CAT. 82-83

LUFKIN

PUMPING UNITS

LUFKIN INDUSTRIES, INC.
LUFKIN, TEXAS

LUFKIN EQUIPMENT OF ADVANCED DESIGN

1. Oil Field Pumping Units:
   - A. Air Balanced Pumping Units—Pages 23-25.
   - B. Beam Balanced Pumping Units—Page 6.
   - C. Crank Balanced Pumping Units—Pages 7-15.
   - D. Mark II Unitorque Pumping Units—Pages 16-21.
2. Useful Formulas—Page 26

Factory and Executive Offices P.O. Box 849, LUFKIN, TEXAS 75901 Phone: 713-634-2211
Oilfield Sales and Service—Offices and Warehouses of Lufkin Industries Inc.

OIL FIELD SALES AND SERVICES

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276 Meadows Bldg.
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Suite 242
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Nisku Industrial Park
Nisku, Alberta, Canada
T0C 2G0
Phone: 403/955-7566

HOUSTON, TEXAS 77079
810 Highway 6 South
Suite 206
Phone: 713/870-9151

KILGORE, TEXAS 75662
P. O. Box 871
Phone: 214/984-3875

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Phone: 714/963-0859
198 Barbara Street
Oakview, California 93022
Phone: 805/649-2757

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Building
Room 408
Edison, New Jersey 08817
Phone: 201/549-1021
Telex: 710-998-0559

ODESSA, TEXAS 79760
East Hwy. 80
P. O. Box 1632
Phone: 915/563-0363

OKLAHOMA CITY
OKLAHOMA 73143
P. O. Box 95205
2300 S. Prospect
Phone: 405/677-0567

PITTSBURGH,
PENNSYLVANIA 15235
201 Penn Center Blvd.
Suite 101
Phone: 412/241-5131
412/241-5133

SAN ANTONIO, TEXAS 78209
The Crossroads, Suite 202
1635 N.E. Loop 410
Phone: (512) 828-8142
(512) 828-8143

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10703 Durland Ave. N.E.
Phone: 206/362-7373

TULSA, OKLAHOMA 74105
3025 East Skelly Drive
Suite 446
Phone: 918/749-6846

INTERNATIONAL DIVISION

HOUSTON, TEXAS 77060
Suite 340
One Green Briar Place
654 E. North Belt Drive
Phone: 713/820-9884
Telex: 79-4309
Cable: Luffo Houston Texas

LUFKIN SUCKER ROD PUMPING UNITS ARE AVAILABLE TO HANDLE ALL INSTALLATION PROBLEMS AND DOWN HOLE CONDITIONS.

MARK II UNITORQUE UNITS

The Mark II unit, due to its unique geometry and phased counterbalance feature, lowers peak torque and horsepower requirements. The unusual geometry of the Mark II produces a somewhat slower up stroke and faster down stroke with reduced acceleration where the load is greatest, resulting in lower peak loads and longer rod life.

COMPACT TYPE AIR BALANCED UNITS FOR OFFSHORE PLATFORMS

Lufkin has taken advantage of the inherent compactness and light weight of the Air Balanced unit, reducing the height, width, and length to an absolute minimum. This makes this unit particularly desirable for offshore platforms where space is of greatest importance. Since all loads are approximately in the vertical plane, the destructive horizontal dynamic forces set up by rotating crank counterweights on conventional units are eliminated.

COMPUTER SERVICE IS AVAILABLE TO AID IN SIZING PUMPING UNITS, SUCKER RODS, AND PUMPS TO INSURE MAXIMUM PRODUCTION AND OPTIMUM UTILIZATION OF EQUIPMENT.

CONVENTIONAL UNITS

The LUFKIN Conventional Crank Balanced Unit, widely known and accepted, is the old reliable "WORK HORSE" of the oil patch. This is the most universally adaptable unit in the "LUFKIN LINE," simple to operate and requires minimum maintenance. For all around pumping situations where dependability, ruggedness, and simplicity are prime considerations.

AIR BALANCED UNITS

The utilization of compressed air instead of heavy cast iron counterweights allows more accurate fingertip control of counterbalance. As a result, the weight of the unit is greatly reduced, significantly lowering transportation and installation costs. Air Balanced units have a distinct advantage in the larger sizes with long strokes, where cast iron counterweights on conventional crank counterbalanced units must be so massive that their use is practically prohibitive.

For large volume production from any depth Lufkin has developed the Hi-V Series of Air Balanced units with peak torque ratings up to 2,560,000 inch pounds, and stroke lengths up to 240 inches.

DOUBLE REDUCTION GEAR UNITS

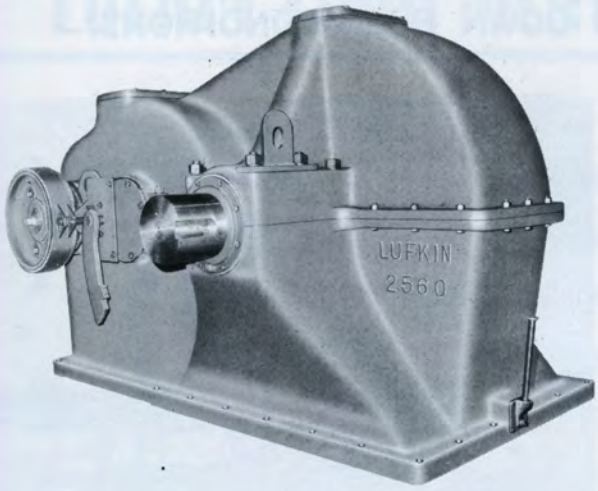

FIGURE 1
2560D Double Reduction Gear Unit

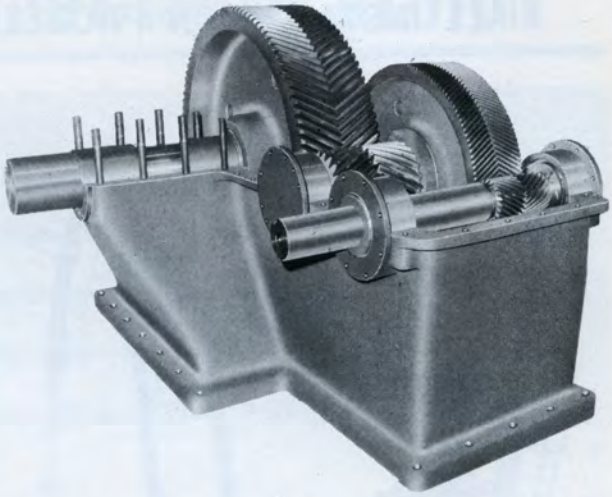

FIGURE 2
2560D Double Reduction Gear Unit, cover removed

1. **Housing especially built for oil well service, of rugged construction with large factors of safety.**
2. **Precision cut Lufkin herringbone gears are used exclusively in all Lufkin pumping units.**
3. **Gear Cases are jig bored to same accuracy as gears.**
4. **All shafts forged from alloy steel, heat treated and precision ground.**
5. **Oversize Bearings on crankshafts. Easily renewable but seldom requiring replacement.**
6. **All pinions float on Straight Roller Bearings.**
7. **No Oil Pumps. Lufkin gears operate in oil bath with gear wipers to flood bearings.**

GEAR SPECIFICATIONS
DOUBLE REDUCTION

2560D GEAR REDUCER:
RATING: 2,560,000 In. Lbs. Peak Torque
RATIO OF GEARS: 34.53
CRANKSHAFT DIA.: 11¾"
SHEAVE 55", 68" P.D.—16D
6½" Bore
GEAR BOX OIL CAPACITY: 235 Gallons

1824D GEAR REDUCER:
RATING: 1,824,000 In. Lbs. Peak Torque
RATIO OF GEARS: 28.33
CRANKSHAFT DIA.: 9"
SHEAVE: 55", 68" P.D.—11D
68" P.D.-10D, 4-15/16" Bore
GEAR BOX OIL CAPACITY: 165 Gallons

1280D GEAR REDUCER:
RATING: 1,280,000 In. Lbs. Peak Torque
RATIO OF GEARS: 28.05
CRANKSHAFT DIA.: 8½" (Mark II, 10½")
SHEAVE: 35", 68" P.D.—12C,
35", 68" P.D.-10D 4-15/16" Bore
GEAR BOX OIL CAPACITY: 120 Gallons

912D GEAR REDUCER:
RATING: 912,000 In. Lbs. Peak Torque
RATIO OF GEARS: 28.72
CRANK SHAFT DIA.: 7" (Mark II, 9")
SHEAVE: 34", 40", 47.6", 55.2" P.D.—8D
50", 55¼" P.D.-10C, 4-3/16" Bore
GEAR BOX OIL CAPACITY: 107 Gallons

640D GEAR REDUCER:
RATING: 640,000 In. Lbs. Peak Torque
RATIO OF GEARS: 28.6
CRANKSHAFT DIA.: 7" (Mark II, 9")
SHEAVE: 22", 27", 33", 48", 55.4" P.D.—6D
24", 36", 44", 50", 55.6" P.D.—8C
3-7/16" Bore
GEAR BOX OIL CAPACITY: 70 Gallons

456D GEAR REDUCER:
RATING: 456,000 In. Lbs. Peak Torque
RATIO OF GEARS: 29.04
CRANKSHAFT DIA.: 7" (Mark II, 9")
SHEAVE: 22", 27", 33", 48" P.D.—6D
24", 36", 44", 50" P.D.—8C
3-7/16" Bore
GEAR BOX OIL CAPACITY: 55 Gallons

320D GEAR REDUCER:
RATING: 320,000 In. Lbs. Peak Torque
RATIO OF GEARS: 30.12
CRANKSHAFT DIA.: 6-7/16" (Mark II, 8½")
SHEAVE: 24", 30", 36", 44" 47" P.D.—6C
2-15/16" Bore
GEAR BOX OIL CAPACITY: 50 Gallons

228D GEAR REDUCER:
RATING: 228,000 In. Lbs. Peak Torque
RATIO OF GEARS: 28.45
CRANKSHAFT DIA.: 6" (Mark II, 7")
SHEAVE: 24", 30", 36", 41" P.D.—5C
2-7/16" Bore
GEAR BOX OIL CAPACITY: 34 Gallons

160D GEAR REDUCER:
RATING: 160,000 In. Lbs. Peak Torque
RATIO OF GEARS: 28.67
CRANKSHAFT DIA.: 5-7/16" (Mark II, 7")
SHEAVE: 20", 24", 30", 36", 38" P.D.—4C
2-3/16" Bore
GEAR BOX OIL CAPACITY: 22 Gallons

114D GEAR REDUCER:
RATING: 114,000 In. Lbs. Peak Torque
RATIO OF GEARS: 29.4
CRANKSHAFT DIA.: 4-7/16" (Mark II, 6-7/16")
SHEAVE: 20", 24", 30", 33.6" P.D.—3C
1-15/16" Bore
GEAR BOX OIL CAPACITY: 17 Gallons

80D GEAR REDUCER:
RATING: 80,000 In. Lbs. Peak Torque
RATIO OF GEARS: 29.15
CRANKSHAFT DIA. 4 7/16"
SHEAVE: 20"-24"-30" P.D.—3C 1-15/16" Bore
GEAR BOX OIL CAPACITY: 17 Gallons

57D GEAR REDUCER:
RATING: 57,000 In. Lbs. Peak Torque
RATIO OF GEARS: 29.32
CRANKSHAFT DIA.: 4"
SHEAVE: 20", 24", 27" P.D.—2C
20", 25", 27.6" P.D.—3B, 1-15/16" Bore
GEAR BOX OIL CAPACITY: 13 Gallons

40D GEAR REDUCER:
RATING: 40,000 In. Lbs. Peak Torque
RATIO OF GEARS: 29.2
CRANKSHAFT DIA.: 4"
SHEAVE: 20", 24" P.D.—2C
20", 23.3" P.D.—3B, 1-11/16" Bore
GEAR BOX OIL CAPACITY: 7 Gallons

25D GEAR REDUCER:
RATING: 25,000 In. Lbs. Peak Torque
RATIO OF GEARS: 28.9
CRANKSHAFT DIA.: 3"
SHEAVE: 18.4" P.D.—2B, 1⅜" Bore
GEAR BOX OIL CAPACITY: 5 Gallons

16D GEAR REDUCER
RATING: 16,000 In. Lbs. Peak Torque
RATIO OF GEARS: 35.7
CRANKSHAFT DIA.: 2½"
SHEAVE: 15.3" P.D.—3A or 2B, 1-3/16" Bore
GEAR BOX OIL CAPACITY: 5 Gallons

EXPLANATION OF PUMPING UNIT DESIGNATIONS

C - 228D-246-86

Type Pumping Unit:
A—Air Balanced
B—Beam Balanced
C—Conventional
M—Mark II Unitorque

Peak Torque Rating In Thousands Of Inch Pounds

Polished Rod Load Rating In Hundreds of Pounds

D—Double Reduction Gear Reducer

Stroke Length In Inches

INSTRUCTIONS FOR ORDERING SPARE PARTS

WHEN ORDERING SPARE PARTS, THE DESIGNATION AND SERIAL NUMBER OF THE UNIT MUST BE GIVEN. This information is necessary in addition to the description of the part, part number, etc. By supplying all the information available our personnel will have a cross check on the particular part wanted and errors in typing, etc. can be circumvented.

LUBRICATION INSTRUCTIONS

LUFKIN PUMPING UNITS

GEAR REDUCER:

For temperatures down to 0° F use an AGMA No. 5EP (ISO VG 220) premium mild extreme pressure lubricant (preferably a sulphur-phosphorous type) with rust and oxidation inhibitors and an anti-foam agent. Pour point of the oil should be 5° F or lower.

For temperatures down to -30° F use an AGMA No. 4 EP (ISO VG 150) premium mild extreme pressure lubricant (preferably sulphur-phosphorous type) with rust and oxidation inhibitors and anti-foam agent. Pour point of the oil should be -15° F or less.

If desired, units can be shipped with the gear reducer filled with oil that will comply with the above specifications.

Maintain the oil level above the low mark on gage but do not fill the gear reducer above the high mark on gage.

Every six months the operator should collect a typical sample of the oil in a glass jar. A visual inspection will expose possible dirt, sludge, water emulsion or other forms of contamination. If the lubricant has an abnormal appearance or smell, check with your oil supplier about replacement.

STRUCTURAL BEARINGS

All structural bearings are lubricated at the factory; however, they do require periodic relubrication as outlined below.

1. WARM CLIMATES: (Lowest annual temperature is above 0° F.)

Roller Bearings except Tapered Roller Crank Pin Bearings should be relubricated every 6 months. Use a premium NLGI No. 1 lithium soap base grease with an extreme pressure additive. Do not use soda soap grease.

Bronze Bearings and Tapered Roller Crank Pin Bearings should be relubricated as required to maintain oil level. Use an EP140 extreme pressure oil with an extreme pressure additive and a pour point of +15° F or lower. If available, the use of a heavier oil (viscosity up to 6600 SUS at 100° F) is recommended.

2. COLD CLIMATES: (Lowest annual temperature down to -30° F.)

Roller Bearings except Tapered Roller Crank Pin Bearings should be relubricated every 6 months. Use a premium NLGI No. 0 lithium soap base grease with an extreme pressure additive. Do not use soda soap grease.

Bronze Bearings and Tapered Roller Crank Pin Bearings should be relubricated as required to maintain oil level by removing fill plug and adding oil until reservoir is full. Use an EP 80 or EP 90 extreme pressure oil with an extreme pressure additive and a pour point of -10° F or lower.

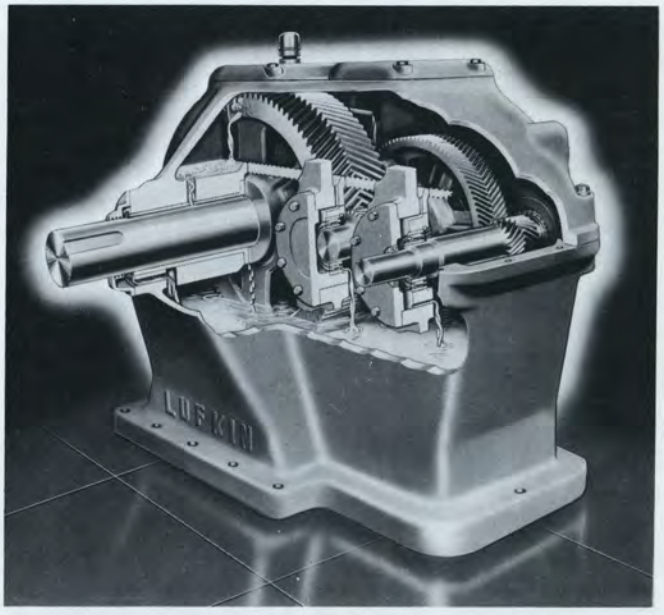

FIGURE 3

As long as the oil is maintained at the proper level, the slow speed and high speed gears dip in oil and provide continuous lubrication to the gear mesh.

Large oil wipers direct a flood of oil into oversized oil troughs which in turn provide each individual bearing with more than adequate lubrication.

