Type H Hydro-Line Pumps

Standard Models HL - HM - HH

Type: Multi-stage, Vertical,
In-Line Suction and Discharge
Barrel-enclosed Bowls
Models HL-HM-HH: Standard configuration with barrel subject to suction pressure.

Capacities: To 2500 gpm (50,000 gpm available).

Heads: To 1350 ft.

Working Pressure: To 600 PSIG.

Temperature Range: 0°F. to 200°F. with standard material construction, -32°F to 450°F. available.

Drives: Electric Motor, Right Angle gear, Turbine: VSS type preferred.

Application: Refinery, Petrochemical, Power Plant, Secondary Recovery Injection.

Features: Fabricated Steel Head and Barrel Assembly meets ASME Boiler and Pressure Vessel Code for Unfired Vessels- Includes Hydrotest of Head and Barrel.

Mechanical Seal or Packing with optional shaft sleeve.

Standard or High Pressure (Deep Set) Bowls.

Optional Bowl and Impeller Wear Rings, Bearings.

Optional Materials of Construction all components.

General: Type H Hydrolines are Heavy Duty pumps which have gained wide acceptance in many markets. They have been primarily designed for refinery and petrochemical applications.

VERTICAL PROCESS PUMPS

Peerless Pump Company
Indianapolis, IN 46207-7026

Type H Hydro-Line Pumps

Standard Models HL - HM - HH

Engineering Data

Bowl Size	Head/ Barrel Size	HEAD AND BARREL DATA										
		Disch Flg (In)	Suct Flg (In)	Inner Col (In) ①	Head ② Working Press			Min Wall Thick-ness Head	Barrel Max ② Working Press.			Min Wall Thick-ness Barrel
					HL	HM	HH		HL	HM	HH	
6LB	2x3x8	2	3	3	230	600	600	.203	150	150	300	.260
7LB	3x4x10	3	4	4	230	600	600	.203	150	150	300	.290
8LB	3x4x10	3	4	4	230	600	600	.223	150	150	300	.290
8LB	4x6x10	4	6	4	230	600	600	.223	150	150	300	.290
9LA	4x6x12	4	6	6	230	600	600	.223	150	150	300	.310
10MA	4x6x12	4	6	6	230	600	600	.223	150	150	300	.310
12LB	6x8x16	6	8	8	230	600	600	.260	150	150	300	.353
12MB	6x8x16	6	8	8	230	600	600	.260	150	150	300	.353
14LC	6x8x18	6	8	8	230	600	600	.260	150	150	300	.353
14MC	8x10x18	8	10	10	230	600	600	.260	150	150	300	.353

Bowl Size	Head/ Barrel Size	STUFFING BOX DATA								BOWL DATA						
		Shaft Size	Sleeve O.D.	Depth Box	③ Dia Box	Size Pkg	No. Rings	Width Lant-ern Ring	℄ Ring End Box	Bowl Shaft Size		④ Thrust Lbs/Ft of Hd (Sp.Gr 1.0)	Min Wall Thick-ness	Eye Area	② ⑤ Maximum Differential Pressure(lbs)	
										Std.	Hi-Press.				Std.	Hi-Press.
6LB	2x3x8	7/8	1-3/16	2-11/16	1-1/2	5/16	10	--	2-1/16	7/8	1	1.5	5/32	3.38	500	600
7LB	3x4x10	1	1-1/2	2-9/16	1-3/4	3/8	8	7/8	1-15/16	1	1-3/16	1.9	7/32	4.37	550	600
8LB	3x4x10	1-3/16	1-11/16	3-7/16	1-15/16	3/8	8	7/8	2-5/8	1-3/16	1-1/2	2.6	3/16	6.92	500	600
8LB	4x6x10	1-3/16	1-11/16	3-7/16	1-15/16	3/8	8	7/8	2-5/8	1-3/16	1-1/2	2.6	3/16	6.92	500	600
9LA	4x6x12	1-3/16	1-11/16	3-7/16	1-15/16	3/8	8	7/8	2-5/8	1-3/16	1-1/2	3.9	1/4	9.03	330	600
10MA	4x6x12	1-3/16	1-11/16	3-7/16	1-15/16	3/8	8	7/8	2-5/8	1-3/16	1-1/2	5.5	1/4	12.25	250	550
12LB	6x8x16	1-1/2	1-15/16	4-3/8	2-5/8	1/2	8	7/8	2-15/16	1-1/2	---	6.0	1/4	14.14	400	---
12MB	6x8x16	1-1/2	1-15/16	4-3/8	2-5/8	1/2	8	7/8	2-15/16	1-1/2	1-15/16	7.5	5/16	17.87	250	500
14LC	6x8x18	1-15/16	2-7/16	4-3/8	2-15/16	1/2	8	7/8	3-1/4	1-15/16	2-3/16	9.4	5/16	19.49	400	500
14MC	8x10x18	1-15/16	2-7/16	4-3/8	2-15/16	1/2	8	7/8	3-1/4	1-15/16	2-3/16	10.0	5/16	23.58	300	400

① Maximum length of each inner column piece (NPSH Spool) with spider and sleeve bearing: 3500 rpm - 3 ft., 1760 rpm - 5 ft.
② Maximum test pressure is two times design pressure or 1½ times the shutoff pressure, whichever is greater.
③ Based on shaft without sleeve or mechanical seal.
④ These are nominal thrust values. For specific operating thrust loads, see thrust curves, in Turbine Section 133.
⑤ Figures shown are for Class 40 CI.

TEMPERATURE RANGE: Operating temperature range for standard unit is 0° - 200°F. For temperatures outside this range (cryogenic to 450°F), refer to L.A. Factory for recommendations on materials of construction.

Peerless Pump Company
Indianapolis, IN 46207-7026

Type H Hydro-Line Pumps

Standard Models HL-HM-HH

TEMPERATURE - PRESSURE RANGE

Mfr	Type	Code	Temperature °F	Pressure PSIG
Dura	PTO ROTT PT	ES5NFVV ES5NFTT ES5NFTT	-20 to 350	600 (1) 600
Crane	1B 9B 8B1	XF191 Q/XF191 XF191	-40 to 400	600

(1) 132 PSIG at 1750 RPM and 65 PSIG at 3500 RPM for 1-15/16 shaft. For smaller shaft sizes pressure can be higher, see Duraseal PV curve or contact factory.

Temperature range shown is for hydrocarbons and lubricating liquids. For hot water service above 180°F use water jacketed stuffing box or circulating type mechanical seal and heat exchanger as required to hold seal box temperature to a value low enough to provide seal face lubrication and to prevent flashing across the seal face (usually not higher than 180°F). Seal face material to be selected by manufacturer.

Balanced seals recommended on liquids of Sp. Gr. .63. If below .63 the pressure must be above 75PSIG.

MATERIALS OF STANDARD CONSTRUCTION

Mfr	Type	Code	General Description	Stationary Face	Rotating Face	Springs	Seal Drive	Shaft Packing	Sleeve	Flange with By-pass	Throttle* Bushing
Dura	PTO	ES5NFVV	Balanced	#9 Carbon	316SS Stellited	316SS	316SS	Viton	304SS	Steel	Brz
	ROTT	ES5NFTT	Unbalanced	#9 Carbon	316SS Stellited	316SS	316SS	Viton	304SS	Steel	Brz
	PT		Balanced								
Crane	1B	XF 191	Balanced	Stellite	Carbon	18-8SS	18-8SS	Viton	18-8SS	Steel	Brz
	8B1	XF191	Balanced	Stellite	Carbon	18-8SS	18-8SS	Viton	18-8SS	Steel	Brz
	9B	Q/XF191									

* Includes Vent and Drain. Carbon or Teflon bushing available.

Type H Hydro-Line Process Pumps

Standard Models HL-HM-HH (Also used for Standard Model HE)

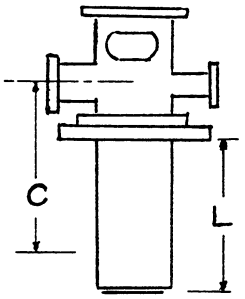
NPSH Calculations to FIND LENGTH of NPSH SPOOL and BARREL

EXAMPLE: 3x4x10 HM with 10-stage 7LB bowl unit at 3600 rpm; for 200 gpm, 900 ft of light hydrocarbon Sp Gr 0.62. 1 ft NPSH is available (Specified by customer). NPSH required is 9 ft at first stage impeller eye (from performance curve).

NPSH required by pump at eye of impeller (from performance curve):	9' 0"
Correction for submergence ("C" in chart below):	- 6' 1"
Subtotal	2' 11"
Head loss at 200 gpm between suction flange and bowl assembly (from sheet 2826482).	± 6" ***
NPSH required by pump at ℄ of suction flange:	3' 5"
NPSH available (specified by customer): (subtract +1)	- 1' 0"
NPSH spool required for proper operation	2' 5"
NPSH Spool added*	3' 0
Minimum barrel length before NPSH correction** ("L" in chart below)	+6' 3"
Actual barrel length required	9' 3"

* NPSH spool must be added increments of one (1) foot.
** If no NPSH correction is required, this is the actual barrel length.
*** Depending upon the application, a loss of this magnitude may be omitted.

It is recognized that there are many low NPSH requirements which occur intermittently and that a minor deficiency (e.g. 1 ft) in NPSH to the bowl under such conditions would not be detrimental. It is sound engineering to design the pump in the light of the specific application and avoid unnecessary addition of NPSH spool sections. Conversely where the specified low NPSH condition is continuous and even incipient cavitation is to be avoided (such as some power plant condensate pumps) this loss should be taken fully into account. Although the Hydraulic Institute acknowledges a hydrocarbon correction factor for NPSH, our policy is to quote on the basis of the water NPSH required.



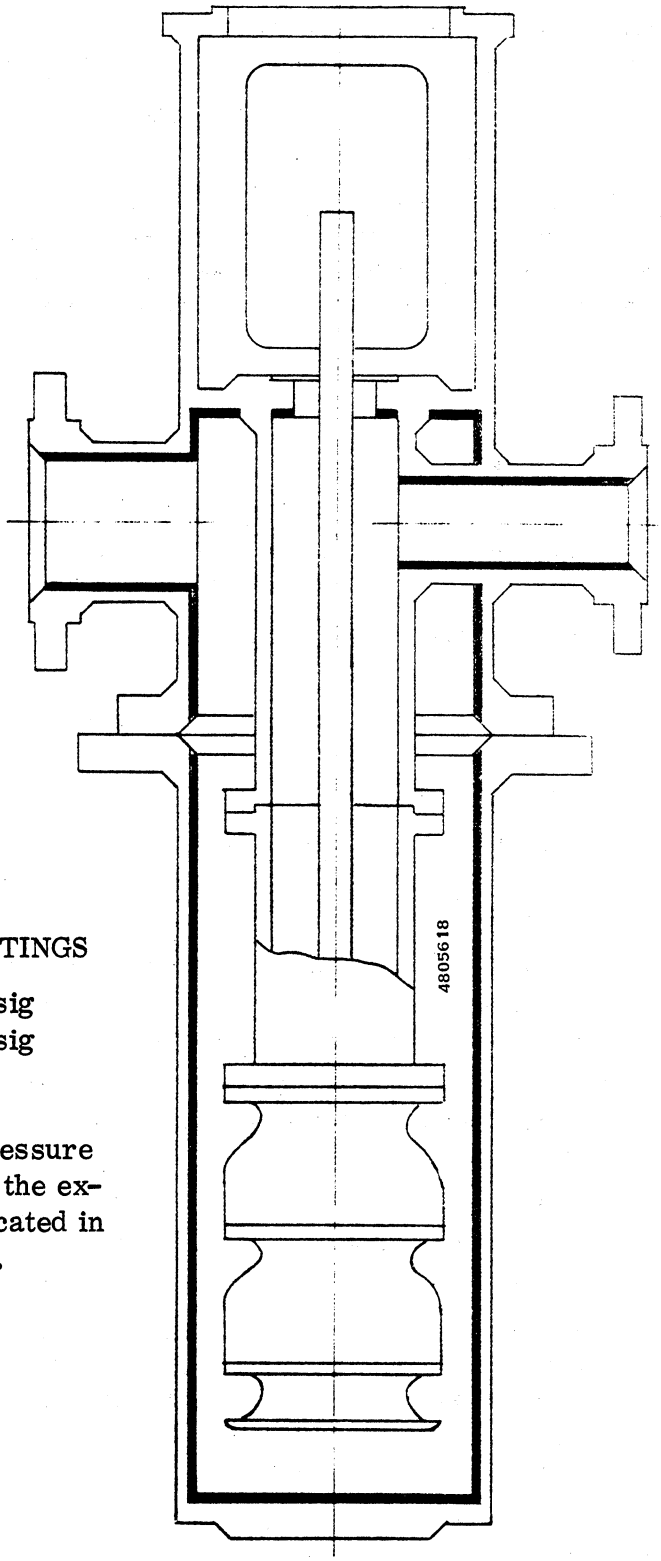
L = minimum barrel length with specified number of stages before NPSH correction**.
C = correction for submergence; and is approximately the distance from ℄ of suction flange to eye of bottom stage impeller.

