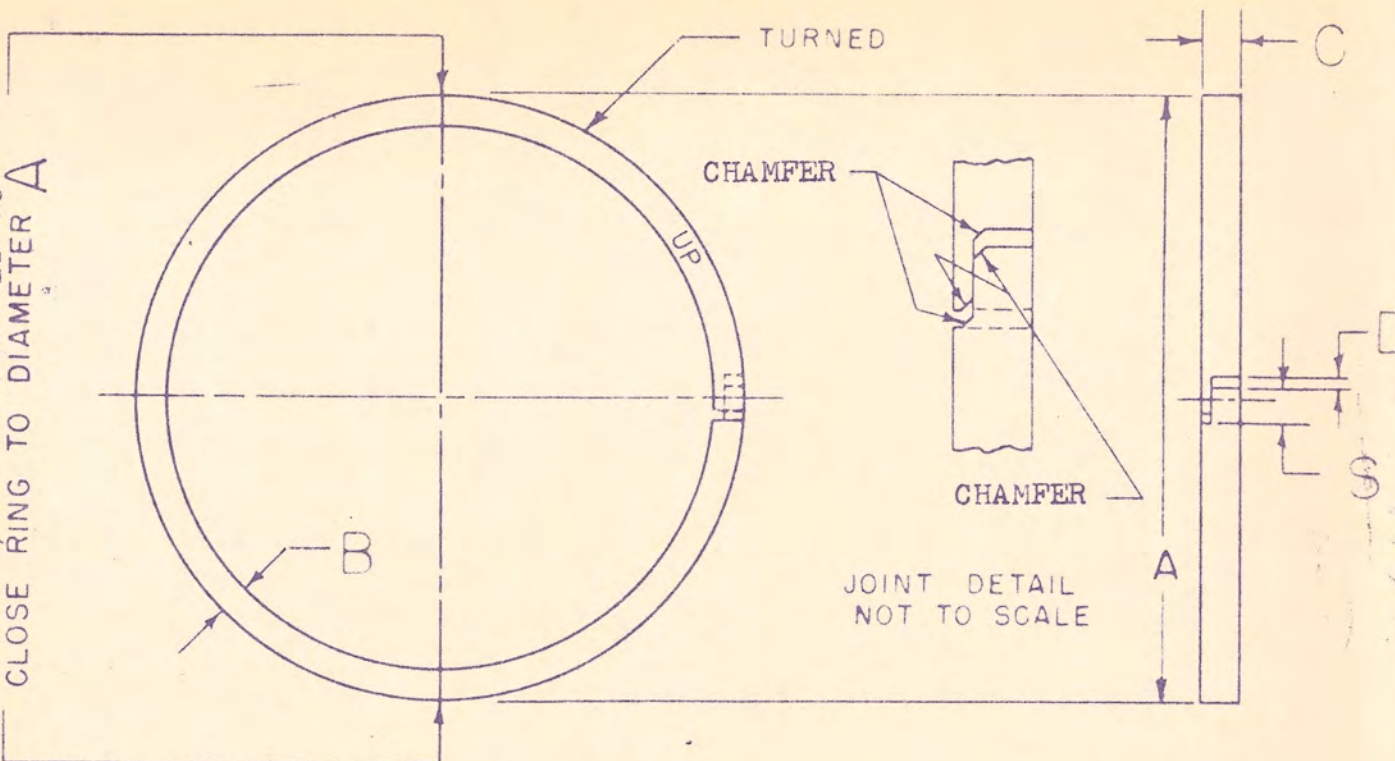
Standard with Single Adjustment (designated as Type DS) for setting operating point only. Differential (on-off switch) is factory set and cannot be changed in the field.

For single pole, single throw operation only. Not available for 440V. service or for multiple circuit control. Where higher electrical ratings are required use with Type A Mercoid Relay. For complete description of Series D-200 see page 8.

PART NUMBER
R-23476

TENSION, LOAD REQUIRED TO
CLOSE RING TO DIAMETER A

MATERIAL Koppers B-18 Bronze



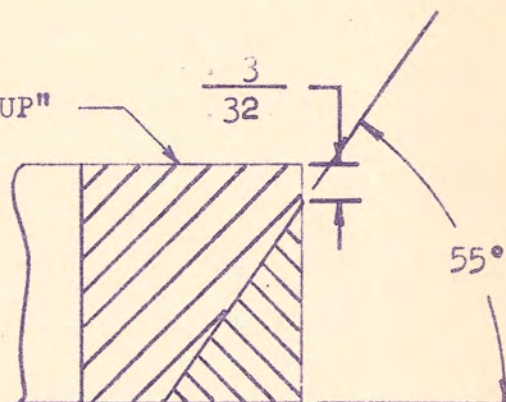
ATTENTION

Install side marked "UP" toward pressure

REVISIONS

CHG LET	DATE	CHANGE
A	9-24-58	Drawn

MARK "UP"



SECTION THROUGH JOINT

SCALE: 2 X

RING SIZE	DIAMETER A	WIDTH C	WALL B	END CLEAR D	TENSION LBS	STEP S
20 x 5/8	20.000	.621-.623	.578-.598	.005-.020	63-78	5/8

ADD SUFFIX CODE TO PART NO TO
INDICATE STD & OVERSIZE RING DIAMETER

SIZE	CODE	DIAM A	SIZE	CODE	DIAM A
Std	0	20.000			

STEP SEAL RING



KOPPERS COMPANY, INC.
METAL PRODUCTS DIVISION
PISTON RING DEPARTMENT
BALTIMORE 3, MARYLAND

DRAWN

WJC

CHECKED

WJC

APPROVED

WJC

R-23476

PART NUMBER

"E" and "V" General-Purpose Enclosed Switches

Enclosed general purpose switches answer the needs of many industrial requirements for limit, safety and control switches. Available in either side mounted or bottom mounting designs, the sturdy aluminum housing offers physical protection to the enclosed precision switch, provides a means of mounting and a $\frac{1}{2}$ - 14 NPSM internally tapped hub for connecting conduit. A variety of actuator designs are available.

MOUNTING

Side mounted enclosed switches (BZE series) are mounted with 6 - 32 x $1\frac{1}{2}$ round head machine screws through two holes located on one inch centers. Screws, nuts and lockwashers are furnished. Bottom mounting switches (BZV series) are mounted through two holes in the bottom plate, which are located on 1.625 inch centers.

VARIETY OF ACTUATOR DESIGNS

A wide variety of actuator designs eliminates the need of adapting applications to fit the physical requirements of the switch. MICRO SWITCH precision switches are designed to fit the applications.

Many actuator designs which are not shown in this catalog are also available. For more information please contact the nearest MICRO SWITCH Branch Office.

SEALED PLUNGER



These plunger actuated switches are widely used as mechanically operated limit switches in applications where the means of actuation is in line with the motion of the plunger. BZE-2RN (side mount) shown. BZV-2RN is bottom mount.

CHARACTERISTICS BZE-2RN and BZV-2RN

Operating force	9-24 oz.	Pretravel	.078 in. max.
Release force	4 oz. min.	Overtavel	.219 in. min.
	Differential travel		.002 in. max.

SEALED ROLLER LEVER



This sealed roller-lever switch is for cam or slide operation. Lever is adjustable horizontally through 360 degrees; vertically through 225 degrees. Has elastomer seal boot. BZV-2RN2 (bottom mount) shown. BZE-2RN2 is side mount. This type is also available with a hinged, one-way actuator. Side-mount version is BZE-2RN28; bottom-mount version is BZV-2RN28.

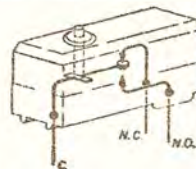
CHARACTERISTICS BZE-2RN2 and BZV-2RN2

Operating force	10 - 20 oz.	Pretravel	.188 in. max.
Release force	6 oz. min.	Overtavel	.219 in. min.
	Differential travel		.006 in. max.

Note: Dimensions shown on this page are subject to change; current drawings will be supplied on request.

CONTACT ARRANGEMENT

Enclosed general purpose switches have single-pole double-throw contact arrangements and may be wired either normally-open or normally-closed.

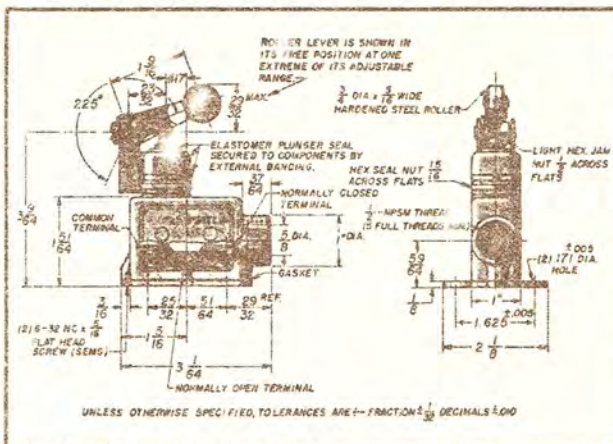
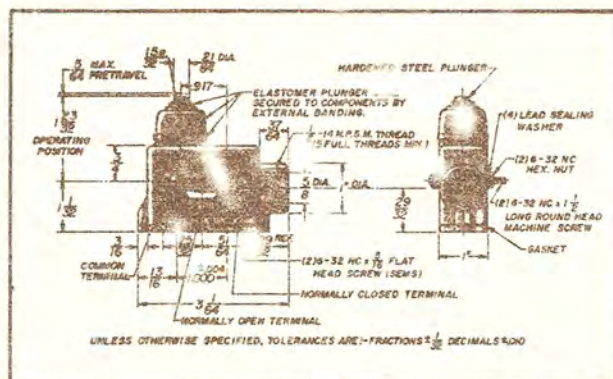
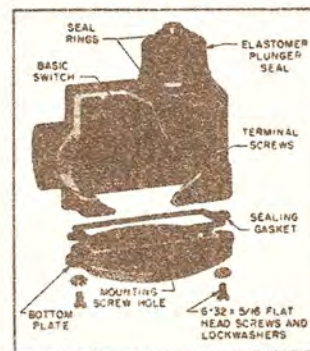


UNDERWRITERS' LABORATORIES LISTING

15 amperes 125, 250 or 480 volts a-c; $\frac{1}{2}$ ampere 125 volts d-c;
 $\frac{1}{4}$ ampere 250 volts d-c.

ENCLOSED SWITCH IS REPLACEABLE IN FIELD

The enclosed precision, snap-action switching unit is accessible for wiring or replacement by removing the bottom plate of the housing which is held in place by two screws and lockwashers. Wires are fed through the conduit hub and attached to the screw-type terminals.



MICRO SWITCH

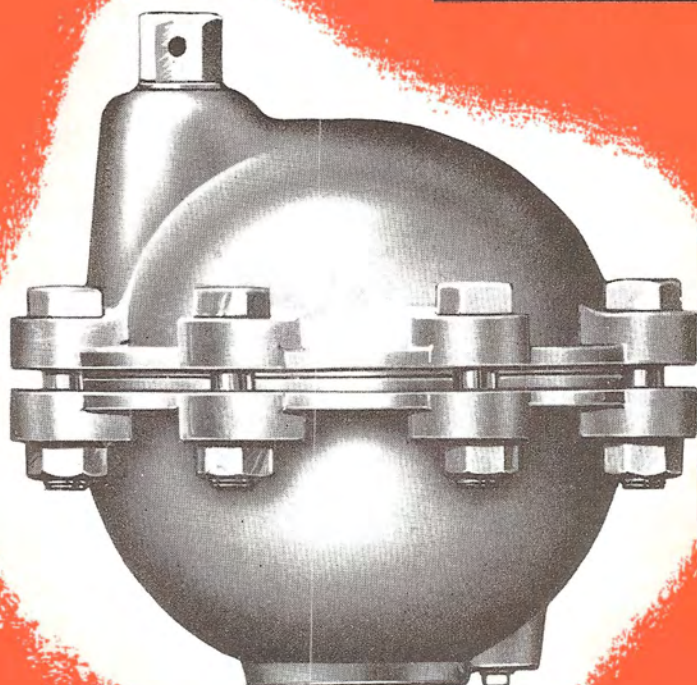
A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

1a Canada, Lakeside, Toronto 17, Ontario • FREEPORT, ILLINOIS



•SIMPLEX

AIR RELEASE VALVES



REPRESENTED BY
H. D. FOWLER CO., INC.
1714 1ST AVENUE
SEATTLE, WASH.
PHONE, N.W. 4600

**FOR WATER,
SEWAGE AND
INDUSTRIAL USE**

BULLETIN
NO. 1206

SIMPLEX[®]

VALVE AND METER COMPANY

LANCASTER

PENNSYLVANIA

TYPE K AUXILIARY SWITCH

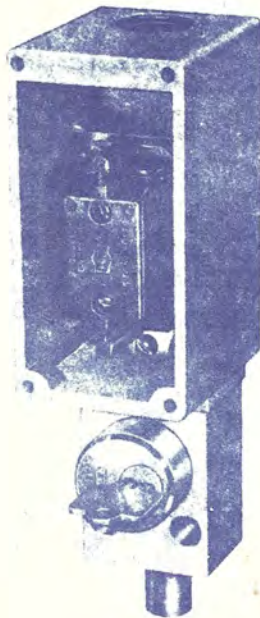


FIG. 34

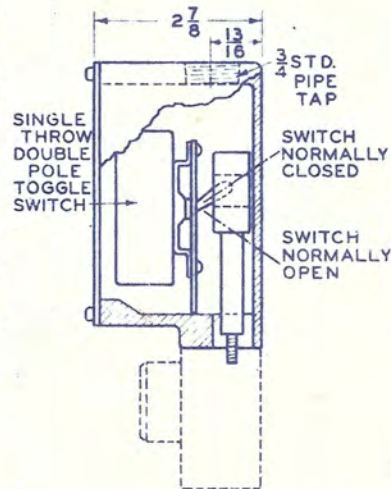
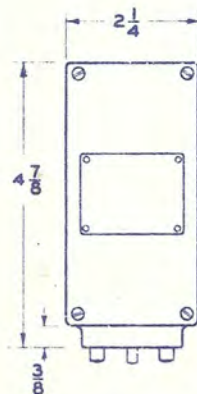


FIG. 35

The Type K auxiliary switch is a quick-make, quick-break device capable of handling relatively large currents. The assembly normally uses a Cutler-Hammer extra heavy duty snap switch, catalog No. 7410. This switch is rated 20 amperes, 250 volts a-c or d-c, (non-inductive), or at 2 H.P., 125/250 volts.

The snap switch is operated in response to the movements of the interlock lock bolt. However, the Type K switch remains in its initial position until the lock bolt has traveled substantially the full $\frac{3}{4}$ " distance to its second position. The Type K auxiliary switch therefore does not give an indication as to initial movement of the lock bolt.

The switch is normally mounted with the cover on the same side as the lock, but can be mounted so that the cover faces away from the lock. This arrangement makes for easy access to the switch from the back of a panelboard, for instance.

TYPICAL APPLICATIONS

The Type K auxiliary switch can be used as a key operated power switch. A few examples of its application might be as follows:

First, as an elevator control switch which enables only authorized personnel to use the elevator.

Second, the protection of photo-sensitive material by permitting the turning on of lights only under prescribed conditions—such as when the "light-locks" have been locked in a safe position.

Third, as motor control switch, either independently or in conjunction with an interlock system.

220 VOLT PERFORMANCE CURVES

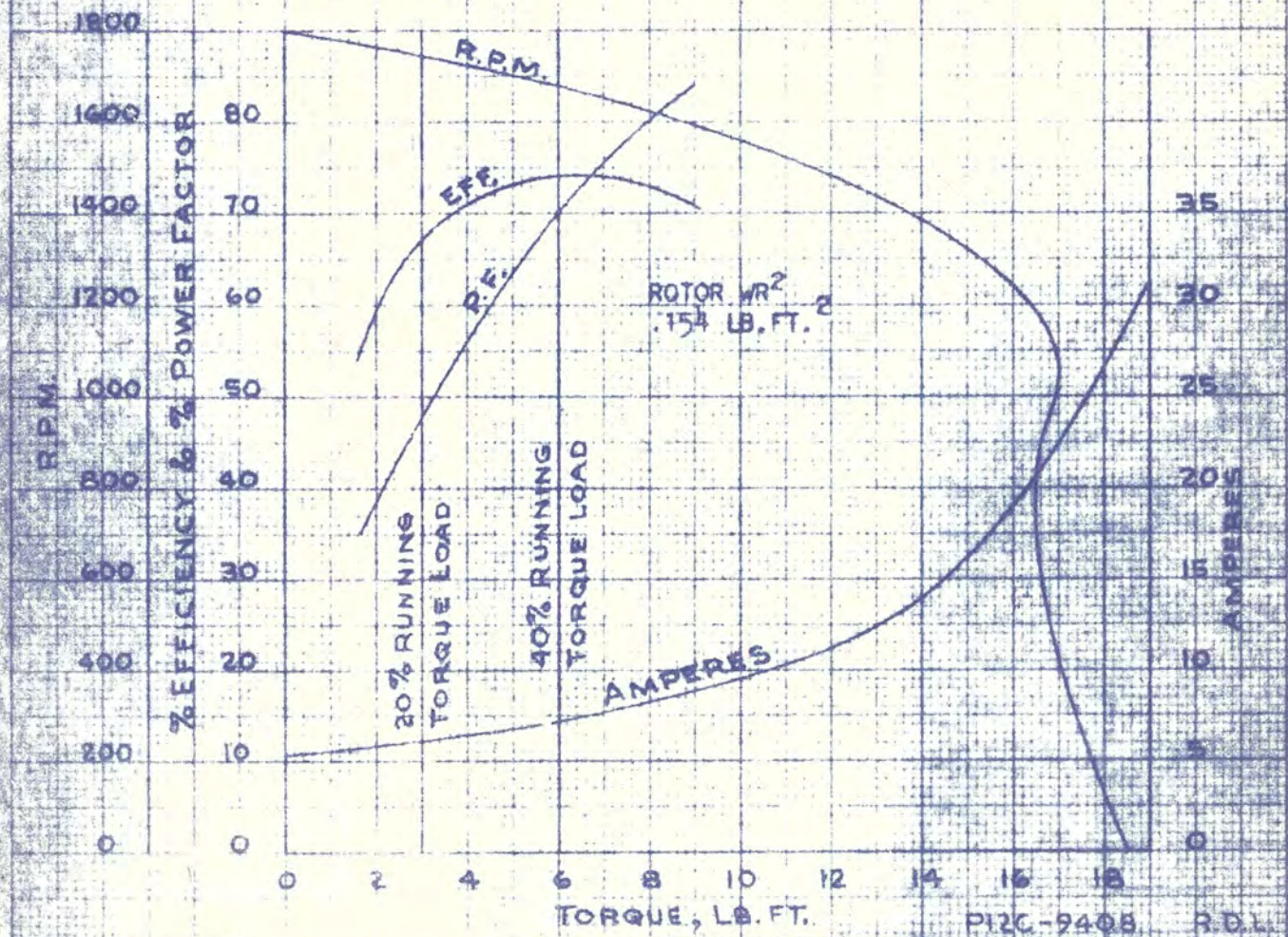
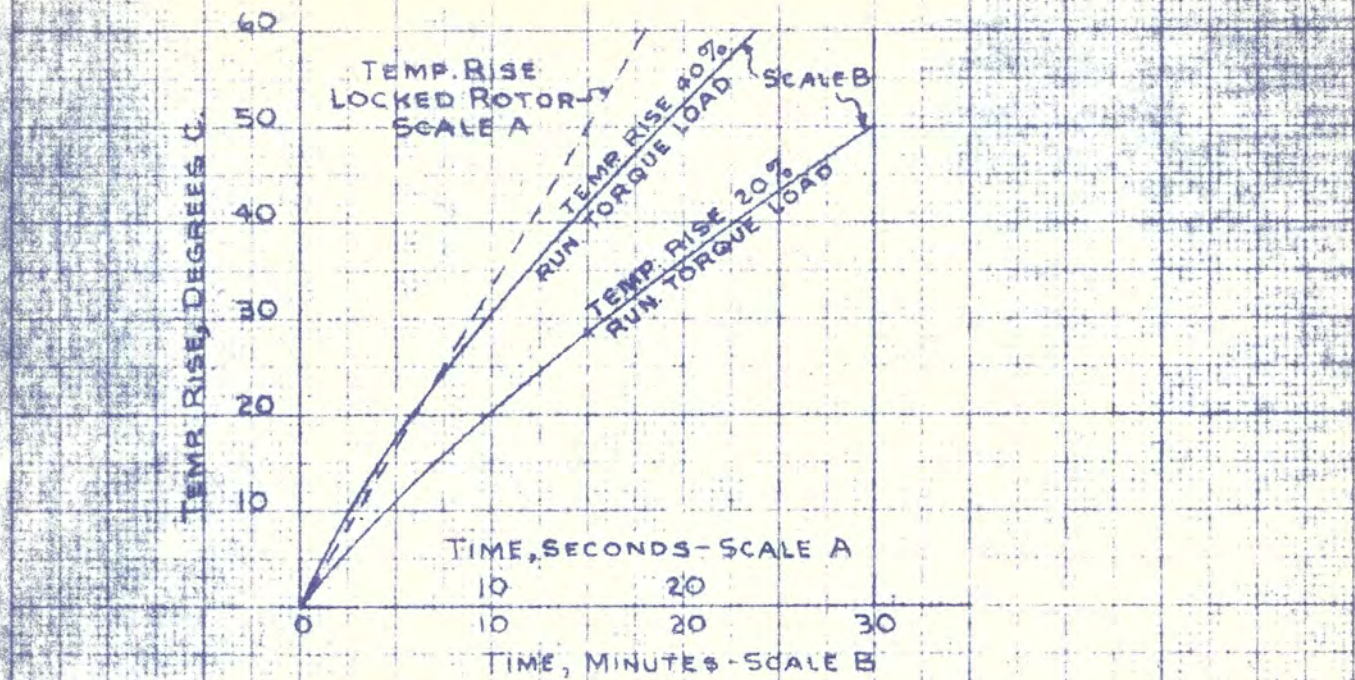
SQUIRREL CAGE INDUCTION MOTOR

THE PEERLESS ELECTRIC CO., WARREN, O.

15[#] FT. L.R. TORQUE, P12C FRAME

220/440 VOLTS, 3 PHASE, 60 CYCLES

1750 R.P.M. - T.E.N.V. MOTOR



L-41498

TYPES B, F AND FN

The Type B interlock housing is a heavy bronze casting, mounted with hex head bolts $\frac{3}{8}$ " x $\frac{3}{4}$ ". Type B is generally used for base mounting.

The Type F interlock housing is of heavy bar stock, mounted with filister head bolts $\frac{3}{8}$ " x $1\frac{3}{4}$ " through the front of the housing. This type is generally used for flat or face mounting. Because the Type F is $\frac{3}{4}$ " narrower in width than the Type B, it may be mounted in smaller spaces.

Type FN interlocks are similar to Type F interlocks except that they are $\frac{1}{4}$ " narrower, permitting them to be mounted in still smaller spaces. Mounting is by means of tapped holes in the base. A mounting adapter plate can be furnished for applications where it is not feasible to use these tapped holes.

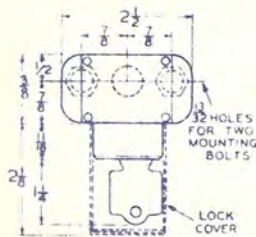
The locking bolt in all these interlocks is made of $\frac{5}{8}$ " diameter Everdur. The throw, or travel, of the bolt is $\frac{3}{4}$ ". The bolt can be made with a length so that when it is in the withdrawn position there is no projection beyond the housing. It can also be made with a projection of $\frac{3}{8}$ " to be flush with a $\frac{3}{8}$ " mounting plate. Other regular projection lengths are $\frac{1}{4}$ ", 1, 2, and 3". If no projection length is specified, 1" projection will be supplied.