LUFKIN BEAM BALANCED PUMPING UNIT ASSEMBLIES

STRUCTURAL SPECIFICATIONS AND DIMENSIONS

See page 4 for GEAR Specifications

UNIT	B-57D-109-48	B-57D-109-42	B-40D-76-42	B-40D-89-36	B-25D-67-36	B-25D-53-30	B-16D-53-30	B-16D-53-24
Polished Rod Cap., #	10,900	10,900	7,600	8,900	6,700	5,300	5,300	5,300
†Stroke Lengths, Ins.	48, 36	42, 32	42, 32	36, 28	36, 24	30, 25	30, 25	24, 20
Walking Beam	16″ x 45 Lbs.	16″ x 45 Lbs.	14″ x 34 Lbs.	14″ x 34 Lbs.	14″ x 34 Lbs.	10″ x 26 Lbs.	10″ x 26 Lbs.	10″ x 22 Lbs.
Equalizer Bearing	BRONZE BUSHED, OIL BATH TYPE							
Center Bearing	BRONZE BUSHED, OIL BATH TYPE							
Crank Pin Bearings	BRONZE BUSHED, OIL BATH TYPE				SPHERICAL ROLLER BEARINGS			
Wireline Hanger	⅞″ x 9″ Ctrs.	⅞″ x 6½″ Ctrs.	¾″ x 6½″ Ctrs.	¾″ x 6½″ Ctrs.	⅝″ x 6½″ Ctrs.	½″ x 5½″ Ctrs.	½″ x 5½″ Ctrs.	½″ x 5½″ Ctrs.
*1″ thick Beam Wts., #	150	150	125	125	125	100	100	100
No. of Beam Weights	EFFECTIVE COUNTERBALANCE AT POLISHED ROD, LBS.							
0	400	550	420	550	300	170	170	265
1	700	880	660	830	520	345	345	470
2	1000	1205	895	1105	740	515	515	670
3	1300	1530	1130	1380	955	685	685	870
4	1595	1850	1365	1650	1170	850	850	1065
5	1890	2165	1595	1915	1380	1015	1015	1260
6	2180	2480	1825	2180	1590	1175	1175	1445
7	2490	2790	2050	2440	1795	1330	1330	1635
8	2760	3100	2275	2700	2000	1485	1485	1820
9	3045	3405	2495	2955	2200	1645	1645	2000
10	3325	3710	2715	3210	2400	1795	1795	2175
11	3605	4010	2930	3460	2595	1940	1940	2350
12	3885	4300	3145	3705	2790	2090	2090	2525
13	4160	4595	3360	3950	2980	2230	2230	2690
14	4435	4890	3570	4190	3170	2375	2375	2855
15	4705	5180	3780	4430	3355	2520	2520	3015
16	4975	5470	3985	4665	3540	2665	2655	3175
17	5240	5755	4190	4900	3720	2785	2785	3330
18	5505	6040	4390	5130	3900	2920	2920	3485
19	5765	6320	4590	5360	4075	3050	3050	3635
20	6025	6600	4790	5585	4245	3180	3180	3785
21	6280	6875	4985	5810	4415	3300	3300	3925
22	6535	7150	5180	6030	4580	3425	3425	4065
23	6785	7420	5370	6250	4745	3545	3545	4205
24	7035	7685	5560	6465	4905	3660	3660	4340
25	7280	7950	5745	6680	5065	3780	3780	
26	7525	8210	5930	6890	5220	3890	3890	
27	7770	8470	6110	7100	5375	4000	4000	
28	8010							
29	8250							
30	8485							

Note: * 3″ thick Beam Weights optional for all Beam Balanced units.
† On B-25D-53-30 and B-16D, units, stroke length changes are obtained by moving equalizer bearing on beam.

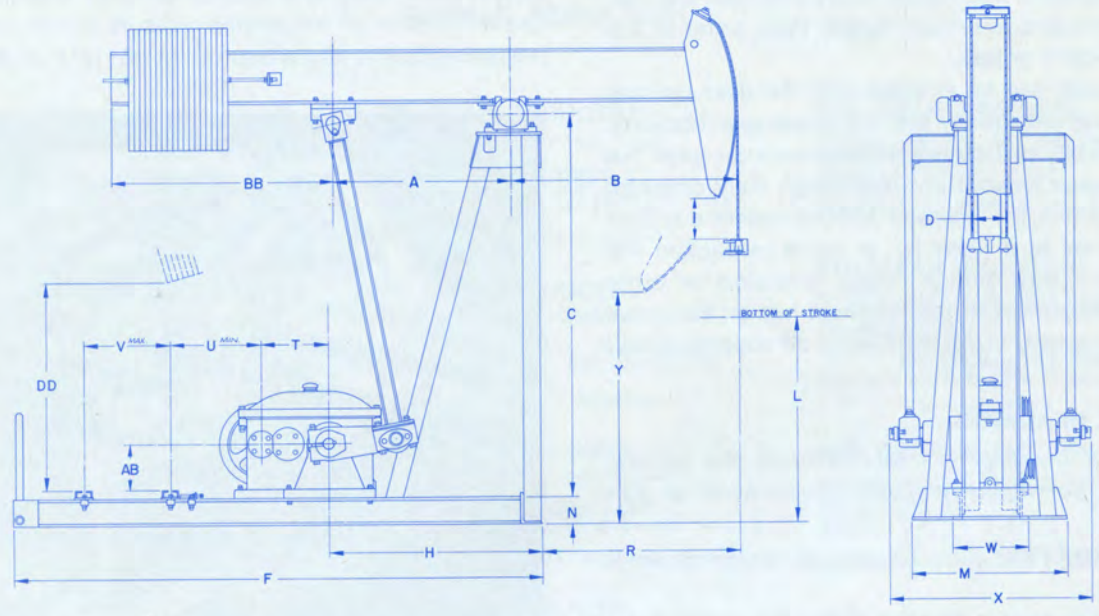

FIGURE 4

GENERAL DIMENSIONS

UNIT	A	B	C	D	F	H	I	L	M	N	R	T	U	V	W	X	Y	AB	BB	DD
B-57D-109-48	46	64	8′-9″	9	13′-3″	69	14½	43¾	40¾	10	43	20	24½	39¾	25	57½	69¾	14¾	7′-1″	47¼
B-57D-109-42	″	56	″	6½	″	″	15½	51	″	″	35	″	″	″	″	″	75½	″	6′-6″	50
*B-40D-76-42	″	″	8′-2½″	″	11′-8½″	61	″	42	38½	8	41	17½	19	34¼	20	50¾	67	10¾	63	50¾
*B-40D-89-36	″	48	″	″	″	″	13	50½	″	″	33	″	″	″	″	″	72½	″	61½	51¼
B-25D-67-36	32	48	7′-0½″	″	10′-4″	48	″	34½	31	6	34	13½	18	39	16¾	45	56½	12	54½	45
B-25D-53-30	33	41¼	70½	5½	9′-7″	39	6	36	28½	″	35¼	″	″	″	″	″	48	″	40	34¾
B-16D-53-30	″	″	″	″	8′-0½″	″	″	35	″	5	35¼	12¾	10½	25¼	13¾	35	47	8½	″	″
B-16D-53-24	″	33	″	″	″	″	12½	35¾	″	″	27	″	″	″	″	″	52½	″	36	36¼

* Base Shown Is For Electric Motor Only, For Gas Engine Drive Dim. "F" is 13′-4″, Dim. "U" Is 19, and Dim. "V" Is 53¾.

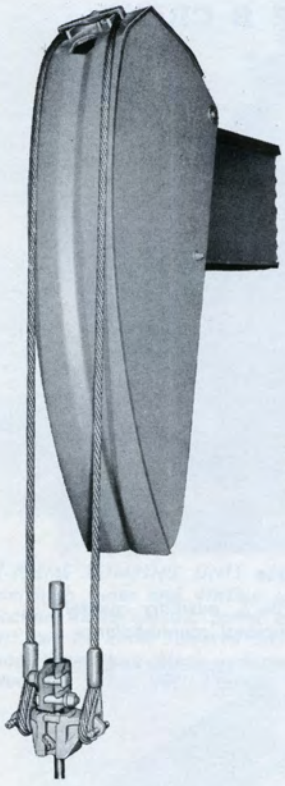

FIGURE 5

HORSEHEAD AND WIRE LINE ASSEMBLY

Easily aligned with polished rod without disconnecting well load. One-piece arc plate is used for greater strength.

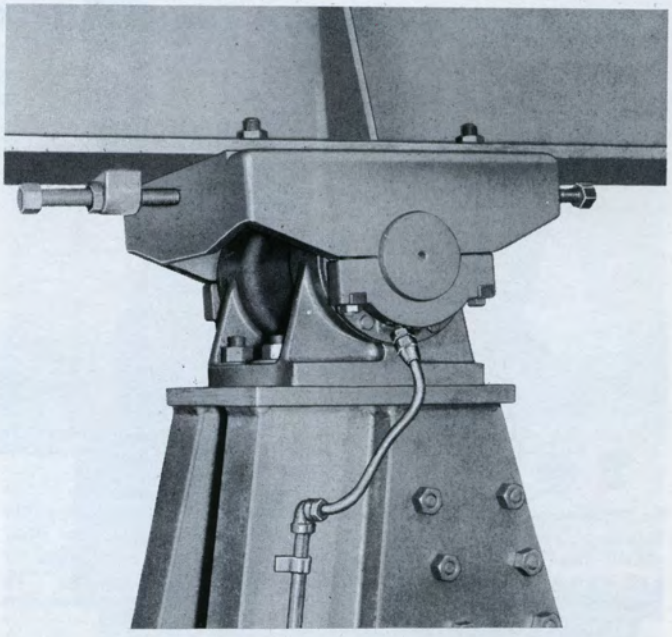

FIGURE 6

CENTER BEARING ASSEMBLY

Furnished with roller bearings on some C-114D and all larger sizes.

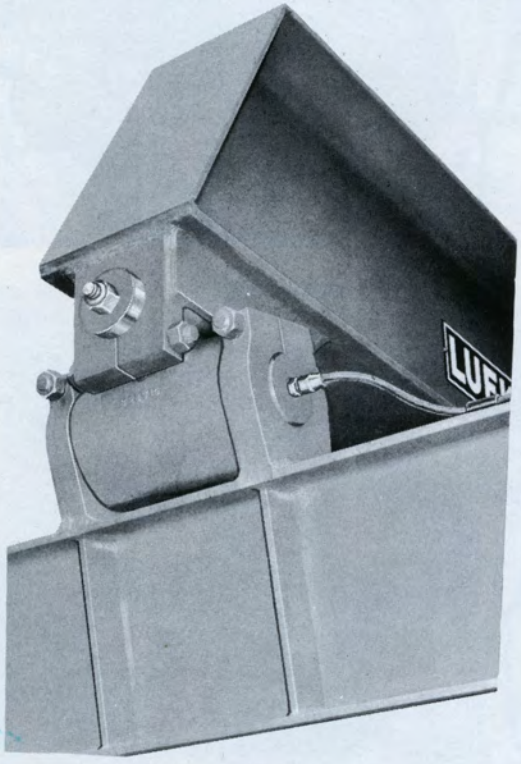

FIGURE 7

CRANK BALANCED UNIT EQUALIZER BEARING ASSEMBLY

Furnished with roller bearings on all sizes. Cross-pin type connection to walking beam is utilized.

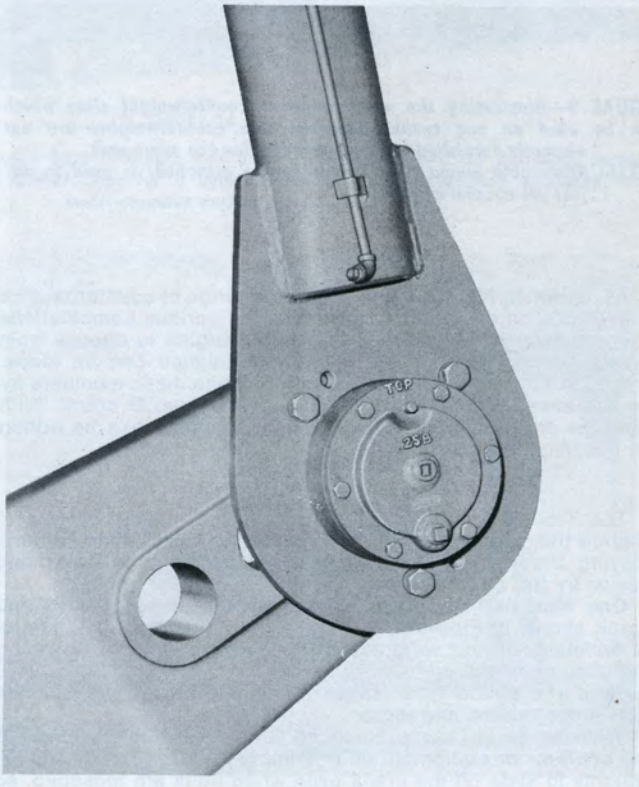

FIGURE 8

CRANK PIN ASSEMBLY

Furnished with roller bearings on some C-114D and all larger sizes.

A WIDER RANGE OF COUNTERBALANCE AVAILABLE WITH THE TROUT COUNTERBALANCED TYPE B CRANK

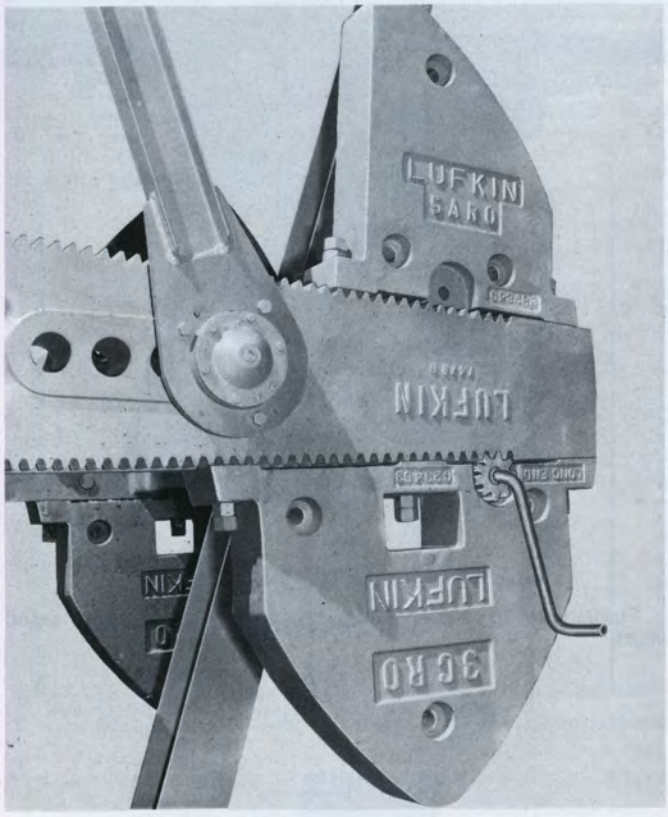

FIGURE 9—*illustrating the wide range of counterweight sizes which can be used on one crank. Different size counterweights are not normally furnished or recommended for the same unit.*
NOTE: *Removable pinion (with crank handle attached) is used to adjust all counterweights.*

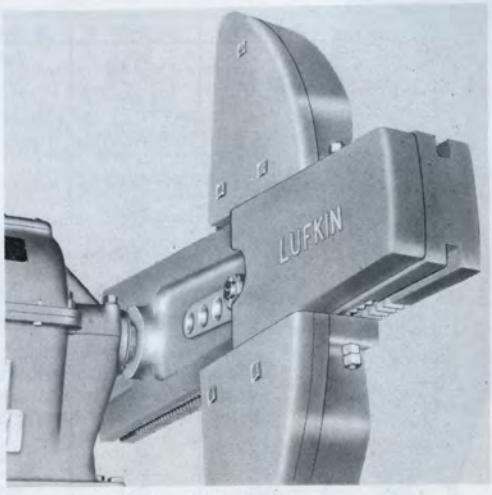

FIGURE 10
Various combinations of type S auxiliary counterweights available for additional counterbalance.