Bowl Size	Head/Barrel Size	Dim *	Number of Stages														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
6LB	2x3x8	L	1-5	1-10	2-3	2-8	3-1	3-6	3-11	4-4	4-8	5-1	5-6	5-11	6-4	6-9	7-2
		C	1	1	2	2	3	3	3	4	4	5	5	6	6	6	7
7LB	3x4x10	L	1-10	2-4	2-10	3-4	3-9	4-3	4-9	5-3	5-9	6-3	6-8	7-2	7-8	8-2	8-8
		C	1-8	2-2	2-8	3-2	3-7	4-1	4-7	5-1	5-7	6-1	6-6	7-0	7-6	8-0	8-6
8LB	3x4x10	L	1-9	2-3	2-9	3-4	3-10	4-4	4-10	5-5	5-11	6-5	7-0	7-6	8-0	8-7	9-1
		C	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
8LB	4x6x10	L	1-9	2-3	2-9	3-4	3-10	4-4	4-10	5-5	5-11	6-5	7-0	7-6	8-0	8-7	9-1
		C	1	2	2	3	3	4	4	5	6	6	7	7	8	8	9
9LA	4x6x12	L	2-1	2-9	3-4	3-11	4-7	5-2	5-10	6-5	7-1	7-8	8-4	8-11	9-6	10-2	10-9
		C	1	2	3	3	4	5	5	6	6	7	8	8	9	10	10
10MA	4x6x12	L	2-1	2-8	3-4	3-11	4-7	5-2	5-10	6-5	7-1	7-8	8-4	8-11	9-7	10-2	10-10
		C	1	2	3	3	4	5	5	6	6	7	8	8	9	10	10
12LB	6x8x16	L	2-4	3-2	4-0	4-9	5-7	6-5	7-2	8-0	8-10	9-7	10-5	11-3	12-0	12-10	13-8
		C	2	3	3	4	5	6	7	7	8	9	10	11	11	12	13
12MB	6x8x16	L	2-3	3-1	3-10	4-8	5-5	6-3	7-0	7-10	8-7	9-5	10-2	11-0	11-9	12-7	13-4
		C	2	3	3	4	5	6	7	7	8	9	10	10	11	12	13
14LC	6x8x18	L	2-9	3-9	4-8	5-8	6-7	7-7	8-6	9-6	10-5	11-5	12-4	13-4	14-3	15-3	16-2
		C	2-5	3-5	4-4	5-4	6-3	7-3	8-2	9-2	10-1	11-1	12-0	13-0	13-11	14-11	15-10
14MC	8x10x18	L	2-10	3-11	4-11	6-0	7-1	8-1	9-2	10-3	11-3	12-4	13-4	14-5	15-6	16-6	17-7
		C	2-8	3-9	4-10	5-10	6-11	7-11	9-0	10-1	11-1	12-2	13-3	14-3	15-4	16-4	17-5

* L and C in feet and inches

VERTICAL PROCESS PUMPS

PRESSURE RATINGS



Typical Construction, Peerless
API Canned Pump

MAXIMUM PRESSURE RATINGS

Suction _____ psig
Discharge _____ psig

NOTE:

Corrosion allowance on pressure retaining parts exposed to the external environment is indicated in illustration by heavy lines.

Type H Hydro-Line Pumps

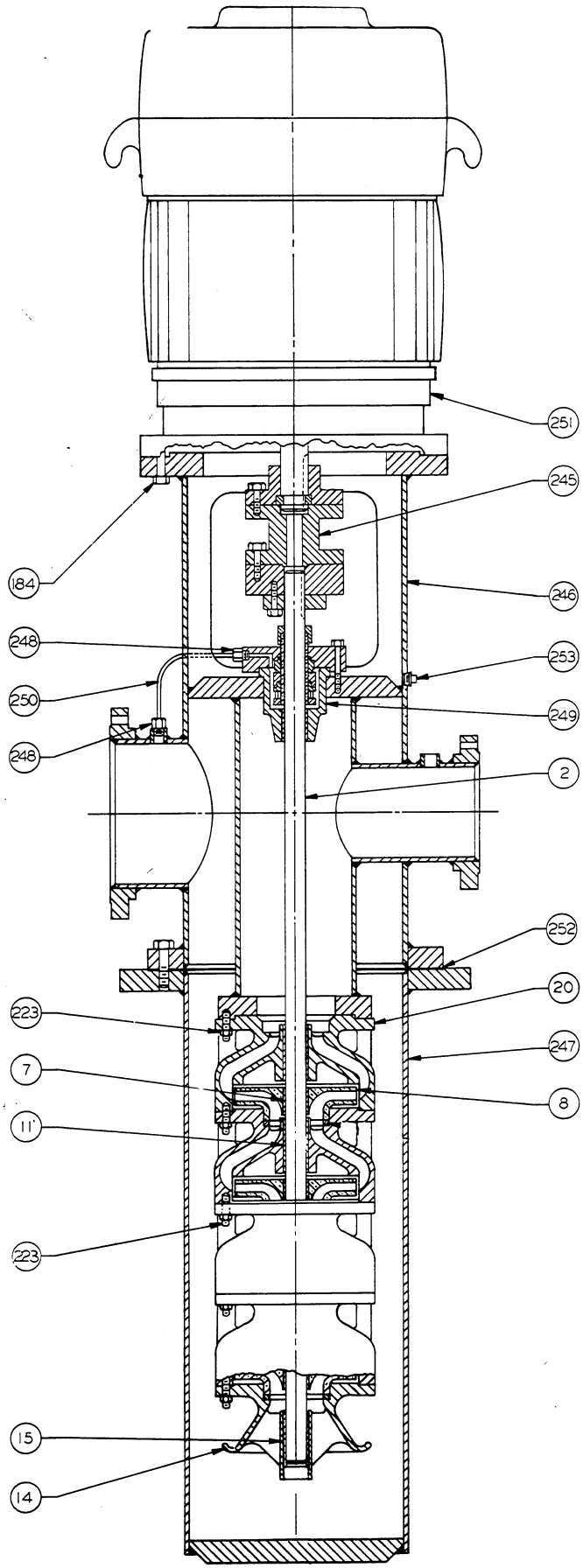
Standard Models HL - HM - HH

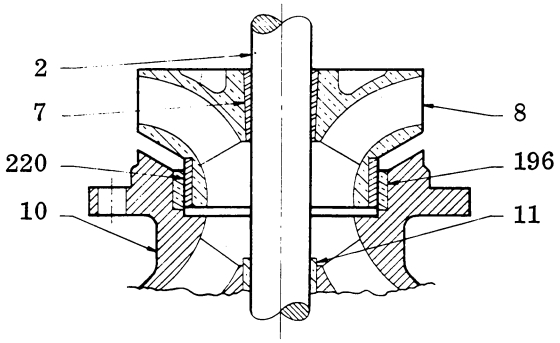
Sizes 2x3x8 and larger

Item No.	Description
2	pump shaft
7	impeller bushing
8	impeller
10	standard bowl
11	bearing for intermediate bowl
14	suction manifold
15	bearing for bell
20	top stage bowl, OLS
184	cap screw drive to head
196	bowl wear ring
220	impeller wear ring
*223	stud & nut
245	spacer coupling assembly
246	nozzle head
247	barrel
248	bypass line connection
249	mechanical seal assembly or packing container
250	bypass line
251	driver
252	gasket
253	drain plug

* All bowls are connected by cap screws except 6LB, 7LB, which are threaded and 16MA which has studs and nuts.

Dwg No 2827892



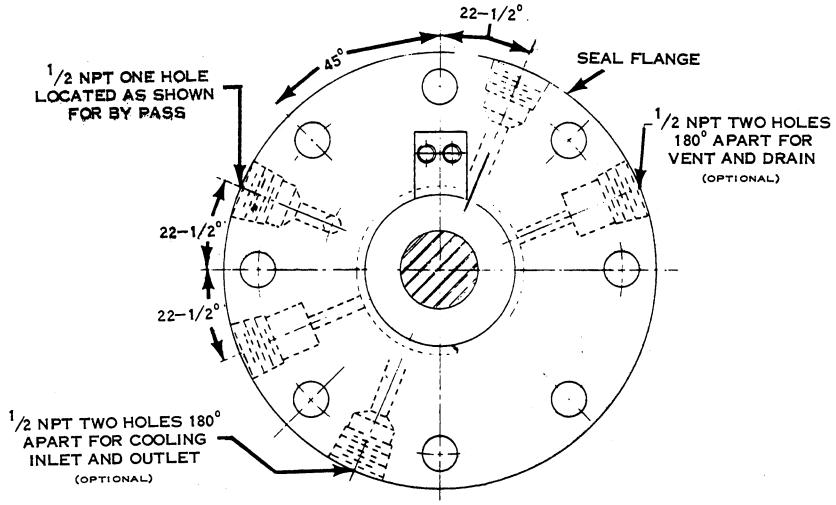


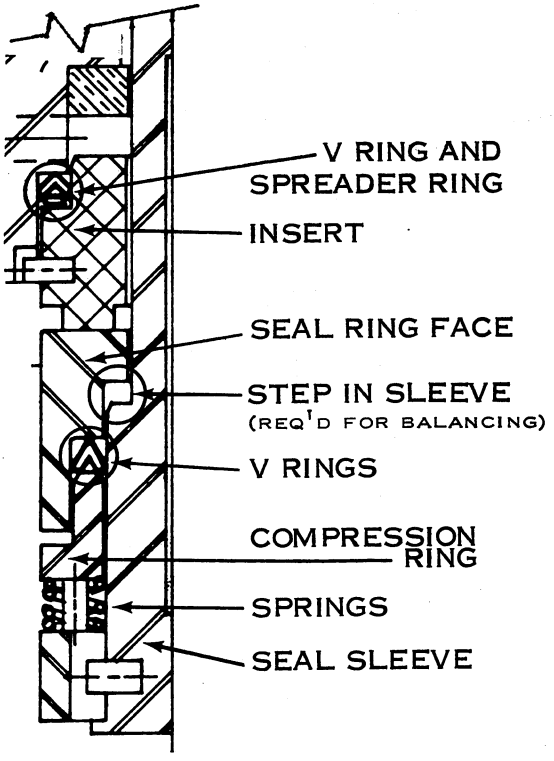
DETAIL OF IMPELLER AND BOWL WEAR RINGS
(optional construction)

Type H Hydro-Line Pumps

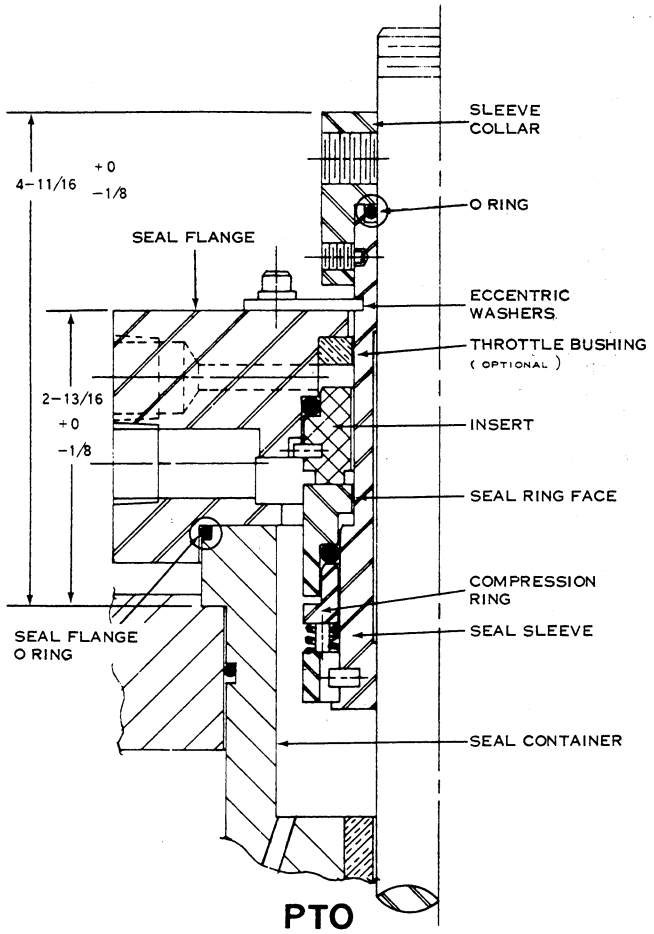
Standard Models HM-HL-HH
and VDM Hydro-Lines

Durametallic Seal Assembly





PT (BALANCED)



PTO

SHOWN HERE FOR GENERAL ARRANGEMENT PURPOSES. FLANGE AND SLEEVE COLLAR INFORMATION SAME FOR PT.