Type S, SS, and K auxiliary switches can be mounted on these interlocks as required.

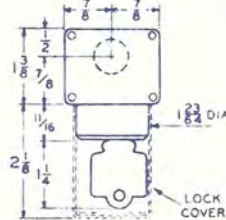
All three interlocks can be arranged so that the keys may be removable when the locking bolt is either extended or withdrawn.

Multiple type B, F, and FN interlocks can be furnished, for example, M2B, M5F, M3FN.

TYPE B



TYPE F



TYPE FN

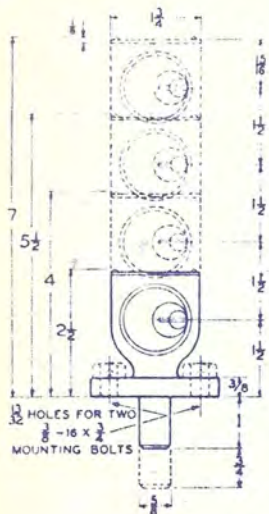
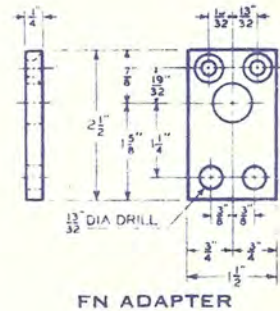
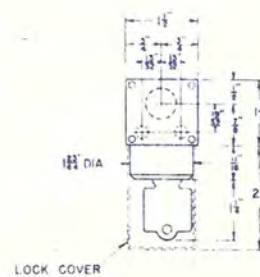


FIG. 11

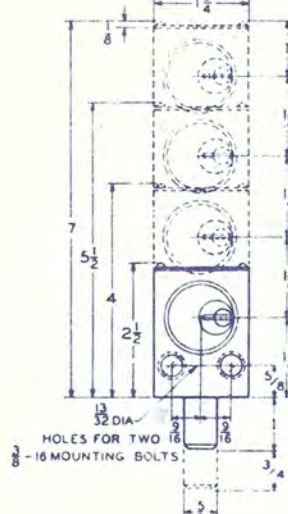


FIG. 12

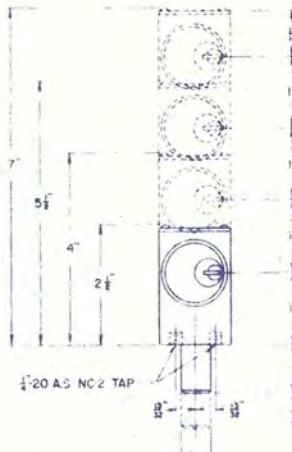


FIG. 13

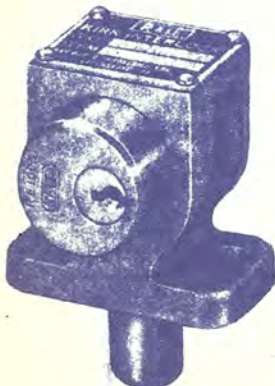


FIG. 14



FIG. 15

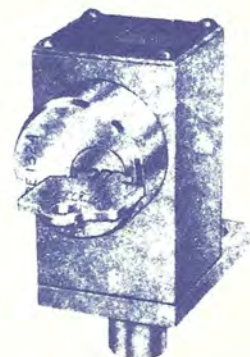
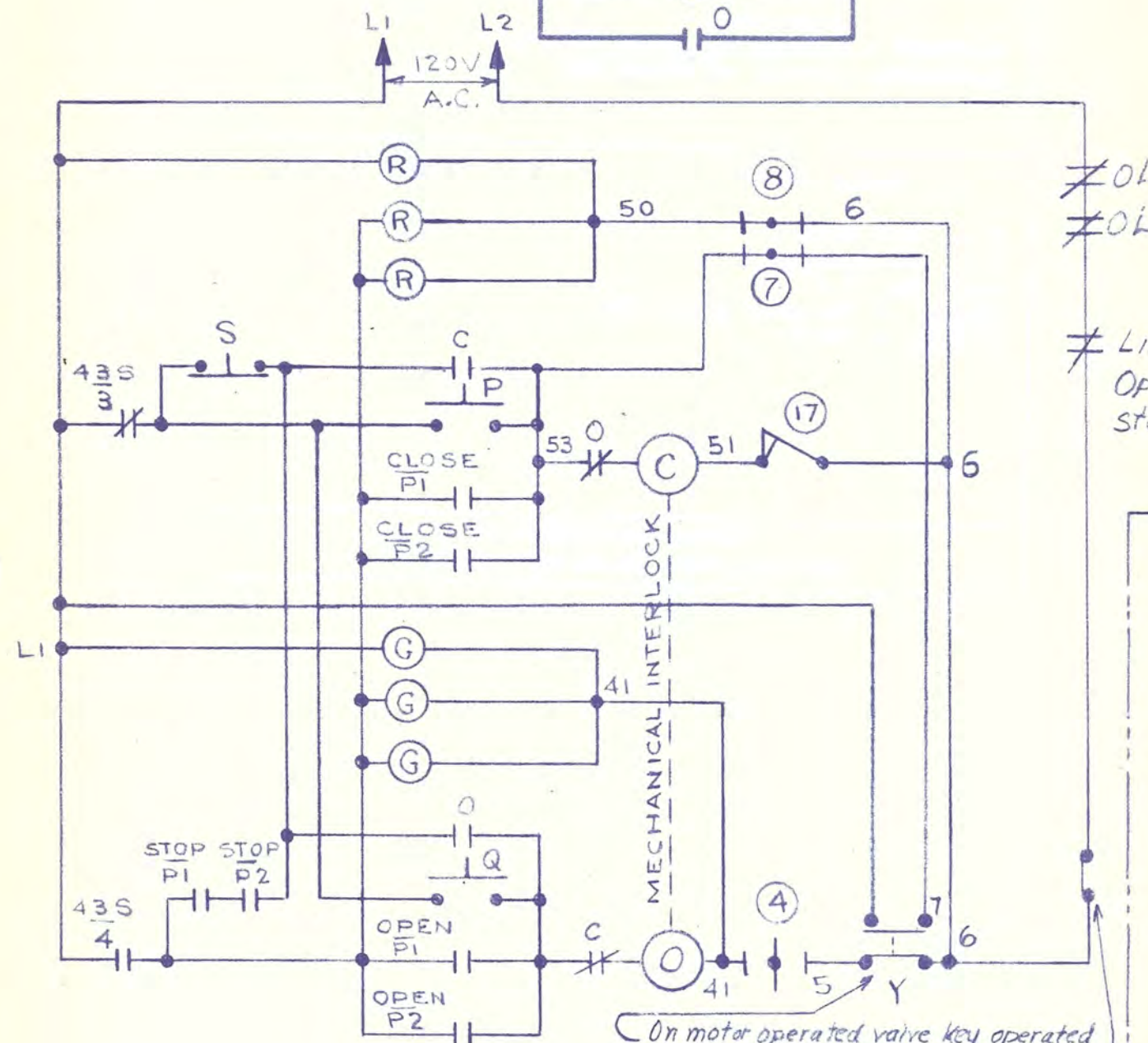
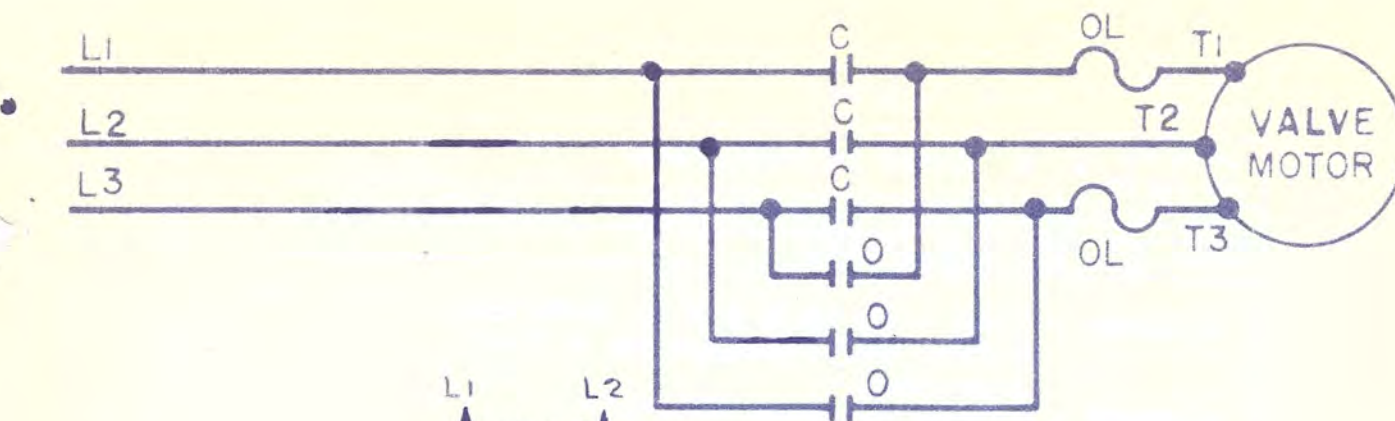
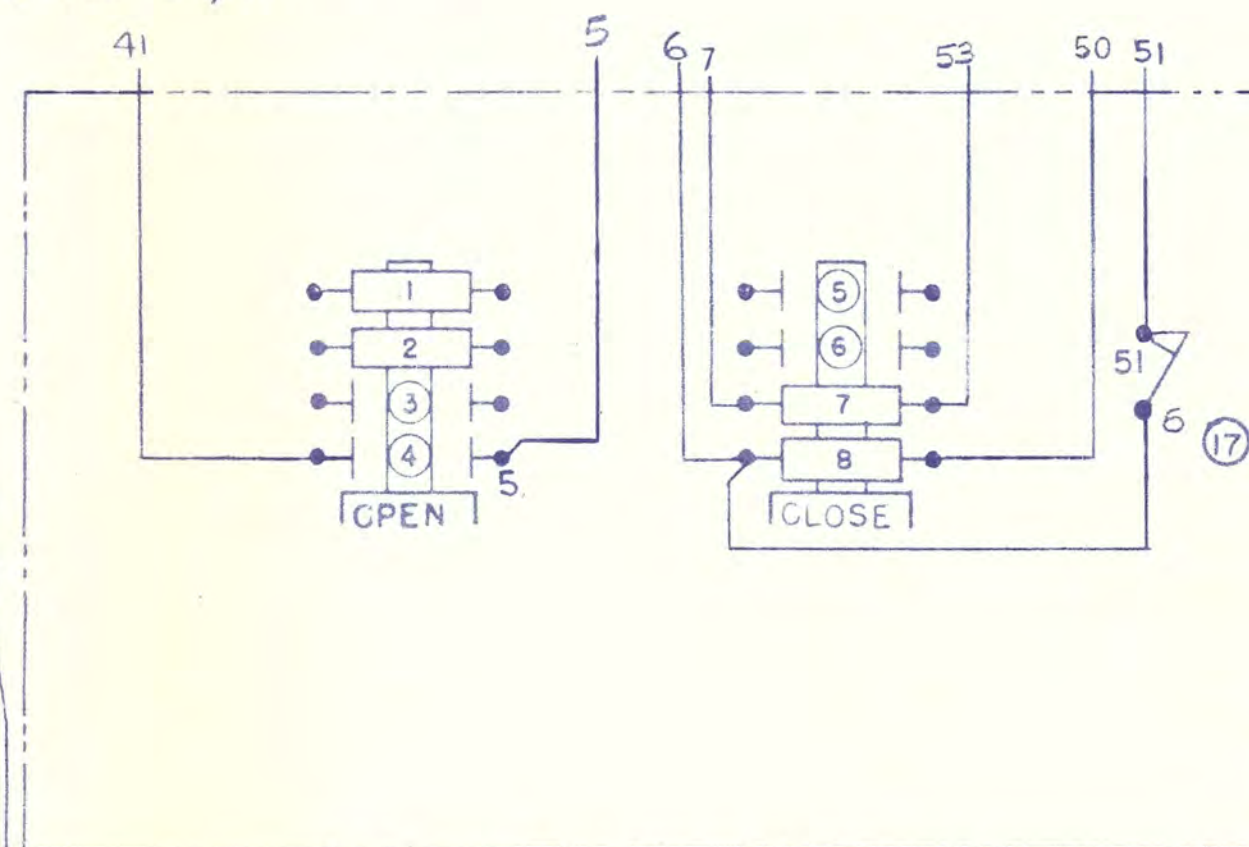


FIG. 16
TYPE FN



~~OL~~
~~OL~~

~~Limit Switch on Drain Valve,
Opens when drain valve
starts to open~~



Key operated mechanical & electrical interlock on drain valve key may be removed when valve is locked

VALVE SELECTOR SWITCH (43S) SHOWN "VALVE ROOM" POSITION.

VALVE SHOWN IN FULL OPEN POSITION

LIMIT SWITCH CONTACT DEVELOPMENT				
CONTACT	VALVE FULL OPEN	INTERMEDIATE VALVE POSITION	VALVE FULL CLOSED	CONTACT FUNCTION
1	CLOSED	OPEN	OPEN	SPARE
2	CLOSED	OPEN	OPEN	SPARE
3	OPEN	CLOSED	CLOSED	SPARE
4	OPEN	CLOSED	CLOSED	OPEN LIMIT
5	OPEN	OPEN	CLOSED	SPARE
6	OPEN	OPEN	CLOSED	SPARE
7	CLOSED	CLOSED	OPEN	AUTO CLOSE
8	CLOSED	CLOSED	OPEN	IND. LIGHT

17 CLOSING TORQUE SWITCH INTERRUPTS CONTROL CIRCUIT IF MECHANICAL OVERLOAD OCCURS DURING CLOSING CYCLE OR FULL CLOSED VALVE.

EE-60 (RFC)
89A - APP'D
80

C-CLOSING CONTACT & CONTACTOR
O-OPENING CONTACT & CONTACTOR

Ⓢ-CLOSING COIL

Ⓢ-OPENING COIL

Ⓢ-GREEN INDICATOR LIGHT

Ⓢ-RED INDICATOR LIGHT

J-LAMP RESISTOR

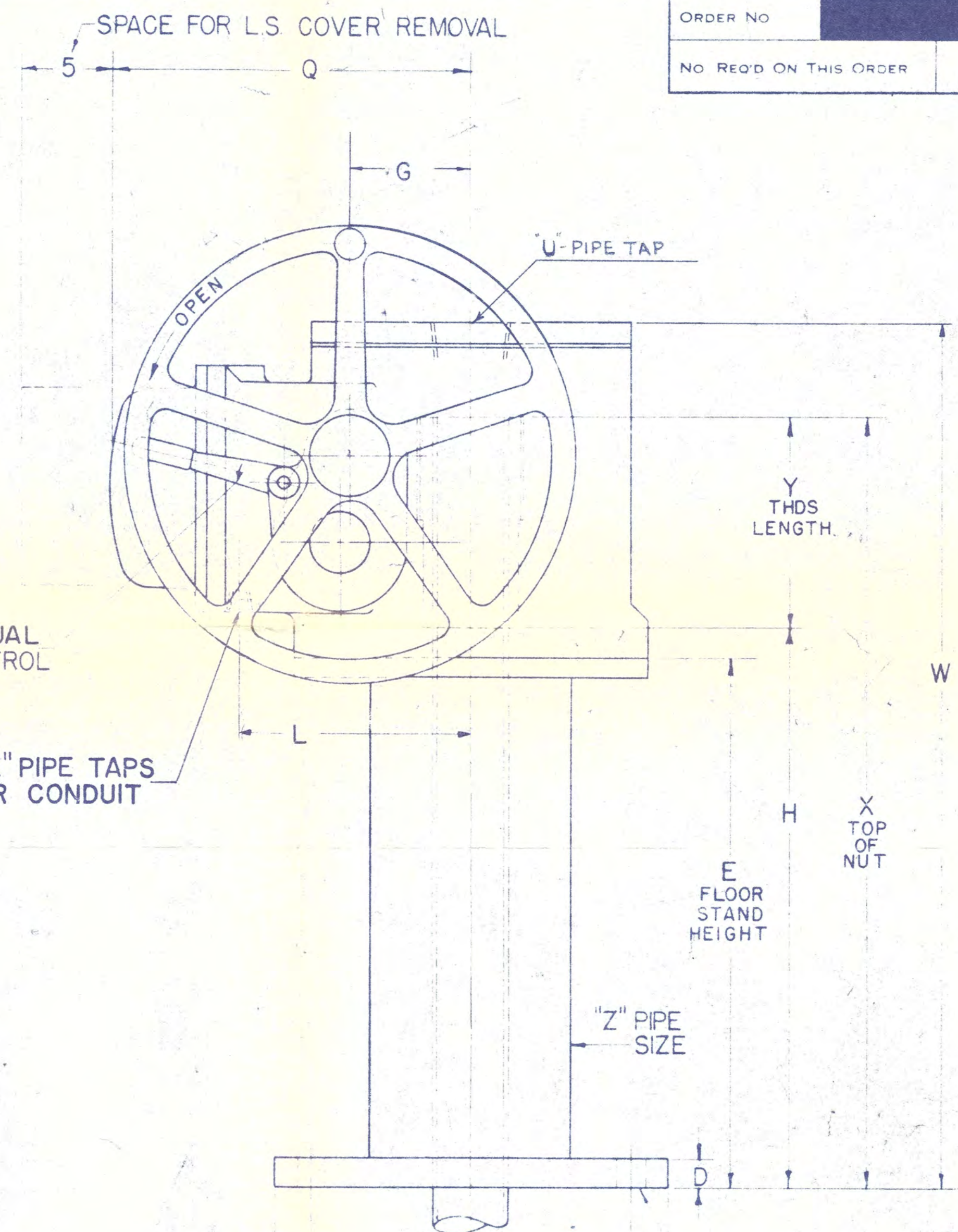
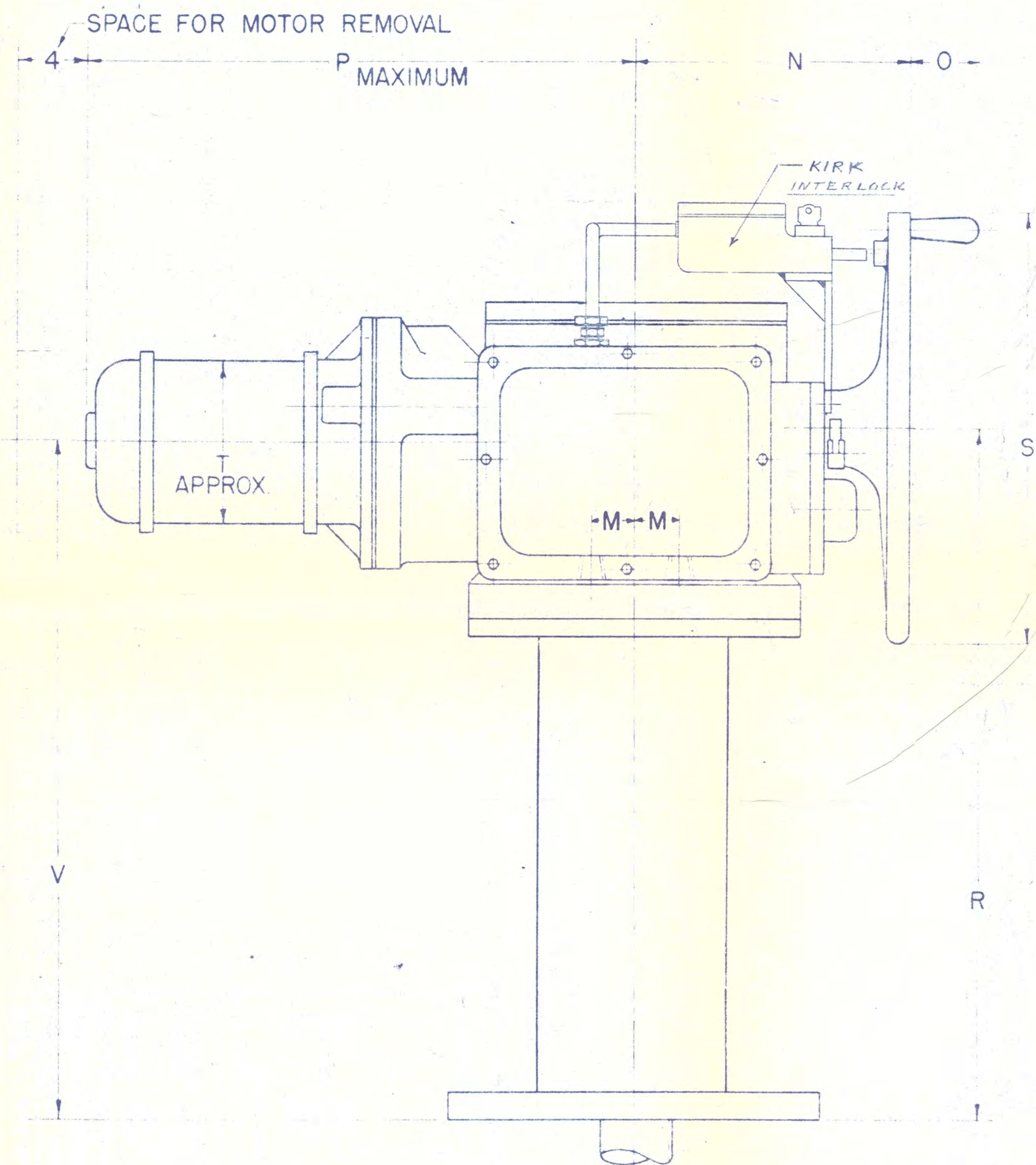
Y-KIRK INTERLOCK
P-CLOSE PUSHBUTTON
Q-OPEN PUSHBUTTON
S-STOP PUSHBUTTON
OL-OVERLOAD RELAY

On motor operated valve key operated mechanical & electrical interlock, with key in lock and turned, motor or hand wheel may be operated. Turn key mechanically locks wheel and electrically closes valve

GEARED LIMIT SWITCHES

DRN. J.G.A.	PHILADELPHIA GEAR CORPORATION-PHILA., PA.		
TR.	TITLE		
CHKD.	WIRING DIAGRAM		
APPVD.	IST ORDER NO. L-41498	MACH. SIZE	B-68302
SCALE	DATE 12-18-58		

NO.	DESCRIPTION	DATE
D		
C		
B		
A	ADD 2ND KIRK INTLK AS PER Dwg. 2-26-59	
REVISIONS		



ORDER NO.	
NO REQ'D ON THIS ORDER	

**SMA UNITS WITH SINGLE TORQUE FAB. STL. FLOORSTAND
WITH KIRK INTERLOCK**

A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
0 1 13/16	8 1/2	10	7/8	28	7/8	2 1/8	29	4	1	5 7/8	2 1/2	8 3/4	4	2 1/4	13 3/8	34 7/16	12	7 5/8	2 1/2	33 11/16	38	35 1/16	6 1/16	4
1 2 1/4	11	14	1	28	1 1/8	3 1/2	29	4	1 1/2	8 3/8	2 1/2	10 5/8	4	23 9/16	16	36 1/16	12	7 5/8	3	35 3/16	39 7/8	36 3/16	7 3/16	6
2 2 3/4	14	17	1	28	1 1/8	3 7/16	29	4	1 1/2	8 3/4	2 1/2	11 5/16	4	29 1/2	16 1/4	35 1/4	18	10 1/4	4	34 7/16	41 1/4	37 1/4	8 1/4	8
3 3 1/2	14	17	1	28	1 3/8	5 5/8	29	4	1 1/2	11 1/8	2 1/2	14 1/2	4	31 5/8	18 5/8	37 1/4	18	12	5	36 1/8	42 3/4	38 3/8	9 3/8	8
4 4 1/2	17	21	1 1/2	28	1 5/8	6 1/2	29 5/8	4	1 1/2	12 1/2	2 1/2	15 3/8	4	36 3/4	20 1/8	38 5/8	24	15	6	37 3/4	45 3/4	40 5/8	11	10

VALVE STEM THREADED LEFT HAND

REVISIONS U B A NO.	DATE	OLD PART NO.	NO. REQ. PER UNIT	PHILADELPHIA GEAR WORKS — PHILA., PA.	
		LAST ORDER NO.	CHKD. JK.	STOCK SIZE	ROUGH WT.
		SUPERSEDER	TR.	ALL MACH. FRACTIONAL DIMENSIONS & DIA. UNLESS NOTED	
		SUPERSEDED BY	CHKD.	NAME	
SCALE			MAT. HEAT TREAT	MACH. SIZE	DWG. NO.
DATE 10-9-58				SMA-UNITS	C-79184

PHILADELPHIA

LIMITORQUE VALVE CONTROLS

TYPES SMA-000, SMA-00, SMA-0 THROUGH SMA-4



SMA-000 and SMA-00



SMA-0 through SMA-4

what limitorque is

LimiTorque is an efficient, sensitive, automatic, power actuated device for controlling all types of valves, sluice gates and shipboard water tight doors. In the event of a power failure, LimiTorque can always be manually operated through a powerful handwheel control.