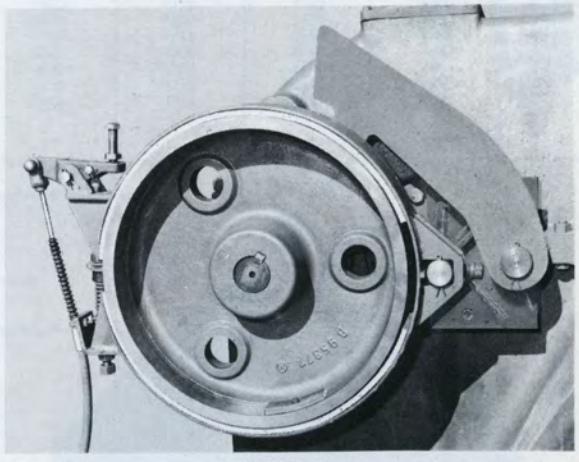

FIGURE 11a
Engaged Position

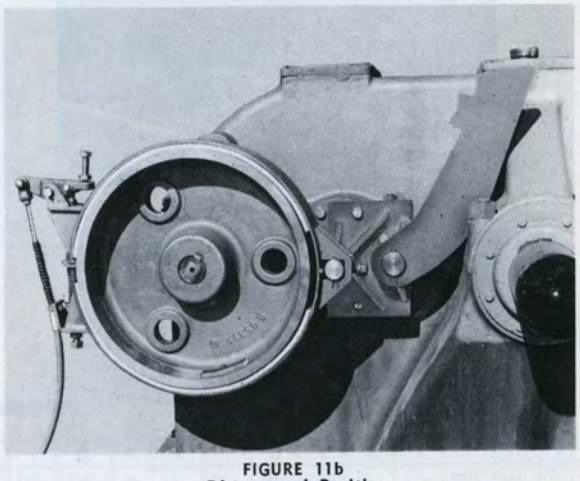

FIGURE 11b
Disengaged Position

As shown in Figures 9 and 10, a wide range of counterbalance is available on all LUFKIN units. With the various combinations of counterweights and auxiliary counterweights to choose from a very economical selection of counterbalance can be made.

Note in Figure 10 the extra counterbalance made available by the increased thickness at the end of the type B crank. With this type crank up to 8 type S auxiliary weights can be added for maximum counterbalance.

The Trout Counterbalanced Crank, using sliding weights to change the counterbalance effect, is an Original Lufkin Feature. Moving the counterweights has been made even safer and easier by the addition of a rack and pinion.

One Man Alone, using the special combination pinion and crank shown in Figure 9, can make the adjustment in a matter of minutes. All four weights can be adjusted without changing the position of the cranks.

Rack and pinion type cranks are regularly furnished on the C-40D assemblies and larger.

With the Trout Counterbalanced Crank there is no hazard to the operator or equipment as it is impossible for Trout counterweights to slide off the crank even when bolts are loosened, so long as nuts are not completely removed from bolts.

This same Safe, Simple and Easy Trout Counterbalance has been in use over a period of many years and has been installed on over ONE HUNDRED AND FIFTY THOUSAND LUFKIN PUMPING UNITS.

FLEX-SHOE BRAKE

Lufkin's Flex-Shoe brake provides much greater holding capacity than the Clam Shell type formerly used. Smoother acting with no "grabbing." Positive stop pawl can be engaged with notches in brake drum to provide additional safety.

FIGURE 12

HI-PRIME PUMPING UNIT with elevated motor provides protection from high water and drifting sand and snow. If unit is moved to a location where electric power is not available, bolted-on motor support can be easily removed and a jointed gas engine base installed. Short foundation block reduces installation costs. Available in all structures using 40D through 912D gear reducers. Unit shown is a C-228D-246-86.

FIGURE 13

HEAVY DUTY "STRONGBACK" Portable base is standard on all units with reducer end working center 7'-0" and greater. Available at added cost to smaller units. Bases are also available with "UNI-SET" plated bottom to permit installation directly on soil with a minimum bearing capacity of 1500 pounds per square foot. Unit shown is a C-320D-256-120.

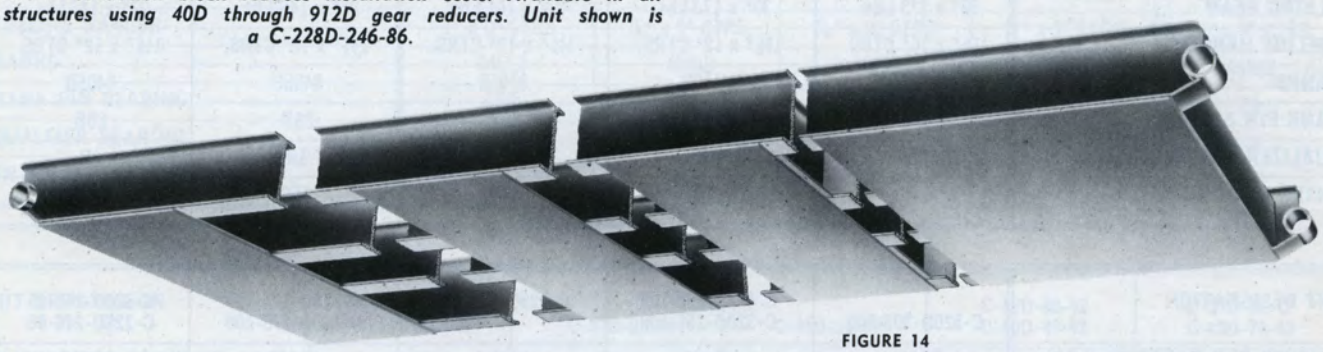

FIGURE 14

BOTTOM VIEW of Uniset portable base available with both conventional and air balanced pumping units. Base shown is a typical Uniset base for a conventional unit with the base extended for a multi-cylinder engine drive.

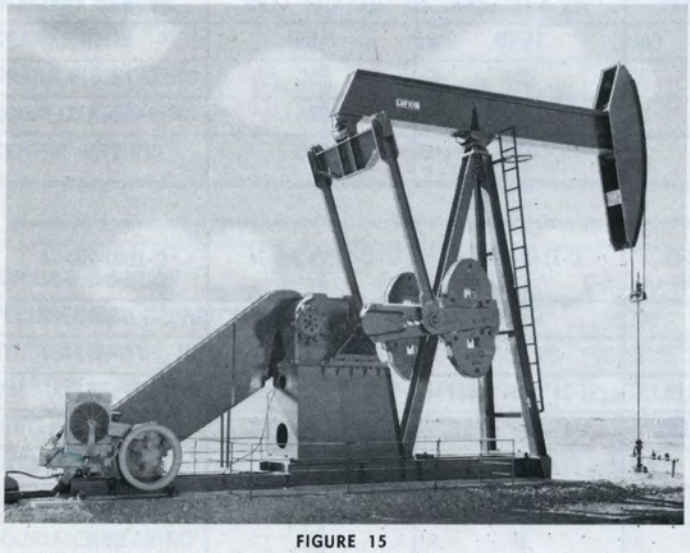

FIGURE 15

JOINTED SLOW SPEED ENGINE BASE, tailor made to fit particular prime mover. Since slide rails are not required with this type base the center of gravity is kept low, thus reducing vibration. Unit shown is a C-456D-256-144 driven by a SLOW SPEED Engine.

FIGURE 16

JOINTED ELL BASE adapts easily to all multi-cylinder engines by using slide rails. This type engine base can also be used with fly-wheel-clearing slow speed engines as shown on this C-160D-173-74 unit.

CONVENTIONAL PUMPING UNIT SPECIFICATIONS

UNIT DESIGNATION	C-912D-365-168 C-640D-365-168	C-912D-305-168 C-640D-305-168 C-456D-305-168	C-912D-427-144	C-912D-365-144 C-640D-365-144	C-640D-305-144 C-456D-305-144
POLISHED ROD CAPACITY, LBS.	36,500	30,500	42,700	36,500	30,500
STROKE LENGTHS, INCHES	168, 145, 124	168, 145, 124	144, 124, 106	144, 124, 106	144, 124, 106
WALKING BEAM	33″ x 221 Lbs.	33″ x 201 Lbs.	33″ x 221 Lbs.	33″ x 201 Lbs.	30″ x 173 Lbs.
WIRELINE HANGER	1⅜″ x 16″ CTRS.	1¼″ x 16″ CTRS.	1⅜″ x 16″ CTRS.	1⅜″ x 16″ CTRS.	1¼″ x 16″ CTRS.
CRANKS	94110B	94110B	94110B	94110B	94110B
CRANK PIN BEARING	1SB	1SB	1SB	1SB	1SB
EQUALIZER BEARING	0R	0R	0R	0R	0R
CENTER BEARING	0TG	0TG	0TG	0TG	1TG

UNIT DESIGNATION	C-640D-256-144 C-456D-256-144 C-320D-256-144	C-456D-365-120	C-640D-305-120 C-456D-305-120	C-456D-256-120 C-320D-256-120	C-456D-213-120 C-320D-213-120 C-228D-213-120
POLISHED ROD CAPACITY, LBS.	25,600	36,500	30,500	25,600	21,300
STROKE LENGTHS, INCHES	144, 124, 106	120, 105, 90	120, 102, 85	120, 102, 85	120, 102, 85
WALKING BEAM	30″ x 173 Lbs.	30″ x 173 Lbs.	27″ x 161 Lbs.	27″ x 146 Lbs.	27″ x 146 Lbs.
WIRELINE HANGER	1¼″ x 16″ CTRS.	1⅜″ x 12″ CTRS.	1¼″ x 12″ CTRS.	1⅛″ x 12″ CTRS.	1⅛″ x 12″ CTRS.
CRANKS	94110B	94110B	8495B	8495B	8495B
CRANK PIN BEARING	1SB	1SB	2SB	2SB	2SB
EQUALIZER BEARING	0R	0R	0R	1R	1R
CENTER BEARING	1TG	0TG	1TG	2TG	2TG

UNIT DESIGNATION	C-320D-305-100	C-456D-256-100 C-320D-256-100	C-228D-213-100	C-228D-173-100 C-160D-173-100	C-320D-246-86 C-228D-246-86
POLISHED ROD CAPACITY, LBS.	30,500	25,600	21,300	17,300	24,600
STROKE LENGTHS, INCHES	100, 85, 70	100, 85, 70	100, 86, 73	100, 86, 73	86, 74, 61
WALKING BEAM	27″ x 146 Lbs.	27″ x 146 Lbs.	24″ x 117 Lbs.	24″ x 104 Lbs.	24″ x 117 Lbs.
WIRELINE HANGER	1¼″ x 12″ CTRS.	1⅛″ x 12″ CTRS.	1⅛″ x 12″ CTRS.	1⅛″ x 12″ CTRS.	1⅛″ x 12″ CTRS.
CRANKS	8495B	8495B	7478B	7478B	8495B
CRANK PIN BEARING	2SB	2SB	2SB	3SC	3SC
EQUALIZER BEARING	1R	1R	1R	2RA	2RA
CENTER BEARING	2TG	2TG	2TG	2TG	2TG

UNIT DESIGNATION	C-320D-213-86 C-228D-213-86	C-160D-173-86	C-114D-119-86	C-320D-246-74	C-228D-200-74 C-160D-200-74
POLISHED ROD CAPACITY, LBS.	21,300	17,300	11,900	24,600	20,000
STROKE LENGTHS, INCHES	86, 74, 62	86, 74, 62	86, 72, 59	74, 64, 54	74, 64, 54
WALKING BEAM	24″ x 104 Lbs.	24″ x 104 Lbs.	24″ x 84 Lbs.	24″ x 104 Lbs.	24″ x 94 Lbs.
WIRELINE HANGER	1⅛″ x 12″ CTRS.	1⅛″ x 12″ CTRS.	1⅛″ x 12″ CTRS.	1⅛″ x 9″ CTRS.	1″ x 9″ CTRS.
CRANKS	7478B	7478B	6468B	7478B	7478B
CRANK PIN BEARING	3SC	3SC	4SC	3SC	3SC
EQUALIZER BEARING	2RA	2RA	3R	2RA	2RA
CENTER BEARING	2TG	2TG	4TG	2TG	2TG

CONVENTIONAL PUMPING UNIT SPECIFICATIONS

UNIT DESIGNATION	C-228D-173-74 C-160D-173-74	C-160D-143-74 C-114D-143-74	C-160D-173-64 C-114D-173-64	C-160D-143-64 C-114D-143-64	C-80D-119-64
POLISHED ROD CAPACITY, LBS.	17,300	14,300	17,300	14,300	11,900
STROKE LENGTHS, INCHES	74, 62, 51	74, 62, 15	64, 54, 44	64, 52, 40	64, 53, 42
WALKING BEAM	24″ x 84 Lbs.	24″ x 84 Lbs.	24″ x 84 Lbs.	18″ x 71 Lbs.	18″ x 60 Lbs.
WIRELINE HANGER	1″ x 9″ CTRS.	1″ x 9″ CTRS.	1″ x 9″ CTRS.	1″ x 9″ CTRS.	1″ x 9″ CTRS.
CRANKS	6468B	6468B	6468B	5456B	4850B
CRANK PIN BEARING	3SC	4SC	4SC	4SC	5A
EQUALIZER BEARING	2RA	3R	3R	3R	4R
CENTER BEARING	2TG	4TG	4TG	4TG	4TG

UNIT DESIGNATION	C-114D-173-54	C-114D-133-54 C-80D-133-54	C-80D-119-54	C-57D-76-54	C-80D-133-48
POLISHED ROD CAPACITY, LBS.	17,300	13,300	11,900	7,600	13,300
STROKE LENGTHS, INCHES	54, 44, 34	54, 45, 36	54, 45, 36	54, 41, 28	48, 40, 32
WALKING BEAM	18″ x 71 Lbs.	18″ x 60 Lbs.	18″ x 60 Lbs.	16″ x 36 Lbs.	16″ x 57 Lbs.
WIRELINE HANGER	1″ x 9″ CTRS.	⅞″ x 9″ CTRS.	⅞″ x 9″ CTRS.	¾″ x 9″ CTRS.	⅞″ x 9″ CTRS.
CRANKS	5456B	4850B	4850B	4246B	4850B
CRANK PIN BEARING	4SC	5A	5A	5A	5A
EQUALIZER BEARING	3R	4R	4R	5R	4R
CENTER BEARING	4TG	4TG	4TG	5C	4TG

UNIT DESIGNATION	C-80D-109-48 C-57D-109-48	C-57D-95-48	C-40D-76-48	C-57D-89-42 C-40D-89-42	C-57D-76-42 C-40D-76-42
POLISHED ROD CAPACITY, LBS.	10,900	9,500	7,600	8,900	7,600
STROKE LENGTHS, INCHES	48, 37, 25	48, 37, 25	48, 37, 27	42, 33, 23	42, 33, 23
WALKING BEAM	16″ x 45 Lbs.	16″ x 45 Lbs.	16″ x 36 Lbs.	16″ x 36 Lbs.	16″ x 36 Lbs.
WIRELINE HANGER	⅞″ x 9″ CTRS.	⅞″ x 9″ CTRS.	⅞″ x 9″ CTRS.	¾″ x 6½″ CTRS.	¾″ x 6½″ CTRS.
CRANKS	4246B	4246B	3644B	3644B	3644B
CRANK PIN BEARING	5A	5A	6	6	6
EQUALIZER BEARING	5R	5R	7R	7R	7R
CENTER BEARING	5C	5C	6CA	6CA	6CA

UNIT DESIGNATION	C-40D-89-36	C-25D-67-36	C-25D-56-36	C-25D-67-30	C-25D-53-30
POLISHED ROD CAPACITY, LBS.	8,900	6,700	5,600	6,700	5,300
STROKE LENGTHS, INCHES	36, 28, 20	36, 28, 20	36, 28, 20	30, 20	30, 20
WALKING BEAM	14″ x 34 Lbs.	12″ x 26 Lbs.	12″ x 26 Lbs.	12″ x 26 Lbs.	12″ x 26 Lbs.
WIRELINE HANGER	¾″ x 6½″ CTRS.	⅝″ x 6½″ CTRS.	⅝″ x 6½″ CTRS.	⅝″ x 6½″ CTRS.	½″ x 6½″ CTRS.
CRANKS	3644B	3644B	3644B	2436B	2436B
CRANK PIN BEARING	6	6	6	6	6
EQUALIZER BEARING	7R	7R	7R	7R	7R
CENTER BEARING	6CA	6CA	6CA	6CA	6CA

CONVENTIONAL COUNTERBALANCE DATA

All Counterbalance Shown In Lbs., Effective At Polished Rod With Weights At Maximum Position, **Including Structural Unbalance.** See Example below.