VERTICAL PROCESS PUMPS

Peerless Pump Company
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Type H Hydro-Line Pumps

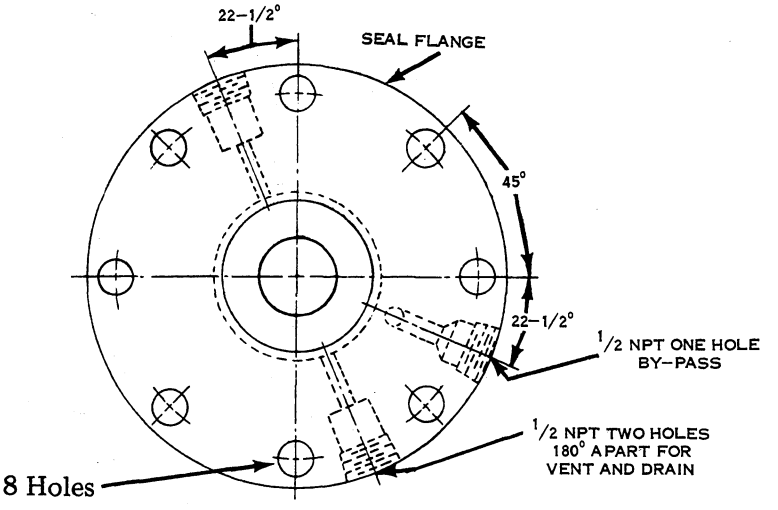
Standard Models HM-HL-HH
and VDM Hydro-Lines

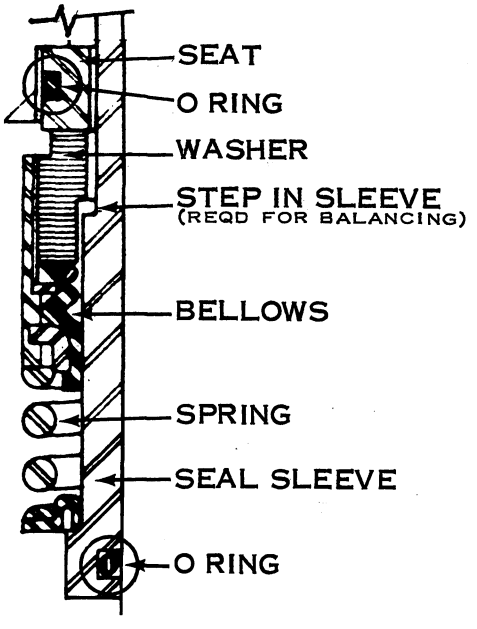
John Crane Seal Assembly

Seal Flange Dimensions

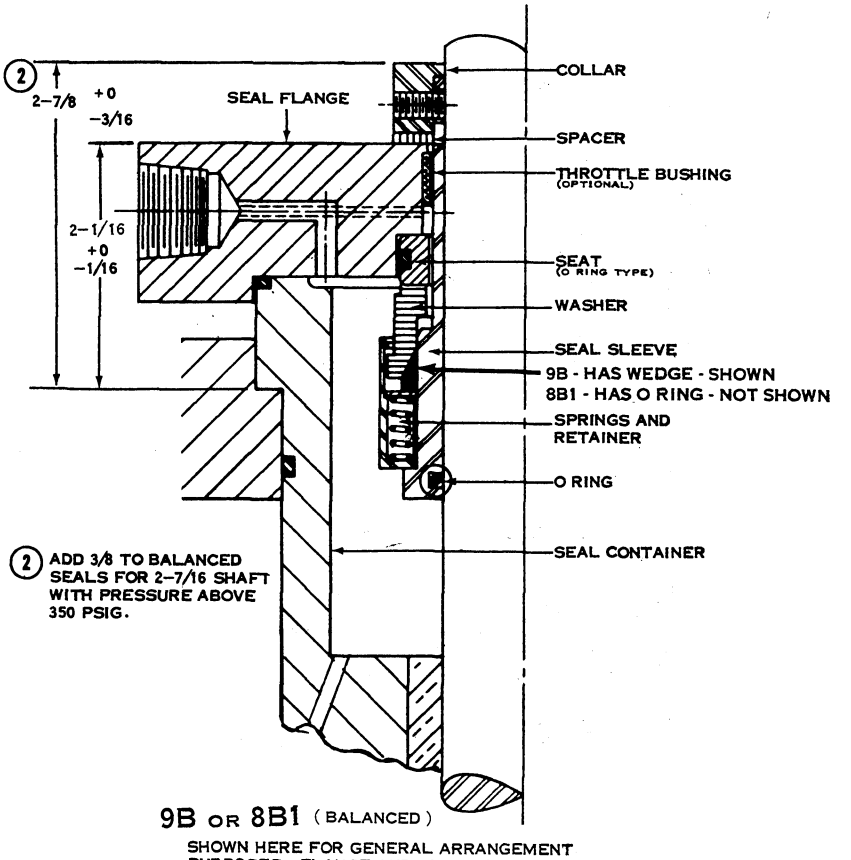
Head Size	Hole Size	Bolt Circle	Register DIA (1)	Seal Flange O.D.
2x3x8 3x4x10 4x6x10 4x6x12	1/2	5-1/4	4.498 4.500	6-1/8
6x8x16	9/16	6-1/8	5.060 5.062	7-1/4
6x8x18 8x10x18	11/16	7-1/8	5.936 5.938	8-5/8

(1) All register depths are 5/16 ±1/16 to fit seal containers.





1B (BALANCED)



9B OR 8B1 (BALANCED)

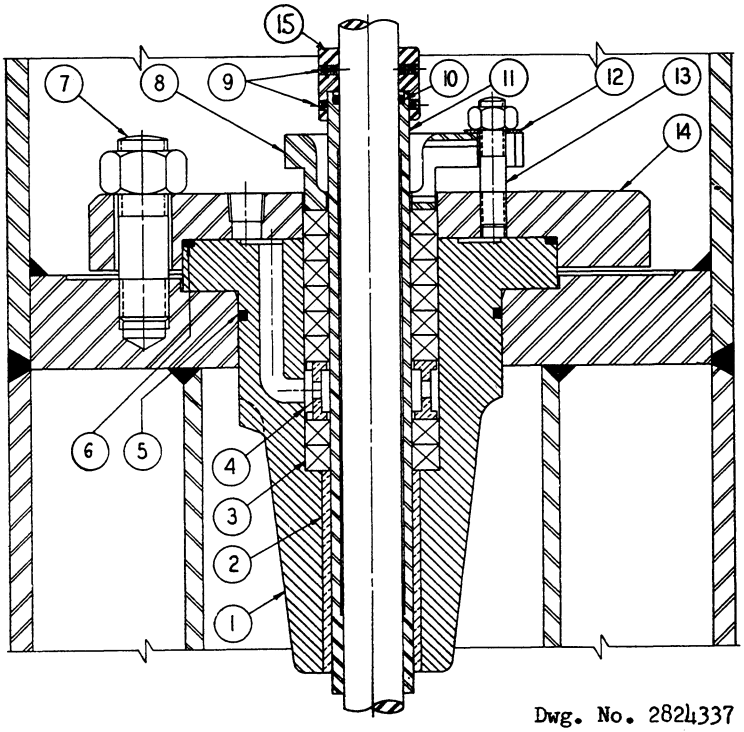
SHOWN HERE FOR GENERAL ARRANGEMENT PURPOSES. FLANGE AND SLEEVE COLLAR INFORMATION SAME FOR 1B.

Type H Hydro-Line Pumps

Standard Models HM-HL-HH
and VDM Hydro-Lines

Packing Container Assembly

1	packing container
2	bushing
3	packing
4	lantern ring
5 & 6	O-rings
7	flange stud
8	packing gland
9	set screw (if required)
10	O-ring (if required)
11	shaft sleeve (if required)
12	gland clamp
13	gland stud
14	flange
15	collar (if required)



Dwg. No. 2824337

PERFORMANCE CURVES

for Types HL-HM-HH, HE and HF Hydro-Lines

1. The curve sheets in Vertical Turbine Section 140 show bowl performance with standard enameled bowls and bronze or CI impellers.

   NPSH required is referred to impeller eye.

2. When high pressure (deep set) bowls are used reduce curve efficiency as follows:

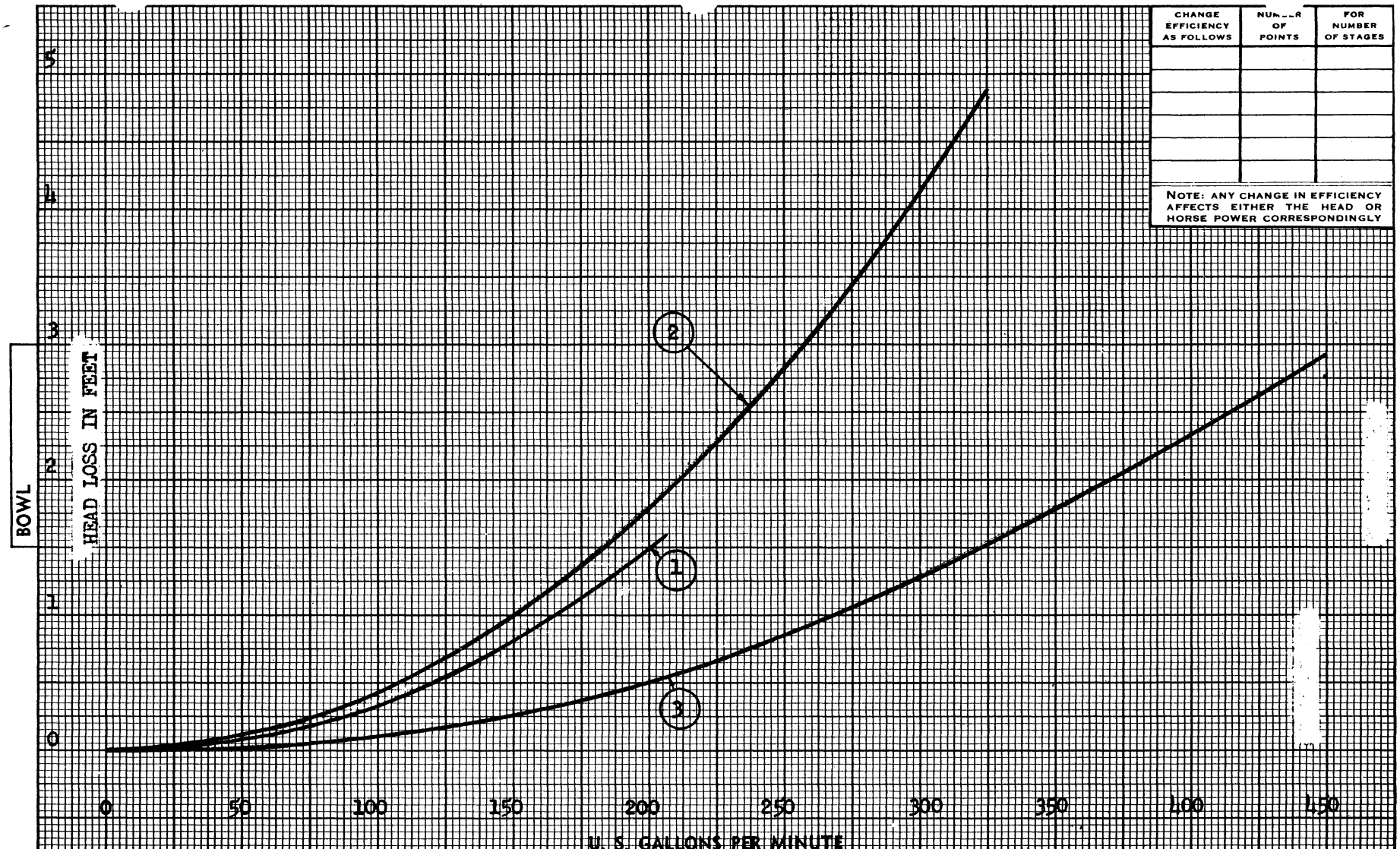
6LB	3%
7LB	3
8LB	3
9LA	3
10MA	4
12LB	3
12MB	4

3. Head and Barrel Losses

   Discharge head losses may be estimated at 1.5 times discharge velocity head ($1.5 \times \frac{V^2}{2g}$). This loss need not be included unless it exceeds 2% of total head.

   Suction head-and-barrel losses may be estimated from the loss-vs-capacity curves which follow. These losses affect the NPSH required at the pump suction flange. As discussed on page 5 (NPSH calculations), this loss may be omitted under certain conditions.

4. For performance with other bowl and impeller materials, refer to LA Factory.



CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES

NOTE: ANY CHANGE IN EFFICIENCY AFFECTS EITHER THE HEAD OR HORSE POWER CORRESPONDINGLY

HYDRAULIC PERFORMANCE

GUARANTEED AT THE DESIGNATED POINT ONLY AND IS CONTINGENT ON WELL PROPERLY FURNISHING PUMP WITH NON-AERATED OR NON-GASEOUS WATER FREE FROM ABRASIVES. PUMP BOWLS MUST BE PROPERLY ADJUSTED FOR THE HEAD AT WHICH THEY OPERATE AND MUST BE SUBMERGED.