The use of LimiTorque Control eliminates need for personnel to manually operate valves. LimiTorque is favored for its simplicity, economy, and dependability where fully automatic operation is desired, where valves are inaccessible, or where emergency may require rapid, positive operation from a remote point. LimiTorque provides absolute safety for operating personnel because the handwheel cannot rotate during power operation.

what limitorque does

LimiTorque is more than a valve actuating device for it also controls and limits the opening and closing travel of the valve.

Proper valve seating is of prime importance in automatic valve operation because most valves are damaged through improper seating or by meeting a foreign obstruction during seating. By limiting torque and thrust loads with its torque limit switch LimiTorque protects all valve operating parts from overload. Also LimiTorque provides a constant seating thrust thus assuring an absolutely tight valve on

LimiTorque may be fitted to any size valve in almost any position or location and can readily be adapted to existing equipment. LimiTorque can be actuated by a wide range of power sources including electricity, hydraulic pressure, air, or high pressure natural gas. Gas and Oil Pipelines utilize VHF Microwaves as a means of initiating operation of remote valves.

LimiTorque Valve Controls have been designed and perfected by our engineers over a period of 30 years. This highly specialized experience plus pride in our product is your guarantee of safe, positive, and trouble-free valve operation. Our nation-wide engineering and sales organization is available to help you with your valve control problems.

each closure. This seating thrust may be varied by means of a micrometer adjustment of the torque limit switch and thereby enabling operating personnel to compensate for valve wear or other changing service conditions throughout the life of the valve.

Should an obstruction be met while closing the valve, the torque limit switch becomes operative and disconnects the source of motive power regardless of whether this source be electricity, air, gas, or hydraulic pressure. Thus LimiTorque prevents damaged valve seats, stems, and discs.

A PRODUCT OF PHILADELPHIA GEAR CORPORATION

Controlead

MEDIUM DUTY TERMINAL BLOCKS

200 - 300 SERIES

Outstanding Features

BREAKAGE RESISTANT

1



The improved disposition of material in this block results in terminals that are stronger, better supported on a base that resists breakage, yet occupies no more space than blocks of similar design. This feature makes these blocks mechanically practical in a wide range of different molding materials, including the inherently brittle, heat electrical types.

BUILT-IN INSULATION

2



The insulating plugs are molded as an integral part of the block, yet are designed for clean knock-out to readily provide end holes or additional thru-holes. The dielectric strength through these plugs is in excess of the line-to-ground flash over. This eliminates the necessity of a separate insulating strip between screw tip and ground.

3-POSITION SPRING MOUNTED MARKER

3



Spring mounted marker offers three positions for positive identification. The strip snaps into place. When mounted in either side position, a row of terminals is completely exposed and accessible for wiring. In the center position the marker provides a distinct circuit identifying strip leaving adequate room to apply test probes or clips for circuit checking purposes.

LONG LINE-TO-GROUND CLEARANCE

4



These blocks provide the longest line-to-ground distances available in any blocks of comparable size and type.

MODIFICATIONS



APR 9 1954



ENGINEERING DATA

SQUIRREL CAGE INDUCTION MOTORS

55°C Rise--NEMA Design B Enclosed
and Explosion Proof--Old NEMA Frames

3 Phase--60 Cycle--Continuous Rated
220, 440, 550 Volts

Hp	SPEED (RPM)		EFFICIENCY			POWER FACTOR			CURRENT IN AMPERES					TORQUE IN LBS. AT ONE FOOT RADIUS		
	Syn- chro- nous	Full Load Approx.	Load			Load			Full Load			Locked Rotor		Full Load	Locked Rotor	Maxi- mum Run- ning
			1/2	3/4	Full	1/2	3/4	Full	220 Volts	440 Volts	550 Volts	220 Volts (1)	Code Letter			
1/4	900	860	54	61	66.5	38	45	54.5	2.7	1.25	1.08	12	L	3.05	4.6	7.7
1/4	1200	1150	63	69.5	71	44	56	60.5	3.1	1.55	1.24	18	L	3.42	5.0	9.45
	900	850	60	67	71	39	52	53	2.6	1.3	1.44	18	L	4.58	6.9	11.5
1	1800	1740	69.5	75	77	51	63	72.5	3.5	1.75	1.4	24	L	3.02	8.45	9.06
	1200	1150	65	71	72	46	58	62	4.0	2.0	1.5	24	L	4.57	8.0	12.6
	900	860	67.5	72	73	41	52.5	61	4.4	2.2	1.75	24	L	6.1	9.15	15.3
1 1/4	3600	3500	80	81.5	82	70	81	87	4.1	2.05	1.64	35	K	2.25	3.95	6.2
	1800	1740	73	77.5	80	55	67	73.5	5.0	2.5	2.0	35	K	4.53	12.0	13.6
	1200	1150	73	77	77.5	50	60	71	5.34	2.67	2.14	35	K	6.95	12.0	16.9
	900	860	68	74	75	42	54	65	6.0	3.0	2.4	35	K	9.15	13.8	22.9
2	3600	3500	81	83.5	84	71	81	87.5	5.3	2.65	2.12	45	K	3.0	5.25	7.5
	1800	1740	78.5	81	82	58	72	82	5.8	2.9	2.3	45	K	6.04	15.1	16.7
	1200	1150	74	77	78.5	51	63	71	7.0	3.5	2.8	45	K	9.15	16.0	22.9
	900	860	70	75	76	44	56	66	7.8	3.9	3.12	45	K	12.2	18.3	27.5
3	3600	3500	74.5	81	81.5	81	87	90	8.0	4.0	3.2	60	J	4.5	7.9	11.3
	1800	1740	76	81	82.5	58	69	79	9.0	4.5	3.6	60	J	9.06	22.7	25
	1200	1150	75.5	79.5	80.5	53	67	75	9.6	4.8	3.84	60	J	13.7	24	34.4
	900	860	71	76	78	46	58	67	11.7	5.0	4.48	60	J	18.3	27.5	41.5
5	3600	3500	81	84	84.5	80	87	89	12.0	6.5	5.2	90	H	7.5	11.3	16.9
	1800	1740	83	85	86	65	75.5	81.5	14.0	7.0	5.6	90	H	15.1	28.0	34.0
	1200	1150	80	82.5	83	60	72	80.5	14.5	7.3	5.84	90	H	27.6	36.5	51.5
	900	860	80	82	82.5	51	64	72	16.5	8.25	6.6	90	H	30.5	40.0	68.5
7 1/2	3600	3500	80	82.5	83	77	84	88	20	10	8.0	120	G	11.25	16.9	24.2
	1800	1740	81	84	84.5	72	81	86.5	20	10	8.0	120	G	22.7	39.8	49.0
	1200	1150	83	85	85	61	73	81.5	21.2	10.6	8.5	120	G	34.2	51.5	73.5
	900	860	80.5	82.5	83	51	64	71	25	12.5	10.0	120	G	45.9	57.5	99.0
10	3600	3500	79	82.5	83.5	80	87	89.5	26.2	13	10.5	150	G	15	22.5	30
	1800	1740	83.5	85	85	77.5	86.5	89.5	25.6	12.8	10.2	150	G	40.2	43.0	61.0
	1200	1150	84	84.5	85	69	76	82.5	23	14	11.2	150	G	45.7	68.5	97.0
	900	860	82	84.5	85.5	65	76	82.0	26	14	11.2	150	G	61	76.5	127
15	3600	3500	83	84.5	85.5	83	89.5	91.5	37.4	18.7	15	220	F	27.5	33.8	45
	1800	1740	84	86.5	86.5	80	89	90.5	37.5	18.75	15	220	F	45.1	74.7	90.5
	1200	1160	86	88	89	67.5	78	83	39.6	19.8	15.8	220	F	68	95.2	136
	900	860	83	85	85	66	76.5	82.5	47	21	16.8	220	F	91.5	114.5	183
20	3600	3500	84	86	87.5	87	91.5	93	48	24	19.2	290	F	30	45	60
	1800	1750	85	86.5	87	80	87	88	51	25.5	20.4	290	F	60	90	120
	1200	1160	87	89	90	70	80	84	52	26	20.8	290	F	90.5	122	181
	900	865	87	88	88.5	70	81	85	52	26	20.8	290	F	121.5	152	243

(1) Currents for the other voltages are inversely proportional to the voltage

The power factor, efficiency and full load current data apply to a typical machine, and must not be used for guarantee purposes.

Prices and Data Subject to Change Without Notice.

5.67.8

ENGINEERING DATA

POLYPHASE SQUIRREL CAGE INDUCTION MOTORS

motor, in addition to its lower breakdown torque, also sacrifices to some extent, the efficiency and power factor of a Design B motor.

Design D motors have high torque and high slip. This type is generally used on applications involving high inertia and frequent load changes of which the most common example is the flywheel-equipped punch press. The high torque, high-slip characteristics serve a dual purpose:

1. The high torque enables the motor to accelerate the load without preheating.
2. The high slip permits the motor to pick up the load when the kinetic energy stored in the flywheel has been released during the working stroke of the cycle. Further, as the load decreases after the working stroke is completed the light load is accelerated again to full speed, again restoring energy to the flywheel. This alternate supplying and releasing of power irons out the load peaks, thereby diminishing the maximum power demand to an amount but slightly higher than that taken by other loads which can be accommodated by Design B or C motors of the same horsepower rating.

LOCKED-ROTOR TORQUE

With rated voltage and frequency applied at the instant of starting the locked-rotor torques of the various classes of motors will not be less than the values shown in Tables A and B which are expressed in percent of full-load torque, and which represent the upper limit of the range of application of these motors.

TABLE A — LOCKED-ROTOR TORQUES —
Design A and B — 60 and 50-cycle

Hp	Number of Poles							
	2	4	6	8	10	12	16	20
1/2	100	100	100	100	100	100	100	100
3/4	100	100	100	100	100	100	100	100
1	100	100	100	100	100	100	100	100
1 1/2	100	100	100	100	100	100	100	100
2	100	100	100	100	100	100	100	100
3	100	100	100	100	100	100	100	100
5	100	100	100	100	100	100	100	100
7 1/2	100	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100	100
15	100	100	100	100	100	100	100	100
20	100	100	100	100	100	100	100	100
25	100	100	100	100	100	100	100	100
30	100	100	100	100	100	100	100	100
40	100	100	100	100	100	100	100	100
50	100	100	100	100	100	100	100	100
60	100	100	100	100	100	100	100	100
75	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100
125	100	100	100	100	100	100	100	100
150	100	100	100	100	100	100	100	100
200	100	100	100	100	100	100	100	100
250	100	100	100	100	100	100	100	100
300	100	100	100	100	100	100	100	100
400	100	100	100	100	100	100	100	100
500	100	100	100	100	100	100	100	100
600	100	100	100	100	100	100	100	100
750	100	100	100	100	100	100	100	100
1000	100	100	100	100	100	100	100	100

TABLE B — LOCKED-ROTOR TORQUES
(Design C) — 60 and 50-cycle

Hp	Number of Poles		
	4	6	8
1/2	100	100	100
3/4	100	100	100
1	100	100	100
1 1/2	100	100	100
2	100	100	100
3	100	100	100
5	100	100	100
7 1/2	100	100	100
10	100	100	100
15	100	100	100
20	100	100	100
25	100	100	100
30	100	100	100
40	100	100	100
50	100	100	100
60	100	100	100
75	100	100	100
100	100	100	100
125	100	100	100
150	100	100	100
200	100	100	100
250	100	100	100
300	100	100	100
400	100	100	100
500	100	100	100
600	100	100	100
750	100	100	100
1000	100	100	100

Design D — The locked-rotor torque of Design D, 60 and 50-cycle 4, 6 and 8-pole polyphase squirrel-cage motors, with rated voltage and frequency applied, shall be 175% expressed in percentage of full-load torque, and represents the upper limit of application for these motors.

FULL-UP TORQUE

The full-up torque of designs A, B and C squirrel-cage motors in tables A and B with rated voltage and frequency applied, will not be less than 70% of the listed locked-rotor torque, but in no case less than rated full-load torque.

BREAKDOWN (MAXIMUM) TORQUES

With rated voltage and frequency applied, the breakdown torques of the various types of motors will not be less than the values shown in Table C which are expressed in percent of full-load torque.

TABLE C — BREAKDOWN TORQUES

Hp	Number of Poles				
	2	4	6	8	10 and 12
1/2	100	100	100	100	100
3/4	100	100	100	100	100
1	100	100	100	100	100
1 1/2	100	100	100	100	100
2	100	100	100	100	100
3	100	100	100	100	100
5	100	100	100	100	100
7 1/2	100	100	100	100	100
10	100	100	100	100	100
15	100	100	100	100	100
20	100	100	100	100	100
25	100	100	100	100	100
30	100	100	100	100	100
40	100	100	100	100	100
50	100	100	100	100	100
60	100	100	100	100	100
75	100	100	100	100	100
100	100	100	100	100	100
125	100	100	100	100	100
150	100	100	100	100	100
200	100	100	100	100	100
250	100	100	100	100	100
300	100	100	100	100	100
400	100	100	100	100	100
500	100	100	100	100	100
600	100	100	100	100	100
750	100	100	100	100	100
1000	100	100	100	100	100

DIVISION OF THE A.O. SMITH COMPANY

96



MODEL NUMBER	PIPE THD. SIZE	RECOMMENDED PRESSURE RANGE	ELECTRICAL CURRENT RATING	
			AMP.	A.C. VOLTS
STI-02-10-10	1/4"	100 - 1000 P S I	10 @	110-125
STI-02-20-10		100 - 2000 P S I	5 @	220-250
STI-02-50-10		500 - 5000 P S I	3 @	440-480

GENERAL USAGE IN AN OIL HYDRAULIC SYSTEM REQUIRING AN ADJUSTABLE PRESSURE ACTUATED ELECTRICAL SWITCH TO MAKE OR BREAK AN ELECTRIC CIRCUIT AT A SET HYDRAULIC PRESSURE.

ADJUSTMENT OF PRESSURE SETTINGS ARE ADJUSTABLE THROUGHOUT COMPLETE PRESSURE RANGE. REMOVE COVER AND TURN HIGH PRESSURE ADJUSTING SCREW ("A" SWITCH) CLOCKWISE TO INCREASE, COUNTER-CLOCKWISE TO DECREASE PRESSURE. SETTING LOW PRESSURE ADJUSTMENT ("B" SWITCH) CAN BE SET FOR DESIRED DIFFERENTIAL BETWEEN CUT-IN AND CUT-OUT PRESSURE.

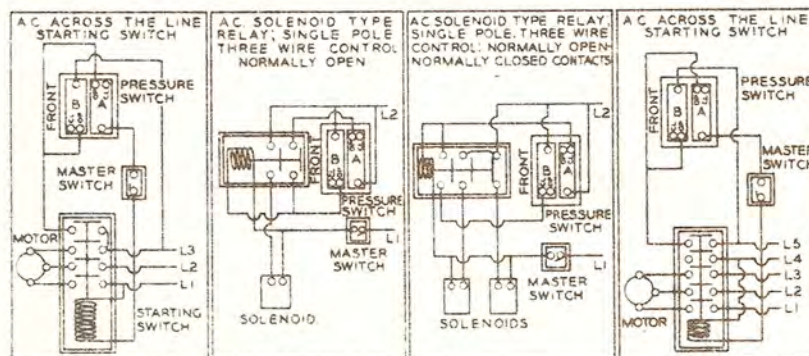
OIL VISCOSITY RANGING BETWEEN 150 S.S.U AND 310 S.S.U AT 100° F. FOR AMBIENT TEMPERATURES ABOVE 65°F IS RECOMMENDED. THESE PRESSURE SWITCHES WILL OPERATE IN ANY HYDRAULIC SYSTEM USING A GOOD GRADE OF CLEAN HYDRAULIC OIL.

MOUNTING SCREWS ARE ACCESSIBLE UNDER FRONT COVER

DRAIN CONNECTION MUST BE PIPED DIRECTLY TO TANK

ELECTRICAL CONNECTIONS-REFER TO CIRCUIT DIAGRAMS SHOWN FOR SUGGESTED CIRCUITS.

WEIGHT (APPROXIMATE) ----- 6-1/2 LBS



NOTE:
PRESSURE SWITCH CONSTRUCTION IS SUCH THAT SWITCHES ARE NORMALLY DEPRESSED BY THRUST OF THE SPRINGS ACTING THRU PUSH RODS. THIS REVERSES CONTACT POSITIONS AS LABELED ON THE SWITCH COVERS. THEREFORE, CONTACTS LABELED "NORMALLY OPEN" ARE CLOSED AND CONTACTS LABELED "NORMALLY CLOSED" ARE OPEN.

REVISÉ 1-30-50 W.H.

VICKERS INC. DETROIT
U. S. A.
DIVISION OF SPERRY RAND CORPORATION

INSTALLATION DRAWING

“H15 2006年1月1日 第15号公告” - 10-48

T. 113929	CHICK 0-3-40	G.F.
	BRAND 11-20-47	

1890

SEC
b

PRINTED IN U.S.A.

DIRECTIONAL
CONTROLS

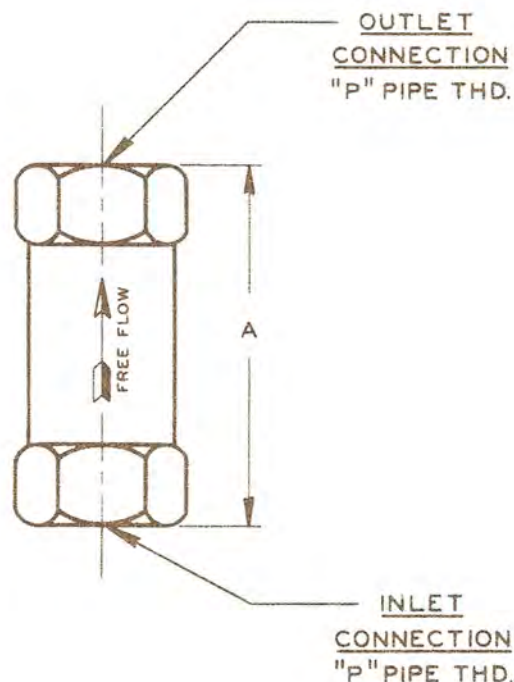
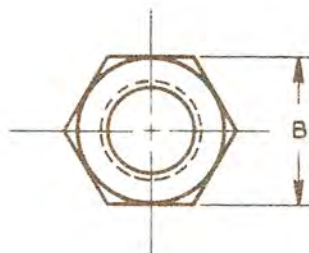
CHECK
VALVES

IN - LINE
TYPE

1/4" 3/8" 3/4" & 1-1/4"
PIPE SIZES

PIPE TH'D.
CONNECTIONS

INST. DRWG.
I. 113720



VICKERS. IN-LINE TYPE CHECK VALVES

PIPE THREAD CONNECTIONS
SPRING CLOSED CONSTRUCTION

MODEL NUMBER	"P" PIPE TH'D.	CAPACITY G.P.M.	CRACKING PRESSURE	A	B	WEIGHT
DT8PI-02-5	1/4	3.2	5 P.S.I.	2-1/4	7/8	6.5 OZ.
DT8PI-02-30			30 P.S.I.			
DT8PI-02-65			65 P.S.I.			
DT8PI-03-5	3/8	8	5 P.S.I.	3	1	8 OZ.
DT8PI-03-30			30 P.S.I.			
DT8PI-03-65			65 P.S.I.			
DT8PI-06-5	3/4	20	5 P.S.I.	3-7/8	1-1/2	1.5 LBS.
DT8PI-06-30			30 P.S.I.			
DT8PI-06-65			65 P.S.I.			
DT8PI-10-5	1-1/4	50	5 P.S.I.	5-1/4	2-1/2	5 LBS.
DT8PI-10-30			30 P.S.I.			
DT8PI-10-65			65 P.S.I.			

FOR (OIL) HYDRAULIC SYSTEMS ONLY. RATED CAPACITY BASED ON USING HYDRAULIC OIL HAVING A VISCOSITY RATING OF 150 S.S.U. @ 100°F.

OPERATING PRESSURE ----- MAX. RECOMMENDED 3000 P.S.I.

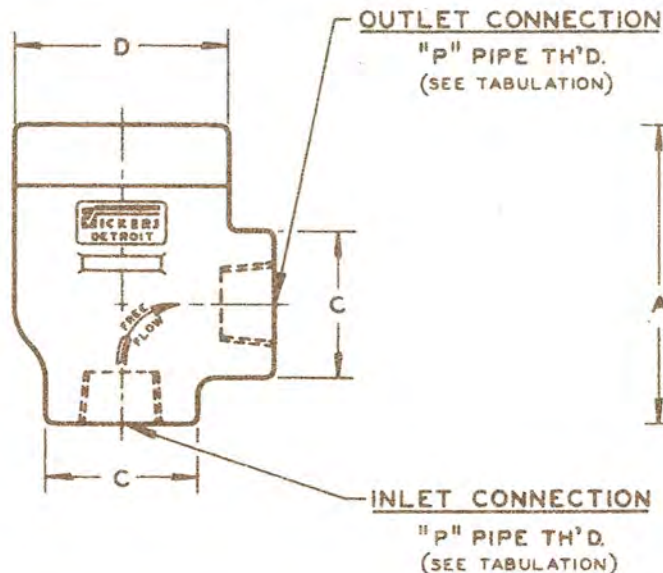
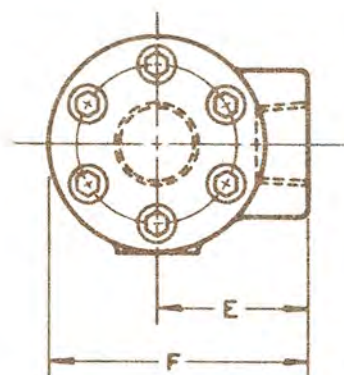
CRACKING PRESSURE AS TABULATED INDICATES PRESSURE REQUIRED TO OPEN VALVE AND ALLOW FREE FLOW.

MODEL NUMBER MUST BE SPECIFIED COMPLETE WHEN ORDERING TO INSURE CORRECT SIZE AND CRACKING PRESSURE REQUIRED.

CAUTION: WHERE A VALVE IS REQUIRED TO CHECK A HIGH VELOCITY REVERSE FLOW OF FLUID, THE VICKERS RIGHT ANGLE CHECK VALVE IS RECOMMENDED.

Keep out dirt, sludge and grit.

VICKERS INC. DETROIT U. S. A.	
DIVISION OF SPERRY RAND CORPORATION	
INSTALLATION DRAWING	
THIS DRAWING RELEASED 10-5-49	Lang
I. 113720	CHECK 9-28-49 K.V.K.
REVISED 10-31-50 W.H.S.	DRAWN 11-28-47 W.H.S.