UNIT	C-912D-365-168 C-912D-305-168 C-640D-365-168 C-640D-305-168 C-456D-305-168	C-912D-427-144 C-912D-365-144 C-640D-365-144	C-640D-305-144 C-456D-305-144	C-640D-256-144 C-456D-256-144 C-320D-256-144	C-456D-365-120	C-640D-305-120 C-456D-305-120	C-456D-256-120 C-320D-256-120	C-456D-213-120 C-320D-213-120 C-228D-213-120
STROKE	168″	144″	144″	144″	120″	120″	120″	120″
STRUCTURAL UNBALANCE	—1,500 Lbs.	—650 Lbs.	—520 Lbs.	—400 Lbs.	+570 Lbs.	—120 Lbs.	+55 Lbs.	0 Lbs.
CRANKS	94110B	94110B	94110B	94110B	94110B	8495B	8495B	8495B
C'Bal., Cranks Only	4,270	6,080	6,250	6,370	8,540	5,575	5,745	5,690
4 No. OORO Counterweights	19,675	24,065	24,325	.....	29,835	.....	.....	.....
4 No. OOS Aux. Weights	24,315	29,485	.....	.....	36,250	.....	.....	.....
8 No. OOS Aux. Weights	28,960	34,905	.....	.....	.....	.....	.....	.....
4 No. ORO Counterweights	17,690	21,750	22,000	22,120	27,090	20,800	20,965	.....
4 No. OS Aux. Weights	22,145	26,950	27,225	.....	33,250	25,855	.....	.....
8 No. OS Aux. Weights	26,600	32,150	.....	.....	39,405	.....	.....	.....
4 No. OARO Counterweights	15,600	19,310	19,550	19,670	24,205	18,635	18,800	18,745
4 No. OAS Aux. Weights	19,110	23,405	23,665	23,785	29,055	22,675	22,840	.....
8 No. OAS Aux. Weights	22,615	27,500	27,780	.....	33,900	26,715	.....	.....
4 No. 1RO Counterweights	13,030	16,310	16,530	16,650	20,650	15,690	15,860	15,805
4 No. 1S Aux. Weights	15,725	19,455	19,690	19,810	24,370	18,800	18,965	18,910
8 No. 1S Aux. Weights	18,415	22,595	22,850	*22,970	28,095	21,905	22,070	.....
4 No. 2RO Counterweights	11,555	14,590	14,800	14,920	18,615	13,985	14,155	14,100
4 No. 2S Aux. Weights	14,165	17,635	17,865	17,985	22,220	16,995	17,165	17,110
8 No. 2S Aux. Weights	16,780	20,685	20,930	*21,050	25,830	20,010	20,175	20,120
4 No. 3CRO Counterweights	10,130	12,925	13,125	13,245	16,640	12,390	12,555	12,500
4 No. 3BS Aux. Weights	12,655	15,870	16,090	16,210	20,130	15,320	15,490	15,435
8 No. 3BS Aux. Weights	*15,180	*18,815	19,055	*19,175	23,620	18,250	*18,425	**18,370
4 No. 5ARO Counterweights	8,510	11,035	11,225	11,345	14,405	10,550	10,720	10,665
4 No. 5A Aux. Weights	10,220	13,030	13,230	13,350	16,765	12,560	12,730	12,675
8 No. 5A Aux. Weights	*11,930	*15,025	15,235	*15,355	19,125	14,570	*14,740	*14,685
4 No. 5CRO Counterweights	7,370	9,705	9,890	10,010	12,830	9,235	9,405	9,350
4 No. 5C Aux. Weights	8,910	11,500	11,695	11,815	14,955	11,045	11,215	11,160
8 No. 5C Aux. Weights	10,445	13,295	13,500	*13,620	17,080	12,855	13,020	12,965

UNIT	C-228D-173-74 C-160D-173-74	C-160D-143-74 C-114D-143-74	C-160D-173-64 C-114D-173-64	C-160D-143-64 C-114D-143-64	C-80D-119-64	C-114D-173-54	C-114D-133-54 C- 80D-133-54	C-80D-119-54
STROKE	74″	74″	64″	64″	64″	54″	54″	54″
STRUCTURAL UNBALANCE	+450 Lbs.	+300 Lbs.	+550 Lbs.	+360 Lbs.	0 Lbs.	+500 Lbs.	+330 Lbs.	+330 Lbs.
CRANKS	6468B	6468B	6468B	5456B	4850B	5456B	4850B	4850B
C'Bal., Cranks Only	4,125	3,681	4,755	2,660	2,155	3,180	2,845	2,845
4 No. 3CRO Counterweights	11,185	11,050	12,835	8,820	.....	10,370	.....	.....
4 No. 3BS Aux. Weights	14,220	14,090	.....	11,465	.....	13,460	.....	.....
8 No. 3BS Aux. Weights	.....	.....	.....	.....	.....	16,550	.....	.....
4 No. 5ARO Counterweights	9.445	9.305	10,845	7,445	6,120	8,765	7,470	7,470
4 No. 5A Aux. Weights	11,605	11,470	13,315	9,390	7,738	11,035	9,360	9,360
8 No. 5A Aux. Weights	*13,765	*13,635	*15,785	*11,335	.....	13,305	11,250	.....
4 No. 5CRO Counterweights	8,065	7,925	9,265	6,215	5,133	7,335	6,320	6,320
4 No. 5C Aux. Weights	10,015	9,880	11,495	7,980	6,608	9,390	8,040	8,040
8 No. 5C Aux. Weights	*11,965	*11,830	*13,725	*9,740	.....	11,445	9,760	.....
4 No. 6RO Counterweights	7,205	7,065	8,280	5,455	4,514	6,440	5,595	5,595
4 No. 6 Aux. Weights	8,365	8,225	9,610	6,505	5,406	7,670	6,635	6,635
8 No. 6 Aux. Weights	9,525	9,390	10,940	7,560	6,297	8,900	7,675	7,675
4 No. 7RO Counterweights	6,110	5,965	7,025	4,470	3,699	5,295	4,645	4,645
4 No. 7 Aux. Weights	6,995	6,855	8,040	5,280	4,395	6,245	5,460	5,460
8 No. 7 Aux. Weights	7,880	7,740	9,055	6,095	5,091	7,190	6,270	6,270

EXAMPLE:
A C-640D-305-144 Unit with 4 No. OARO Counterweights and 4 No. OAS Auxiliary Weights would have a maximum counterbalance effect of 23,665 pounds in the 144″ stroke. This effect includes a structural unbalance of —520 pounds. If the counterbalance effect is desired for the 106″ stroke, subtract the structural unbalance from the effect in the 144″ stroke and multiply this difference by the ratio of 144 ÷ 106; then add the structural unbalance to this product. Thus, counterbalance effect in the 106″ stroke = [23,665 — (—520)] × 144/106 + (—520) = 24.185 × 144/106 —520 = 32,335 pounds.
Structural Unbalance with a negative (—) sign indicates a walking beam assembly that is heavy on the well end. Structural Unbalance without the negative sign indicates a walking beam assembly that is heavy on the gear reducer end.

* Use only one aux. weight per counterweight on belt cover side on 912D, 320D, 160D, & 40D units.
** Use only one aux. weight per counterweight on belt cover side on 320D & 228D units.
*** Use only one aux. weight per counterweight on belt cover side on 160D units.

CONVENTIONAL COUNTERBALANCE DATA

All Counterbalance Shown In Lbs., Effective At Polished Rod With Weights At Maximum Position, **Including Structural Unbalance.** See Example below.

UNIT	C-456D-256-100 C-320D-256-100 C-320D-305-100	C-228D-213-100 C-228D-173-100 C-160D-173-100	C-320D-246-86 C-228D-246-86	C-320D-213-86 C-228D-213-86	C-160D-173-86	C-114D-119-86	C-320D-246-74 C-228D-200-74 C-160D-200-74
STROKE	100″	100″	86″	86″	86″	86″	74″
STRUCTURAL UNBALANCE	+550 Lbs.	+0 Lbs.	+800 Lbs.	+450 Lbs.	+450 Lbs.	+115 Lbs.	+800 Lbs.
CRANKS	8495B	7478B	8495B	7478B	7478B	6468B	7478B
C'Bal. Cranks Only	7,390	3,786	8,725	4,850	4,850	3,298	5,890
4 No. OARO Counterweights	23,070	.....	.....	.....	.....	.....	.....
4 No. OAS Aux. Weights	27,925	.....	.....	.....	.....	.....	.....
4 No. 1RO Counterweights	19,535	12,710	22,810	.....	.....	.....	.....
4 No. 1S Aux. Weights	23,270	16,040	.....	.....	.....	.....	.....
8 No. 1S Aux. Weights	27,000	19,370	.....	.....	.....	.....	.....
4 No. 2RO Counterweights	17,490	11,485	20,435	13,800	13,800	.....	16,235
4 No. 2S Aux. Weights	21,105	14,240	.....	17,005	17,005	.....	19,935
8 No. 2S Aux. Weights	24,720	16,995	.....	.....	.....	.....	.....
4 No. 3CRO Counterweights	15,570	10,085	18,210	12,175	12,175	9,410	14,355
4 No. 3BS Aux. Weights	19,095	12,780	22,295	15,310	15,310	.....	17,975
8 No. 3BS Aux. Weights	*22,620	*15,475	.....	*18,445	.....	.....	*21,595
4 No. 5ARO Counterweights	13,365	8,450	15,655	10,270	10,270	7,905	12,155
4 No. 5A Aux. Weights	15,780	10,335	18,450	12,465	12,465	9,775	14,685
8 No. 5A Aux. Weights	*18,195	*12,220	*21,245	14,660	*14,660	11,645	***17,215
4 No. 5CRO Counterweights	11,780	7,230	13,820	8,855	8,855	6,710	10,515
4 No. 5C Aux. Weights	13,955	8,935	16,340	10,835	10,835	8,400	12,805
8 No. 5C Aux. Weights	16,130	*10,640	18,860	12,815	*12,815	10,085	***15,095
4 No. 6RO Counterweights	10,795	6,465	12,675	7,965	7,965	5,965	9,490
4 No. 6 Aux. Weights	12,075	7,475	14,160	9,140	9,140	6,970	10,845
8 No. 6 Aux. Weights	13,360	8,485	15,650	10,315	10,315	7,975	12,205
4 No. 7RO Counterweights	9,560	5,505	11,240	6,845	6,845	5,015	8,195
4 No. 7 Aux. Weights	10,530	6,270	12,370	7,740	7,740	5,780	9,225
8 No. 7 Aux. Weights	11,500	7,040	13,495	8,635	8,635	6,550	10,260

UNIT	C-57D-76-54	C-80D-133-48	C-80D-109-48 C-57D-109-48 C-57D-95-48	C-40D-76-48	C-57D-89-42 C-57D-76-42 C-40D-89-42 C-40D-76-42	C-40D-89-36 C-25D-67-36 C-25D-56-36	C-25D-67-30 C-25D-53-30
STROKE	54″	48″	48″	48″	42″	36″	30″
STRUCTURAL UNBALANCE	0 Lbs.	+440 Lbs.	+320 Lbs.	0 Lbs.	+150 Lbs.	+275 Lbs.	+150 Lbs.
CRANKS	4246B	4850B	4246B	3644B	3644B	3644B	2436B
C'Bal., Cranks Only	1,649	3,270	2,175	1,338	1,675	2,055	1,370
4 No. 5ARO Counterweights	5,760	8,475	6,800	.....	.....	.....	.....
4 No. 5A Aux. Weights	7,440	10,595	8,690	.....	.....	.....	.....
8 No. 5A Aux. Weights	.....	.....	.....	.....	.....	...	.....
4 No. 5CRO Counterweights	4,750	7,175	5,665	4,525	5,300	6,285	.....
4 No. 5C Aux. Weights	6,285	9,115	7,395	6,160	7,165	.....	.....
8 No. 5C Aux. Weights	.....	.....	.....	.....	.....	.....	.....
4 No. 6RO Counterweights	4,120	6,365	4,955	3,995	4,700	5,580	4,400
4 No. 6 Aux. Weights	5,050	7,535	6,005	5,000	5,840	6,915	5,540
8 No. 6 Aux. Weights	5,985	8,705	7,055	.....	*6,985	.....	.....
4 No. 7RO Counterweights	3,275	5,295	4,005	3,090	3,670	4,380	3,400
4 No. 7 Aux. Weights	4,005	6,210	4,830	3,885	4,570	5,435	4,320
8 No. 7 Aux. Weights	4,740	7,125	5,655	.....	*5,475	.....	.....

EXAMPLE:
A C-456D-305-144 with 4 No. OARO counterweights and 3 No. OAS auxiliary weights would have a maximum counterbalance effect in the 144″ stroke of 19550 + ¾ (23665 — 19550) = 22635 pounds. With this same combination of weights, the counterbalance effect in the 106″ stroke is [22635 — (—520)] × 144/106 + (—520) = 30935 pounds.

To convert effective counterbalance to maximum counterbalance torque for dynamometer card analysis, multiply the pounds counterbalance, minus the structural unbalance, by the torque factor at the 90° crank position.

* Use only one aux. weight per counterweight on belt cover side on 912D, 320D, 160D, & 40D units.
** Use only one aux. weight per counterweight on belt cover side on 320D & 228D units.
*** Use only one aux. weight per counterweight on belt cover side on 160D units.

CONVENTIONAL PUMPING UNIT ASSEMBLIES
GENERAL DIMENSIONS

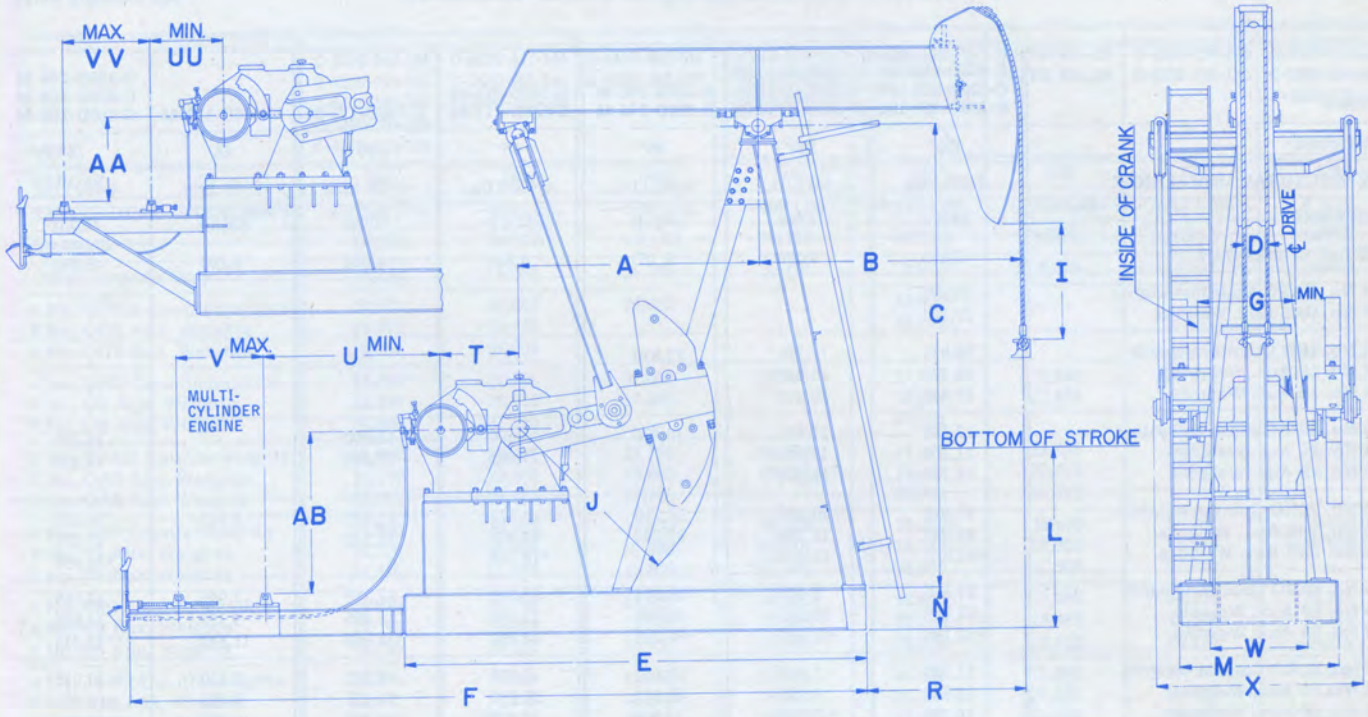

FIGURE 17

UNIT	A	B	C	D	E	F	G	I	J	L	M	N	R	T	U	V	W	X	AA	AB	UU	VV
C-912D-365-168	10′-0″	17′-6″	20′-6″	16″	18′-9½″	29′-10½″	53⅛″	20½″	110″	62½″	6′-3¾″	16″	13′-9½″	48½″	89¼″	48½″	46¾″	8′-2½″	51¾″	93″	22½″	50½″
C-912D-305-168	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“
C-912D-427-144	“	15′-0″	“	“	“	“	“	33¼″	“	74½″	“	“	11′-3½″	“	“	“	“	“	“	“	“	“
C-912D-365-144	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“
C-640D-365-168	“	17′-6″	“	“	18′-6″	29′-7″	51⅜″	20½″	“	62½″	“	“	13′-9½″	41½″	92¼″	“	“	“	“	“	26¼″	“
C-640D-305-168	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“
C-640D-365-144	“	15′-0″	“	“	“	“	“	33¼″	“	74½″	“	“	11′-3½″	“	“	“	“	“	“	“	“	“
C-640D-305-144	“	“	20′-4″	“	“	“	“	33″	“	72½″	“	“	“	“	“	“	“	“	“	“	“	“
C-640D-256-144	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“
C-640D-305-120	9′-3″	12′-11″	18′-2″	12″	17′-6″	27′-4″	52½″	26″	95″	77¾″	70″	“	9′-5½″	“	77¾″	“	“	8′-1″	51½″	78″	26¾″	37¾″
C-456D-305-168	10′-0″	17′-6″	20′-6″	16″	18′-6″	29′-7″	51⅜″	20½″	110″	62½″	6′-3¾″	“	13′-9½″	38⅜″	96″	“	“	8′-2½″	51¾″	93″	29½″	50½″
C-456D-305-144	“	15′-0″	20′-4″	“	“	“	“	33″	“	72½″	“	“	11′-3½″	“	“	“	“	“	“	“	“	“
C-456D-256-144	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“
C-456D-365-120	“	12′-8″	20′-6″	12″	“	“	“	55¾″	“	75″	“	“	8′-11½″	“	“	“	“	“	“	“	“	“
C-456D-305-120	9′-3″	12′-11″	18′-2″	“	17′-6″	27′-4″	52½″	26″	95″	77¾″	70″	“	9′-5½″	“	81″	“	“	8′-1″	51½″	78″	30″	37¾″
C-456D-256-120	“	“	18′-0″	“	“	“	“	“	“	75¾″	“	“	“	“	“	“	“	“	“	“	“	“
C-456D-213-120	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“
C-456D-256-100	“	10′-9″	“	“	“	“	“	46¼″	“	“	“	“	7′-3½″	“	“	“	“	“	“	“	“	“
C-320D-256-144	10′-0″	15′-0″	20′-4″	16″	18′-0½″	29′-1½″	44¾″	33″	110″	72½″	6′-3¾″	“	11′-3½″	34″	92½″	“	43″	7′-3½″	51¾″	93″	30⅜″	34¼″
C-320D-256-120	9′-3″	12′-11″	18′-0″	12″	17′-0½″	27′-4½″	“	26″	95″	75¾″	69¾″	“	9′-5½″	“	86″	“	“	7′-2″	53″	80″	“	“
C-320D-213-120	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	7′-1½″	“	“	“	“
C-320D-305-100	“	10′-9″	“	“	“	“	“	46¼″	“	“	“	“	7′-3½″	“	“	“	“	7′-2″	“	“	“	“
C-320D-256-100	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	7′-1½″	“	“	“	“
C-320D-246-86	“	9′-3″	“	“	“	“	“	60½″	“	“	“	“	69½″	“	“	“	“	“	“	“	“	“
C-320D-213-86	8′-0″	“	15′-0″	“	15′-4½″	24′-3½″	45¼″	24½″	78″	74½″	57¾″	“	6′-2½″	“	69″	“	“	“	36″	63″	“	“
C-320D-246-74	“	8′-0″	“	9″	“	“	“	35¾″	“	77¼″	“	“	59½″	“	“	“	“	“	“	“	“	“

NOTE: Do not use above dimensions for foundation. Request foundation plan.