CURVE NO.	HYDROLINE	TAKEN FROM
1	4LO - 2 x 3 x 8	
2	6LB - 2 x 3 x 8	
3	7LB - 3 x 4 x 10	

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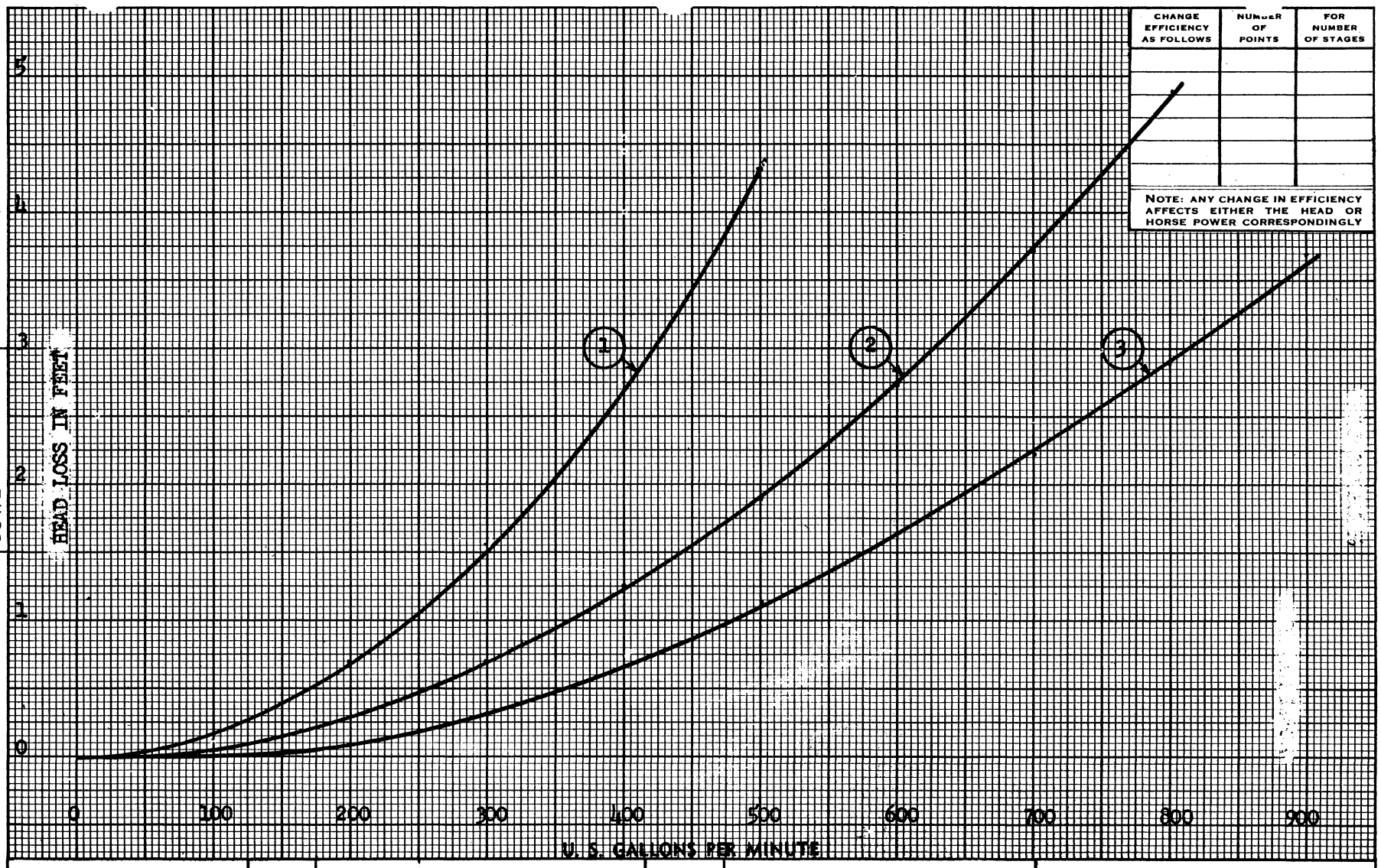
Head loss between suction flange and bowl assembly suction manifold in hydrolines.

SHEET NO. 2826482



CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES

NOTE: ANY CHANGE IN EFFICIENCY AFFECTS EITHER THE HEAD OR HORSE POWER CORRESPONDINGLY

HYDRAULIC PERFORMANCE

GUARANTEED AT THE DESIGNATED POINT ONLY AND IS CONTINGENT ON WELL PROPERLY FURNISHING PUMP WITH NON-AERATED OR NON-GASEOUS WATER FREE FROM ABRASIVES. PUMP BOWLS MUST BE PROPERLY ADJUSTED FOR THE HEAD AT WHICH THEY OPERATE AND MUST BE SUBMERGED.

CURVE NO.	HYDROLINE	TAKEN FROM
1	8LB - 3 x 4 x 10	
2	8LB - 4 x 6 x 10	
3	9LA - 4 x 6 12	

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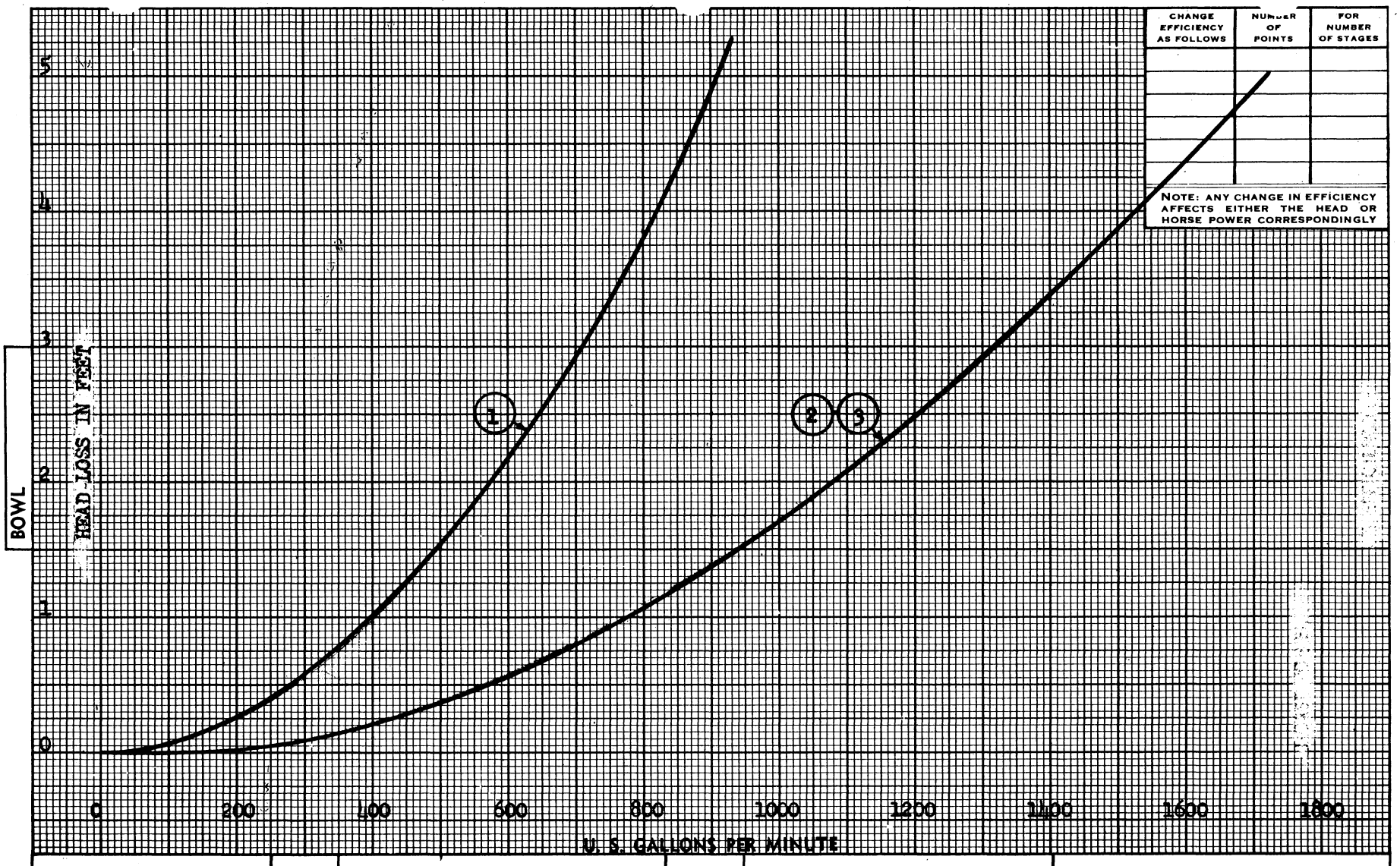
Head loss between suction flange and bowl assembly suction manifold in hydrolines.

SHEET NO. 2826483

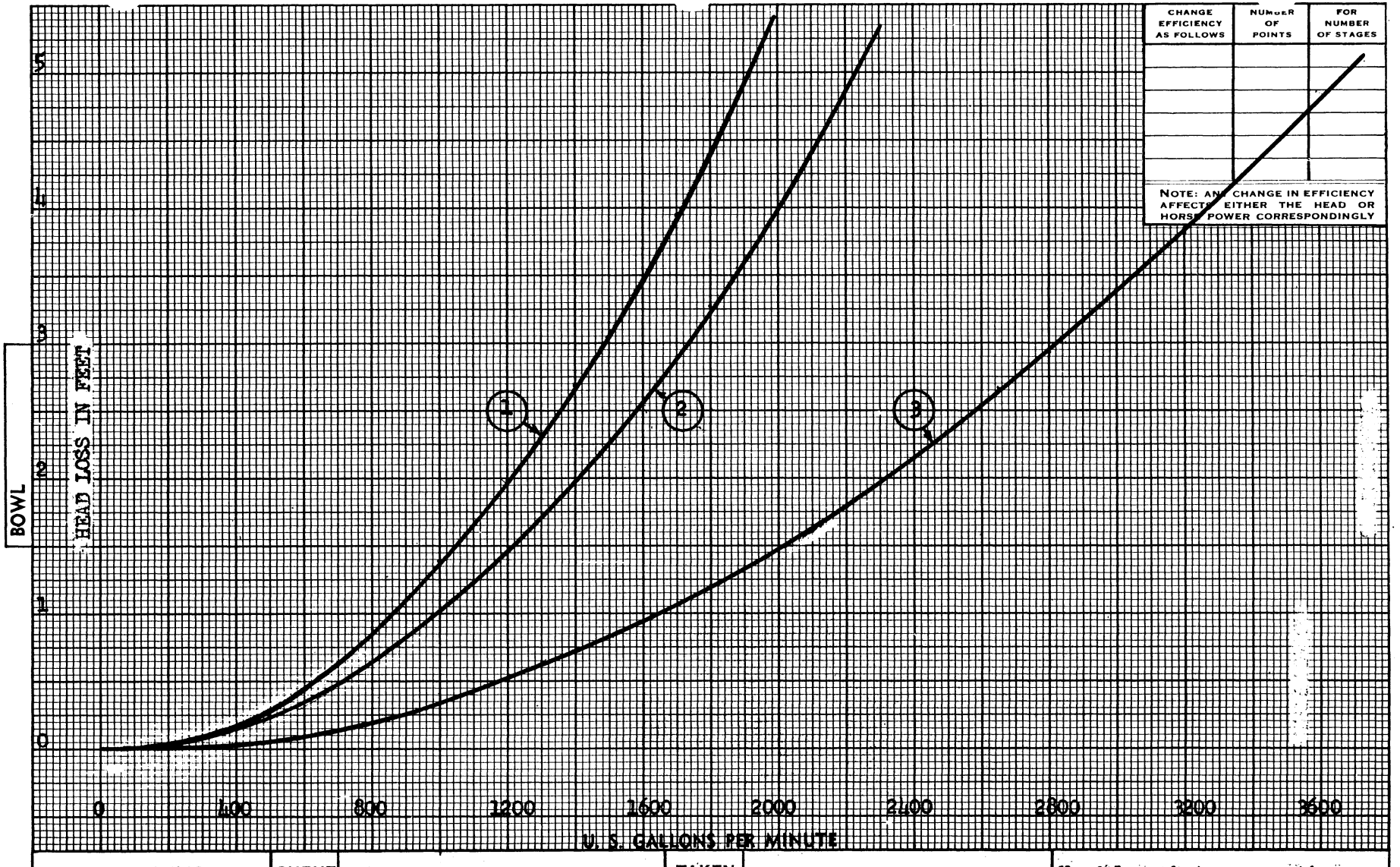


HYDRAULIC PERFORMANCE	CURVE NO.	HYDROLINE	TAKEN FROM
GUARANTEED AT THE DESIGNATED POINT ONLY AND IS CONTINGENT ON WELL PROPERLY FURNISHING PUMP WITH NON-AERATED OR NON-GASEOUS WATER FREE FROM ABRASIVES. PUMP BOWLS MUST BE PROPERLY ADJUSTED FOR THE HEAD AT WHICH THEY OPERATE AND MUST BE SUBMERGED.	1	10MA 4 x 6 x 12	
	2	12LB 6 x 8 x 16	
	3	12MB 6 x 8 x 16	

PEERLESS PUMP® Peerless Pump Company
Indianapolis, IN 46207-7026

Head loss between suction flange and bowl assembly suction manifold in hydrolines.