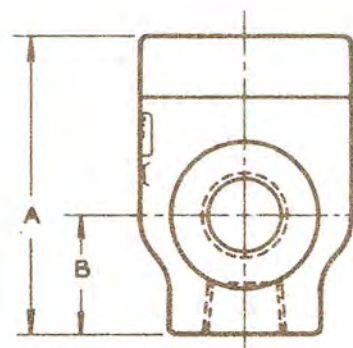
DIRECTIONAL
CONTROLSCHECK
VALVESRIGHT ANGLE
TYPE1/4" TO 2"
PIPE SIZESTHREADED
CONNECTIONSINST. DRWG.
R-5567

VICKERS RIGHT ANGLE CHECK VALVES (THREADED CONNECTIONS)

MODEL NUMBERS ITEMIZED IN TABULATION BELOW MUST BE USED TO SPECIFY CORRECT SIZE & TYPE OF VALVE REQUIRED.

MOUNTING POSITION OF VALVES IS NOT LIMITED BECAUSE OF SPRING CLOSURE CONSTRUCTION.

MAXIMUM OPERATING PRESSURE...3000 LBS. PER SQ. IN.



* MODELS WITH SUFFIX S12 ARE FITTED WITH AN ORIFICE PLUG, WHICH CAN BE DRILLED TO ALLOW A SUITABLE BLEED WHEN VALVE IS CLOSED.

MODEL NUMBER (FOR CRACKING PRESSURE) P.S.I.				"P" PIPE TH'D.	RATED CAPACITY	A	B	C	D	E	F	WEIGHT
5	50	75	*5	IN.	G.P.M.							
C2-800	C2-800-S3	C2-800-S8	C2-800-S12	1/4	3	2-15/16	1-1/32	1-1/4	2-1/8	1-1/4	2-5/16	3 LBS.
C2-805	C2-805-S3	C2-805-S8	C2-805-S12	3/8	8	2-15/16	1-1/32	1-1/4	2-1/8	1-1/4	2-5/16	3 LBS.
C2-815	C2-815-S3	C2-815-S8	C2-815-S12	3/4	18	3-7/8	1-3/4	2	2-3/4	1-13/16	3-3/16	5 LBS.
C2-820	C2-820-S3	C2-820-S8	C2-820-S12	1	28	4-9/16	1-27/32	2-1/4	3-1/4	2-1/4	3-7/8	8 LBS.
C2-825	C2-825-S3	C2-825-S8	C2-825-S12	1-1/4	45	5-7/16	2-5/8	3	3-1/4	2-5/8	4-1/4	10-1/2 LBS.
C2-830	C2-830-S3	C2-830-S8	C2-830-S12	1-1/2	65	5-7/16	2-5/8	3	3-1/4	2-5/8	4-1/4	10-1/2 LBS.
C2-835	C2-835-S3	C2-835-S8	C2-835-S12	2	100	7-3/8	2-7/8	3-1/2	4-1/2	3-5/8	5-7/8	27 LBS.

REVISED 7-18-50 W.H.S.

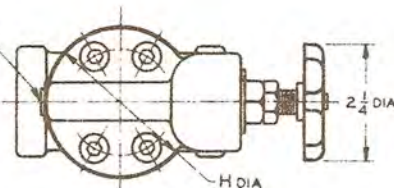
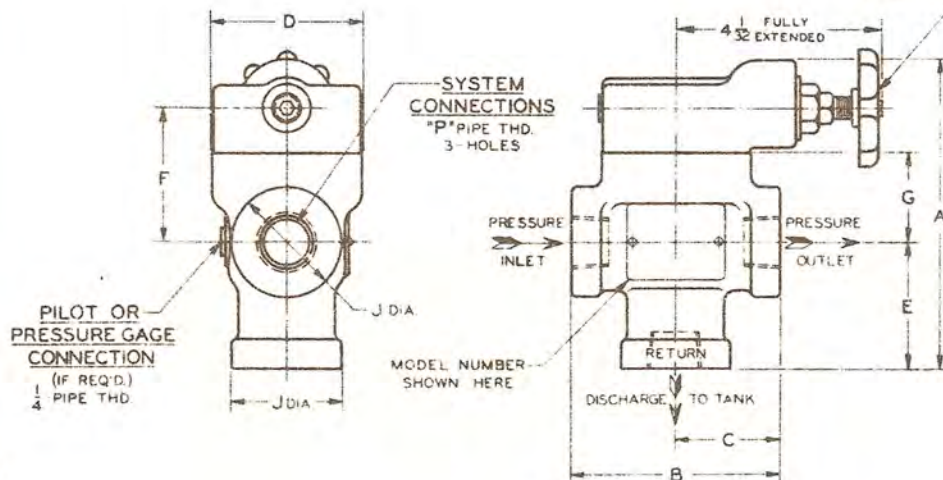
VICKERS INC. DETROIT
U. S. A.
DIVISION OF THE SPERRY CORPORATION

INSTALLATION DRAWING

THIS DRAWING RELEASED 5-22-41 L.R.T.

R 5567 CHECK 7-18-50 W.H.S.
DRAWN 4-10-25 W.H.S.

P SFC

PRESSURE
CONTROLSRELIEF
VALVESBALANCED
PISTON TYPE3/4 & 1-1/4
PIPE SIZESTHREADED
CONNECTIONSINST. DRWG.
R-131952VENT CONNECTION
3/8 PIPE THD.LEAVE VENT CONNECTION PLUGGED
EXCEPT WHEN CIRCUIT INDICATES A
CONNECTION FOR *VENTING *RELIEF VALVEPRESSURE
ADJUSTMENT
CONTROL**VICKERS Inc.**
DETROIT U.S.A.

BALANCED PISTON TYPE RELIEF VALVES

(3/4" & 1-1/4" THREADED CONNECTIONS)

RELIEF VALVE (FOR CONTINUOUS CONTROL OF MAXIMUM SYSTEM PRESSURE)

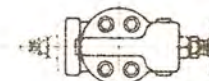
INCLUDES APPLICATIONS REQUIRING AN ADJUSTABLE PRESSURE RELIEF OR REGULATING VALVE TO LIMIT THE PRESSURE IN AN OIL CIRCUIT TO THE DESIRED MAXIMUM. ALL VALVES ARE OF THE PATENTED VICKERS BALANCED PISTON TYPE.

PRESSURE RANGE OF VALVE SHOULD BE SELECTED SO THAT EXCESSIVELY HIGH WORKING PRESSURES WILL NOT BE IMPOSED UPON PUMP OR OTHER EQUIPMENT.

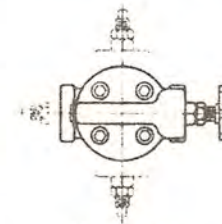
ADJUSTMENT OF PRESSURE IS ACCOMPLISHED BY LOOSENING JAM NUT AND TURNING ADJUSTING SCREW. CLOCKWISE ROTATION INCREASES PRESSURE; COUNTER-CLOCKWISE ROTATION DECREASES PRESSURE.

OIL VISCOSITY RANGING BETWEEN 150 S.S.U. (LIGHT) AND 225 S.S.U. (MEDIUM) AT 100°F. FOR AMBIENT TEMPERATURES ABOVE 65°F. IS RECOMMENDED. MAXIMUM SAFE OPERATING TEMPERATURE, 155°F. REFER TO DATA SHEET 286-5 FOR RECOMMENDED HYDRAULIC OIL SPECIFICATIONS.

PRESSURE INLET AND OUTLET CONNECTIONS ARE CONNECTED BY A THRU PASSAGE WHICH PERMITS USE OF EITHER CONNECTION AS AN INLET.



CT-06 SERIES



CT-10 SERIES

OPTIONAL POSITIONS OF ADJUSTING SCREW, WHICH CAN BE OBTAINED BY ROTATING COVER ASSEMBLY.

EXAMPLE OF MODEL NUMBER

MODEL	DESIGN
CT-06-BV	10
DESIGN NUMBERS SUBJECT TO CHANGE INSTALLATION DIMENSIONS REMAIN AS SHOWN FOR DESIGN NUMBERS 10 TO 19.	

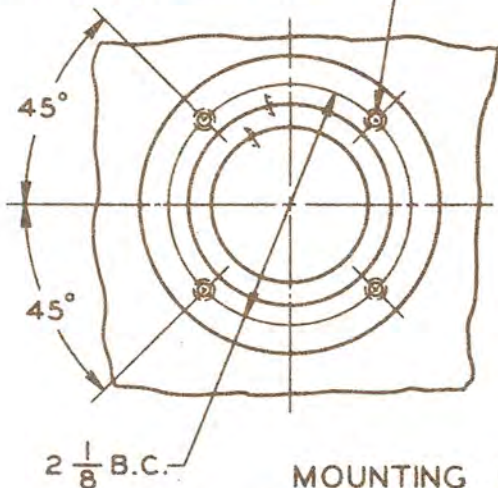
MODEL NUMBER	PIPE THD "P"	RATED CAPACITY	PRESSURE RANGE	APPROXIMATE MINIMUM VENTING PRESSURES IN LB./SQ. INCH AT VARIOUS PERCENTAGES OF MAXIMUM RATED CAPACITY				INSTALLATION DIMENSIONS										WT. LBS. APPROX.
				G.P.M.	LB./SQ. IN.	25%	50%	75%	100%	A	B	C	D	E	F	G	H	
CT-06-B-10	3/4	0 TO 20	75 TO 1000	10	11	15	23	6 1/4	4 1/4	2 1/8	3 1/16	2 9/16	2 11/16	1 13/16	3	2 1/4	10	
CT-06-BV-10			56	57	59	63												
CT-06-C-10			10	11	15	23												
CT-06-CV-10			56	57	59	63												
CT-06-F-10			10	11	15	23												
CT-06-FV-10			56	57	59	63												
CT-10-B-10	1 1/4	10 TO 50	75 TO 1000	6	10	23	39	7 7/16	5	2 1/2	3 3/4	3 1/16	3 7/16	2 3/8	3 3/4	3	20	
CT-10-BV-10			52	54	57	59												
CT-10-C-10			6	10	23	39												
CT-10-CV-10			52	54	57	59												
CT-10-F-10			6	10	23	39												
CT-10-FV-10			52	54	57	59												

VICKERS INCORPORATED
DIVISION OF VICTOR COMPANY
DETROIT, MICHIGAN, U.S.A.
INSTALLATION DRAWING
THIS DRAWING RELEASED 3-15-50
REVISED 11-15-55
1-131952
DRAWN 1-15-50

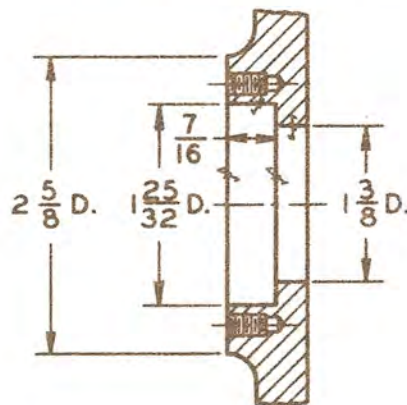
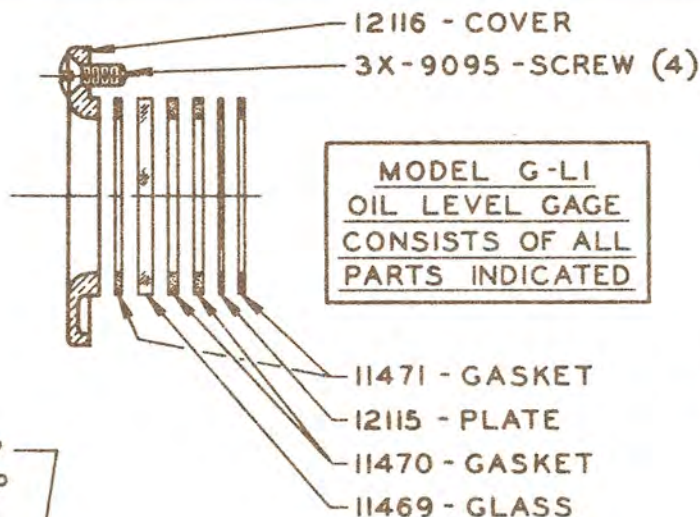
Set relief valves properly.



#25 (.1495) DRILL - 15/32 DEEP
#10 - 24 N.C. - 3 TAP - 11/32 DEEP
4 HOLES - EQUALLY SPACED
DO NOT DRILL THRU



MOUNTING DIMENSIONS



VICKERS Inc.
DETROIT MICHIGAN

OIL LEVEL GAGE
MODEL G-LI

GENERAL USAGE :- IN HYDRAULIC SYSTEM
RESERVOIRS TO INDICATE PROPER OIL
LEVEL. USUALLY INSTALLED IN MACHINED
RECESS AS SHOWN BY MOUNTING DIMEN-
SION SKETCH.

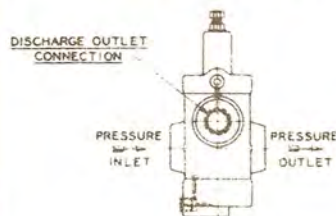
VICKERS Inc. DETROIT
U. S. A.

INSTALLATION DRAWING
(USE CERTIFIED COPY FOR FINAL DESIGN)

THIS DRAWING RELEASED	10-7-41	123
C 22576	CHECK 9-29-41	G.F.E.
	DRAWN 8-28-41	C.J.H.

MODEL RT-*-*1 RELIEF VALVE

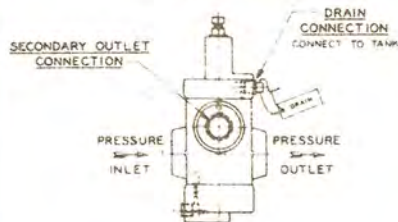
DIRECTLY OPERATED - INTERNAL DRAIN
TYPE 1 DESIGNATED BY SUFFIX "1"
IN MODEL NUMBER



MAXIMUM PRESSURE SETTING IS LIMITED TO
500 PSI FOR OVERLOAD PROTECTION

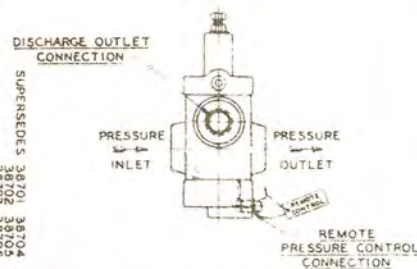
MODEL RT-*-*2 SEQUENCE VALVE

DIRECTLY OPERATED - EXTERNAL DRAIN
TYPE 2 DESIGNATED BY SUFFIX "2"
IN MODEL NUMBER



MODEL RT-*-*4 UNLOADING VALVE

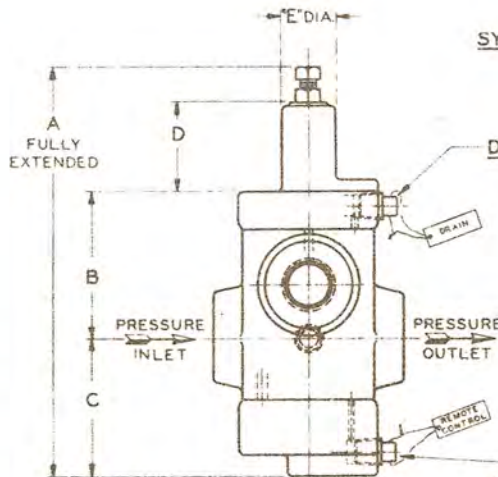
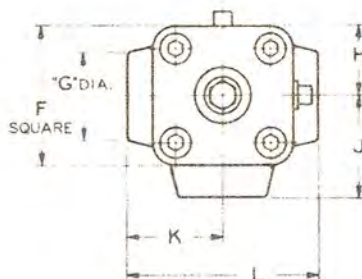
REMOTELY CONTROLLED - INTERNAL DRAIN
TYPE 4 DESIGNATED BY SUFFIX "4"
IN MODEL NUMBER



REMOTE PRESSURE CONTROL CONNECTION MUST
BE PIPED TO THAT PORTION OF THE CIRCUIT
IN WHICH THE PRESSURE IS TO CONTROL THE
ACTION OF THE UNLOADING VALVE.

MODEL RT-*-*3 SEQUENCE VALVE

REMOTELY CONTROLLED - EXTERNAL DRAIN
TYPE 3 DESIGNATED BY SUFFIX "3"
IN MODEL NUMBER



PRESSURE INLET AND PRESSURE
OUTLET CONNECTIONS MAY BE
REVERSED.

SYSTEM CONNECTIONS

"R" PIPE THD.
3-HOLES

DRAIN CONNECTION

1/4 PIPE THD.
CONNECT TO TANK

REMOTE PRESSURE CONTROL CONNECTION

1/4 PIPE THD.

VICKERS PRESSURE CONTROL VALVES

HYDRO-CUSHION TYPE - RT-* SERIES
(THREADED CONNECTIONS)

PRESSURE ADJUSTMENT RANGE PSI	MODEL NUMBERS				
	RELIEF DIRECTLY OPERATED	SEQUENCE DIRECTLY OPERATED	SEQUENCE REMOTE CONTROL	UNLOADING REMOTE CONTROL	
	TYPE "1"	TYPE "2"	TYPE "3"	TYPE "4"	
25-125	RT-K-Z1	RT-K-Z2	RT-K-Z3	RT-K-Z4	
75-250	RT-K-A1	RT-K-A2	RT-K-A3	RT-K-A4	
125-500	RT-K-B1	RT-K-B2	RT-K-B3	RT-K-B4	
250-1000		RT-K-D2	RT-K-D3	RT-K-D4	

FOR OIL HYDRAULIC SYSTEMS ONLY, USING HIGH QUALITY LUBRICATING
OIL HAVING VISCOSITY OF 100-250 SSU AT 100°F. REFER TO VICKERS
DATA SHEET 286-5 FOR OIL SPECIFICATIONS.

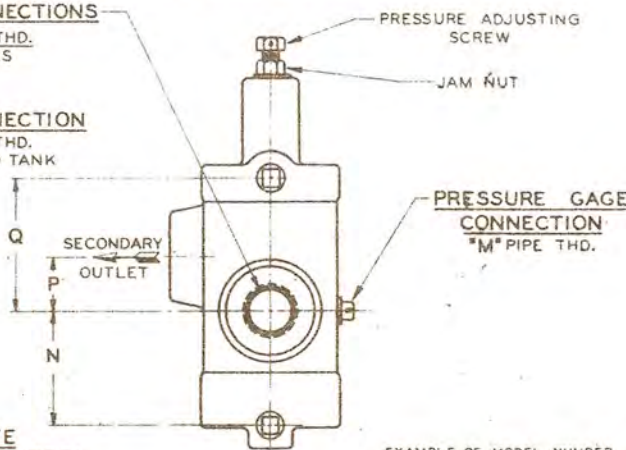
GENERAL APPLICATION AND OPERATING DATA OF THESE VALVES ARE
GIVEN IN VICKERS CATALOG #5001.

MAXIMUM SYSTEM OPERATING PRESSURE ----- 2000 PSI

MODEL NUMBERS LISTED COVER BASIC TYPES AND PRESSURE RANGES.
SYMBOL (M) FOR VALVE SIZE (PIPING SIZE) AS FOLLOWS MUST
BE INDICATED IN MODEL NUMBER.

VALVE OR PIPING SIZE SYMBOL

3/4 06
1-1/4 10
1-1/2 12
SEE EXAMPLE OF MODEL NUMBER BELOW



EXAMPLE OF MODEL NUMBER

MODEL	DESIGN
RT-06-B2-10	

DESIGN NUMBERS SUBJECT TO CHANGE.
INSTALLATION DIMENSIONS REMAIN AS
SHOWN FOR DESIGN NUMBERS 10 TO 19.

MODEL NUMBER	MAXIMUM RATED CAPACITY (GPM)	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	(APPROX.) WEIGHT (LBS.)
RT-03-* -10	6	6 15/32	2	2 3/32	1 1/8	1 1/8	2 3/8	1 1/4	1 3/16	1 1/8	1 3/8	2 3/4	1 1/4	1 21/32	2 3/8	2 1/8	3 3/8	6
RT-06-* -10	16	8 7/32	2	2 3/4	1 1/2	1 1/8	2 3/8	1 3/4	1 1/2	2	1 7/8	3 3/4	1 1/4	2 1/4	1 1/2	2 3/8	3 3/4	11
RT-10-* -10	45	10 1/8	3	3 1/2	1 3/4	1 1/2	3 1/4	2 1/4	1 7/8	2 1/2	2 1/2	4 1/4	1 1/2	2 3/4	1 3/4	3 1/2	4 1/4	18
RT-12-* -10	65	10 1/8	3	3 3/4	1 3/4	1 1/2	3 3/4	2 1/4	1 7/8	2 1/2	2 1/2	4 1/4	1 1/2	2 3/4	1 3/4	3 1/2	4 1/4	18

REVISED 6-4-54 W.H.S.

VICKERS INC. DETROIT, U.S.A.
DIVISION OF THE SPERRY CORPORATION
INSTALLATION DRAWING
THIS DRAWING RELEASED 4-10-50
I.132395

Set relief valves properly.

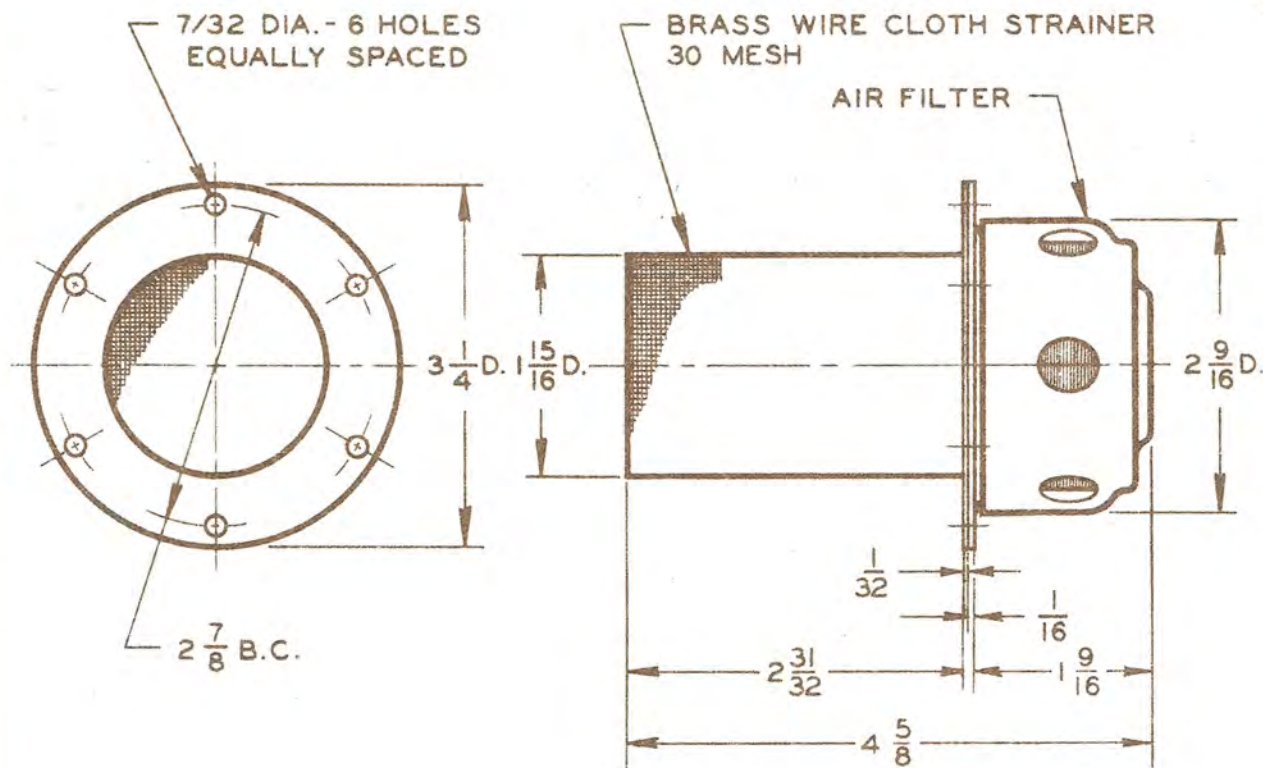
PRINTED IN U.S.A.