GENERAL DIMENSIONS Continued

UNIT	A	B	C	D	E	F	G	I	J	L	M	N	R	T	U	V	W	X	AA	AB	UU	VV
C-228D-213-120	9′-3″	12′-11″	18′-0″	12″	16′-5½″	27′-4″	38⅛″	26″	95″	75½″	69¾″	16″	9′-5½″	30″	90″	46½″	37″	6′-6½″	53″	80″	27⅜″	34¼″
C-228D-213-100	8′-0″	10′-9″	15′-0″	"	14′-9½″	24′-3″	39⅛″	12″	78″	63″	57¾″	"	7′-8½″	"	72½″	"	"	"	36″	63″	"	"
C-228D-173-100	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
C-228D-246-86	9′-3″	9′-3″	18′-0″	"	16′-5½″	27′-4″	38⅛″	60¾″	95″	75½″	69¾″	"	69½″	"	90″	"	"	"	53″	80″	"	"
C-228D-213-86	8′-0″	"	15′-0″	"	14′-9½″	24′-3″	39⅛″	24½″	78″	74½″	57¾″	"	6′-2½″	"	72½″	"	"	"	36″	63″	"	"
C-228D-200-74	"	8′-0″	"	9″	"	"	"	35¾″	"	77¼″	"	"	59½″	"	"	"	"	"	"	"	"	"
C-228D-173-74	7′-0″	"	13′-0″	"	13′-5″	22′-10½″	"	17¼″	68″	68¼″	51¾″	12″	64″	"	"	"	"	"	26″	53″	"	"
C-160D-173-100	8′-0″	10′-9″	15′-0″	12″	14′-5″	23′-2″	33⅛″	12″	78″	63″	57¾″	16″	7′-8½″	26″	65¼″	"	32″	70½″	38¾″	65″	26⅝″	34¼″
C-160D-173-86	"	9′-3″	"	"	"	"	"	24½″	"	74½	"	"	6′-2½″	"	"	"	"	"	"	"	"	"
C-160D-200-74	"	8′-0″	"	9″	"	24′-1″	"	35¾″	"	77¼″	"	"	59½″	"	"	"	"	"	"	"	"	"
C-160D-173-74	7′-0″	"	13′-0″	"	13′-0½″	22′-8½″	"	17¼″	68″	68¼″	51¾″	12″	64″	"	"	"	"	"	29″	55″	"	"
C-160D-143-74	"	"	12′-9¾″	"	"	"	"	"	"	66¼″	"	"	"	"	"	"	"	"	"	"	"	"
C-160D-173-64	"	7′-0″	"	"	"	"	"	26½″	"	66½″	"	"	52″	"	"	"	"	69¾″	"	"	"	"
C-160D-143-64	6′-0″	"	11′-0″	"	11′-1¾″	18′-11¾″	"	18¾″	56″	53¼″	50¾″	"	62¾″	"	54¼″	"	"	"	30¼″	43″	17″	30¼″
C-114D-119-86	7′-0″	9′-3″	12′-9¾″	12″	12′-7″	21′-10½″	29⅜″	15½″	68″	54″	51¾″	"	6′-7″	24″	68¼″	"	25″	66¾″	29″	55″	23″	34¾″
C-114D-143-74	"	8′-0″	"	9″	"	"	"	17¼″	"	66¼″	"	"	64″	"	"	"	"	"	"	"	"	"
C-114D-173-64	"	7′-0″	"	"	"	"	"	26¾″	"	66¼″	"	"	52″	"	"	"	"	"	"	"	"	"
C-114D-143-64	6′-0″	"	11′-0″	"	10′-8¼″	18′-6¼″	"	18¾″	56″	53¼″	50¾″	"	62¾″	"	50¾″	"	"	"	30¼″	43″	13½″	30¼″
C-114D-173-54	"	6′-0″	"	"	"	"	"	20″	"	61½″	"	"	50¾″	"	"	"	"	"	"	"	"	"
C-114D-133-54	5′-4″	"	9′-8″	"	10′-0″	17′-10″	"	14¼″	50″	49¼″	46¼″	10″	51″	"	"	"	"	67¼″	24″	37″	"	"
C-80D-119-64	"	7′-0″	"	"	"	17′-4½″	"	14″	"	40″	"	"	63″	22″	"	"	"	"	"	"	15½″	"
C-80D-133-54	"	6′-0″	"	"	"	"	"	14¼″	"	49¼″	"	"	51″	"	47¼″	"	"	"	"	"	"	"
C-80D-119-54	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
C-80D-133-48	"	5′-4″	"	"	"	"	"	15¼″	"	54½″	"	"	43″	"	"	"	"	"	"	"	"	"
C-80D-109-48	4′-8″	"	8′-9″	"	9′-3⅛″	16′-8½″	30⅝″	"	46″	43¾″	40¾″	"	"	"	"	"	"	65¼″	20″	33″	"	"
C-57D-76-54	"	6′-0″	"	"	"	"	26″	13″	"	39″	"	"	51″	20″	49¼″	"	"	58¼″	"	"	17½″	"
C-57D-109-48	"	5′-4″	"	"	"	"	"	15¼″	"	43¾″	"	"	43″	"	"	"	"	"	"	"	"	"
C-57D-95-48	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
C-57D-89-42	4′-0″	4′-8″	8′-2½″	6½″	8′-2″	13′-8¾″	28¼″	17½″	44″	40¾″	38½″	8″	41″	"	33¾″	40½″	"	58″	18″	33¾″	"	"
C-57D-76-42	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
C-40D-76-48	"	5′-4″	"	9″	7′-9″	13′-6″	23¾″	14½″	"	35¼″	"	"	57″	17½″	28″	44¾″	20″	51″	10¾″	"	17″	21¼″
C-40D-89-42	"	4′-8″	"	6½″	"	"	"	17¾″	"	40¾″	"	"	41″	"	"	"	"	51¼″	"	"	"	"
C-40D-76-42	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
C-40D-89-36	"	4′-0″	"	"	"	"	"	15″	"	49½″	"	"	33″	"	"	"	"	"	"	"	"	"
C-25D-67-36	"	"	"	"	7′-4″	11′-7″	20¼″	13″	44″	50½″	"	"	"	13⁹⁄₁₆″	27″	26¾″	17″	47″	"	"	15½″	"
C-25D-56-36	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
C-25D-67-30	3′-0″	3′-9″	7′-0½″	"	6′-3″	10′-6″	20½″	"	36″	37½″	31″	6″	31″	"	"	28″	"	"	"	27¾″	"	"
C-25D-53-30	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"

NOTE: Do not use above dimensions for foundation. Request foundation plan.

LUFKIN MARK II *UNITORQUE* PUMPING UNITS

FIGURE 18

Lufkin M-1280D-427-216 driven by a slow speed engine.

THE *UNITORQUE* GEOMETRY

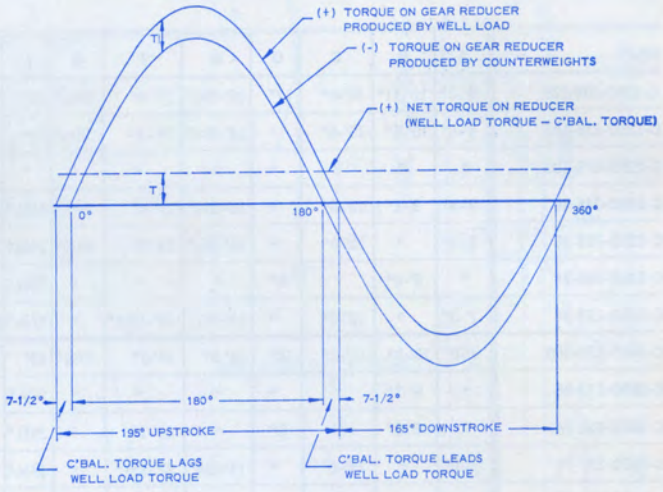

FIGURE 19

Illustration showing how a uniform torque can be obtained under ideal conditions.

NOTE: The Mark II Unit must be operated in a counter-clockwise direction. (Standing at the side of the unit with the wellhead to the right.)

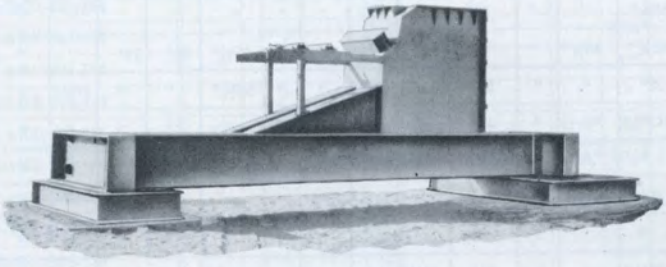

FIGURE 20

Uniset "two-point" suspension fabricated steel foundation pads are available for Mark II hi-prime electric units and where engines are mounted on the unit base.

Bottom plate on pads assures full bearing surface. Fill foundation pads with crushed rock or sand to add stabilizing weight. Mark II unit base shown mounted in place.

FIGURE 21

"TWO-POINT" SUSPENSION bases are standard for all Lufkin Mark II Pumping Units. The "two point" base reduces concrete requirements approximately 80% by permitting the use of small salvageable precast concrete blocks in front and rear. This simple foundation assures a completely portable unit and foundation which requires a minimum of installation time.

(1) The cross yoke (equalizer) is shifted forward toward the horsehead instead of placing it directly over the gear reducer. This produces approximately a 195° upstroke and a 165° downstroke. (See Fig. 19)
The 195° upstroke reduces the acceleration where the load is greatest and thus effects a reduction in polished rod load.
By locating the cross yoke forward a greater mechanical advantage is obtained for lifting the load, and a lesser mechanical advantage is obtained for the reduced downstroke load, i.e., the maximum upstroke torque factor is decreased and the maximum downtroke torque factor is increased.

(2) The counterbalance weights are offset on the crank. This produces a counterbalance torque which at the beginning of the upstroke "lags" the well load torque approximately 7½°. Similarly, at the beginning of the downstroke this same offset condition produces a counterbalance torque which "leads" the well load torque approximately 7½°. (See Fig. 19)

Independently, these features would not produce a uniform torque, but working together a "unitorque" system is obtained which in turn can effect a torque reduction on the gear reducer up to 35%.

MARK II PUMPING UNIT SPECIFICATIONS

UNIT DESIGNATION	M-1280D-427-216	M-912D-305-216	M-1280D-427-192	M-912D-305-192 M-640D-305-192 M-456D-305-192	M-912D-365-168	M-912D-305-168 M-640D-305-168 M-456D-305-168
POLISHED ROD CAPACITY, LBS.	42,700	30,500	42,700	30,500	36,500	30,500
STROKE LENGTH, INCHES	216, 192, 167	216, 192, 167	192, 168, 144	192, 168, 144	168, 149, 130	168, 149, 130
WALKING BEAM	24″ x 131 Lbs.	24″ x 131 Lbs.	24″ x 131 Lbs.	24″ x 131 Lbs.	24″ x 104 Lbs.	24″ x 84 Lbs.
CRANK PIN BEARING	1SB	1SB	1SB	1SB	1SB	1SB
SAMSON POST BEARING	P19	P19	P19	P19	P18	P18
CROSS YOKE BEARING	C232	C232	C232	C232	C22 C	C22C
WIRELINE HANGER	1⅜″ x 16″ Ctrs.	1⅜″ x 16″ Ctrs.	1⅜″ x 16″ Ctrs.	1⅜″ x 16″ Ctrs.	1⅜″ x 12″ Ctrs.	1¼″ x 12″ Ctrs.
CRANKS	216130 MRO	216130 MRO	192130 MRO	192130 MRO	168108 MRO	168108 MRO

UNIT DESIGNATION	M-912D-365-144 M-640D-365-144 M-456D-365-144	M-912D-305-144 M-640D-305-144 M-456D-305-144	M-640D-256-144 M-456D-256-144 M-320D-256-144	M-456D-365-120	M-640D-305-120 M-456D-305-120 M-320D-305-120	M-456D-256-120 M-320D-256-120 M-228D-256-120
POLISHED ROD CAPACITY, LBS.	36,500	30,500	25,600	36,500	30,500	25,600
STROKE LENGTH, INCHES	144, 128, 112	144, 128, 112	144, 128, 112	120, 104, 88	120, 104, 88	120, 104, 88
WALKING BEAM	24″ x 84 Lbs.	24″ x 84 Lbs.	21″ x 68 Lbs.	24″ x 84 Lbs.	24″ x 84 Lbs.	21″ x 68 Lbs.
CRANK PIN BEARING	1SB	2SB	2SB	1SB	2SB	2SB
SAMSON POST BEARING	P18	P18	P18	P18	P18	P18
CROSS YOKE BEARING	C232	C22 C	C22 C	C232	C22 C	C22C(M-228D,C20)
WIRELINE HANGER	1⅜″ x 12″ Ctrs.	1¼″ x 12″ Ctrs.	1⅛″ x 9″ Ctrs.	1⅜″ x 12″ Ctrs.	1¼″ x 12″ Ctrs.	1⅛″ x 9″ Ctrs.
CRANKS	144108 MRO	144108 MRO	144108 MRO	120108 MR	120108 MR	120108 MR

UNIT DESIGNATION	M-320D-213-120 M-228D-213-120	M-320D-305-100	M-320D-256-100 M-228D-256-100	M-228D-173-100	M-228D-246-86	M-228D-213-86 M-160D-213-86
POLISHED ROD CAPACITY, LBS.	21,300	30,500	25,600	17,300	24,600	21,300
STROKE LENGTH, INCHES	120, 104, 88	100, 84, 68	100, 84, 68	100, 84, 68	86, 72.4, 58.6	86, 72.4, 58.6
WALKING BEAM	21″ x 62 Lbs.	24″ x 84 Lbs.	21″ x 68 Lbs.	16″ x 57 Lbs.	16″ x 57 Lbs.	16″ x 45 Lbs.
CRANK PIN BEARING	2SB	2SB	2SB	2SB	2SB	2SB
SAMSON POST BEARING	P18(M-228D,P16)	P18	P18	P16	P16	P16
CROSS YOKE BEARING	C22C(M-228D,C19)	C22 C	C22C(M-228D,C20)	C19	C20N	C20N
WIRELINE HANGER	1⅛″ x 9″ Ctrs.	1¼″ x 12″ Ctrs.	1⅛″ x 9″ Ctrs.	1⅛″ x 9″ Ctrs.	1⅛″ x 9″ Ctrs.	1″ x 9″ Ctrs.
CRANKS	120108 MR	100108 MR	100108 MR	100108 MR	8686 MR	8686 MR