SHEET NO. 2826484



CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES

NOTE: ANY CHANGE IN EFFICIENCY AFFECTS EITHER THE HEAD OR HORSE POWER CORRESPONDINGLY

HYDRAULIC PERFORMANCE

GUARANTEED AT THE DESIGNATED POINT ONLY AND IS CONTINGENT ON WELL PROPERLY FURNISHING PUMP WITH NON-AERATED OR NON-GASEOUS WATER FREE FROM ABRASIVES. PUMP BOWLS MUST BE PROPERLY ADJUSTED FOR THE HEAD AT WHICH THEY OPERATE AND MUST BE SUBMERGED.

CURVE NO.	HYDROLINE		TAKEN FROM
1	14LC	6 x 8 x 18	
2	14MC	8 x 10 x 18	
3	14HXB	10 x 12 x 20	

PEERLESS PUMP® Peerless Pump Company
Indianapolis, IN 46207-7026

Head loss between suction flange and bowl assembly suction manifold in hydrolines.

SHEET NO. 2826485

TYPE HE HYDRO-LINE PUMPS

Type: Multi-stage, Vertical,
In-line Suction and Discharge
Barrel-enclosed Bowls
Standard configuration with barrel subject to suction pressure.

Capacities: Up to 2500 gpm.

Heads: To 530 ft.

Working Pressure: To 230 psig.

Temperature Range: 0^{o} F. to 170^{o} F (Group B)
0^{o} F. to 115^{o} F (Group A)

Drives: Electric motor or Right Angle Gear, (VHS).

Application: General Transfer and Booster Service: Municipal, Industrial.

Features: Fabricated Steel Head and Barrel Assembly - same as Model HL units.

Outside Mechanical Seal or packing.

Bowls: Group A with lateral seal ring
Group B industrial type.

General: Type HE Hydro-Lines are heavy duty pumps primarily designed for water service. They can be applied on any liquid transfer service, within their application range.

Standard Type HE Hydro-Line Pumps

ENGINEERING DATA

Bowl Size	Head/ Barrel Size	HEAD AND BARREL DATA						
		Disch Flg (In)	Suct Flg (In)	Inner Col (In) (1)	Head (2) Working Press	Min Wall Thick-ness Head	Barrel Max (2) Working Press.	Min Wall Thick-ness Barrel
6LB	2x3x8	2	3	3	230	.203	150	.260
7LB	3x4x10	3	4	4	230	.203	150	.290
8LB	3x4x10	3	4	4	230	.223	150	.290
8LB	4x6x10	4	6	4	230	.223	150	.290
9LA	4x6x12	4	6	6	230	.223	150	.310
10MA	4x6x12	4	6	6	230	.223	150	.310
12LB	6x8x16	6	8	8	230	.260	150	.353
12MB	6x8x16	6	8	8	230	.260	150	.353
14LC	6x8x18	6	8	8	230	.260	150	.353
14MC	8x10x18	8	10	10	230	.260	150	.353

Bowl Size	Head/ Barrel Size	STUFFING BOX DATA					BOWL DATA (4)				
		Shaft Size	Depth Box	(3) Dia Box	Size Pkg	No. Rings	Bowl Shaft Size Std.	Thrust Lbs/Ft of Hd (Sp. Gr 1.0)	Min Wall Thick-ness	Eye Area	Max Dif. Press. (2) (5)
6LB	2x3x8	7/8	2 7/16	1 11/16	3/8	6	7/8	1.5	5/32	3.38	500
7LB	3x4x10	1	2 7/16	1 25/32	3/8	6	1	1.9	7/32	4.89	550
8LB	3x4x10	1 3/16	2 7/16	1 31/32	3/8	6	1 3/16	2.6	3/16	6.92	500
8LB	4x6x10	1 3/16	2 7/16	1 31/32	3/8	6	1 3/16	2.6	3/16	6.92	500
9LA	4x6x12	1 3/16	2 7/16	1 31/32	3/8	6	1 3/16	3.9	1/4	9.03	330
10MA	4x6x12	1 3/16	2 7/16	1 31/32	3/8	6	1 3/16	5.5	1/4	12.25	250
12LB	6x8x16	1 1/2	3 3/16	2 17/32	1/2	6	1 1/2	6.0	1/4	14.14	400
12MB	6x8x16	1 1/2	3 3/16	2 17/32	1/2	6	1 1/2	7.5	5/16	17.87	250
14LC	6x8x18	1 15/16	3 3/16	2 31/32	1/2	6	1 15/16	9.4	5/16	19.74	400
14MC	8x10x18	1 15/16	3 3/16	2 31/32	1/2	6	1 15/16	10.0	5/16	26.05 (6)	300

(1) Maximum length of each inner column spool with spider and sleeve bearing: over 2200 rpm - 3 ft., under 2200 rpm - 5 ft.

(2) Maximum test pressure is two times design pressure or 1½ times the shutoff pressure, whichever is greater.

(3) Based on shaft without sleeve.

(4) These are nominal thrust values. For specific operating thrust loads, see thrust curves, turbine Section 133.

(5) Figures shown are for Class 30 CI Standard Bowls - High Pressure Bowls not furnished.

(6) High capacity impeller 2626083.

Temperature Range: Group A Bowls 32° - 115°F.
Group B Bowls 0 - 170°F.

Standard Type HE Hydro-Line Pumps

MECHANICAL SEAL DATA

Temperature - Pressure Range

Mfr	Type	Code	Max Temp. (1)	Max Press.
Dura	RA	ES5NFV	300°F-Hydrocarbons	350 PSI

(1) 160° for water service.

MATERIALS OF STANDARD CONSTRUCTION

Mfr	Type	Code	General Description	Stationary Face	Rotating Face	Springs	Seal Drive	Shaft Packing	Flange with By-pass
Dura	RA	ES5NFV	Balanced	#9 Carbon	(2) Stellite	316SS	316SS	Viton	Steel

(2) Alternate - Ceramic coated 316 SS face recommended for water service.

NOTES

When mechanical seal is used VHS driver must have stabilizer bushing at lower end of hollow shaft.

Standard Type HE Hydro-Line Pumps

Bowl Assembly

1 line shaft coupling

2 pump shaft

7 impeller bushing

8 impeller

9 impeller seal ring - optional

10 intermediate bowl

11 bronze bearing for intermediate bowl

14 suction bell

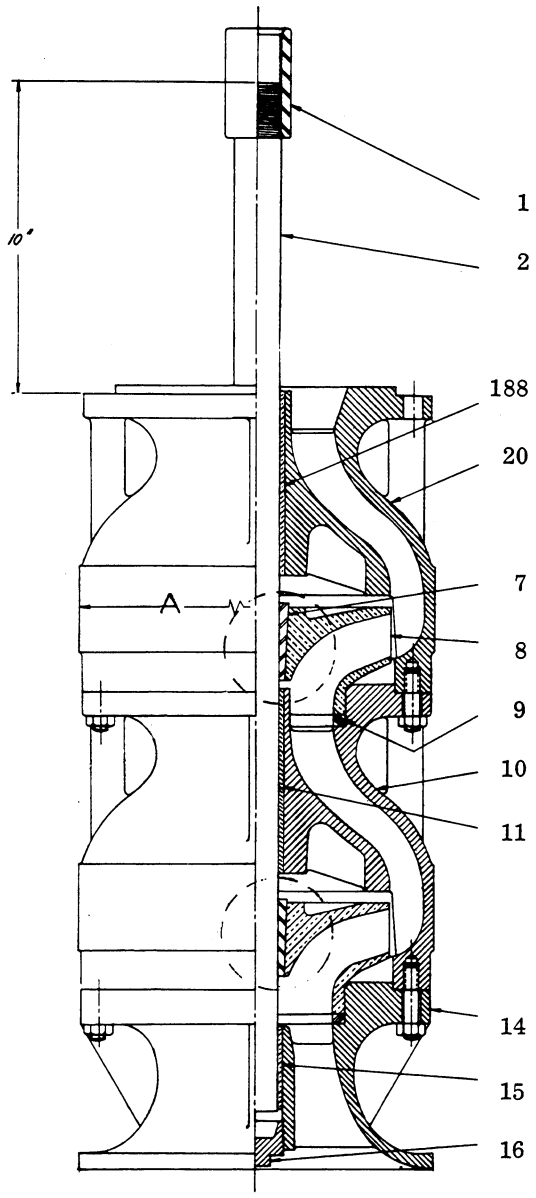
15 bronze bearing for suction bell

16 pipe plug for suction bell

20 top stage bowl

188 bronze bearing for top stage bowl (bronze-rubber combination optional)

All bowls connected by studs except 6LB, 6MA, 6HXB, 7LA, 7HXB and 8HXB which are threaded.