APPLICATION
DATA

INSTALLATION
DETAILS

OIL FILLER AND
FILTER CAP

REF. DRWG.
I. 89298



VICKERS.

**OIL FILLER CAP AND AIR
FILTER UNIT**
MODEL SP-113-B

GENERAL USAGE: AS A FILLER
CAP AND AIR FILTER FOR HY-
DRAULIC SYSTEM BUILT-IN OIL
RESERVOIRS.

PROVIDES PROTECTED AIR VENT
OPENING, DIRT SCREEN AND AIR
FILTER.

REVISED 8-18-57 W.H.S.

VICKERS INC. DETROIT
U. S. A.
DIVISION OF SPERRY RAND CORPORATION

INSTALLATION DRAWING

THIS DRAWING RELEASED 11-15-48 R.E.

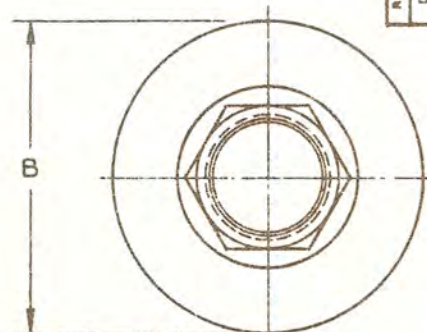
I.89298 CHECK 11-1-48 R.E.
DRAWN 10-25-46 W.H.S.

SEC
!

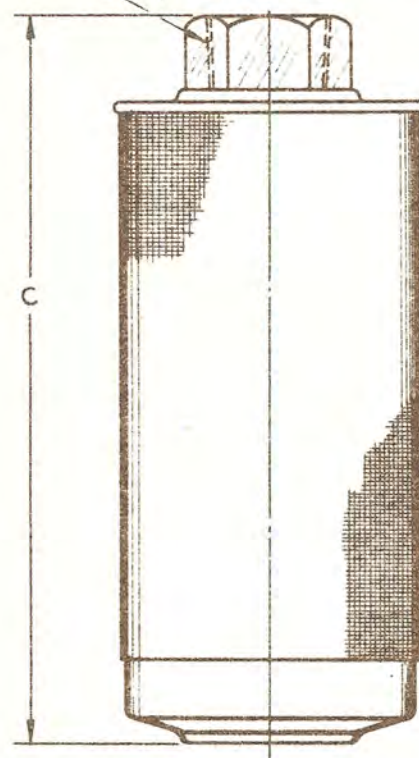
OIL FILTER ELEMENTS

REVISED	8-14-51	R.E.B.
DRAWN	8-13-48	W.WISE
CHECK	10-15-48	C.A.L.
RELEASED	10-28-48	

VICKERS PART NUMBER	CAPACITY G.P.M.	FILTER SLOTS (WIDTH)	"A" PIPE SIZE	"B" OUTSIDE DIA.	"C" OVERALL LENGTH
17415	10.0	.005	1"	3-1/4"	7-19/32"
29092	20.0	.005	1-1/4"	4-1/16"	9-9/16"
140539	50.0	.005	1-1/2"	4-3/4"	10-1/4"



PUMP INTAKE CONNECTION
"A" PIPE TH'D.



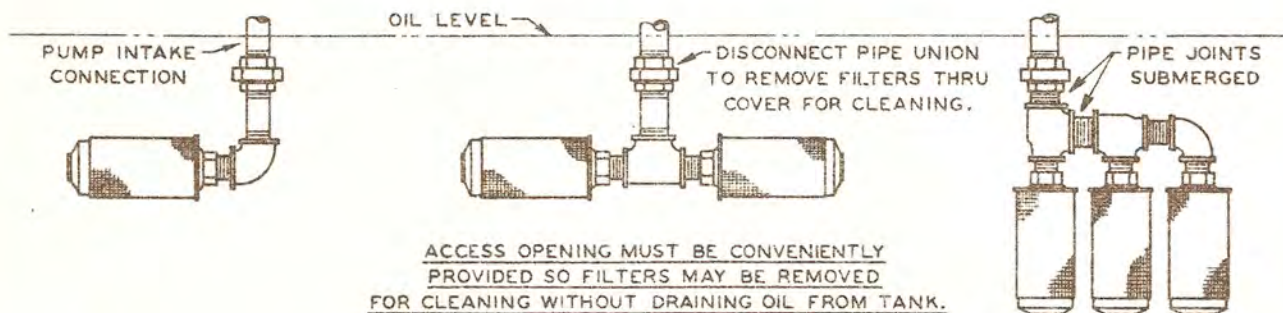
GENERAL USAGE -- IN AN OIL HYDRAULIC CIRCUIT TO PROTECT THE PUMP AND CONTROL SYSTEM FROM ABRASIVE OR OTHER FOREIGN MATTER. USED AS AN IMMERSION SUCTION FILTER ON THE PUMP INTAKE LINE, AS INDICATED BY TYPICAL INSTALLATION DIAGRAMS SHOWN BELOW.

SELECTION OF SIZE AND NUMBER OF ELEMENTS MAY BE MADE ON BASIS OF TABULATED CAPACITIES LISTED ABOVE. RATINGS ARE CONSERVATIVE IN ORDER THAT A CHANGE IN OIL VISCOSITY SHOULD NOT MATERIALLY AFFECT CAPACITY.

CLEANING SHOULD BE DONE PERIODICALLY BY REMOVING ELEMENTS FROM OIL RESERVOIR, WASHING IN KEROSENE, AND BLOWING WITH AIR (FROM INSIDE TO OUTSIDE).

ORDER BY PART NUMBERS ITEMIZED ABOVE. A STOCK OF THESE STANDARD FILTER ELEMENTS IS CARRIED BY VICKERS FOR IMMEDIATE SHIPMENT.

TYPICAL OIL INTAKE FILTER INSTALLATIONS
USE FILTERS PIPED IN MULTIPLE TO OBTAIN ADEQUATE CAPACITY



Electrol HAND PUMPS

MODEL 425

Uniform two-way action for maximum efficiency. Low cost, economical operation. Few moving parts, minimum maintenance. Delivers maximum power with minimum of effort.

SPECIFICATIONS: Bore of $1\frac{1}{4}$ " and stroke of $1\frac{1}{4}$ ". Volume: 1.5 cu. in. per cycle (2 strokes). $\frac{1}{2}$ " pipe thread ports. Suction and pressure check valves built in. Operation pressure from 0 to 1,500 P.S.I. Handle load, only 17 lbs. at 500 P.S.I., 35 lbs. at 1,000 P.S.I. and 52 lbs. at 1,500 P.S.I. Handle is 22" long, with maximum arc of 60°. Housing: $7\frac{1}{2}$ " x 3" x $2\frac{1}{4}$ ". (4 mounting holes for $\frac{1}{4}$ " bolts. Centers $2\frac{1}{2}$ " x 4-9/16").



MODEL 770

The Electrol 770 Hand Pump is of uniform two-way action for maximum operating efficiency. It has few moving parts, is low in cost and requires but a minimum of maintenance.

SPECIFICATIONS: Bore of 1-7/16" and stroke of $1\frac{1}{4}$ "; volume, 2 cu. in. per cycle (2 strokes). Available in $\frac{1}{2}$ " pipe thread ports or AND 10050 ports. Suction and pressure check valves built in. Operating pressure, 0 to 1,500 P.S.I., 42 lbs. at 1,000 P.S.I. and 65 lbs. at 1,500 P.S.I. Handle is 25" long, with maximum arc of 60°. 4 mounting holes for $\frac{1}{4}$ " bolts (centers $2\frac{1}{4}$ " x $2\frac{3}{4}$ "). Can be used in mineral oil or water.



APPROVED

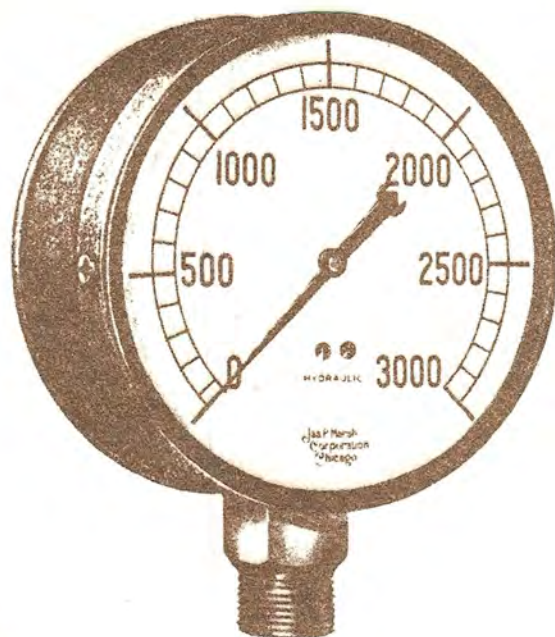
NOTE: 1,000 P.S.I. Hand Pumps
available as spare equipment
U. S. ARMY ENGINEERING DISTRICT, GARRISON
CORPS OF ENGINEERS

DEC 2 1958 DATE

*Better Designed Products
Use Electrol Hydraulics*



THROTTLES - SELECTOR VALVES - SHUT-OFF VALVES
CHECK VALVES - RELIEF VALVES - HAND PUMPS
POWERPACS - LANDING GEAR CHECKS - SOLENOID
VALVES - ON/OFF VALVES - SERVO CYLINDERS - TRANSFER
VALVES - CUT-OUT VALVES - SPEED CONTROL VALVES



Type 9

The Marsh Hydraulic Gauge offers the finest construction possible in Gauges for this service. Built with lathe-turned Bourdon tube and heavy-duty bronze-bushed movement, this instrument is designed for high pressure installations such as on hydraulic presses, hydraulic production equipment, diesel engines and refrigeration equipment.

The standard dial is graduated in pounds per square inch but a number of other dials are also available to indicate tons or pounds on ram or piston atmospheres or a double graduated dial having pounds per square inch and corresponding ram pressure.

Gauges are furnished in cast iron, cast brass or Phanal case with glass crystal and $\frac{1}{2}$ " N.P.T. male bottom or back connections (See Specification Section 9 for complete information on case styles, finishes and dimensions). They are standard with a restriction screw in the connection. They also can

be furnished with maximum reading hand. All Marsh Hydraulic Gauges are available with the Marsh "Recalibrator". See Page 3.

Construction . . . Bourdon tube is of lathe-turned chrome molybdenum steel scientifically formed and oil hardened. The connection socket and tip are made from solid steel bar. Bourdon tube is fitted to tip and socket with the Lock-Tite screwed assembly to form a pressure-tight seal under all conditions.

The bronze-bushed movement is fitted with a bronze segment having extra wide machine-cut gearing and with stainless steel pinion and staff.

Dial Size	3½", 4½", 6", 8", 12"
Pressure Ranges	0 to 1000 lbs. 0 to 8000 lbs.
	0 to 1500 lbs. 0 to 10,000 lbs.
	0 to 2000 lbs. 0 to 15,000 lbs.
	0 to 3000 lbs. 0 to 20,000 lbs.
	0 to 4000 lbs. 0 to 25,000 lbs.
	0 to 5000 lbs. 0 to 30,000 lbs.
	0 to 6000 lbs.

SO 5008

B/M-6001

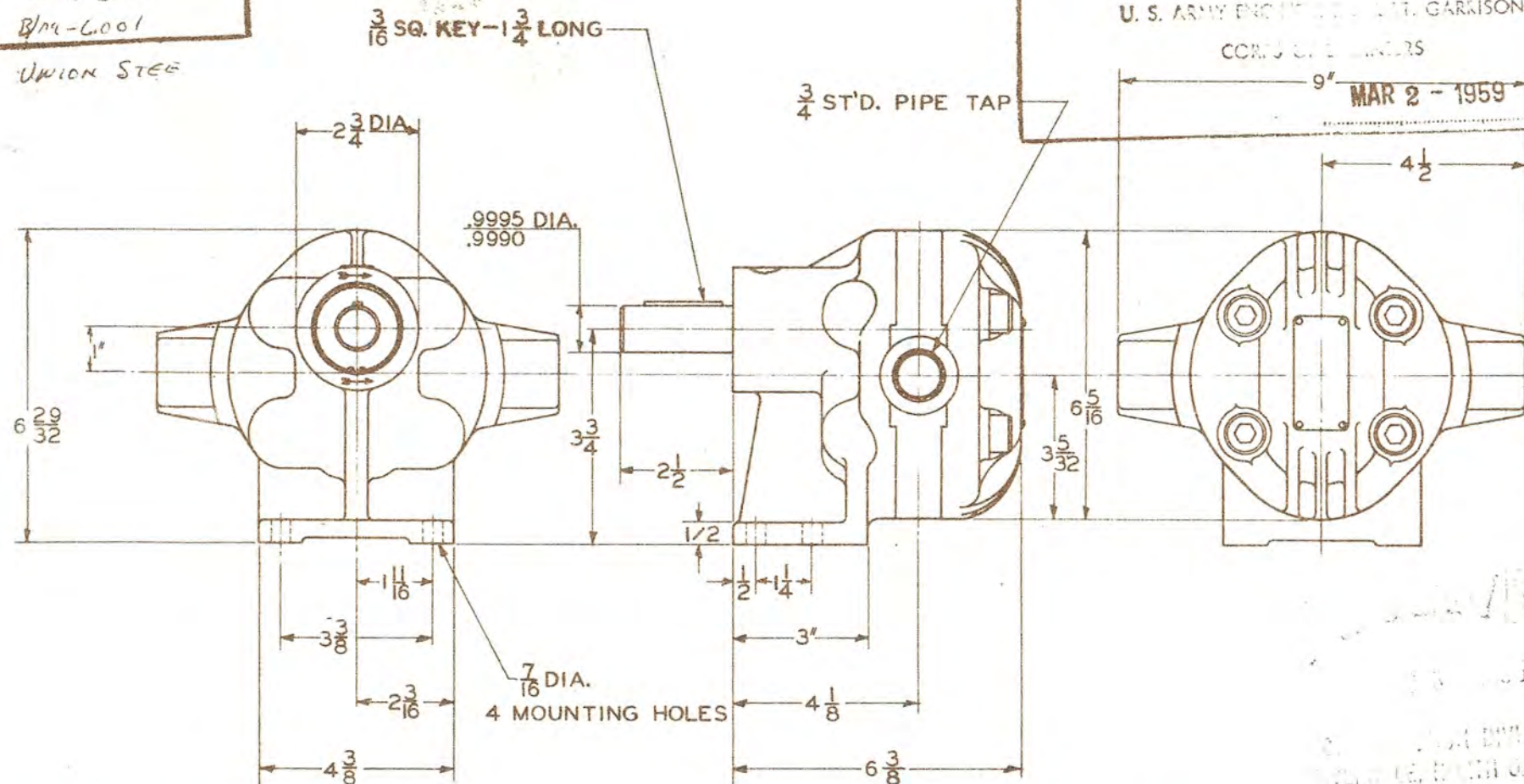
UNION STEEL

APPROVED

U. S. ARMY ENGINEERING CENTER, GARRISON
CORPS OF ENGINEERS

MAR 2 - 1959

DATE



COUNTER-CLOCKWISE ROTATION
INLET ON RIGHT
CLOCKWISE ROTATION
INLET ON LEFT

15.8 GPM @ 1800 RPM

SEE BACK SHEET

RATED CAPACITY — GPM
AT 1200 RPM — 1000 PSI 10.0

TYPE-N

SEE REVERSE SIDE FOR
COMPLETE PERFORMANCE
DATA.

FOR APPLICATIONS WHERE DRIVE SHAFT IS
SUBJECT TO SIDE THRUST AS WITH STRAIGHT
GEAR OR PULLEY DRIVES, OR WITH UNIVERSAL
DRIVES WHERE MISALIGNMENT IS EXCESSIVE.

HYDRECO

A DIVISION OF THE NEW YORK AIR BRAKE CO.

1100 EAST 122nd STREET

CLEVELAND 17, OHIO



JIC SYMBOL



FIXED

DISPLACEMENT

PUMPS

FOOT

MOUNTED

GEAR TYPE

REVERSIBLE
ROTATION

INSTALLATION DRAWING

SERIES 2010H3BI PUMPS

All performance data is based upon the average of performance tests of regular production built Hydreco pumps. The data is not theoretical or derived by interpolation. All pumps will perform at standard rated capacity or better.

R P M	PRESSURES-LBS. SQ. IN.							PRESSURES-LBS. SQ. IN.						
	0	250	500	750	1000	1250	1500	0	250	500	750	1000	1250	1500
	DELIVERY-GALS MIN							HORSEPOWER INPUT						
500	4.4	4.2	4.0	3.9	3.8	3.6	2.8	.12	.75	1.5	2.2	3.2	4.0	5.3
750	6.8	6.5	6.3	6.1	6.0	5.9	5.1	.21	1.15	2.3	3.4	4.8	6.0	7.7
1000	9.1	8.8	8.5	8.2	8.1	8.0	7.8	.31	1.55	3.1	4.5	6.4	8.0	10.1
1200	11.0	10.7	10.5	10.1	10.0	10.0	9.5	.41	1.91	3.7	5.4	7.6	9.6	12.0
1400	12.8	12.4	12.3	12.0	12.0	11.8	11.3	.55	2.32	4.3	6.2	8.9	11.3	14.0
1800	14.7	14.2	14.0	13.9	13.9	13.6	13.2	.73	2.73	5.0	7.1	10.2	12.9	15.8
1800	16.5	16.0	15.8	15.8	15.8	15.3	15.1	.92	3.16	5.6	8.0	11.4	14.5	17.7
2000	18.3	17.8	17.6	17.2	17.1	17.0	17.0	1.13	3.66	6.2	8.8	12.6	16.0	19.5

R P M	PRESSURES-LBS. SQ. IN.							PRESSURES-LBS. SQ. IN.						
	0	250	500	750	1000	1250	1500	0	250	500	750	1000	1250	1500
	DELIVERY-GALS. /MIN.							HORSEPOWER INPUT						
500	6.5	6.0	5.0	4.7	4.5	4.4	4.2	.08	.90	2.2	3.5	4.5	6.0	7.0
750	10.0	9.5	8.7	8.5	8.3	8.0	7.5	.13	1.5	3.2	5.0	6.7	8.5	11.0
1000	13.0	13.2	12.7	12.4	12.3	11.7	11.4	.20	2.1	4.3	6.6	9.2	11.7	14.8
1200	15.7	15.9	15.5	15.1	15.0	14.4	13.5	.28	2.7	5.2	7.9	10.8	14.5	17.8
1400	18.5	18.8	18.0	17.7	17.2	17.0	16.4	.36	3.3	6.2	9.5	12.6	16.2	20.5
1600	21.1	21.2	20.7	20.3	20.0	19.5	18.7	.53	3.8	7.2	10.7	14.5	18.4	23.3
1800	23.7	23.9	23.3	23.0	22.5	22.3	21.3	.67	4.3	8.0	12.1	16.3	20.8	26.2
2000	28.5	28.5	26.0	25.6	25.4	24.9	23.7	.83	4.9	9.1	13.3	17.8	23.2	29.2

R P M	PRESSURES-LBS. SQ. IN.							PRESSURES-LBS. SQ. IN.						
	0	250	500	750	1000	1250	1500	0	250	500	750	1000	1250	1500
	DELIVERY-GALS. MIN.							HORSEPOWER INPUT						
500	9.0	8.5	8.0	7.9	7.2	7.0	6.8	.10	1.4	2.7	4.2	6.5	7.5	10.0
750	13.2	13.0	12.5	12.3	12.0	11.7	11.2	.20	2.2	4.1	6.2	8.7	11.2	13.9
1000	18.0	17.8	17.5	17.1	16.7	16.4	16.0	.34	2.8	5.5	8.5	11.5	15.0	18.6
1200	21.4	21.4	21.0	20.8	20.4	20.0	19.5	.52	3.5	6.9	10.3	13.9	18.3	22.6
1400	25.0	25.0	24.7	24.4	24.0	23.6	23.1	.73	4.4	7.9	12.3	16.9	21.6	27.3
1600	28.7	28.8	28.3	28.0	27.7	27.1	26.9	1.1	5.1	8.2	14.0	18.9	24.1	29.3
1800	32.2	32.5	32.0	31.8	31.3	30.8	30.0	1.5	5.7	10.3	15.6	22.1	27.1	34.4
2000	36.5	36.0	35.3	35.2	35.0	34.5	34.0	2.5	6.6	11.5	17.5	24.0	30.0	38.2

R P M	PRESSURES-LBS. SQ. IN.							PRESSURES-LBS. SQ. IN.						
	0	250	500	750	1000	1250	1500	0	250	500	750	1000	1250	1500
	DELIVERY-GALS. MIN.							HORSEPOWER INPUT						
500	11.0	10.5	10.0	9.5	9.0	8.9	8.4	1.12	1.7	3.5	5.2	7.0	10.0	12.5
750	16.5	16.4	16.0	15.5	15.0	14.5	14.0	1.24	2.6	5.2	8.0	11.0	14.2	17.0
1000	22.1	22.2	21.7	21.2	20.8	20.6	20.2	1.43	3.5	6.9	10.5	14.4	18.8	23.1
1200	26.5	26.7	26.0	25.7	25.4	24.9	24.5	1.67	4.4	8.5	13.7	18.1	23.5	27.5
1400	31.0	31.2	31.0	30.5	29.9	29.4	29.2	1.11	5.8	9.9	14.9	20.5	26.5	32.3
1600	35.5	36.0	35.5	35.0	34.5	34.0	33.5	1.16	6.4	11.2	17.2	24.5	30.0	37.0
1800	40.0	40.5	40.0	39.5	39.0	38.7	38.2	2.2	7.8	12.5	19.5	27.7	34.0	41.5
2000	44.5	45.0	44.5	44.2	43.7	43.2	42.7	2.6	9.0	14.2	21.5	31.0	37.5	46.0

HYDRECO PUMPS ARE DESIGNED FOR INTERMITTENT OPERATION UNDER ALL CONDITIONS OF PRESSURE AND SPEED SHOWN IN THESE CHARTS. IT IS SUGGESTED THAT THE HYDRECO ENGINEERING DEPARTMENT BE CONSULTED ON APPLICATIONS REQUIRING CONTINUOUS OPERATION AT FULL SYSTEM PRESSURE.

SERIES 2000 PUMPS
REVERSIBLE ROTATION

London in 1788. A

MODEL
2000 H3BI

mechanical modifications

- For special applications end frames, bearings, and similar parts can be omitted. Motor shafts of almost any length of special metals and with special machining on request.
- Tropicalized motors with special insulation and treatment to avoid attack by fungus, insects and corrosive elements meet adverse environmental conditions.
- NEMA "C" face, "D" flange and vertical "P" base motors meet most requirements for machined end frames. However, special flanges and faces are available for specific applications in both footmounted or footless frames.

nationwide service—More than 315 authorized service stations throughout the United States give you low cost 24 hour motor repairs and parts replacement service.



vertical solid shaft motor
"P" base



close coupled pump motor
"C" face



Open-drip proof
motor with NEMA
"D" flange



Rib construction
speeds cooling
of TEFC motors



Explosion proof
design for use in
hazardous locations

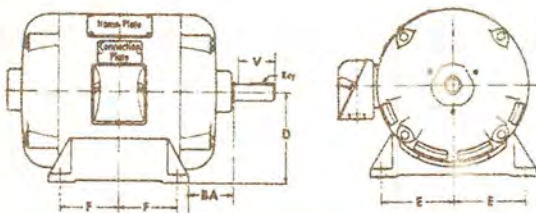
integral hp • single phase

horizontal • general purpose • capacitor start
ball bearing • 40° C rise continuous duty • dual rotation
115 230 volts • 60 cycles

ratings		NEMA frame sizes	ratings		NEMA frame sizes
hp	rpm (syn)		hp	rpm (syn)	
3/4	1200	184	2	3600	184
	1800	182		1800	213
1	1200	213	3	3600	213
	1800	182		1800	215
1 1/2	3600	184	5	3600	215
	1800			1800	254U

Automatic overload protector is optional up to 2 hp. Refer to factory for 50 cycle applications. Dimensions with drawings on page 7.

dimensions



frame	D	E	F	shaft dia.	V	BA	key		
							width	thickness	length
182	4 1/2	3 3/4	2 1/4	7/8	2	2 3/4	3/16	3/16	1 3/8
184	4 1/2	3 3/4	2 3/4	7/8	2	2 3/4	3/16	3/16	1 3/8
213	5 1/4	4 1/4	2 3/4	1 1/8	2 3/4	3 1/2	1/4	1/4	2
215	5 1/4	4 1/4	3 1/2	1 1/8	2 3/4	3 1/2	1/4	1/4	2
254U	6 1/4	5	4 1/8	1 3/8	3 1/2	4 1/4	5/16	5/16	2 3/4



A. O. Smith hermetic motors are application-engineered to match compressor requirements. Finest insulation materials are used. Production-line quality control requires every motor to pass the toughest electrical and mechanical tests.