UNIT DESIGNATION	M-160D-173-86	M-114D-143-86	M-228D-200-74 M-160D-200-74	M-228D-173-74 M-160D-173-74 M-114D-173-74	M-114D-143-74	M-114D-173-64	M-114D-143-64
POLISHED ROD CAPACITY, LBS.	17,300	14,300	20,000	17,300	14,300	17,300	14,300
STROKE LENGTH, INCHES	86, 72.4, 58.6	86, 74, 62	74, 60.4, 46.8	74, 60.4, 46.8	74, 60, 46	64, 52, 40	64, 52, 40
WALKING BEAM	16″ x 45 Lbs.	14″ x 34 Lbs.	16″ x 45 Lbs.	16″ x 45 Lbs.	14″ x 34 Lbs.	14″ x 34 Lbs.	14″ x 34 Lbs.
CRANK PIN BEARING	2SB	4SB	2SB	2SB(M-114D,3SB)	4SB	3SB	4SB
SAMSON POST BEARING	P13	P13	P16	P13	P13	P13	P13
CROSS YOKE BEARING	C18N	C18N	C20N	C18N	C18N	C18N	C18N
WIRELINE HANGER	1″ x 9″ Ctrs.	1″ x 9″ Ctrs.	1″ x 9″ Ctrs.	1″ x 9″ Ctrs.	1″ x 9″ Ctrs.	1″ x 9″ Ctrs.	1″ x 9″ Ctrs.
CRANKS	8686 MR	8662 MR	7486 MR	7486 MR	7462 MR	6462 MR	6462 MR

MARK II PUMPING UNIT ASSEMBLIES
GENERAL DIMENSIONS

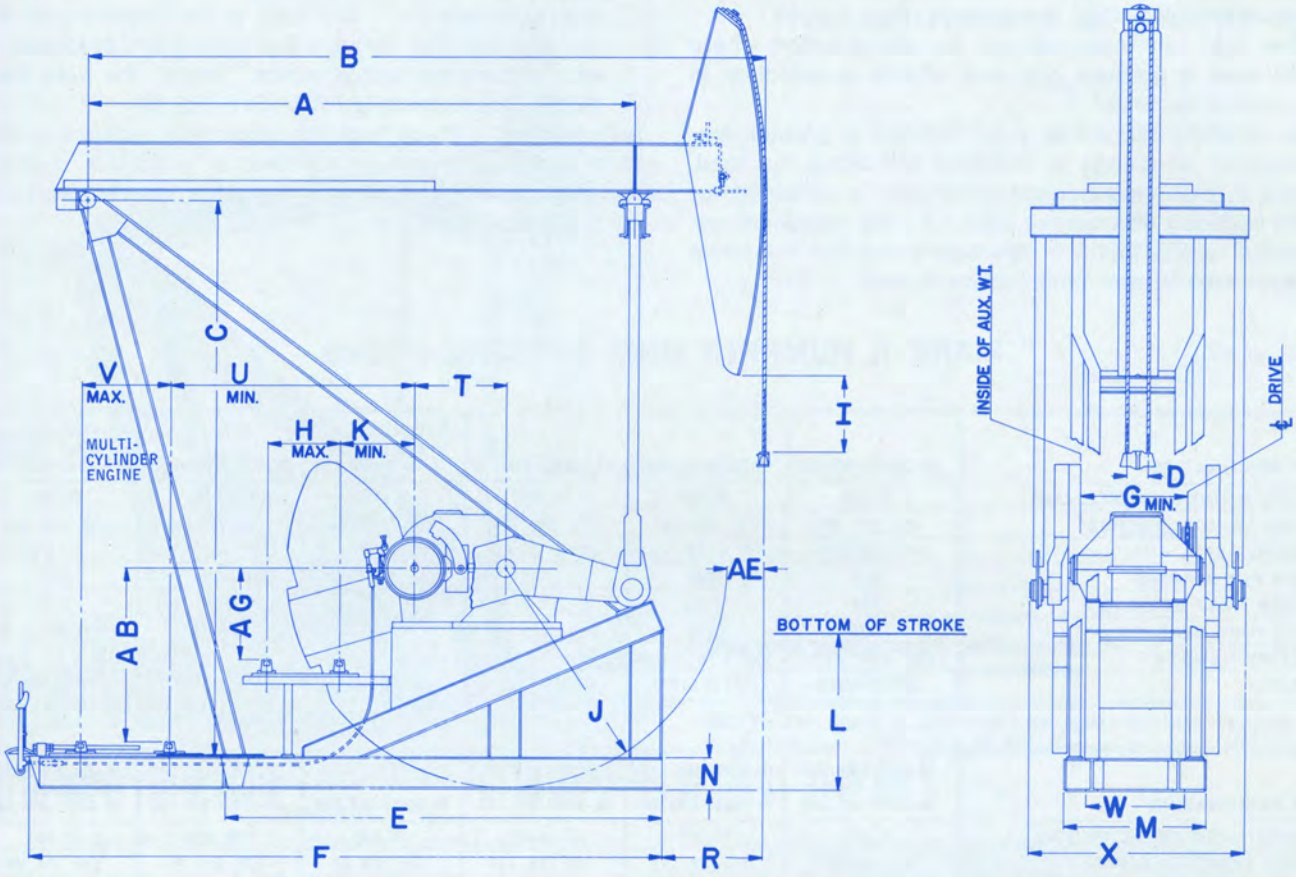

FIGURE 22

UNIT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	R	T	U	V	W	X	AB	AE	AG
M-1280D-427-216	25′-6″	32′-0″	27′-5⅞″	16″	18′-7″	25′-2½″	57⅝″	55″	47¼″	130″	31¾″	68⅝″	8′-0″	18″	45″	52½″	11′-3¼″	48½″	48½″	9′-6″	9′-6″	26″	51″
M-1280D-427-192	“	“	“	“	“	“	“	“	72½″	“	“	71¼″	“	“	“	“	“	“	“	“	“	“	“
M-912D-305-216	“	“	“	“	“	“	54″	51¾″	47¼″	“	23″	68⅜″	“	“	“	48½″	“	“	“	9′-1″	“	“	59⅛″
M-912D-305-192	“	“	“	“	“	“	“	“	72½″	“	“	71¼″	“	“	“	“	“	“	“	“	“	“	“
M-912D-365-168	22′-6″	27′-10″	23′-0⅞″	12″	18′-2¾″	24′-10¼″	“	46¾″	42¾″	108″	25½″	71½″	6′-9½″	16″	48″	“	9′-2″	“	50″	8′-9″	7′-8″	19″	46⅛″
M-912D-305-168	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	23¾″	“
M-912D-365-144	21′-6″	26′-0″	21′-0⅞″	“	“	“	“	“	40″	“	“	75⅛″	“	“	42½″	“	“	“	“	“	“	13½″	“
M-912D-305-144	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	8′-7⅜″	“	“	“
M-640D-305-192	25′-6″	32′-0″	27′-5⅞″	16″	18′-7″	25′-2½″	50¼″	51¾″	72½″	130″	26⅝″	71¼″	8′-0″	18″	45″	41½″	11′-3¼″	“	48½″	8′-9″	9′-6″	26″	60⅛″
M-640D-305-168	22′6″	27′-10″	23′0⅞″	12″	18′-2¾″	24′-10¼″	“	46¾″	42¾″	108″	27⅞″	71½″	6′-9½″	16″	48″	“	9′-2″	“	50″	8′-5″	7′-8″	23⅜″	46⅛″
M-640D-365-144	21′-6″	26′-0″	21′-0⅞″	“	“	“	“	“	40″	“	“	75⅛″	“	“	42½″	“	“	“	“	“	“	18″	“
M-640D-305-144	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	8′-3⅜″	“	“	“
M-640D-256-144	“	“	“	9″	“	“	“	“	44¼″	“	“	71⅝″	“	“	“	“	“	“	“	“	“	“	“
M-640D-305-120	“	“	“	12″	“	“	“	“	64¾″	“	“	75⅛″	“	“	“	“	“	“	“	“	“	“	“
M-456D-305-192	25′-6″	32′-0″	27′-5⅞″	16″	18′-7″	25′-2½″	“	51¾″	72½″	130″	29¾″	71¼″	8′-0″	18″	45″	38⅜″	11′-3¼″	“	48½″	8′-9″	9′-6″	26″	60⅛″
M-456D-305-168	22′-6″	27′-10″	23′-0⅞″	12″	18′-2¾″	24′-10¼″	“	46¾″	42¾″	108″	31″	71½″	6′-9½″	16″	48″	“	9′-2″	“	50″	8′-5″	7′-8″	23⅜″	46⅛″
M-456D-365-144	21′-6″	26′-0″	21′-0⅞″	“	“	“	“	“	40″	“	“	75⅛″	“	“	42½″	“	“	“	“	“	“	18″	“
M-456D-305-144	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	8′-3⅜″	“	“	“
M-456D-256-144	“	“	“	9″	“	“	“	“	44¼″	“	“	71⅝″	“	“	“	“	“	“	“	“	“	“	“
M-456D-365-120	“	“	“	12″	“	“	“	“	64¾″	“	“	75⅛″	“	“	“	“	“	“	“	8′-5″	“	“	“
M-456D-305-120	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	8′-3½″	“	“	“
M-456D-256-120	“	“	“	9″	“	“	“	“	69″	“	“	71⅝″	“	“	“	“	“	“	“	“	“	“	“

NOTE: Do not use above dimensions for foundation. Request foundation plan.

MARK II PUMPING UNIT ASSEMBLIES
GENERAL DIMENSIONS

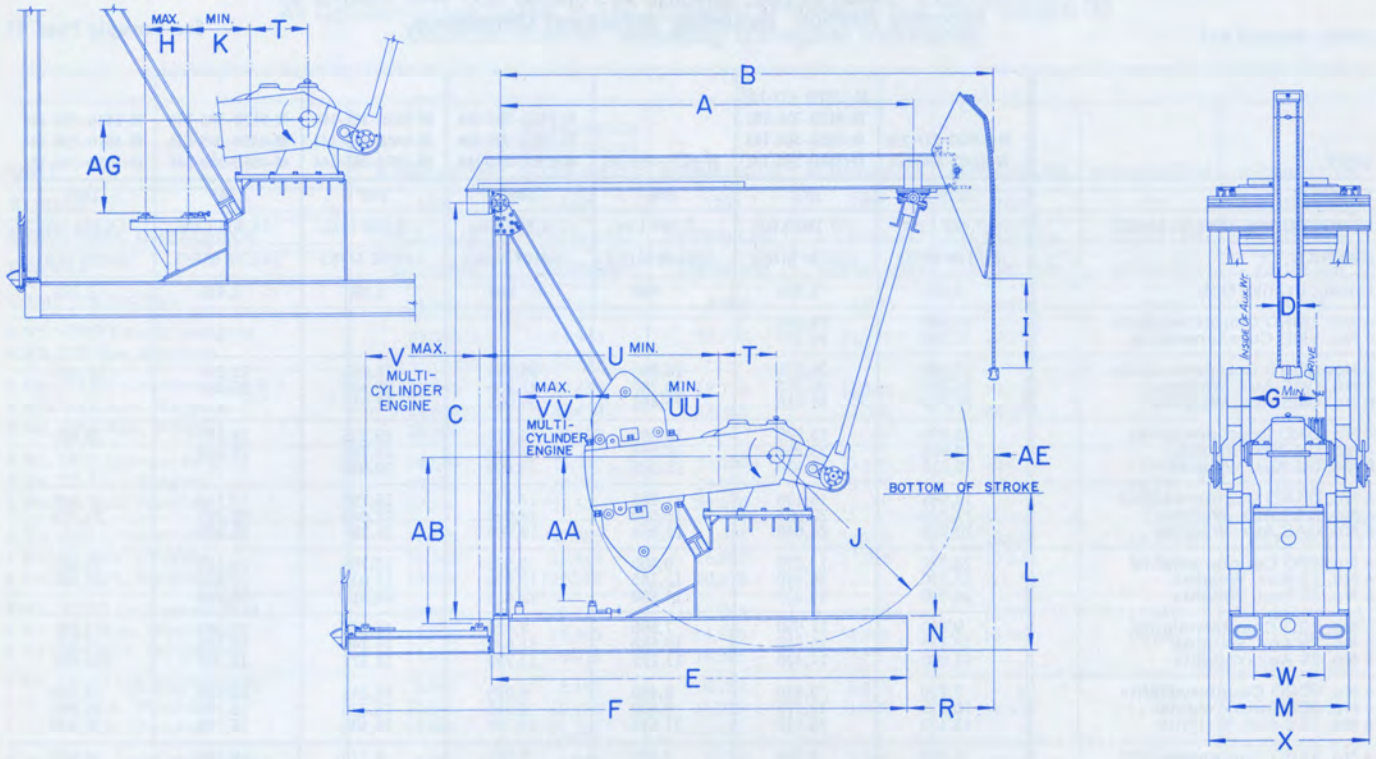

FIGURE 23

UNIT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	R	T	U	V	W	X	AA	AB	AE	AG	UU	VV
M-320D-256-144	21′-6″	26′-0″	21′-0⅞″	9″	21′-3½″	29′-2″	44½″	33¼″	44¼″	108″	35⅛″	79⅝″	69¾″	24″	60″	34″	9′-4⅜″	68⅛″	43½″	7′-4⅜″	7′-2″	9′-0⅛″	18″	46⅛″	7′-4″	51½″
M-320D-305-120	“	“	“	12″	“	*	“	“	64¾″	“	“	83⅛″	“	“	“	“	*	*	“	“	“	*	“	“	“	“
M-320D-256-120	“	“	“	9″	“	*	“	“	69″	“	“	79⅝″	“	“	“	“	*	*	“	“	“	*	“	“	“	“
M-320D-213-120	“	“	“	“	“	*	“	“	“	“	“	“	“	“	“	“	*	*	“	“	“	*	“	“	“	“
M-320D-305-100	“	“	“	12″	“	*	“	“	7′-1″	“	“	82⅝″	“	“	“	“	*	*	“	“	“	*	“	“	“	“
M-320D-256-100	“	“	“	9″	“	*	“	“	7′-5″	“	“	79⅝″	“	“	“	“	*	*	“	“	“	*	“	“	“	“
M-228D-256-120	“	“	“	“	“	*	38⅞″	29¼″	69″	“	41⅛″	“	“	“	“	30″	*	*	37″	6′-9⅛″	“	*	“	47⅞″	7′-8″	“
M-228D-213-120	“	“	“	“	“	*	“	“	“	“	“	“	“	“	“	“	*	*	“	“	“	*	“	“	“	“
M-228D-256-100	“	“	“	“	“	*	“	“	7′-5″	“	“	“	“	“	“	“	*	*	“	“	“	*	“	“	“	“
M-228D-173-100	“	“	“	“	“	*	“	“	“	“	“	“	“	“	“	“	*	*	“	“	“	*	“	“	“	“
M-228D-246-86	15′-6″	18′-6″	15′-8⅜″	“	15′-6½″	21′-0″	“	30¼″	40¾″	86⅛″	22¼″	75⅛″	57″	“	39″	“	8′-7¾″	51½″	“	6′-8⅜″	**	6′-3″	11⅜″	40½″	**	**
M-228D-213-86	“	“	“	“	“	“	“	“	“	“	“	73¼″	“	21″	“	“	“	“	“	“	**	“	“	“	**	**
M-228D-200-74	“	“	“	“	“	“	“	“	52½″	“	“	“	“	“	“	“	“	“	“	“	**	“	“	“	**	**
M-228D-173-74	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	**	“	“	“	**	**
M-160D-213-86	“	“	“	“	“	“	32⅞″	33¼″	40¾″	“	24½″	72⅛″	54″	“	“	26″	8′-11¾″	“	32″	6′-0⅜″	**	“	“	38¾″	**	**
M-160D-173-86	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	**	“	“	“	**	**
M-160D-200-74	“	“	“	“	“	“	“	“	52½″	“	“	73¼″	“	“	“	“	“	“	“	“	**	“	“	“	**	**
M-160D-173-74	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	**	“	“	“	**	**
M-114D-143-86	13′-6″	15′-9″	12′-3½″	“	13′-0¾″	18′-6¼″	29⅜″	30″	14¼″	62″	20⅛″	55⅝″	42¾″	16″	32″	24″	8′-0½″	“	25″	67⅜″	**	50″	16″	31⅛″	**	**
M-114D-173-74	15′-6″	18′-6″	15′-8⅜″	“	15′-6½″	21′-0″	“	30¾″	52½″	86⅛″	28″	73¼″	54″	21″	39″	“	9′-1¾″	“	“	69″	**	6′-3″	11⅜″	43¼″	**	**
M-114D-143-74	13′-6″	15′-9″	12′-3½″	“	13′-0¾″	18′-6¼″	“	30″	26⅛″	62″	20⅛″	55¾″	42¾″	16″	32″	“	8′-0½″	“	“	67⅜″	**	50″	16″	31⅛″	**	**
M-114D-173-64	“	“	“	“	“	“	“	“	20½″	“	“	70⅜″	“	“	“	“	“	“	“	“	**	“	“	“	**	**
M-114D-143-64	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	**	“	“	“	**	**

* On 100″, 120″ and 144″ Stroke Units, on This Page Multi-Cylinder Engines are Mounted on Main Base Beams Forward of Samson Post. See Dimensions UU, VV, and AA.
** On 64″, 74″ and 86″ Stroke Units, Multi-Cylinder Engines are Mounted Behind the Samson Post. See Dimensions U, V and AB.