Dwg. No. 2808101

Standard Type HE Hydro-Line Pumps

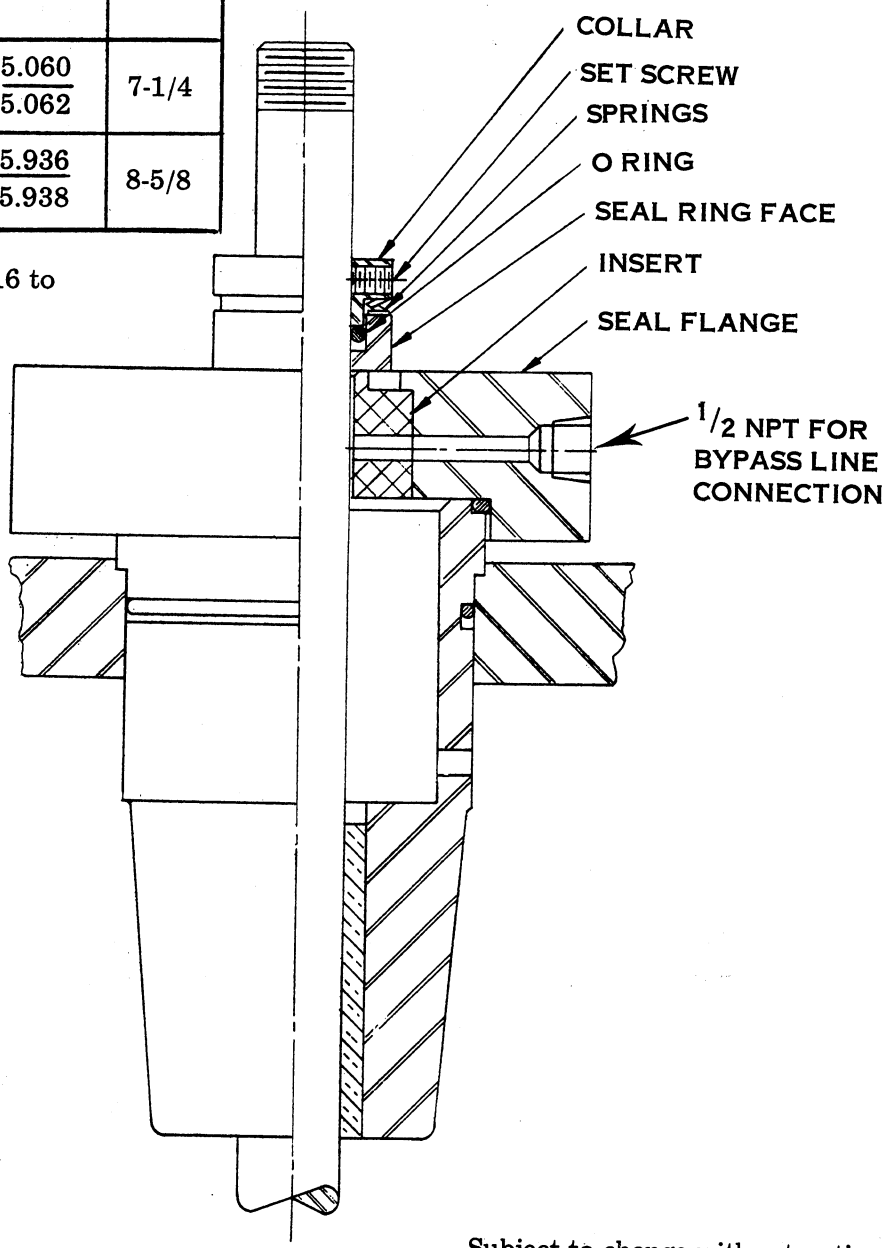
Durametallic Seal Assembly

Outside Type RA

Seal Flange Dimensions

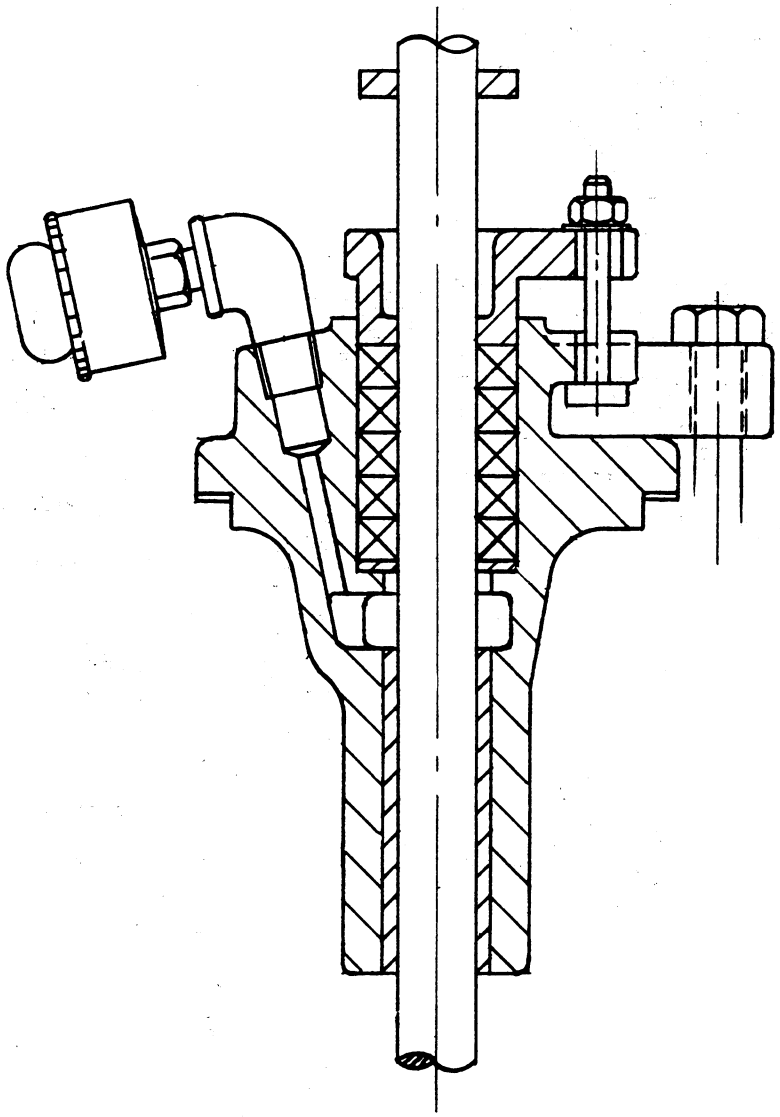
Head Size	Hole Size	Bolt Circle (4 Holes)	Register DIA (1)	Seal Flange O.D.
2x3x10 3x4x10 4x6x10 4x6x12	1/2	5-1/4	4.498 4.500	6-1/8
6x8x16	9/16	6-1/8	5.060 5.062	7-1/4
6x8x18 8x10x18	11/16	7-1/8	5.936 5.938	8-5/8

(1) All register depths are 5/16 ±1/16 to fit seal containers.



Standard Type HE Hydro-Line Pumps

Packing Container Assembly



Above construction for pressures 0 to 100 psi. For higher pressures grease cup and ell are replaced with by-pass line.

TYPE HP HYDRO-LINE PUMPS

Standard Models HP-1 and HP-2

Type: Multi-stage, vertical
In-line suction and discharge
Barrel enclosed bowls
Standard configuration with barrel subject to suction pressure.

Capacity: To 600 gpm

Head: To 2300 ft. standard - single pump
To 4600 ft. - two pumps in series

Working Pressure: Model HP-1: To 230 psig suction, 1000 psig discharge

Model HP-2: To 1000 psig suction, 2000 psig discharge (usually Pump #2 in series with #1)

Temperature Range: $0^{o}F$ to $140^{o}F$

Drives: Electric Motor, Right Angle Gear, Turbine (VSS preferred)

Application: Secondary Recovery Injection, High Pressure Booster

Features: Fabricated steel head and barrel assembly

Bowls: high pressure, optional balance, Group 1 or 2 construction

Shafting 17-4 PH SS

Optional bowl and impeller wear rings, bowl bearings

Mechanical seal or packing with pressure breakdown system

General: Type HP Hydro-Lines are heavy duty pumps primarily designed for high pressure injection applications.

For injection pressures to 600 psig, Standard Type H may be used.

TYPE HP HYDRO-LINE PUMPS

Application Data

Type HP Hydro-Lines have been designed to extend the range of Peerless Hydro-Line pumps to 2000 psi developed head. Model HP-1 covers the pressure range to 1000 psi discharge. Model HP-2 covers the pressure range 1000 psi suction to 2000 psi discharge. Applications over 1000 psi require two pumps in series.

Due to high heads involved in these applications, hydraulic downthrust with non-balanced impellers may reach values impractical to handle with conventional anti-friction driver bearings. To overcome this, downthrust can be reduced through the use of balanced bowls. Balanced and non-balanced bowls may be combined in one bowl assembly to match driver thrust capabilities.

"Non-balanced" impellers are the standard type used in vertical turbine pumps. In normal ranges of application these impellers produce downthrust in accordance with the published thrust curves.

"Balancing" of impellers is accomplished by addition of a balance ring on the back of the impeller. This ring is sized to achieve partial balance and has the effect of moving the standard thrust-versus-capacity curve to the left. This causes the curve to cross the zero-thrust point (leading into upthrust) at a lower capacity. When a complete bowl assembly contains both the balanced and non-balanced impellers, the exact amount of this thrust curve movement depends upon the percentage of bowls in the assembly which are balanced. Thrust curves for both impeller types are included in this section to permit complete thrust calculations. Balanced and non-balanced impellers have the same head-capacity characteristics.

In general these pumps should be operated under continuous downthrust conditions to assure operating the shaft in tension. Drivers must have momentary upthrust protection.

If necessary to extend capacity range, they may be operated with continuous upthrust at low values (i.e. 100-200 pounds) if continuous upthrust capability is provided in the driver. Operation with higher continuous upthrust requires design review by the LA factory.

When pumps are used in series, the discharge pressure of the first pump is the suction pressure of the second pump. This pressure is supplied on the lower end of the impeller shaft of the second pump and acts in the upward direction. This also moves the thrust-versus-capacity curve to the left causing zero-thrust to occur at a lower capacity.

SELECTION EXAMPLE

Conditions Specified:

1. Total capacity: 12,500 BPD
2. Operating pressure: 2000 psig
3. Liquid: water, sp. gr. 1.0, temperature 100°F, supply from surface tank
4. Drive: engine at 1150 rpm maximum through right angle gear.

PUMP SELECTION

Capacity (12500 x .02917) = 364 gpm

Head (2000 x 2.31 x 1.0) = 4620 ft - TDH

Number of Pumps: 2000 psig requires two pumps in series.

Thus TDH per pump is $\frac{4620}{2}$ = 2310 ft.

Bowl: 8LB impeller 2620626 at 3450 rpm (page 58, this Section).

Number stages = $\frac{2310}{100}$ = 23

BHP = $\frac{2310 \times 364 \times 1.0}{3960 \times .742}$ = 286 hp

Head: Pump #1 -- 0 to 1000 psi, use HP-1
3x4x10 (provides pullout feature)

Pump #2 -- 1000 to 2000 psi, use HP-2
3x4x10 (provides pullout feature)

DRIVER SELECTION

Pump #1 Impeller downthrust at design = 2310 x 2.4 = 5545 lb.
From non-balanced impeller downthrust curve (page 72, this Section).

Select: Johnson SG 300, 1:3 ratio, with 7500# downthrust rating, 30% momentary upthrust.

Driver downthrust rating is well in excess of pump requirement and balanced bowls are not required. Calculate gpm at which 7500# downthrust occurs to establish low capacity limit for continuous operation. (In this case low limit is approximately 285 gpm.)

Impeller upthrust occurs at approximately 555 gpm. This is absolute maximum capacity.

Thus satisfactory "Range of Pump Operation" on Pump #1 at 3450 rpm should be quoted as 285 to 550 gpm. (Range on Pump #2 will be less as discussed below).

(Note: Should it be determined that the operating downthrust exceeds driver downthrust rating, a portion of the bowl assembly must be balanced. Use balanced impeller downthrust curve values and non-balanced impeller downthrust curve values and find the net sum of downthrust due to the balanced and non-balanced portions of the bowl. If the balanced bowls go to upthrust at the maximum capacity desired, refer to LA factory for recommendations. In general a positive downthrust must be maintained for optimum operation.)

DRIVER SELECTION (continued)

Pump #2 Impeller downthrust at design = 2310 x 2.4 = 5545 lb.
From non-balanced impeller downthrust curve (page 72, this Section).

Upthrust effect due to 1000 psi suction pressure on end of 1½" impeller shaft counteracts downthrust and must be considered here:

shaft upthrust = shaft area (sq in) x suction pressure (psi)

= 1.765 x 1000

= 1765 lb.

thus: net downthrust at design = 5545 - 1765

= 3780 lb.

Upthrust with Pump #2 occurs when shaft upthrust becomes greater than impeller downthrust. Approximate capacity at which upthrust occurs must be determined by trial method as both upthrust (i.e. suction pressure) and impeller downthrust change with capacity. This point can be easily calculated after pump curve is drawn. It is certain to be less than that of Pump #1. For example in this case try 525 gpm:

tdh Pump #2 at 525 gpm = 23 x 56 = 1288 ft.

Impeller downthrust Pump #2 at 525 gpm = .7 x 1288 = 902 lb.
From non-balanced impeller downthrust curve (page 72, this Section).

Suction pressure Pump #2 = 1288 - 2.31 = 558 psi at 525 gpm

Shaft upthrust Pump #2 = 558 x 1.765 = 985 lb. at 525 gpm

Net thrust at 525 gpm = 985 - 902 = 83 lb. upthrust

If continuous upthrust is to be avoided, the maximum capacity should be limited to approximately 500 gpm. (This would be preferred and would permit use of momentary upthrust protection in the driver, and the same gear would be used for both pumps.)

Bowl Pressure Limits

(High Pressure Type)

Bowl Size	Standard Material	Maximum Differential Across Bowls - PSI
6LB	CL 40 CI	1000
7LA	CL 40 CI	1000
8LB	CL 50 CI	1000
- 10LA	CL 50 CI	1000

Type HP Hydro-Lines

ENGINEERING DATA

Dimension Data

Bowl Model	Bowl O.D.	Length 1st Stage	Length Add'l Stage	Shaft Size
6LB	5-7/8	12-17/32	6-1/4	1
7LA	6-13/16	17-5/16	6-7/8	1-3/16
8LB	7-7/8	16-5/16	7-3/8	1½
10LA	9-1/16	19-3/4	7-7/16	1½

Keyed Bowl Shaft BHP Limits

17-4 SS Ht

Bowl Size	Shaft Size (with keyway)	Max BHP at 3460 RPM
6LB	1	143
7LA	1-3/16	227
8LB - 10LA	1½	488

Note: Max allowable bhp varies directly with speed. Limits with other shaft materials: (Factor applies to above bhp figures).
K. Monel: 0.74. Type 316SS: 0.37.

Flange Ratings - Steel

ASA Standard Designation	Working Pressure - PSI 0^{o} - 150^{o}F
150#	230
300	600
400	750
600	1200
900	2000
1500	3000

Note: For head and barrel pressure ratings refer to Pages 41-45.

Peerless Pump Company
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Type HP Hydro-Line Pumps

Standard Shafting

17-4 PH Stainless Steel

In comparative tests conducted in marine atmospheres and sea water the corrosion resistance of Armco 17-4 PH was found superior to hardenable chromium stainless steels and approximately that of types 302 and 304.

Characteristics:

1. Higher tensile and compressive yield strength than hardenable stainless steels such as 410 and 416 with equally good or better ultimate tensile strength and hardness.
2. Excellent mechanical properties up to 900°F.
3. Corrosion resistance superior to standard hardenable grades and comparable to 302 and 304 under many conditions.
4. High endurance limit and corrosion fatigue strength.
5. Good impact strength at elevated and sub-zero temperatures.
6. Resistant to galling and seizing.
7. Short time heat treatment at 900°F eliminates sealing, distortion, and hardening cracks.
8. Good resistance to stress-corrosion cracking.
9. Excellent fabricating properties.

Analysis of 17-4 PH (Condition H1150)

Carbon	.07% max.
Manganese	1.00% max.
Phosphorous	.04% max.
Sulfur	.03 max.
Silicon	1.00% max.
Chromium	15.5 - 17.5%
Nickel	3.00 - 5.00%
Copper	3.00 - 5.00%
Columbium plus tantalum	0.25 - 0.45%

Tensile Strength -- 135,000 psi

Brinell Hardness -- 277/352

TYPE HP HYDRO-LINE PUMPS

Standard Models HP-1 and HP-2

MATERIALS OF STANDARD CONSTRUCTION

Part	Material
Head	Carbon Steel ASTM A7-58T
Barrel	
Coating for Head and Barrel (Optional)	Epoxy Ferro Martin Engard #480

Bowl Unit		
Part	Group 1	Group 2
Bowl	Cl 40 or Cl 50 CI	Cl 40 or Cl 50 CI
Impeller	CI	40 Brz
Shaft	17-4 Ph SS	17-4 Ph SS
Bearings	660 Brz	660 Brz
Impeller Taperlock Bushing	303 SS	303 SS
Bowl Studs, Nuts	Steel	Steel
Coating for Exterior of Bowl (Optional)	Epoxy - Ferro Martin Engard #480	

By-Pass Piping	
Pipe	Steel
Valve (s)	316 SS
Gages	Steel

Packing - Mech. Seal Container (Reference Page 35)	
Part	Material
AA - stud, nut	c. steel
AB - stud, nut	c. steel
AC - stud, nut	c. steel
B - seal	ref. page 8
C - o-ring	Hycar
D - container	c. steel
E - flange	steel
F - o-ring	Hycar
G - bearing	660 brz
H - bushing	304ss - colm
*I - bushing	304ss - colm
*J - plug	steel
K - sleeve	304ss - colm
L - collar	304ss
M - o-ring	Hycar
N - washer	c. steel
O - taper lock	304ss
P - collar	c. steel
Q - sleeve	316ss
R - gland	c.i.
S - s. box	c. steel
T - packing	crane 101m
U - o-ring	Hycar
V - bearing	660 brz
W - lantern	40 brz
X - packing	**
Y - s. box	c. steel

* Furnished with Model HP-2 only.