Each motor is manufactured with particular attention to the smallest detail. Assembly and tests under controlled atmospheric conditions insure against failure in service.

availability chart

single phase; 115 or 230 volts • 60 cycles
polyphase; 208, 220, 440 or 550 volts • 60 cycles

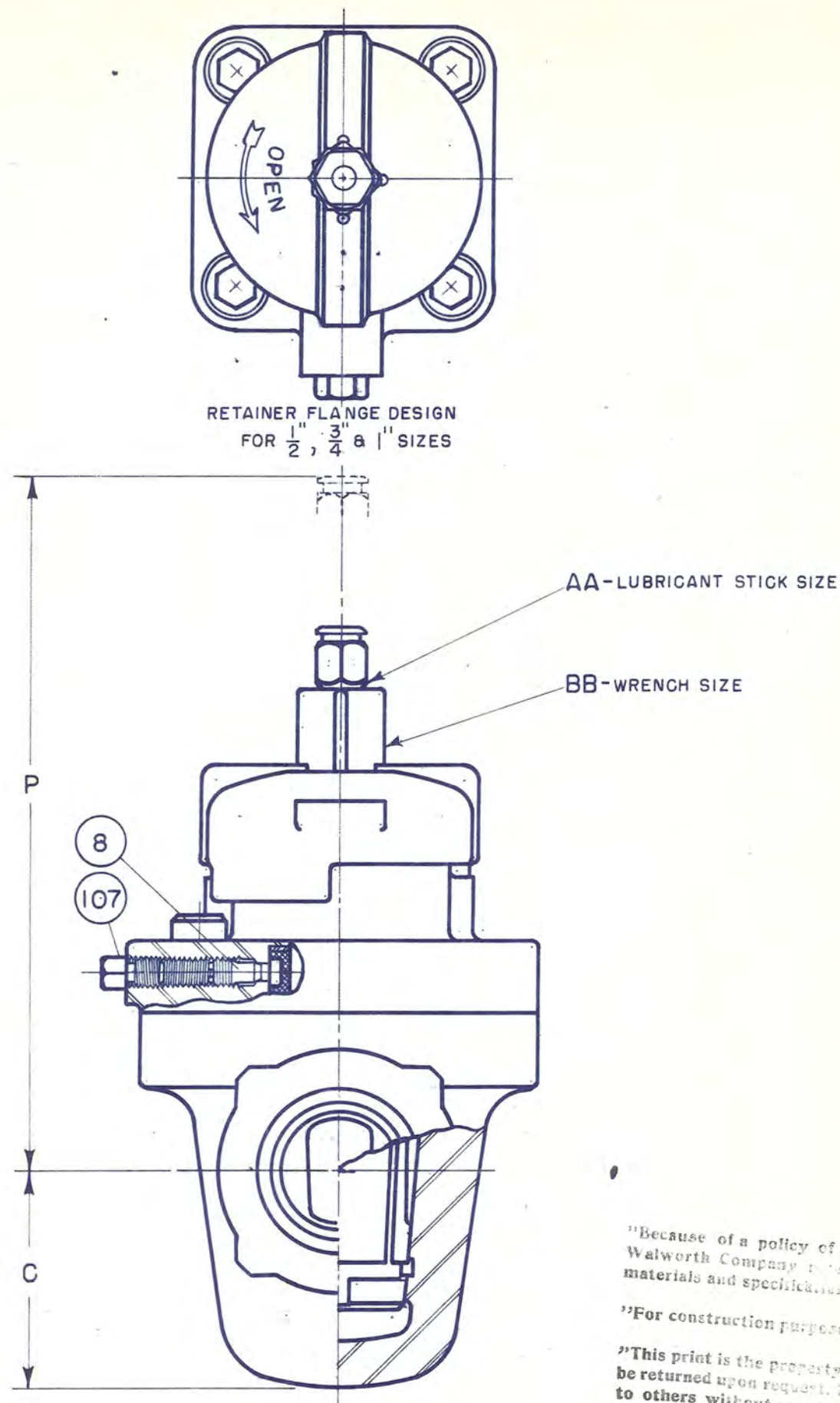
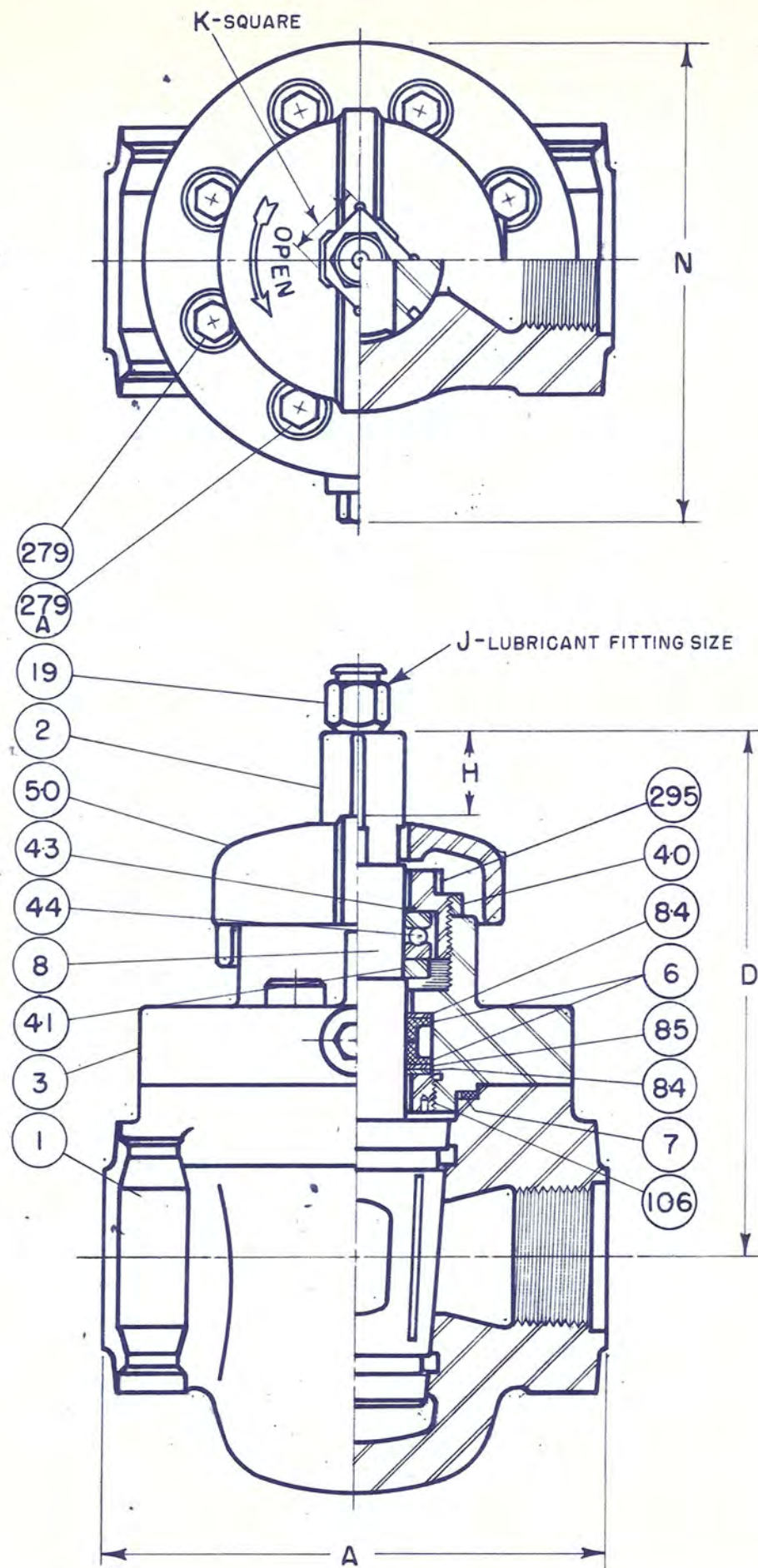
hp	outside dia. of stator	speed (rpm)
3/4, 1, 1 1/2, 2 or 3	6.292	3600
1 1/2, 2, 3, or 5	7.480	1800 or 3600
7 1/2 or 10	7.480	3600
2, 3, 5, 7 1/2 or 10	8.777	1800
10, 15 or 20	10.125	1800 or 3600
20, 25, 30 or 40	12.375	1800
40, 50, 60, 75 or 100	15.563	1800

for other ratings refer to factory

WILLAMETTE P.O. C-60389

REVISIONS	
NO.	DATE
1	12-13-56

ISSUED TO	
Greene Steel	
NO.	DATE
53	JAN 23 1959



LIST OF PARTS			
NO.	PART	MATERIAL	A.S.T.M. SPEC.
1	BODY	CAST STEEL	A-216-WCB
2	PLUG	CAST STEEL (CASE HARDENED)	A-216-WCA
3	RETAINER	CAST STEEL	A-216-WCB
6	PACKING	TEFLON	
7	RETAINER GASKET	FLEXITALLIC	
8	CHECK VALVE UNIT	STEEL	A.I.S.I. - B1113
19	LUBRICANT FITTING	STEEL	
40	LOCKNUT	MALLEABLE	A- 197
41	BALL BEARING RETAINER	STEEL	
43	UPPER BALL BEARING SEAL	J.M. 60	
44	BALL BEARING UNIT	STEEL	
50	STOP COLLAR	MALLEABLE	A- 197
84	INSIDE PACKING RING	STEEL	
85	OUTSIDE PACKING RING	STEEL	
106	PACKING FOLLOWER	STEEL	
107	PLASTIC PACKING SCREW	STEEL	
279	RETAINER CAP SCREW (SHORT)	CHROME MOLY. STEEL	A-193-B7
279A	RETAINER CAP SCREW (LONG)	CHROME MOLY. STEEL	A-193-B7
295	BALL BEARING ADJUSTING NUT	CAST STEEL	A-216-WCB

SIZE	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
A	5	5	5	7 1/8	7 1/8	8 1/2	9 7/8	9 5/8	12 1/2
C	2 3/8	2 3/8	2 3/8	2 13/16	3 1/16	3 15/16	4 7/16	5 1/16	5 15/16
D	6 11/16	6 11/16	6 11/16	7 15/16	7 13/16	8 13/16	9 3/8	10 1/8	12 7/16
H	15/16	15/16	15/16	1 5/16	1 5/16	1 7/16	1 1/2	1 5/8	1 7/8
J	1/4	1/4	1/4	1/4	1/4	3/8	3/8	1/2	3/4
K	13/16	13/16	13/16	1 1/16	1 1/16	1 1/4	1 3/8	1 1/2	1 3/4
N	5 1/4	5 1/4	5 1/4	6 7/8	6 7/8	8 1/8	8 7/8	9 5/8	11 1/8
P	9 15/16	9 15/16	9 15/16	11 3/16	11 1/16	12 9/16	13 1/8	14 3/8	17 1/16
AA	B	B	B	B	B	C	C	D	D
BB	D-4	D-4	D-4	H-4	H-4	K-3	M-3	P-3	R-3

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"For construction purposes use only certified prints."

"This print is the property of W. Walworth Company and shall be returned upon request. It shall not be copied or furnished to others without permission and shall be used in no way detrimental to the interests of Walworth Company."

WALWORTH COMPANY-KEWANEE WORKS			
SIZES	CS	SCRD.	BALL BEARING LUBR. PLUG VALVE
1"-4"	GENERAL DIMENSIONS		NO. 1681
2"-4"			WOG. 3600
DATE	DWN.	CHKD.	APPD.
9-17-56	P.M.S.	J.S.R.	J.H.
4160.2-4507			

OPERATING PRINCIPLES

Model DA Compressors

Eng. Data
Sheet 47.01

The construction of the Model DA Manual Dualine compressors, which differ only in regard to the capacity of their respective reservoirs, is shown in the accompanying sectional view, and those on the following page. The discussion of the operation of this mechanism therefore applies to all models.

The unit is shown arranged with a follower plate A in the reservoir for grease lubrication, and for such lubricants it is recommended that the reservoir B be filled from a Grease-Pak or transfer pump to introduce the lubricant under the follower plate and to avoid the hazard of foreign matter getting into the reservoir. Filling in this manner is provided for as shown on the following page.

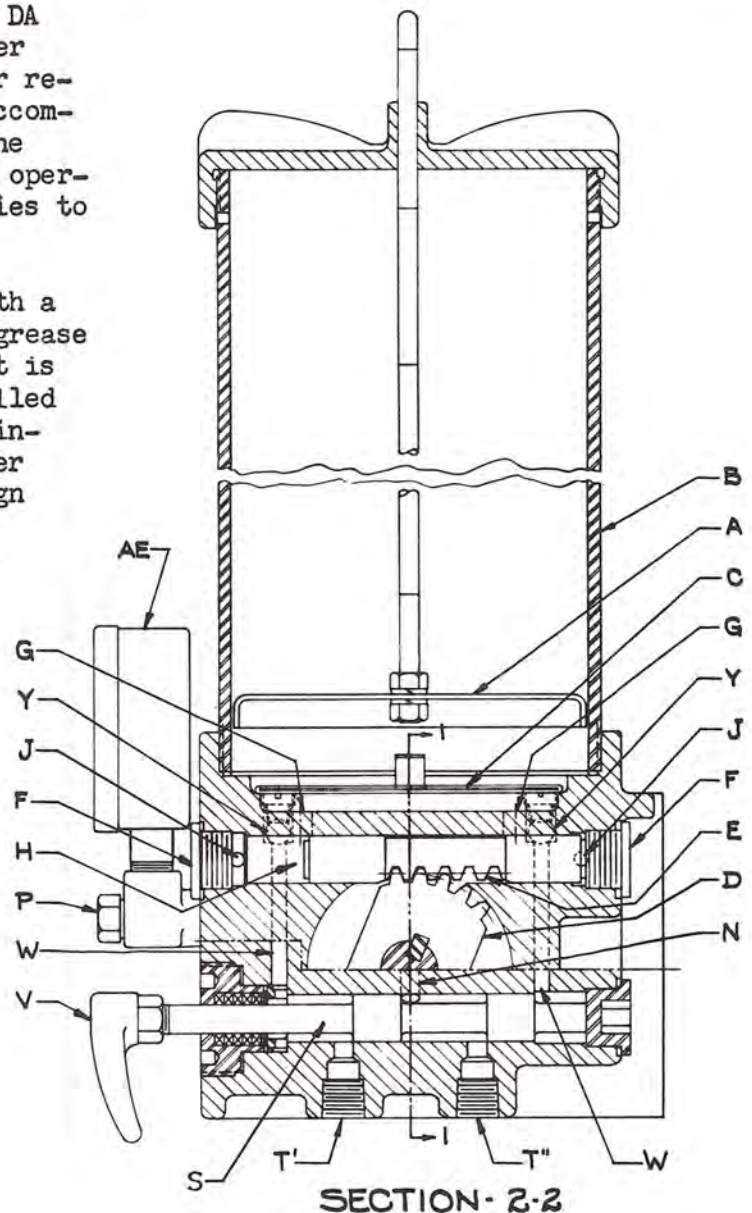
Where oil is employed as a lubricant, the follower plate A and its guide rod are replaced by a cork float with an aluminum oil level indicator rod.

In the operation of the compressor, swinging the pump handle V through an arc of about 40° causes a corresponding movement of the gear segment D, which meshes with the rack teeth cut in the pump piston E, and reciprocates the double acting pump piston in its bore. The plugs F limit the travel of the piston.

In its extreme positions, the pump piston E uncovers one or the other of the two inlet ports G, leading from the reservoir to the pump piston bore, and the vacuum created behind the pump piston as it travels results in a charge of lubricant being drawn into the pumping chamber H through the port G when this port is uncovered.

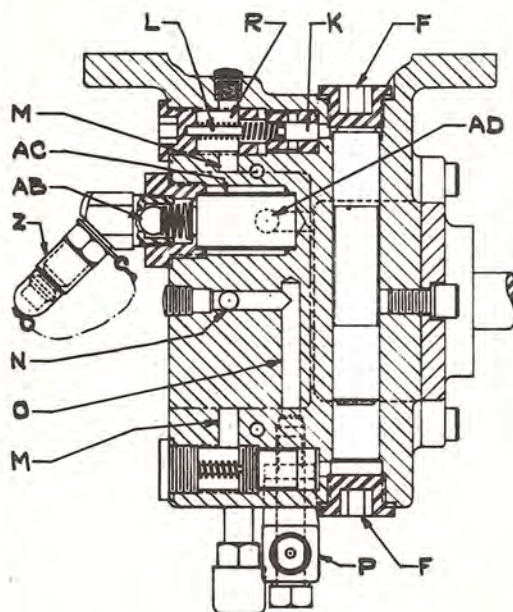
Movement of the piston E in the opposite direction first closes off the port G, then puts pressure on the lubricant in the chamber H, forcing this entrapped lubricant through the port J, through the discharge check valve K shown in section 3-3 on the next page, and into the passage M.

The discharge check valve K is a piston sliding with a very close fit in a steel sleeve. Under pressure, the piston K moves back against the resistance of a spring, striking on the pin L. In this position, it uncovers a series of small by-pass ports that allow the lubricant to pass outside of the steel sleeve and into the spring chamber R.



OPERATING PRINCIPLES

Model DA Compressors



SECTION-3-3

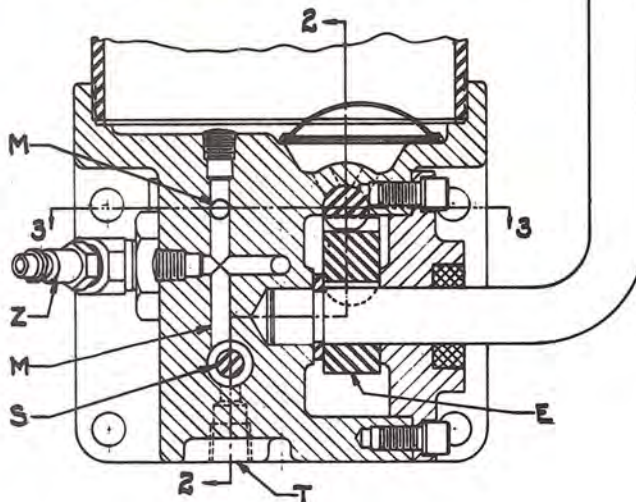
From the spring chamber R, the lubricant is forced through the passage M, common to the two check valves serving the two ends of the pump cylinder, to the vertical passage N, leading to the slide valve bore and the passage O, leading to the pressure gauge attachment fitting P to pressure gauge AE on the front of the compressor base.

Referring again to section 2-2 of the preceding page, lubricant enters the bore in which the slide valve piston S operates, at a point midway between the two supply line connections T' and T". The piston S has two shoulders on it closely fitting the bore in which it slides when manually operated by means of the handle V. Neither of the shoulders on the piston S can cross or cover the port N. Instead, in either of its two extreme positions, the shoulders on the piston S connect one of the two supply line connections T' or T" with the pump discharge passage N, while the other supply line connection is connected to one of the relief passages W, leading upward to the relief check valves Y, to

which open under moderate pressures to admit lubricant to the reservoir, to relieve this line of pressure.

According to the position of the slide valve S, therefore, one of the two supply lines is arranged to receive lubricant under pressure from the pump, while the other is relieved of pressure by connection to the reservoir, and shifting the slide valve S reverses these connections, as required for the operation of the Dualine valves.

Section 3-3 shows the filler connection Z, which is a shielded slip-coupling, permitting quick attachment and detachment of a Grease-Pak or other filler pump hose. Lubricant from such a device may be forced through the coupling Z and the ball check AB, to the inside of the cylindrical screen AC, where foreign matter in the lubricant is trapped. The ball check AB is provided to prevent leakage from the reservoir when the filler hose is removed. The screen AC permits passage of the lubricant outward to a clearance space surrounding it, and connecting, through a continuation of the passage AD, with the reservoir at a point below the follower plate, and at one side of the flat screen C. The passage AD also has a branch leading to the chamber in which the gear segment D operates, providing for the lubrication of the gear segment and the segment shaft bearings.