NOTE: Do not use above dimensions for foundation. Request foundation plan.

MARK II COUNTERBALANCE DATA

All Counterbalance Shown In Lbs., Effective At Polished Rod With Weights At Maximum Position, **Including Structural Unbalance.**

See Example Page 21.

UNIT	M-1280D-427-216 M-912D-305-216	M-1280D-427-192 M-912D-305-192 M-640D-305-192 M-456D-305-192	M-912D-365-168	M-912D-305-168 M-640D-305-168 M-456D-305-168	M-912D-365-144 M-640D-365-144 M-456D-365-144	M-912D-305-144 M-640D-305-144 M-456D-305-144	M-640D-256-144 M-456D-256-144 M-320D-256-144
STROKE	216″	192″	168″	168″	144″	144″	144″
STRUCTURAL UNBALANCE	—7,450 Lbs.	—7,160 Lbs.	—5,385 Lbs.	—4,860 Lbs.	—4,680 Lbs.	—4,300 Lbs.	—4,010 Lbs.
CRANKS	216130 MRO	192130 MRO	168108 MRO	168108 MRO	144108 MRO	144108 MRO	144108 MRO
C'Bal., Cranks Only	1,875	3,365	460	985	3,090	3,470	3,760
4 No. 130RO Counterweights	21,605	24,850	.....	.....	.....	.....	.....
4 No. 130D Counterweights	32,550	36,775	.....	.....	.....	.....	.....
4 No. OORO Counterweights	17,990	20,920	16,040	16,565	21,690	22,065	22,355
4 No. OOS Aux. Weights	22,855	26,215	20,740	21,265	27,300	27,680	.....
8 No. OOS Aux. Weights	27,720	31,510	25,440	25,965	32,910	.....	.....
4 No. ORO Counterweights	15,935	18,675	14,055	14,575	19,315	19,695	19,985
4 No. OS Aux. Weights	20,605	23,760	18,565	19,090	24,700	25,080	.....
8 No. OS Aux. Weights	25,275	28,850	23,075	23,605	30,085	.....	.....
4 No. OARO Counterweights	13,595	16,130	11,945	12,470	16,795	17,180	17,470
4 No. OAS Aux. Weights	17,225	20,085	15,500	16,025	21,040	21,425	21,710
8 No. OAS Aux. Weights	20,855	24,040	19,055	19,580	25,285	25,670	.....
4 No. 1RO Counterweights	10,970	13,275	9,400	9,925	13,755	14,135	14,425
4 No. 1S Aux. Weights	13,770	16,340	12,145	12,670	17,035	17,415	17,705
8 No. 1S Aux. Weights	16,570	19,365	14,890	15,415	20,315	20,695	.....
4 No. 2RO Counterweights	9,430	11,590	7,895	8,420	11,965	12,345	12,635
4 No. 2S Aux. Weights	12,135	14,535	10,560	11,085	15,145	15,525	15,815
8 No. 2S Aux. Weights	14,840	17,480	13,225	13,750	18,325	18,705	*18,995
4 No. 3CRO Counterweights	7,910	9,940	6,450	6,975	10,240	10,620	10,910
4 No. 3BS Aux. Weights	10,515	12,775	9,030	9,555	13,320	13,700	13,990
8 No. 3BS Aux. Weights	13,120	15,610	11,610	12,135	16,400	16,780	*17,070
4 No. 5ARO Counterweights	6,200	8,085	4,800	5,325	8,270	8,650	8,940
4 No. 5A Aux. Weights	7,950	9,985	6,555	7,080	10,365	10,745	11,035
8 No. 5A Aux. Weights	9,700	11,885	8,310	8,835	12,460	12,840	*13,130
4 No. 5CRO Counterweights	5,050	6,820	3,655	4,180	6,895	7,275	7,565
4 No. 5C Aux. Weights	6,620	8,530	5,230	5,755	8,780	9,160	9,450
8 No. 5C Aux. Weights	8,190	10,240	6,805	7,330	10,665	11,045	*11,335
4 No. 6RO Counterweights	4,285	5,985	2,880	3,405	5,970	6,350	6,640
4 No. 6 Aux. Weights	5,190	6,975	3,790	4,315	7,060	7,440	7,730
8 No. 6 Aux. Weights	6,095	7,965	4,700	5,225	8,150	8,530	8,820
4 No. 7RO Counterweights	3,400	5,025	2,000	2,525	4,925	5,305	5,595
4 No. 7 Aux. Weights	4,085	5,770	2,690	3,215	5,745	6,125	6,415
8 No. 7 Aux. Weights	4,770	6,515	3,380	3,905	6,565	6,945	7,235

UNIT	M-320D-305-100	M-320D-256-100	M-228D-256-100	M-228D-173-100	M-228D-246-86	M-228D-213-86 M-160D-213-86	M-160D-173-86	M-114D-143-86
STROKE	100″	100″	100″	100″	86″	86″	86″	86″
STRUCTURAL UNBALANCE	—3,700 Lbs.	—3,470 Lbs.	—3,285 Lbs.	—3,175 Lbs.	—2,140 Lbs.	—2,040 Lbs.	—1,930 Lbs.	—1,535 Lbs.
CRANKS	100108 MR	100108 MR	100108 MR	100108 MR	8686 MR	8686 MR	8686 MR	8662 MR
C'Bal., Cranks Only	4,660	4,890	5,075	5,185	2,715	2,815	2,925	1,525
4 No. 1RO Counterweight	19,440	19,670	19,850	19,960	15,600	15,700	15,810	9,525
4 No. 1S Aux. Weights	23,980	24,210	24,395	24,505	19,565	19,665	19,775	11,980
4 No. 2RO Counterweights	16,955	17,185	17,370	17,480	13,480	13,580	13,690	8,270
4 No. 2S Aux. Weights	21,360	21,590	21,775	21,885	17,335	17,435	17,545	10,690
4 No. 3CRO Counterweights	14,560	14,790	14,975	15,085	11,495	11,595	11,705	7,200
4 No. 3BS Aux. Weights	18,830	19,060	19,245	19,355	15,280	15,380	15,490	9,640
4 No. 5ARO Counterweights	11,840	12,070	12,255	12,365	9,190	9,290	9,400	5,880
4 No. 5A Aux. Weights	14,740	14,970	15,155	15,265	11,890	11,990	12,100	7,650
4 No. 5CRO Counterweights	9,935	10,165	10,350	10,460	7,495	7,595	7,705	4,770
4 No. 5C Aux. Weights	12,545	12,775	12,960	13,070	9,860	9,955	10,070	6,375
4 No. 6RO Counterweights	8,655	8,885	9,070	9,180	6,435	6,535	6,645	4,080
4 No. 6 Aux. Weights	10,160	10,390	10,575	10,685	7,840	7,940	8,050	5,045
8 No. 6 Aux. Weights	11,665	11,895	12,080	12,190	9,245	.....	.....	6,010
4 No. 7RO Counterweights	7,200	7,430	7,615	7,725	5,095	5,195	5,305	3,180
4 No. 7 Aux. Weights	8,340	8,570	8,755	8,865	6,160	6,260	6,370	3,925
8 No. 7 Aux. Weights	9,480	9,710	9,895	10,005	7,225	.....	.....	4,680

*8 Type S Aux. Weights will not clear Belt Cover on M-320D unit.

MARK II COUNTERBALANCE DATA

All Counterbalance Shown In Lbs., Effective At Polished Rod With Weights At Maximum Position, **Including Structural Unbalance.** See Example below.

UNIT	M-456D-365-120	M-640D-305-120 M-456D-305-120 M-320D-305-120	M-456D-256-120	M-320D-256-120	M-228D-256-120	M-320D-213-120	M-228D-213-120
STROKE	120″	120″	120″	120″	120″	120″	120″
STRUCTUAL UNBALANCE	—4,510 Lbs.	—4,130 Lbs.	—3,840 Lbs.	—3,620 Lbs.	—3,435 Lbs.	—3,560 Lbs.	—3,235 Lbs.
CRANKS	120108 MR	120108 MR	120108 MR	120108 MR	120108 MR	120108 MR	120108 MR
C'Bal. Cranks Only	1,990	2,370	2,660	2,880	3,070	2,940	3,270
4 No. ORO Counterweights	21,065	21,445	21,735	21,955	22,140	.....	.....
4 No. OS Aux. Weights	27,395	27,775	.....	.....	.....	.....	.....
4 No. OARO Counterweights	18,105	18,485	18,775	18,995	19,180	19,055	19,380
4 No. OAS Aux. Weights	23,095	23,475	23,765	23,985	24,170	.....	.....
8 No. OAS Aux. Weights	28,085	*28,465	.....	.....	.....	.....	.....
4 No. 1RO Counterweights	14,530	14,910	15,200	15,420	15,605	15,480	15,805
4 No. 1S Aux. Weights	18,385	18,765	19,055	19,275	19,460	19,335	19,660
8 No. 1S Aux. Weights	22,240	*22,620	22,910	.....	.....	.....	.....
4 No. 2RO Counterweights	12,425	12,805	13,095	13,315	13,500	13,375	13,700
4 No. 2S Aux. Weights	16,165	16,545	16,855	17,055	17,240	17,115	17,440
8 No. 2S Aux. Weights	19,905	*20,285	20,575	.....	.....	.....	.....
4 No. 3CRO Counterweights	10,395	10,775	11,065	11,285	11,470	11,345	11,670
4 No. 3BS Aux. Weights	14,015	14,395	14,685	14,905	15,090	14,965	15,290
8 No. 3BS Aux. Weights	17,635	*18,015	18,305	.....	.....	.....	.....
4 No. 5ARO Counterweights	8,085	8,465	8,755	8,975	9,160	9,035	9,360
4 No. 5A Aux. Weights	10,545	10,925	11,215	11,435	11,620	11,495	11,820
8 No. 5A Aux. Weights	13,005	*13,385	13,675	.....	.....	.....	.....
4 No. 5CRO Counterweights	6,470	6,845	7,140	7,360	7,545	7,420	7,745
4 No. 5C Aux. Weights	8,685	9,060	9,355	9,575	9,755	9,630	9,960
8 No. 5C Aux. Weights	10,900	*11,275	11,570	.....	.....	.....	.....
4 No. 6RO Counterweights	5,385	5,765	6,055	6,275	6,460	6,335	6,660
4 No. 6 Aux. Weights	6,660	7,040	7,330	7,550	7,735	7,610	7,935
8 No. 6 Aux. Weights	7,035	8,315	8,605	8,825	9,010	8,885	9,210
4 No. 7RO Counterweights	4,150	4,530	4,820	5,040	5,225	5,100	5,425
4 No. 7 Aux. Weights	5,115	5,495	5,785	6,005	6,190	6,065	6,390
8 No. 7 Aux. Weights	6,080	6,460	6,750	6,970	7,155	7,030	7,355

*8 Type S Aux. Weights will not clear Belt Cover on M-320D Unit.

UNIT	M-228D-200-74	M-160D-200-74	M-228D-173-74 M-160D-173-74	M-114D-173-74	M-114D-143-74	M-114D-173-64 M-114D-143-64
STROKE	74″	74″	74″	74″	74″	64″
STRUCTURAL UNBALANCE	—1,960 Lbs.	—1,890 Lbs.	—1,860 Lbs.	—1,820 Lbs.	—1,440 Lbs.	—1,420 Lbs.
CRANKS	7486 MR	7486 MR	7486 MR	7486 MR	7462 MR	6462 MR
C'Bal., Cranks Only	3,685	3,755	3,785	3,825	2,230	2,845
4 No. 2RO Counterweights	15,990	16,060	16,090	16,130	9,890	11,580
4 No. 2S Aux. Weights	.....	.....	.....	.....	12,630	14,710
4 No. 3CRO Counterweights	13,720	13,790	13,820	13,860	8,670	10,190
4 No. 3BS Aux. Weights	18,045	18,115	18,145	18,185	11,445	13,355
4 No. 5ARO Counterweights	11,085	11,155	11,185	11,225	7,170	8,485
4 No. 5A Aux. Weights	14,080	14,150	14,180	14,220	9,180	10,775
4 No. 5CRO Counterweights	9,145	9,215	9,245	9,285	5,910	7,045
4 No. 5C Aux. Weights	11,845	11,915	11,945	11,985	7,730	9,125
4 No. 6RO Counterweights	7,935	8,005	8,035	8,075	5,130	6,150
4 No. 6 Aux. Weights	9,540	9,610	9,640	9,680	6,225	7,400
8 No. 6 Aux. Weights	11,145	.....	.....	11,285	7,320	8,650
4 No. 7RO Counterweights	6,400	6,470	6,500	6,540	4,105	4,985
4 No. 7 Aux. Weights	7,625	7,695	7,725	7,765	4,950	5,950
8 No. 7 Aux. Weights	8,850	.....	.....	8,990	5,795	6,915

EXAMPLE:
A M-456D-305-144 with 4 No. ORO Counterweights and 4 No. OS Auxiliary Weights would have a maximum counterbalance effect of 25,080 lbs. in the 144″ stroke. (See other examples, pages 12 and 13.
Structural Unbalance with a negative (—) sign indicates a walking beam assembly that is heavy on the well end.

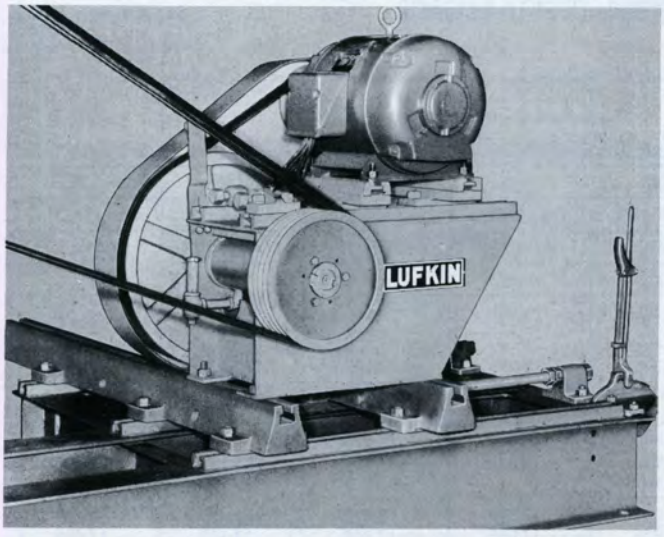

FIGURE 24

This assembly utilizes an electric motor and countershaft and provides a reduction ratio up to 4:1. This compact reduction unit package will fit on conventional slide rails and was designed for use with single reduction gear reducers where slow pumping speeds are encountered. This type assembly is manufactured in two sizes:

No. 1—25-50 HP
No. 2—up to 20 HP

FOUNDATION ANCHOR NUTS

Suspended in concrete forms before foundation is poured.

Provides flush foundation. Wide foot at base of nut insures more than adequate holding power.

Available in the following sizes:

BOLT DIA.	Length
¾″	6″
1″	10″
1¼″	12″
1½″	12″

FIGURE 25

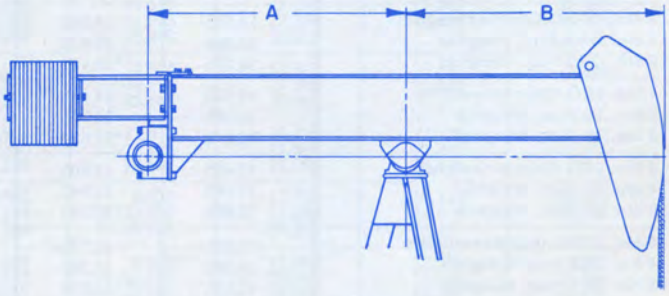

FIGURE 26

BEAM EXTENSIONS FOR EXTRA COUNTERBALANCE

These extensions are available for older units as well as current units. They are made in two sizes and can be adapted to crank balanced units now in service by burning 8 holes in the walking beam.

Extension	Max. Weight Added, Lbs.	Distance from Equalizer Bearing to Center of Weights	Max. Counterbalance Added, Lbs.*
48″	2600	28″	2600(A+28″) ÷ B
60″	4000	40″	4000(A+40″) ÷ B

*For the A and B dimensions refer to the General Dimensions Sheet of the particular unit in question.