** On Model HP-1: Same as "T" above.

On Model HP-2: Garlock 7050 -- (Molded conical shaped center rings of shredded lead foil treated with resin cement, graphited throughout and surface coated with graphite. Center rings are alternated, with formed lead separators. End rings top and bottom are babbit, conical shaped. Pressure rating 2000 psi.)

Type HP Hydro-Line Pumps

Standard Models HP-1 and HP-2

MECHANICAL SEAL DATA

Temperature - Pressure Range

Mfgr	Type	Code	Temp. Range - °F	Pressure Range psig
Borg-Warner	U	B,H	-10 to 140	100-1000
	UW	B,H	-10 to 140	300-1500
Dura	HPTO	M	-10 to 140	100-1500
	HPTO	62-6	-10 to 140	100-2000

Materials of Standard Construction

Mfgr	Type	Code	General Description	Stationary Face	Rotating Face	Springs	Internal Seal Drive	Shaft Packing	Sleeve	Flange with By-pass	Throttle* Bushing
Dura	HPTO	M	Balanced	#5 Carbon	Turg-Car M 316SS	316SS	316SS	Buna N	304SS	304SS	Brz
	HPTO	62-6	Balanced	#5 Carbon	Solid 62-6 Turg-Car	316SS	316SS	Buna N	304SS	304SS	Brz
Borg-Warner	U UW	B	Balanced	Carbon A	316SS Stellited	316SS	416SS	Buna N	416SS	1020 Steel	Brz
	U UW	H	Balanced	Carbon A	316SS Stellited	316SS	316SS	Buna N	316SS	316SS	Brz

* Includes Vent and Drain.

Notes

1. Methanol quench system recommended on brine applications where formation of precipitated salt can cause damage to seal faces. Light turbine oil can be used in place of Methanol if operating temperatures permit free movement of oil.

TYPE HP

HYDRO-LINE PUMPS

5 driver

307 barrel

309 shaft seal

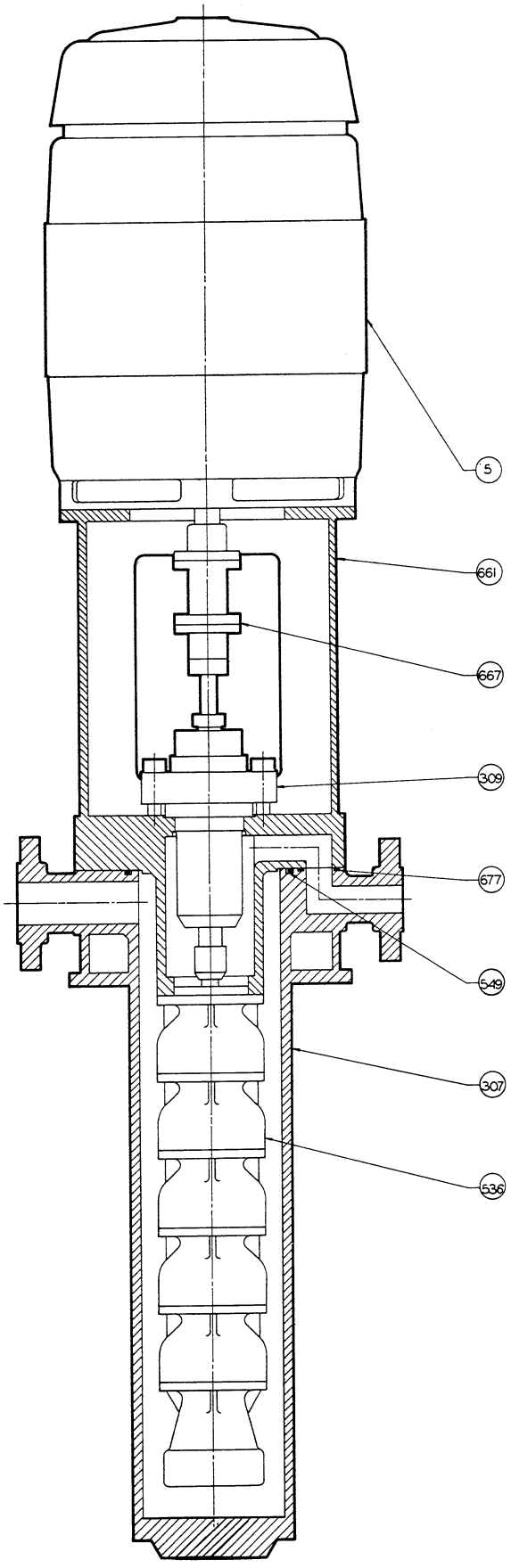
536 bowl assembly

549 discharge o-ring

661 pull-out head

667 spacer coupling assembly

677 head o-ring



Pull-out Model

Sizes: 2x3x10
2x3x12
3x4x10

Dwg. No. 2840058

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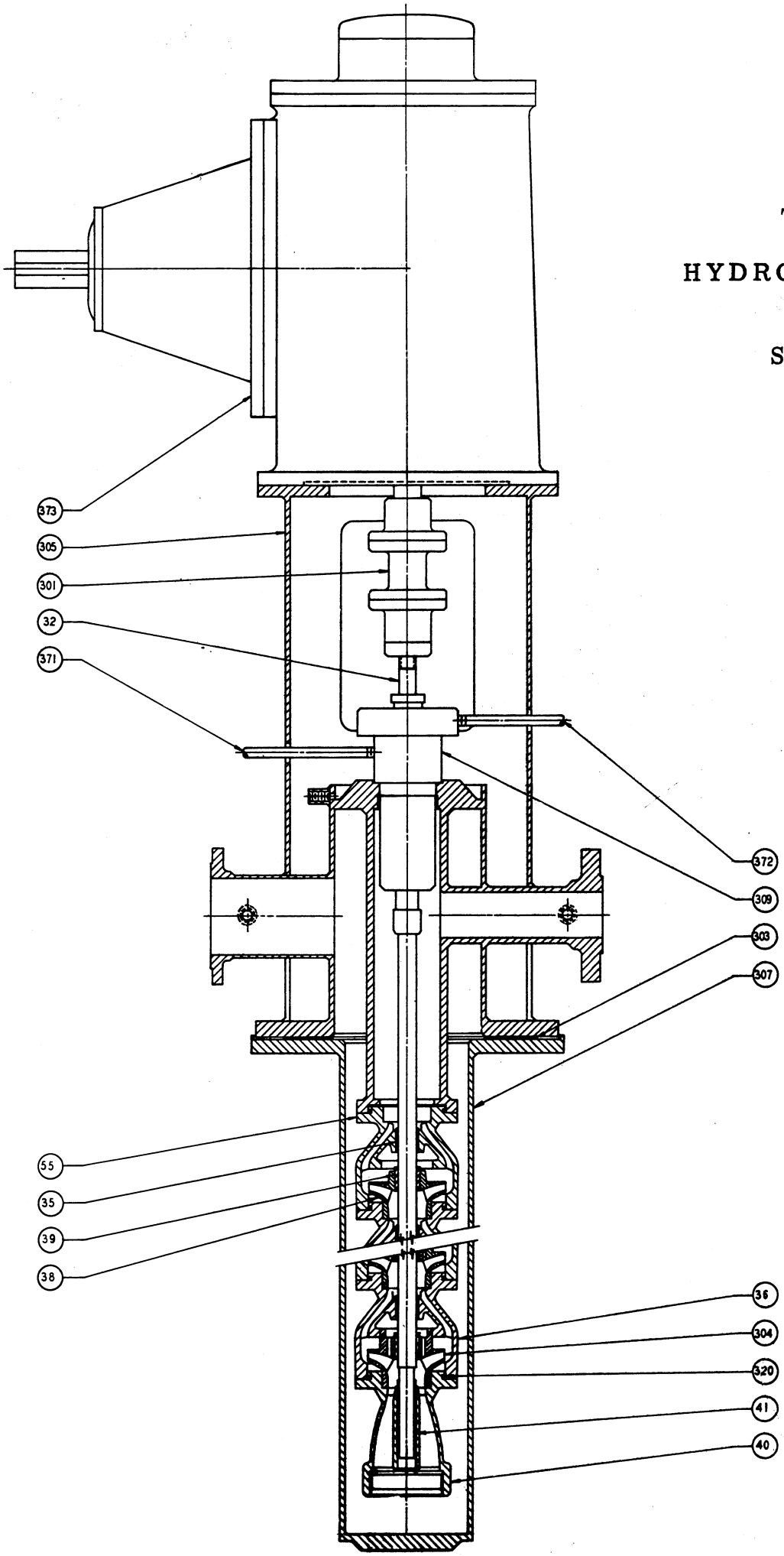
TYPE HP

HYDRO-LINE PUMPS

Size 4 x 6 x 12



32	pump shaft
35	standard bowl bearing
36	standard bowl
38	non-balanced impeller
39	impeller taper lock bushing
40	suction manifold
41	suction manifold bearing
55	top standard bowl
301	spacer coupling assembly
303	head to barrel gasket
304	balanced impeller
305	head nozzle
307	barrel
309	packing container or mechanical seal container
320	o-ring
371	high pressure by-pass line
372	low pressure by-pass line
373	gear assembly

PEERLESS PUMP® Peerless Pump Company
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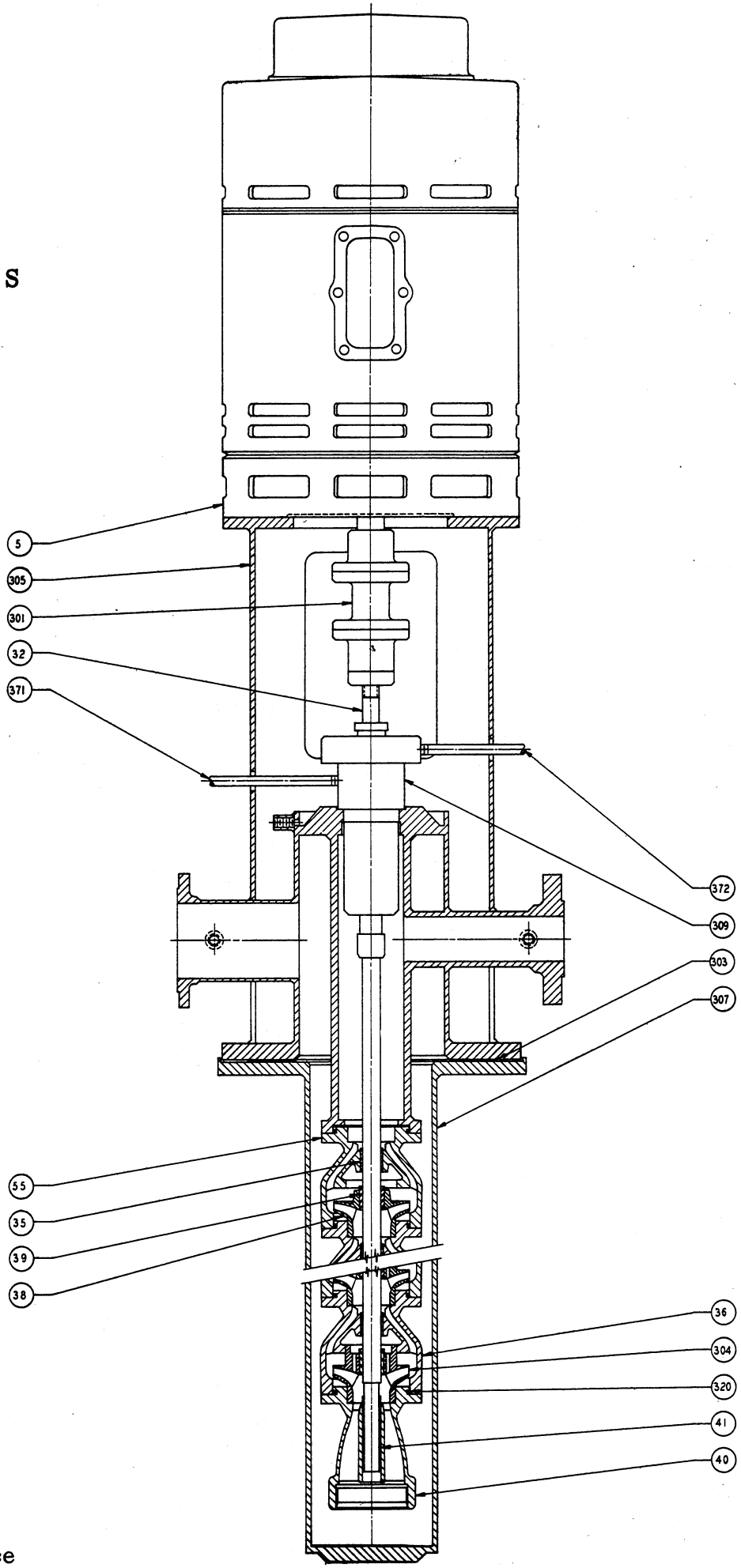
TYPE HP