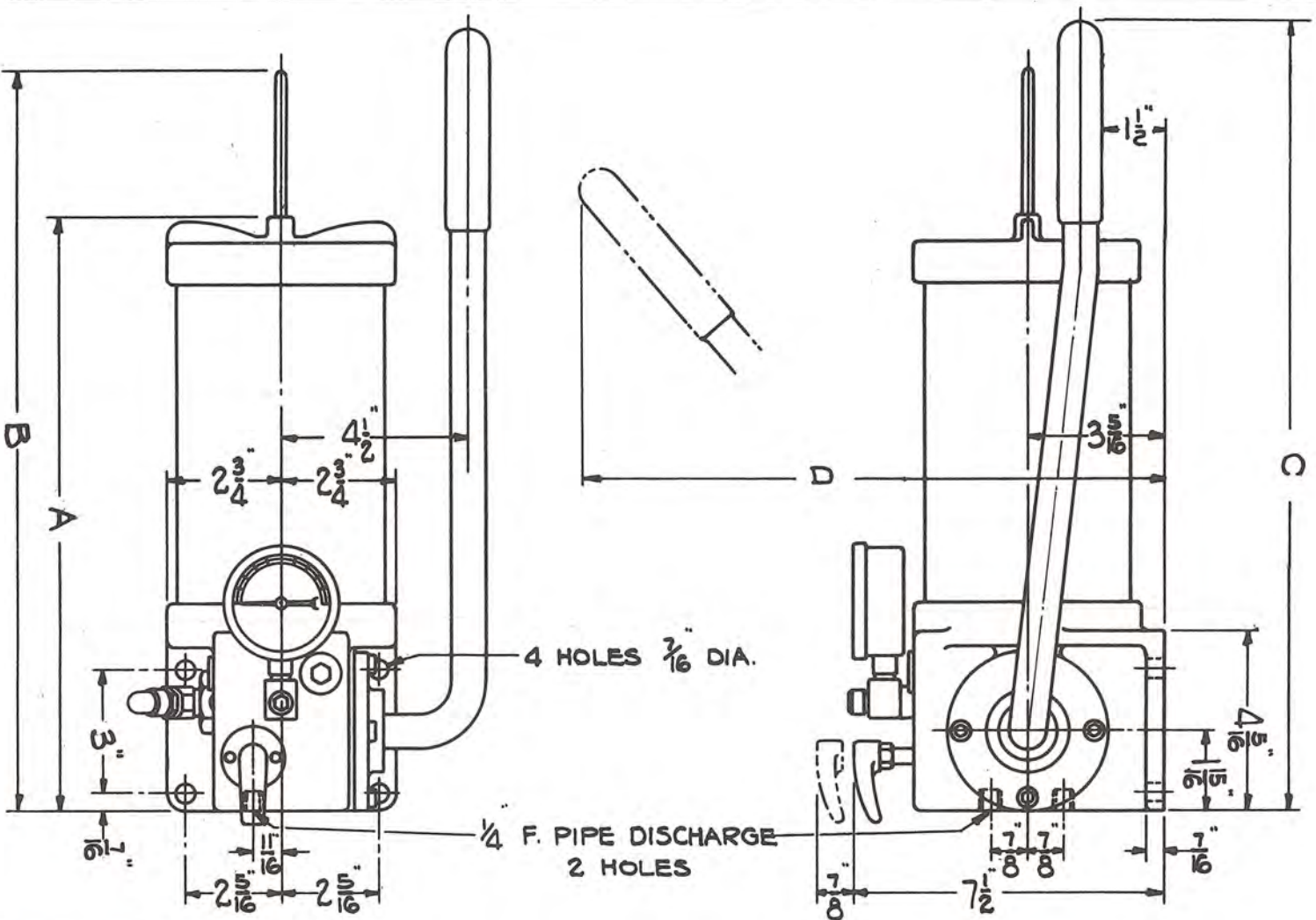


SECTION-1-1

MANUAL COMPRESSOR

Dimensions and Capacities

Eng. Data
Sheet 47.03



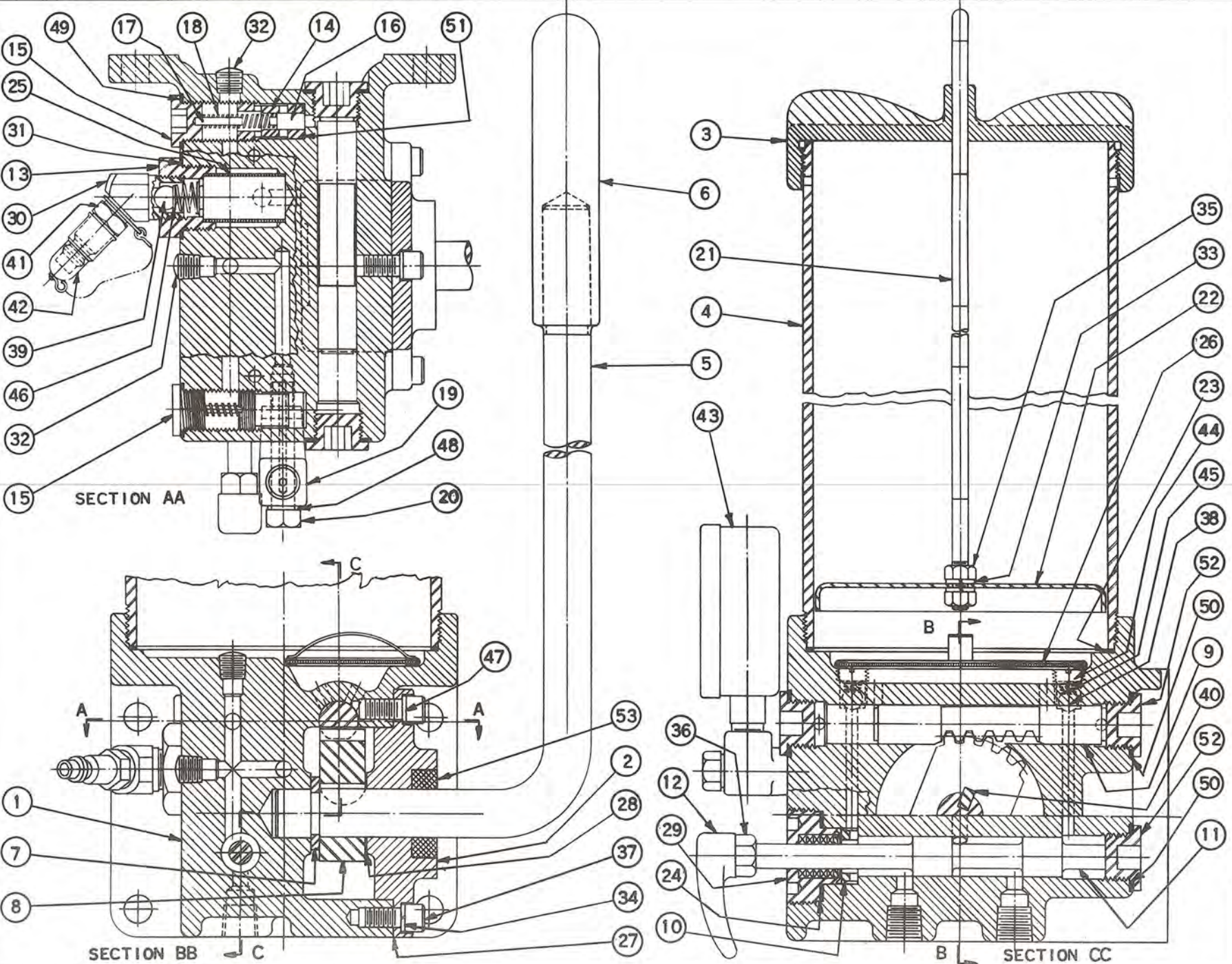
The Model DA Compressors are available as Series IA for grease equipped with reservoir follower-plate and guide rod; and as Series IB for oil lubricants equipped with float rod level indicator. Dimension "B" covers extended height of rod for oil or grease.

Size	Reservoir Capacity		Discharge Per Stroke	A	B	C	D
	Oil	Grease					
DA-4	2½ Qts.	4½ Lbs.	0.250 Fl. Oz.	14 7/16"	23 3/16"	18 5/16"	14 1/8"
DA-5	4½ Qts.	8½ Lbs.	0.250 Fl. Oz.	20 15/16"	36 3/16"	18 5/16"	14 1/8"
DA-6	6½ Qts.	12½ Lbs.	0.250 Fl. Oz.	27 13/16"	49 15/16"	25 3/16"	20"

MODELS DA4, DA5 & DA6 SERIES 1A COMPRESSORS

SECTIONAL VIEWS

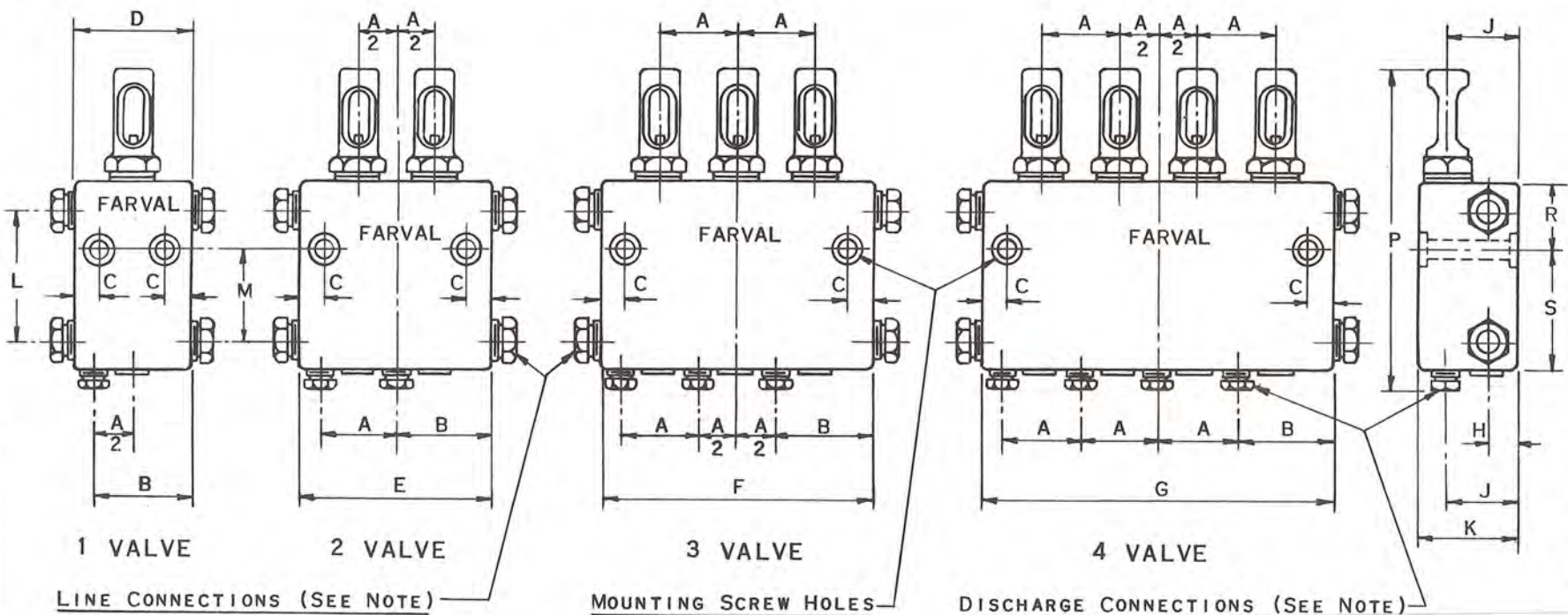
ENG. DATA
SHEET 47.04A



DM30, DM40, DM50 & DM60 DUALINE VALVES

Eng. Data
Sheet 47.06

DIMENSIONS AND CAPACITIES (SERIES 1 & 2)



SIZE	CAPACITY OZ. PER STROKE		DIMENSIONS IN INCHES																	MOUNTING SCREWS FILL-HEAD	SERIES-1		SERIES-2	
			A	B	+C *	D	E	F	G	H	J	K	TUBE		PIPE		P	R *	S *		TUBE CONN.		PIPE CONN.	
	L	M *											L	M *	LINE	DIS.					LINE	DIS.		
DM-31,32,33,34	.040	.007	1 1/8	1 7/16	1 7/16	1 3/4	2 7/8	4	5 1/8	15/32	1 3/32	1 1/2	1 5/8	1 3/16	1 5/8	1 3/16	4 5/32	7/8	1 5/8	5/16-18 x 2	3/8	1/4	1/4	1/8
DM-41,42,43,44	.075	.020	1 1/4	1 9/16	13/32	1 7/8	3 1/8	4 3/8	5 5/8	15/32	1 5/32	1 9/16	2 1/16	1 7/16	2 1/16	1 7/16	5 1/32	1 3/32	1 29/32	5/16-18 x 2	3/8	1/4	3/8	1/4
DM-51,52,53,54	.170	.042	1 7/16	1 23/32	13/32	2 1/8	3 9/16	5	6 7/16	15/32	1 9/32	1 3/4	2 1/4	1 19/32	2 1/16	1 1/2	5 21/32	1 5/32	2 3/32	5/16-18 x 2	3/8	1/4	3/8	1/4
DM-61,62	.475	.100	1 13/16	2 1/32	13/32	2 7/16	4 1/4	-	-	15/32	1 15/32	2 1/4	2 1/4	1 19/32	2 1/16	1 1/2	6 7/32	1 9/32	2 7/32	5/16-18x2 1/2	3/8	1/4	3/8	1/4

NOTE:

THE ABOVE VALVES ARE AVAILABLE IN SERIES -1 FOR TUBE CONNECTIONS, OR SERIES -2 FOR PIPE CONNECTIONS. TUBE COMPRESSION NUTS AND SLEEVES ARE FURNISHED WITH SERIES -1 VALVES. MOUNTING SCREWS ARE FURNISHED WITH EACH VALVE.

THE LAST NUMERAL IN THE SIZE NUMBER INDICATES THE NUMBER OF OUTLETS PER BLOCK.

* FOR SIZE DM31 ONLY, DIMENSION "C" IS 13/32", DIMENSION "M" IS 1-3/32". DIMENSION "R" IS 31/32" AND DIMENSION "S" IS 1-17/32".

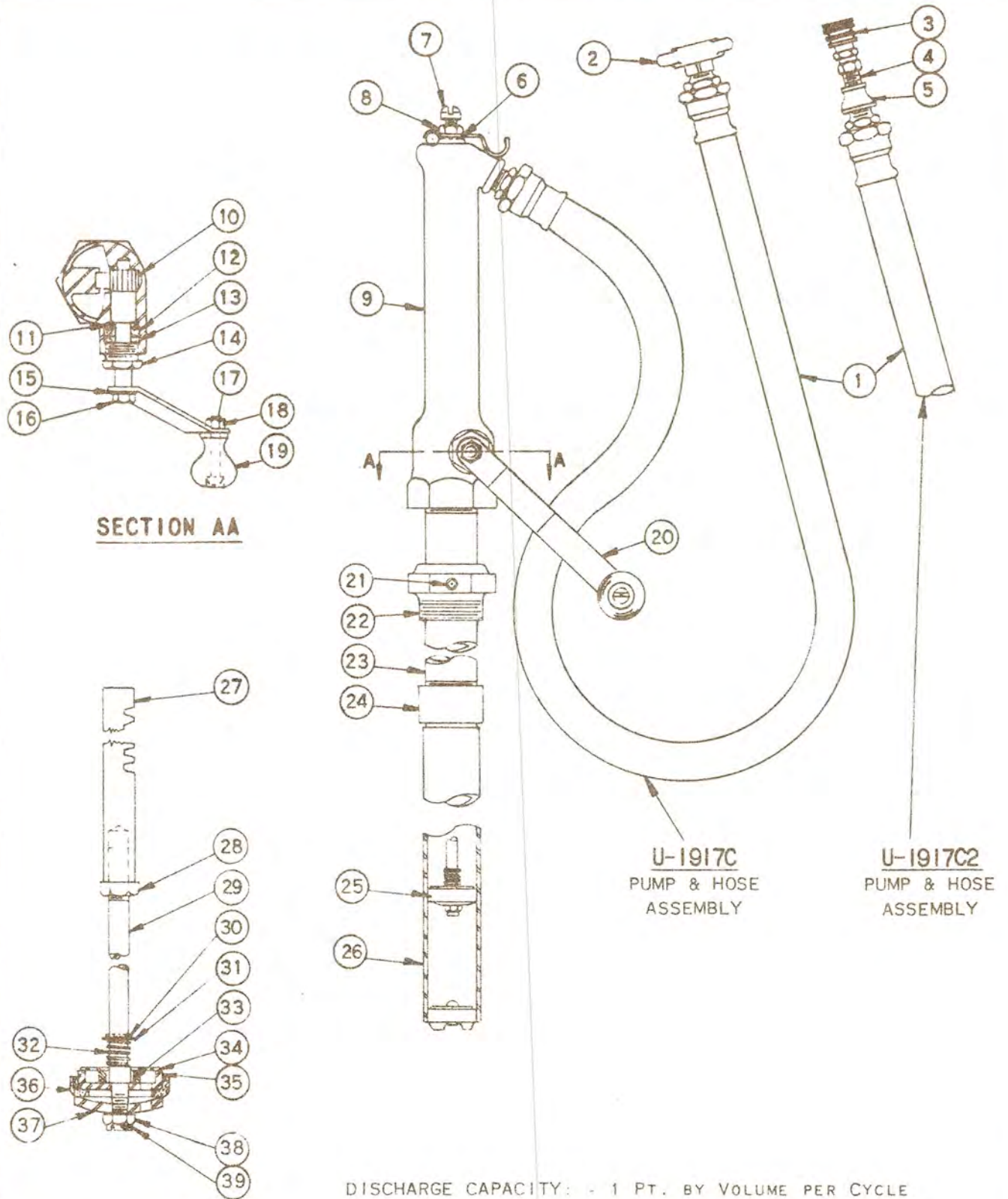
+ SIZE DM32 VALVES HAVE ONLY ONE MOUNTING HOLE.

THE DM62 MANIFOLD IS ALSO FURNISHED AS SERIES -3 FOR TUBE CONNECTIONS OR SERIES -4 FOR PIPE CONNECTIONS INTERNALLY DRILLED TO CONNECT BOTH DISCHARGE CHAMBERS TO THE CENTER OUTLET ONLY, TO OBTAIN A SINGLE OUTLET VALVE OF .95 FLUID OUNCES DISCHARGE CAPACITY.

BARREL TRANSFER PUMP

U-1917C & U-1917C2 FOR 400 LB. DRUM

Eng. Data
Sheet 87.71



**PISTON AND RACK
ASSEMBLY SP4-12**

DISCHARGE CAPACITY: - 1 PT. BY VOLUME PER CYCLE
1 LB. BY WEIGHT PER CYCLE

Eng. Data
Sheet 87.72

BARREL TRANSFER PUMP

U-1917C & U-1917C2 PARTS LIST FOR 400 LB. DRUM

[illegible]

In reassembling, it is necessary to adjust the position of the stationary contact as explained in "Changing or Replacing Stationary Contact Support" below.

Inserting Movable Contacts

To insert the movable contact in the movable contact support (normally open contacts), grasp the contact assembly with the thumb and forefinger (or needle-nose pliers) as shown in Fig. 3. First locate the end of the spring in the rectangular opening in the front side of the support. Then insert the end of the contact in the opening above the spring. Rotate the movable contact approximately 75 degrees toward the center, depress and push forward, making sure that the projections on the movable contact engage in the slots of the contact support. Make sure the spring is properly seated against the movable contact support.

To insert the movable contact in the stationary contact support (normally closed contacts), locate the free end of the spring over the projection on the molded support. Depress the spring and insert the movable contact so that it rests against the stationary contacts. Center the projections on the movable contact, so that they will engage the slots in the movable support. Make sure the projections are properly engaged in the slots of the movable contact support when reassembling.

Removal of Stationary Contacts

To remove the stationary contacts of a four- or six pole contactor, first remove screws (A), Fig. 1, and draw the magnet assembly and movable contact assembly from the contactor. Remove the screws holding the front stationary contacts. Remove the terminal screws on the rear contact assembly. Remove the screws holding the rear

stationary contacts. Pull the contact assembly forward to unseat, then push downward on the terminal causing the contact assembly to rotate approximately 30 degrees. Grasp the contact end of the assembly with the other hand and withdraw with a rotating motion.

To remove the stationary contacts of eight-pole or twelve-pole contactor, first remove the screw which holds the upper movable contact assembly to the push rod. Then remove the four screws on the back of the base plate holding the upper stationary contact support and withdraw the upper movable contact support. Then proceed as outlined above. In reassembling, it is necessary to adjust the position of the stationary contact support as explained in "Changing or Replacing Stationary Contact Support" below.

Changing the Contacts from Normally open to Normally Closed

The outer contacts are most readily changed, since they do not involve any disassembling. On an eight-pole or twelve-pole contactor, the upper inner contacts are the most difficult to change, because they necessitate removing the upper stationary contact support which requires adjusting when reassembling.

To change a contact from open to closed (or vice-versa), remove the contact as described under "Removal of Movable Contacts." Insert the contact as described under "Inserting Movable Contacts."

Changing or Replacing Stationary Contact Support

If, for any reason, the stationary contact support is removed from the contactor base plate, reassemble as follows: Fasten the stationary contact

support to the base plate with the four screws tightened slightly. Place a $\frac{1}{8}$ -inch spacer in the armature gap (C), Fig. 1. Push up on the movable armature (D), loosen the screws holding the contact support to the base plate and adjust the stationary contact support so that the normally open contacts just touch the stationary contacts. Then tighten the screws.

For an eight-pole or twelve-pole contactor, follow the same procedure on each stationary contact support, as the "wipe" on the contacts of the upper and lower contact supports are adjusted independently of each other.

On the contactors which have all normally closed contacts, insert a 9/64-inch spacer in the armature gap (C), Fig. 1, and adjust the contact support so that the contact faces just break contact.



Fig. 4. Typical CR2810 Machine Tool relay with twelve sets of contacts

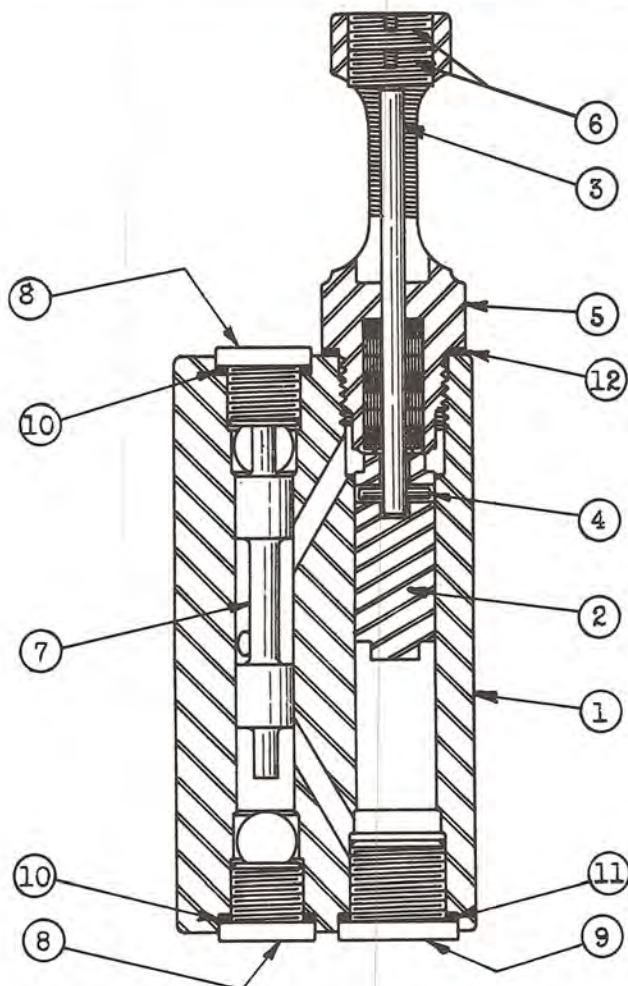
PRINCIPAL RENEWAL PARTS										
DESCRIPTION	CAT NO.	QUANTITY PER FORM								
		A	B	C	D	E	F	G	H	J
Set Sta. & Mov. Contacts With Springs & Screws For One (1) Pole	6960047G26	2	3	4	5	6	7	8	6	12
Coil	22D135G (See Table)	*	*	*	x	x	x	x	*	†
Molded Support For Sta. Contacts For Four (4) Pole Form	9004179G1	1	1	1	2	2	2	2		
Molded Support For Sta. Contacts For Six (6) Pole Form	187D339G1								1	2
Molded Mov. Contact Arm For Four (4) Pole Form	9004180P1	1	1	1	2	2	2	2		
Molded Mov. Contact Arm For Six (6) Pole Form	468C447P1								1	2
COIL SUFFIX										
CYCLES	110V	210/220V	380	440	500	600	115/125 DC	230/250 DC		
60	2	3		4	5	6				
*50	7	8	4	9	10	11	41	42		
25	17	18		19	20	21				
60	102	103		104	105	106				
*50	107	108	104	109	110	111	141	142		
25	117	118		119	120	121				
† 60	202	203		204	205	206				

Typical Nomenclature CR2810A14DE2. Suffix "2" identifies coil rated 110V 60 cycle. Coil is identified by Cat. 22D135G followed by this same suffix. Each device uses one (1) coil. Select proper coil from following table.