HYDRO-LINE PUMPS

Size 4 x 6 x 12



5	motor
32	pump shaft
35	Standard bowl bearing
36	standard bowl
38	non-balanced impeller
39	impeller taper lock bushing
40	suction manifold
41	suction manifold bearing
55	top standard bowl
301	spacer coupling assembly
303	head to barrel gasket
304	balanced impeller
305	nozzle head
307	barrel
309	packing container or mechanical seal container
320	o-ring
371	high pressure by-pass line
372	low pressure by-pass line

Dwg. No. 2834297

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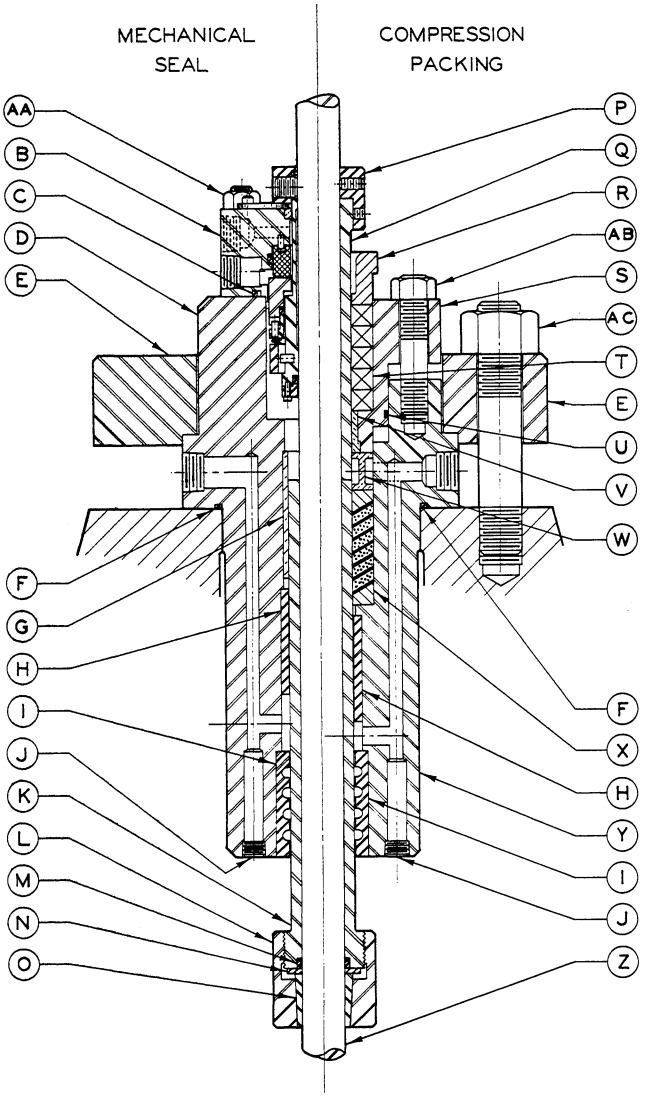
Indianapolis, IN 46207-7026

TYPE HP HYDRO-LINE PUMPS

Hi Pressure Shaft Seal

AA stud and nut for mechanical seal.
AB stud and nut for stuffing box.
AC stud and nut for seal flange.
B mechanical seal assembly.
C o-ring.
D seal container.
E seal flange.
F o-ring.
G bearing.
H bushing seal.
*I labyrinth seal - breakdown for high pressure by-pass.
*J plug and high pressure by-pass.
K lower shaft sleeve.
L sleeve collar.
M o-ring with backup ring.
N washer.
O taper lock bushing.
P sleeve cap
Q upper shaft sleeve.
R gland.
S low pressure stuffing box.
T low pressure packing.
U o-ring.
V bearing for stuffing box.
W lantern ring.
X hi pressure packing.
Y hi pressure stuffing box.
Z shaft.

* Furnished with Model HP-2 only. Not required on Model HP-1.



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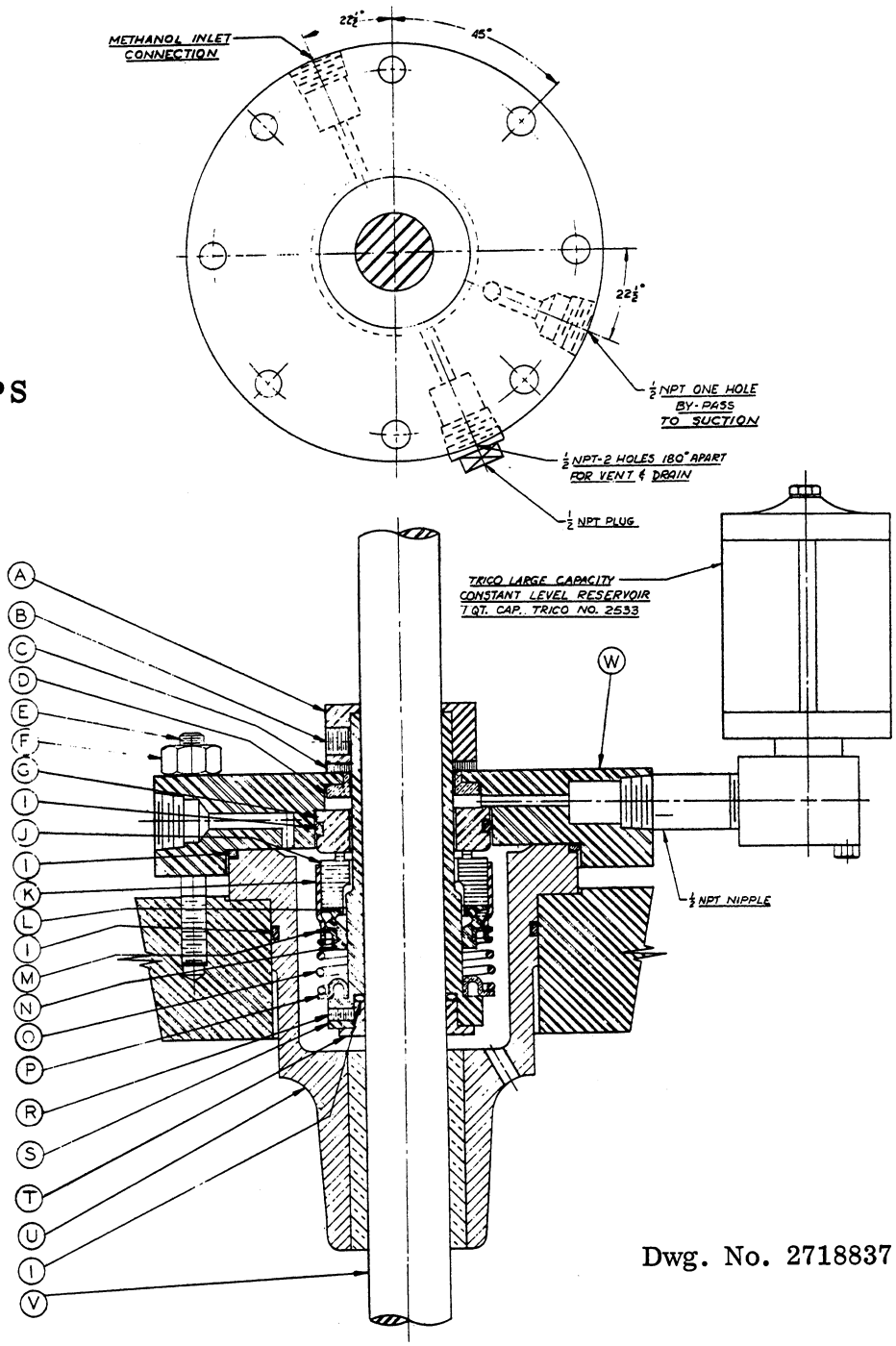
TYPE HP

HYDRO-LINE PUMPS

Quench System for Mechanical Seals

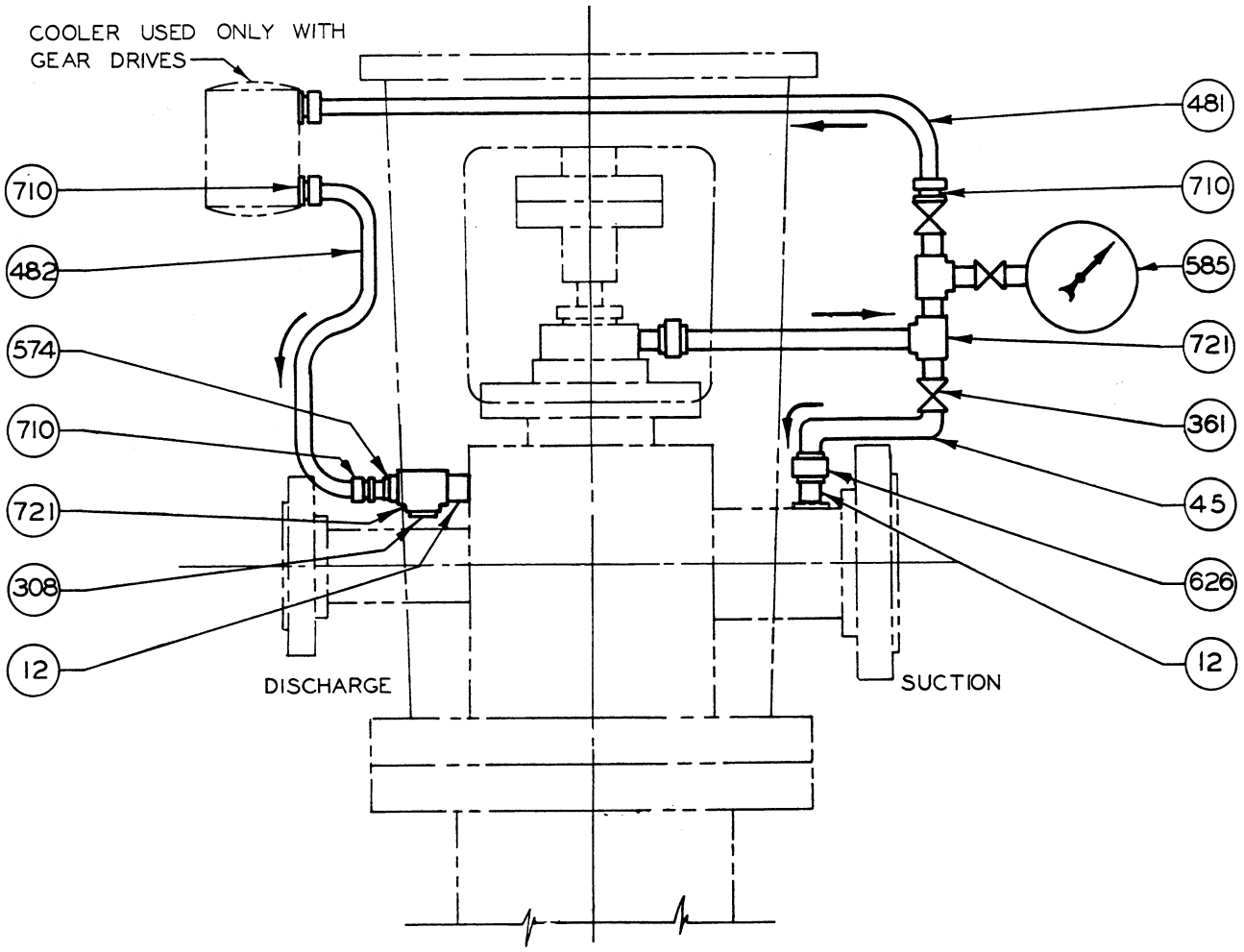


Dwg. No. 2718837

1. Install reservoir as close to seal flange (Item W) as possible.
2. To fill unscrew upper reservoir and fill through spout. Invert and screw back into metal base.
3. The constant level maintained will be approximately in line with the center of the side outlet. If desired, level can be raised by filing or sawing off the feed spout proportionately.
4. The fluid level must be maintained to cover seal ring (Item G) at all times.
5. Methanol can be used only for temperatures of -140°F. to +100°F.

SEAL PIPING WITH SINGLE BY-PASS

TYPE HP-1 PUMP



ITEM NO	DESCRIPTION	ITEM NO	DESCRIPTION
12	NIPPLE	574	REDUCING BUSHING
45	PIPE	585	PRESSURE GAUGE
308	PLUG	626	UNION
361	VALVE	710	MALE CONNECTOR
481	INLET TUBE	721	TEE
482	OUTLET TUBE		

Dwg. No. 2840073