CR2810-A14 OPEN FORM	
AA, AH, AR, CR2811A110A, B, C, D	USE COLUMN A
AB, AJ, AS, BA, CR2811A111A, B, C, D, E, F, G, H	USE COLUMN B
AC, AK, AT, BB, BG	USE COLUMN C
AD, AL, AV, BC, BH, BM	USE COLUMN D
AE, AM, AW, BD, BJ, BN, BS	USE COLUMN E
AF, AN, AX, BE, BK, BP, BT, BW	USE COLUMN F
AG, AP, AY, BF, BL, BR, BV, BX, BY	USE COLUMN G
DE, DF, DG, DH, DJ, DK, DL	USE COLUMN H
EE, EF, EG, EH, EJ, EK, EL, EM, EN, EP, ER, ES, ET	USE COLUMN J
CR2811 ENCLOSED FORM	
A112A, B, C, D, E, F, G, H, J, K	USE COLUMN C
A113A, B, C, D, E, F, G, H, J	USE COLUMN D
A114A, B, C, D, E, F, G, H, J, K	
AE, AF, AG, AH, AJ, AK, AL	USE COLUMN E
A115A, B, C, D, E, F, G, H, J, K, L, R, S, T	USE COLUMN F
A116A, B, C, D, E, F, G, H, J, K, L, R, S, T	USE COLUMN G
A210A, B, C	USE COLUMN A
A211A, B, C, D	USE COLUMN B
A212A, B, C, D, E	USE COLUMN C
A214A, B, C, D, E, F, G	USE COLUMN E
A216A, B, C, D, E, F, G, H, J	USE COLUMN G

DUALINE VALVE MANIFOLDS

Parts List



ITEM	DESCRIPTION OF PART	SIZE OF MANIFOLD			
		DM-30	DM-40	DM-50	DM-60
1	BODY, 1 OUTLET VALVE	DM31-3402D	DM41-4402D	DM51-5402D	DM61-6402D
1	BODY, 2 OUTLET MANIFOLD	DM32-3402D	DM42-4402D	DM52-5402D	DM62-6402D
1	BODY, 3 OUTLET MANIFOLD	DM33-3402D	DM43-4402D	DM53-5402D	
1	BODY, 4 OUTLET MANIFOLD	DM34-3402D	DM44-4402D	DM54-5402D	
2	DISCHARGE PISTON	DM32-3502C	DM42-4502	DM52-5502	DM62-6502
3	INDICATOR STEM	U-1209K	U-1209D	U-1209J	U-1209L
4	CROSS PIN	U-1220-A3	U-1220-A4	U-1220-C6	U-1220-E11
5	PACKING GLAND	PG30-1	PG40-1	PG50-1	PG60-1
6	ADJUSTING SCREW	U-1202E	U-1202E	U-1202E	U-1202J
7	INLET PISTON	DM32-3501C	D2-2501	DM52-5501	DM62-6501
8	INLET BORE PLUG	U-1523A	U-1523A	U-1523A	U-1523A
9	DISCHARGE BORE PLUG	U-1522D	U-1522E	U-1522G	U-1522K
10	INLET PLUG GASKET	U-1305U	U-1305U	U-1305U	U-1305U
11	DISCHARGE PLUG GASKET	U-1305AB	U-1305V	U-1305W	U-1305AA
12	PACKING GLAND GASKET	U-217E	U-217E	U-217F	U-217N

NOTES: PACKING GLAND HAS PERMANENT PACKING ASSEMBLED IN IT.
TUBE AND PIPE MANIFOLDS ARE IDENTICAL EXCEPT FOR LINE
AND DISCHARGE CONNECTIONS IN BODIES.
VALVE PISTONS SHOULD NOT BE INTERCHANGED, AS THEY ARE
SELECTIVELY FITTED TO .0002" CLEARANCE.



INSTRUCTIONS AND RENEWAL PARTS MACHINE TOOL RELAYS CR2811-A210 TO -A218 OPEN AND ENCLOSED CR2810-A14 (OPEN)

NEMA TYPE A1B

GEH-2385C
Supersedes GEH-2385B

RATINGS

Maximum Voltage Rating	8-hr Current Rating
600	10 AMP (OPEN) 9 AMP (ENCLOSED)

The CR2810-A14 and the CR2811-A210 to A218 relays are multi-circuit a-c control relays. Because of their long mechanical life they are particularly adapted for use on machine tool panels. These relays have added flexibility which permits contacts to be easily changed from normally open to normally closed.

The CR2810-A14 relay is a sturdy device, with four, six, eight or twelve sets of contacts for a-c circuits of 10 amperes or less. A typical four-pole relay is shown in Fig. 1, a six-pole relay in Fig. 2, and a twelve-pole relay in Fig. 4. The CR2811-A210 to -A218 relay is an enclosed CR2810-A14 magnetic relay with either four, six or eight sets of contacts. The twelve-pole relay is available only in the open form.

INSTALLATION

1. Remove all packing.
2. Clean the magnet surfaces (C), Fig. 1.
3. Operate the armature by hand to be sure that all moving parts move freely.

MAINTENANCE

The sealing surfaces (C), Fig. 1, on the magnet frame and armature should

be kept clean.

The silver contacts require no attention but must be replaced before the silver is completely gone. Filing or otherwise dressing the contacts results only in loss of silver and reduces normal contact life.

Removal of Coil

Take out screws (A) and (B), Fig. 1, remove and disassemble complete magnet assembly. To remove, if space is limited below the device, hold movable contact support all the way in, and tilt bottom of magnet assembly out. When reassembling make certain that the tapped hole for screw (B) is to the rear. When replacing, tighten the screws securely.

the contact out.

2. Removal of Inner (or all) Movable Contacts

To remove the inner (or all) contacts of a four- or six-pole contactor, remove screws (A), Fig. 1, draw the magnet assembly and movable contact assembly from the contactor. To remove open contacts, grasp the movable contact assembly with the thumb and forefinger as shown in Fig. 3. Rotate toward the center of the movable contact support, depress and pull out through the rectangular opening in the front side of the movable contact support. Closed contacts may be removed directly from the stationary contact supports with a sideways motion.

To remove the inner (or all) contacts of the lower head of an eight-pole or twelve-pole contactor, remove the screw which holds the upper movable contact assembly to the push rod and remove the two screws (A), Fig. 1. Withdraw the complete magnet assembly, including the lower movable contact assembly, from the contactor. Remove the movable contacts as described above.

To remove the inner (or all) contacts of the upper head of an eight-pole or twelve-pole contactor, first remove the screw which holds the upper movable contact assembly to the push rod. Then remove the four screws on the back of the base plate holding the upper stationary contact support. Remove the upper stationary contact support and withdraw the upper movable contact support. Remove the contacts as described in the first paragraph under "Removal of Movable Contacts."

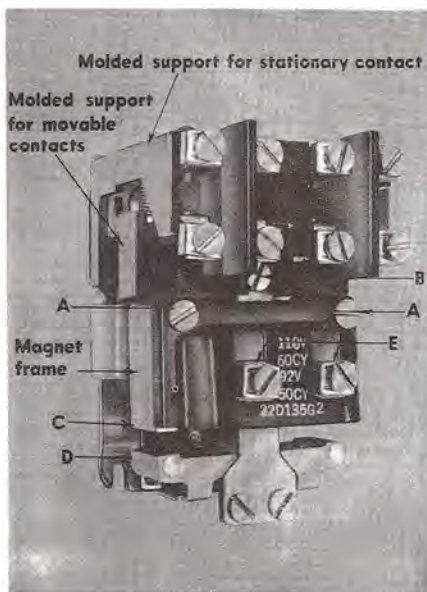


Fig. 1. Typical CR2810 machine tool relay with four sets of contacts

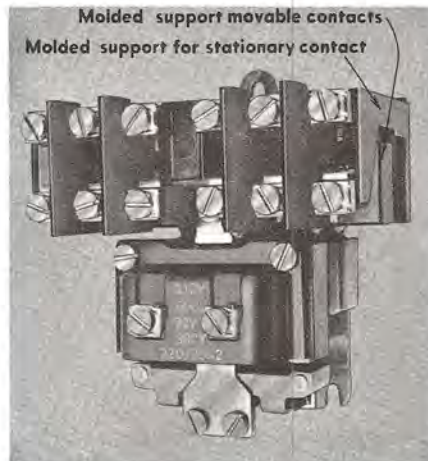


Fig. 2. Typical CR2810 machine tool relay with six sets of contacts

Removal of Movable Contacts

1. Removal of Outer Movable Contacts
To remove the outer normally open contacts, grasp the front side of the movable contact with needle-nose pliers. Depress the spring, turn the contacts approximately 75 degrees toward the center and move the contacts forward until the contact guide projection emerges through the rectangular opening in the front side of the movable contact support. Pull the contact out.

To remove the outer normally closed contacts, grasp the movable contact with needle-nose pliers and depress the spring until the contact is disengaged from the movable contact support. Pull



Fig. 3. Method of removing or replacing movable contacts

NO.	PART NAME	PART NO.	NO.	PART NAME	PART NO.
1	COMPRESSOR BODY OR BASE	DA4002	32	1/8" PIPE CLOSURE PLUG	U119A
2	SIDE PLATE	DA4003	33	1/4" LOCKWASHER	U213E
3	RESERVOIR COVER	DA4004	34	5/16" LOCKWASHER	U213FS
4	RESERVOIR (DA-4)	DA4005	35	1/4" -28 HEX. NUT	U220A
4	RESERVOIR (DA-5)	DA5005	36	3/8" -24 HEX. NUT	U220C
4	RESERVOIR (DA-6)	DA6005	37	5/16" -18 X 5/8" SOCKET HEAD SCREW	U225B2
**5	COMPRESSOR HANDLE (DA-4,DA-5)	DA4006	38	RELIEF CHECK BALL	U230D
**5	COMPRESSOR HANDLE (DA-6)	DA6006	39	FILLER CHECK BALL	U230E
**6	COMPRESSOR HANDLE GRIP	DA4007	40	WOODRUFF KEY	U233F
7	SNAP WASHER	DA4008	41	FILLER CONNECTION	U421B
8	GEAR SECTOR	DA4009	42	FILLER DUST CAP	U423
#9	COMPRESSOR PISTON	DA4010	43	PRESSURE GAUGE	U902B
10	SLIDE VALVE SPACER	DA4012	44	CHECK SPRING RETAINER SCREW	U1204D
#11	SLIDE VALVE PISTON	DA4013	45	RELIEF CHECK SPRING	U1304D
12	SLIDE VALVE HANDLE	DA4014	46	FILLER CHECK SPRING	U1304J
13	FILLER CONNECTION ADAPTER	DA4016	47	GASKET	U1305AE
*14	DISCHARGE CHECK SLEEVE	DA4017	48	GAUGE BOLT GASKET	U1305F
15	DISCHARGE CHECK CLOSURE PLUG	DA4018	49	DISCHARGE CHECK PLUG GASKET	U1305L
*16	DISCHARGE CHECK PISTON	DA4019	50	CLOSURE PLUG GASKET	U1305S
17	DISCHARGE CHECK STOP PIN	DA4020	51	DISCHARGE CHECK SLEEVE GASKET	U1314B
18	DISCHARGE CHECK SPRING	DA4021	52	CLOSURE PLUGS	U1522H
19	GAUGE ADAPTER	DA4022	53	PUMP HANDLE SEAL	U1716A
20	GAUGE ADAPTER BOLT	DA4023			
21	FOLLOWER PLATE ROD (DA-4)	DA4024			
21	FOLLOWER PLATE ROD (DA-5)	DA5024			
21	FOLLOWER PLATE ROD (DA-6)	DA6024			
22	FOLLOWER PLATE	DA4026			
23	RESERVOIR GASKET	DA4027			
24	PACKING GLAND GASKET	DA4028			
25	FILLER SCREEN	DA4029			
26	RESERVOIR SCREEN (GREASE)	DA4030A			
27	SIDE PLATE GASKET	DA4031			
28	SECTOR SPACER	DA4033			
29	SUB-ASSEMBLY-SLIDE VALVE PACKING GLAND	DA4040			
30	FILLER CHECK BODY	DP1703			
31	FILLER ADAPTER GASKET	DP3908-2			

NOTES:

1. # THESE PARTS HAVE SELECTIVE FITS AND MUST BE REPLACED AT FACTORY.
2. * THESE PARTS HAVE SELECTIVE FITS AND MUST BE REPLACED AS SETS.
3. ** HANDLES AND HANDLE GRIPS MUST BE REPLACED AS ASSEMBLIES.

Bourdon Tube Power Element Only
Visible Settings Over Calibrated Dial
Contact—A Wide Selection Of Operating Ranges

PRESSURE CHART FOR SERIES "D" MERCOID PRESSURE CONTROLS

OPERATING RANGES—ADJUSTMENT—DIFFERENTIALS—ELECTRICAL RATINGS

(Note: The differentials (pressure change between on-off operating points) shown in chart below, pertain to single pole single throw controls only. When controls incorporate two mercury switches for double throw or two pole operation, the differentials are approximately double those of the standard single pole controls.
For multiple circuit control see page 15. For Semi-Automatic control with Hand Reset; Lock Type Reset Control or Single Adjustment Control, see page 14.)

TYPE				SERIES D-20 & D-30		SERIES D-500		SERIES D-500	
				With Tilling Type Mercury Switch Complete details page 6		With Magnetic Type Mercury Switch Complete details page 7		With Magnetic Type Mercury Switch Complete details page 8	
ADJUSTMENT				DOUBLE ADJUSTMENT for setting both "on" and "off" operating points. Maximum differential—full scale. Minimum differential is listed below.		DOUBLE ADJUSTMENT for setting both "on" and "off" operating points. Maximum differential—full scale. Minimum differential is listed below.		SINGLE ADJUSTMENT Adjustable operating point. Differential fixed. NOT ADJUSTABLE.	
ELECTRICAL RATING				AC or DC 10A, 115V, 5A, 230V Motor Rating: 115/230V, A.C. 1 Ph. (R.L. 1 hp.) (S.P. 1/2 hp.) (Capacitor 1/2) (For D.C. 115/230V, 1/2 hp.) Available for 440V.		115V, 5A, A.C. 215A, D.C. 230V, 2A, A.C. 1A, D.C. Motor Rating: 1/2, 1/4 hp. S.P. 1/4 hp. D.C. 1/10 hp. For Higher Elec. Cap. use with Mercoird Type V Relay		A.C. 115V, 0.3A, 230V, 0.15A, (24V, 0.9A) D.C. 115V, 0.15A, 230V, 0.07A, For higher electrical capacity use with Mercoird Type V Relay.	
CIRCUIT				SINGLE POLE SINGLE THROW For Multiple Circuit See page 15		SINGLE POLE SINGLE THROW ONLY (Not available for multiple circuit control.)		SINGLE POLE SINGLE THROW ONLY (Not available for multiple circuit control.)	
ALL PRESSURES GAUGE (PSIG.)				MINIMUM DIFFERENTIAL		MINIMUM DIFFERENTIAL		FIXED DIFFERENTIAL	
RANGE No.	ADJUSTABLE OPERATING RANGE PSIG.	MAXIMUM MOMENTARY SURGE PSIG.	BOURDON TUBE MATERIAL	DA-21 DAW-23 DAE-21 Page 6	DA-31 DAW-33 DAE-31 Page 6	DA-521 DAW-523 DAE-521 Page 7	DA-531 DAW-533 DAE-531 Page 7	DS-221 DSW-223 DSE-221 Page 8	DS-231 DSW-233 DSE-231 Page 8
2	*0-30" Vac.	30	Brass		2" Hg.		1" Hg.		2/10" Hg.
3	*10" Vac. 12	30	Brass	1 psig.	1 psig.		1/2 psig.		2 oz.
1	0-14	30	Brass	1	1		1/2		2 oz.
3A	0-20	30	Brass	1	1		1/2		2 oz.
4	0-35	50	Brass		1 1/4		3/4		4 oz.
4	0-35	80	Brass	2 1/2					
5	0-60	80	Brass		2 1/2		1		6 oz.
5	0-60	125	Brass	3					
5S	0-60	150	Steel	6		2 psig.		7 oz.	
6	0-100	125	Brass		3 1/4		2		7 oz.
6S	0-100	200	Brass	6					
6S	0-100	300	Steel	6		3		12 oz.	
7	0-150	200	Brass		6		3		8 oz.
7	0-150	240	Brass	8					
7S	0-150	300	Steel	8		4		12 oz.	
8	0-200	240	Brass		8		3 1/2		12 oz.
8S	0-200	300	Steel	8		4		12 oz.	
9	0-300	400	Brass	12	12		6		1 psig.
9S	0-300	600	Steel	14		7		1 psig.	
10S	0-600	800	Steel	50		25		4 psig.	
11S	0-1000	1500	Steel	75		40		10 psig.	
12S	0-1500	2000	Steel	**100		**50		**12 psig.	
13S	300-2500	3000	Steel	**150		**100		**15 psig.	

* Inches of Mercury.

** Listed as Types DXA, DXAW, DXAE, DXS, DXSW, DXSE (Pages 6, 7, 8.)

FOR SERIES "D" TEMPERATURE CONTROLS SEE PAGE 20

PRESSURE CONTROLS

SERIES D-20 AND D-30 MERCOID PRESSURE CONTROLS

BOURDON TUBE POWER ELEMENT—OUTSIDE ADJUSTMENTS FOR INDIVIDUAL SETTING OF BOTH HIGH AND LOW (ON-OFF) OPERATING POINTS—VISIBLE SETTINGS OVER CALIBRATED DIAL—TILTING TYPE SEALED MERCURY CONTACT—VISIBLE ON-OFF CONTACT

FOR GENERAL PRESSURE APPLICATIONS

(RANGES TO 2,500 P.S.I.)

Types DA-21, DAW-23, DAE-21, DXA-21, DXAW-23, DXAE-21: Equipped with heavier Bourdon tubes (either steel SAE 4130 or brass) than Series D-30 described below. An orifice is incorporated in the bottom pipe stem to help retard pulsations. Where excessive pulsations, surges or water hammer occur, protect control with a surge tank, snubber or capillary tubing connection. Use a remote connection with mounting bracket if vibrations exist at point of connection. See column under list prices for operating ranges and differentials.

FOR STEAM, LIQUIDS OR GASES

WHERE PRESSURE CHANGES ARE FREE FROM SURGES OR PULSATIONS (RANGES TO 300 P.S.I.)

Types DA-31, DAW-33, DAE-31: Equipped with brass Bourdon tubes. For use only with mediums not injurious to brass. A pigtail siphon is furnished as standard for ranges 35 lbs. and higher. See column under list prices for operating ranges and differentials.

AVAILABLE CONSTRUCTION

General Purpose Types (NEMA 1)—Types DA and DXA: For indoor use and other general applications. Has plain case (steel) with glass fronted cover, finished in black baked enamel. Connection 1/4" I.P.S. Electrical connection in back of case for 1/2" Conduit or BX. Furnished standard with locking device to prevent tampering with adjustments. Available with plain case, back connection, flange case back or bottom connection (see illustration). Dimensions: see page 57. Shipping weight approximately 5 lbs.

Weather Resistant (NEMA 1A, 2, 3, 4)—Types DAW and DXAW: For outdoor use and other applications. Zinc plated steel case. Flanged case, bottom connection (surface mounting only). Not available in any other style case. Has three rear mounting flange holes. Zinc plated steel cover with Neoprene gasketed glass inspection port. There is a Neoprene gasket between cover and case. External adjustments are protected by a Neoprene gasketed cover secured by a wing nut. Electrical connection, 1/2" threaded hub back of case. Standard electrical rating, except 440V, 3A. rating limited to SP-ST contact. Bottom connection 1/4" I.P.S. Dimensions: see page 57. Shipping weight approximately 7 lbs. For cast weatherproof housing with hinged cover see page 39.

Explosion Proof (for Class 1, Group C and D; Class 2, Group E, F and G—NEMA 7, 9, 9A): Types DAE and DXAE: For hazardous locations. Has removable shatter-proof glass fronted cover. Adjustments are external and furnished with locking device. Mounting made by means of four mounting lugs. Has three 3/4" openings for electrical connections. Finished in natural aluminum. Pressure connections 1/4" I.P.S. Dimensions: see pages 57. Shipping weight approximately 38 lbs.



GENERAL PURPOSE TYPES DA AND DXA WEATHER RESISTANT TYPES DAW AND DXAW EXPLOSION PROOF TYPES DAE AND DXAE

OPERATING SPECIFICATIONS

DOUBLE ADJUSTMENT

for setting both "on" and "off" operating points. (Pressure change between on-off point is operating differential; Minimum differential adjustable full scale. Minimum differential is listed in column under list prices.

ELECTRICAL RATING

A.C. or D.C. 115 volts 10 amperes, 220 volts 5 amperes. (Available 3A, 440V. —Weather Resistant Types limited to SP-ST.) Motor Ratings: 115/230V. a.c. 1 hp. Rep. Ind., 1/2 hp. Split phase 3-4 Capacitor Single Phase, D.C. 115/230 V. 1/2 hp.

SWITCH ACTION

"Opens" on pressure rise (SPST)—all listed types noted in table. "Closes" on pressure rise (SPST) add suffix -3 to all listed type numbers. Example: DA-21-3, DAW-33-3, DXAE-21-3.

For multiple circuit control see page 15.

ACCESSORIES



MOUNTING BRACKET



REMOTE CONNECTION



FLANGE

Mounting Bracket: No. 32-25.....add to list \$8.00
Remote Connection: For pressures to 300 psi; No. 49-22.....add to list \$5.00
For pressures over 300 psi; No. 49-22HP.....add to list \$6.00
Flange: For surface mounting. Adaptable only to general purpose controls. Easily attached to control case by means of three self-threading screws (for full details see page 14).
Flange only (order by catalog No. 17-22).....add to list \$3.00
Flange assembled to control (order by type number shown under illustrations below and add to list price of control).....\$4.00

SPECIAL FEATURES AVAILABLE

Multiple Circuit combinations see page 15.
3A, 440V (Weather Resistant Type limited to SP-ST. Add to list.....\$4.00
SP-DT 4A 115V.....add to list \$1.00
Plain Case with back connection: (For Types DA and DXA only) Change type as number shown in illustration below.....No extra charge.
Semi-Automatic control with hand reset.....see page 14
Single Adjustment control.....see page 14
Lock Type Reset control.....see page 14
For Oxygen, Acetylene, Hydrogen: Factory conditioned —made on order only.....add to list \$4.00
Welded Construction: Steel Bourdon tube and threaded pipe connection assembly.....add to list \$15.00
Kilogram Calibrations—with equivalent per sq. cm. dial calibrations.....No extra charge.
Diaphragm Protective Seal—for corrosive or viscous pressure mediums.....see page 16

LIST PRICE SCHEDULE

To "CLOSE" switch on pressure increase, add suffix -3 to all type numbers.

Example: DA-31-3, DAW-23-3, DXAE-21-3. NO EXTRA CHARGE.

Maximum differential—full scale. Minimum differential as listed in chart.

Range No.	Adjustable Operating Range Psig	Maximum Momentary Surge	Min. Diff. Psig	Bourdon Tube Material	General Purpose			Weather Resistant		Explosion Proof	
					DA-31	DA-21	DAW-33	DAW-33	DAE-31	DAE-21	
2	0-30" Vac.	30	2"	Brass	\$20.00		\$46.00		\$100.00		
3	10" Vac. 12 1/2"	30	1 1/2"	Brass	16.50	\$17.00	42.50	\$43.00	96.50	\$ 97.00	
1	0-14 1/2"	30	1"	Brass	15.00	15.50	41.00	41.50	95.00	95.50	
3A	0-20 1/2"	30	1"	Brass	15.50	16.00	41.50	42.00	95.50	96.00	
4	0-35	50	1 1/4"	Brass	16.50		42.50		96.50		
4	0-35	80	2"	Brass		17.00		43.00		97.00	
5	0-60	80	2 1/2"	Brass	17.00		43.00		97.00		
5	0-60	125	3"	Brass		18.00		44.00		98.00	
5S	0-60	150	6"	Steel		25.00		52.00		105.00	
6	0-100	125	3 3/4"	Brass	18.00		44.00		98.00		
6	0-100	200	6"	Brass		20.00		46.00		100.00	
6S	0-100	300	6"	Steel		27.00		53.00		107.00	
7	0-150	200	7"	Brass	20.00		46.00		100.00		
7	0-150	240	8"	Brass		22.00		48.00		102.00	
7S	0-150	300	8"	Steel		28.00		54.00		108.00	
8	0-200	240	8"	Brass	24.00		50.00		104.00		
8S	0-200	300	8"	Steel		30.00		56.00		110.00	
9	0-300	400	12"	Brass	25.00	26.00	51.00	52.00	105.00	106.00	
9S	0-300	600	14"	Steel		31.50		57.50		111.50	
10S	0-600	800	50"	Steel		45.00		71.00		125.00	
11S	0-1000	1500	75"	Steel		60.00		86.00		140.00	
12S	0-1500	2000	100"	Steel	DXA-21	DXAW-23	DXAE-21				
13S	300-2500	3000	150"	Steel	\$68.00	\$ 94.00	\$148.00				
					79.00	105.00	159.00				

*Inches of Mercury.