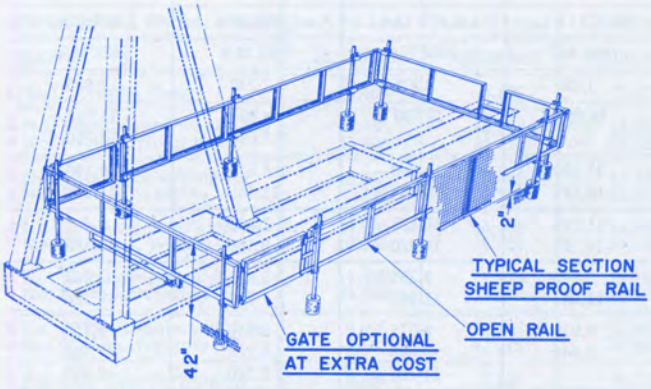

FIGURE 27

RAIL TYPE CRANK GUARDS

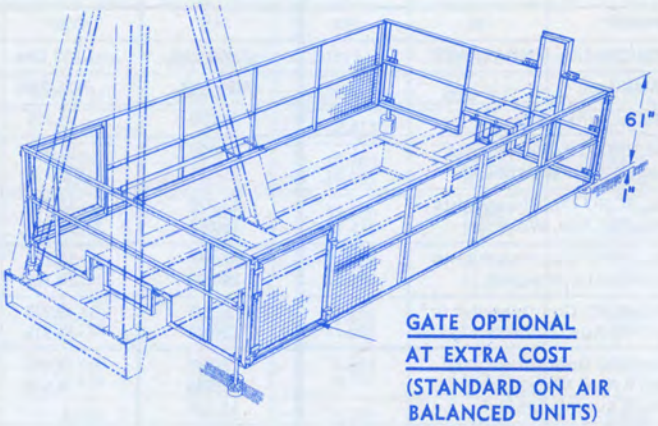

FIGURE 28

TYPE W SHEEP PROOF CRANK GUARDS

Open rail type and sheep proof crank guards are available from stock for all Lufkin Units. No holes required in Base or Post—clamps to top flange of Base and to Post—and can be fitted to any Lufkin unit. Sides are hinged and can be easily removed. Sheep Proof guards are 2 x 2 wire mesh with angle rails.

LUFKIN AIR BALANCED PUMPING UNITS

1. **Perfect counterbalance with finger-tip control.**
2. **Lower installation cost.**
3. **Compact and portable; ideal for well testing.**
4. **Small size and lighter weight make it ideal for export.**
5. **Stroke lengths to 25 feet for high volume production from great depths.**

These are some of the outstanding advantages of LUFKIN AIR BALANCED PUMPING UNITS. These units employ compressed air to counterbalance the well load rather than beam weights or crank weights. The air system has been so simplified that the only continuously operating parts are the balance cylinder and piston. The reservoir capacity of the cylinder is enlarged by a steel receiver which moves with the cylinder as a unit.

On engine-driven units, when the system is in need of air, an automatic regulator engages an air operated clutch (driven by one belt from the unit sheave) and replaces any lost air. The operator sets regulator, initially, at a pressure sufficient to counterbalance well load, and this pressure is maintained automatically. Should the load change appreciably, a slight adjustment of this regulator will restore perfect counterbalance.

A safety shut-off switch is available, which will ground out engine, or shut off motor, if pressure should exceed a preset figure or fall below a minimum pre-set figure.

For units pumping with electricity, a separate motor-driven compressor assembly is standard equipment.

Since the Lufkin Air Balanced Units are approximately 35% shorter and 40% lighter than crank-type units, they are ideal for use as portable or test units, and for installation on piling or superstructures. Since changing counterbalance effect is a matter of adjusting a valve, the air balanced unit is ideal for use in testing wells.

All the ruggedness and simplicity of the conventional Lufkin Pumping Units are incorporated in the design of the Lufkin Air Balanced Pumping Unit.

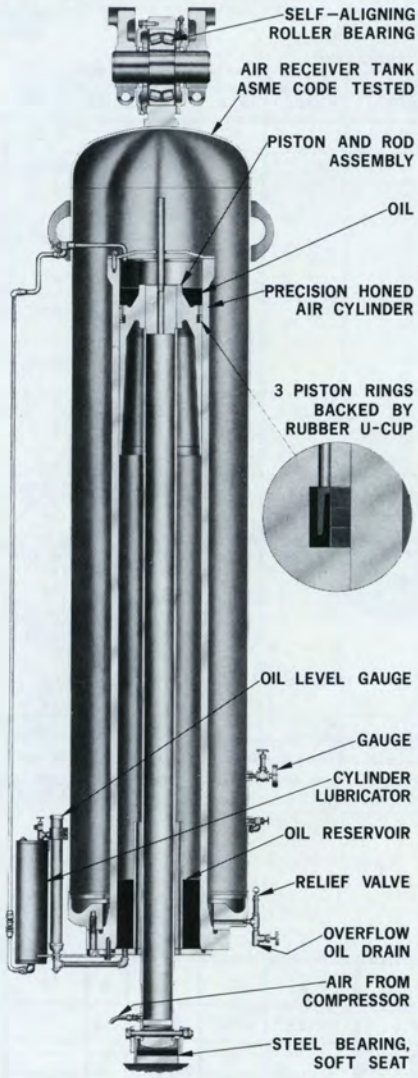

FIGURE 29

FIGURE 30

Mobile A-456D-365-120 Air Balanced Unit, Multi-Cylinder Engine Drive. This trailer-mounted unit with prime mover and diesel fuel tank built integral is ideal for test purposes.

FIGURE 31

A-456D-305-144 Air Balanced Unit, Electric Motor Drive.

LUFKIN AIR BALANCED PUMPING UNITS
GENERAL DIMENSIONS

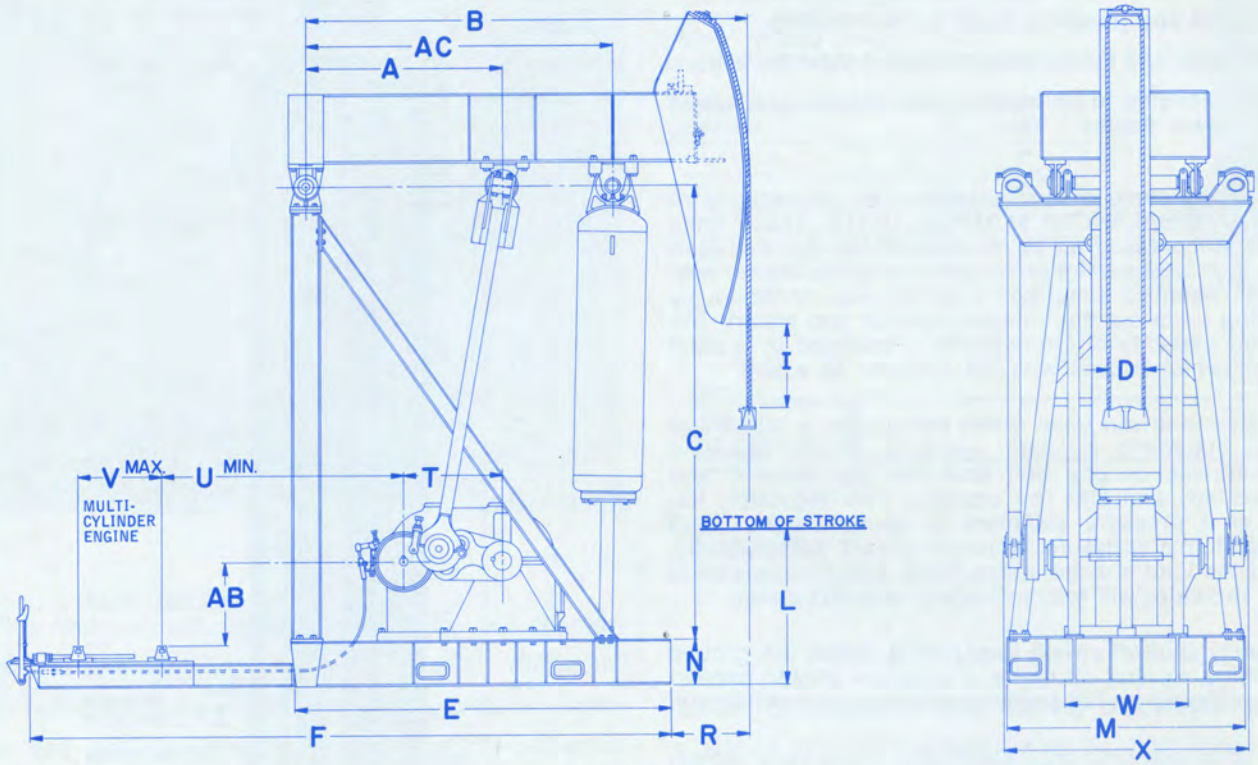

FIGURE 32

UNIT	A	B	C	D	E	F	I	L	M	N	R	T	U	V	W	X	AB	AC
A-2560D-470-240	11′-2½″	28′-0″	25′-3½″	16″	*	32′-0″	16″	57½″	8′-10″	21″	48″	70″	7′-9½″	44¾″	66¼″	10′-10⅝″	36″	19′-5½″
A-1824D-470-240	"	"	"	"	*	"	"	"	8′-0″	"	"	58⅞″	8′-8⅝″	"	50¼″	9′-7⅝″	30″	"
A-1824D-427-216	10′-1½″	25′-8″	23′-6″	"	22′-0⅝″	29′-9⅞″	18¾″	57¼″	7′-11½″	"	"	"	8′-1″	41″	"	"	34⅞″	14′-3½″
A-1824D-427-192	"	23′-0″	21′-0″	"	19′-4⅝″	27′-1⅞″	17½″	52″	"	"	"	"	"	"	"	"	"	"
A-1280D-470-240	11′-2½″	28′-0″	25′-3½″	"	*	32′-0″	16″	57½″	8′-0″	"	"	52½″	9′-3″	44¾″	"	9′-1⅝″	30″	19′-5½″
A-1280D-427-216	10′-1½″	25′-8″	23′-6″	"	22′-0⅞″	29′-9⅞″	18¾″	57¼″	7′-11½″	"	"	"	8′-7⅜″	41″	"	"	34⅞″	14′-3½″
A-1280D-427-192	"	23′-0″	21′-0″	"	19′-4⅝″	27′-1⅞″	17½″	52″	"	"	"	"	"	44¾″	"	"	"	"
A-1280D-305-168	7′-4″	19′-3″	20′-4″	"	14′-10½″	22′-0½″	16″	66½″	"	16⅛″	59″	"	6′-0″	"	"	8′-11⅛″	38⅛″	10′-11½″
A-912D-470-240	11′-2½″	28′-0″	25′-3½″	"	*	32′-0″	"	57½″	8′-10″	21″	48″	48½″	9′-7″	"	50″	8′-6⅝″	24″	19′-5½″
A-912D-427-216	10′-1½″	25′-8″	23′-6″	"	22′-0⅞″	29′-9⅞″	18¾″	57¼″	"	"	"	"	9′-2″	"	"	"	28⅞″	14′-3½″
A-912D-427-192	"	23′-0″	21′-0″	"	19′-4⅝″	27′-1⅞″	17½″	52″	"	"	"	"	"	"	"	"	"	"
A-912D-305-168	7′-4″	19′-3″	20′-4″	"	14′-10½″	22′-0½″	16″	66½″	"	16⅛″	59″	"	6′-4″	"	"	8′-4⅛″	32⅛″	10′-11½″
A-912D-427-144	"	16′-8″	17′-10″	"	12′-3½″	19′-5½″	20½″	55″	"	"	"	"	"	"	"	"	"	"
A-640D-305-168	"	19′-3″	20′-4″	"	14′-10½″	22′-0½″	16″	66½″	"	"	"	41½″	7′-0″	"	46¾″	"	30⅛″	"
A-640D-427-144	"	16′-8″	17′-10″	"	12′-3½″	19′-5½″	20½″	55″	"	"	"	"	"	"	"	"	"	"
A-640D-305-144	6′-5″	17′-4″	"	12″	12′-11¼″	20′-1¼″	12½″	62½″	7′-6″	"	57″	"	7′1⅛″	"	"	"	"	9′-10″
A-640D-365-120	"	14′-7″	15′-7″	"	10′-11¾″	18′-1¾″	22″	49½″	"	"	47½″	"	"	"	"	"	"	"
A-456D-305-144	"	17′-4″	17′-10″	"	12′-11¼″	20′-1¼″	12½″	62½″	"	"	57″	38⅛″	6′-2″	"	"	"	"	"
A-456D-365-120	"	14′-7″	15′-7″	"	10′-11¾″	18′-1¾″	22″	49½″	"	"	47½″	"	"	"	"	"	"	"
A-456D-256-120	69″	15′-4″	"	"	11′-11¾″	19′-1″	14½″	57″	7′-1½″	"	"	"	"	"	"	"	"	8′-8″
A-320D-256-120	70″	"	"	"	11′-3¼″	18′-11¼″	"	"	"	"	53″	34″	6′-6″	"	43¼″	7′-3⅜″	"	8′-11″
A-320D-305-100	"	12′-11″	13′-4″	"	10′-0¼″	17′-8¼″	13″	53″	"	"	39″	"	"	"	"	"	"	"
A-228D-173-100	56″	12′-7″	12′-5″	"	8′-3¼″	15′-0¼″	17″	46¾″	6′-1½″	"	36″	30″	47″	50″	37¼″	6′-8⅜″	29⅛″	7′-3½″
A-228D-246-86	"	10′-11″	"	"	"	"	"	52¾″	"	"	"	"	"	"	"	"	"	"
A-160D-200-74	50″	10′-0″	11′-9″	"	7′-11″	14′-6¾″	16½″	51″	"	9¾″	35½″	26″	57″	43½″	32″	69⅞″	22″	6′-5½″
A-114D-173-64	48″	9′-7″	11′-0″	9″	7′-5½″	14′-5¾″	15″	55½″	63¾″	"	36″	24″	64″	42″	25¼″	66⅞″	13¾″	6′-0½″

* Portable Base is Standard. One Piece and Portable Bases Available on All Units.

NOTE: Do not use above dimensions for foundation. Request foundation plan.

RATING CHART

UNIT	Polish Rod Load Class, Lbs.	Stroke Length, Inches	Piston Dia., Inches	Walking Beam Size	Wireline Hanger Dia. & Centers	*Floating Hub Sheave Sizes, P.D. Inches	Bearings			
							Crank Pin	Equal-izer	Samson Post	Air Tank
A-2560D-470-240	47,000	240-200	14½	36 x 16½ @ 245#	1⅜" x 16"	68" (16D)	OT	E32	P19	334
A-1824D-470-240	"	"	"	"	"	40, 46, 51, 55, 68 (11D)	"	E26	"	"
A-1824D-427-216	42,700	216-190-162	"	33 x 15¾ @ 201#	"	"	"	"	"	"
A-1824D-427-192	"	192-168-144	"	"	"	"	"	"	"	"
A-1280D-470-240	47,000	240-200	"	36 x 16½ @ 245#	"	40, 46, 51, 55, 68 (10D)	"	"	"	"
A-1280D-427-216	42,700	216-190-162	"	33 x 15¾ @ 201#	"	"	"	"	"	"
A-1280D-427-192	"	192-168-144	"	"	"	"	"	"	"	"
A-1280D-305-168	30,500	168-141-118	13	27 x 14 @ 161#	"	"	"	"	"	232
A-912D-470-240	47,000	240-200	14½	36 x 16½ @ 245#	"	28, 34, 40, 46, 51 (8D)	"	"	"	334
A-912D-427-216	42,700	216-190-162	"	33 x 15¾ @ 201#	"	"	"	"	"	"
A-912D-427-192	"	192-168-144	"	"	"	"	"	"	"	"
A-912D-305-168	30,500	168-141-118	13	27 x 12 @ 146#	"	28, 34, 40, 46, 51, (7D)	"	"	"	232
A-912D-427-144	42,700	144-120-100	"	27 x 14 @ 161#	"	"	"	"	"	"
A-640D-305-168	30,500	168-141-118	"	27 x 12 @ 146#	"	28, 34, 40, 46, 51, (6D)	"	"	"	"
A-640D-427-144	42,700	144-120-100	"	27 x 14 @ 161#	"	"	"	"	"	"
A-640D-305-144	30,500	"	12	27⅜ x 12¾ @ 146#	1¼" x 12"	"	"	"	P18	326
A-640D-365-120	36,500	120-100-86	"	"	"	"	"	"	"	"
A-456D-305-144	30,500	144-120-100	"	"	"	28,34,40,46,51(6D or 8C)	"	"	"	"
A-456D-365-120	36,500	120-100-86	"	"	"	"	"	"	"	"
A-456D-256-120	25,600	120-104-90	11	24 x 12¾ @ 104#	"	"	"	"	"	324
A-320D-256-120	"	"	"	"	"	25, 30, 36, 42, 47¼ (6C or 5D)	2T	E22	"	"
A-320D-305-100	30,500	100-86-74	"	"	"	"	"	"	"	"
A-228D-173-100	17,300	"	10	21 x 12 @ 101#	1⅛" x 12"	24¼, 30, 36, 41¼ (5C or 4D)	"	"	P17	322
A-228D-246-86	24,600	86-74-64	"	"	"	"	"	"	"	"
A-160D-200-74	20,000	74-64-54	"	18¼ x 11 @ 76#	"	24¼, 29¼, 33¼, 38 (4C or 3D)	3TA	E19	P16	"
A-114D-173-64	17,300	64-54	8	16 x 8½ @ 67#	1" x 9"	19¼,24,29¼,33¼, (3C)	"	E18	"	318

*Standard Sheave Sizes Shown are Floating Hub Sheaves for Clutch Driven Compressors; Largest Size Shown is Maximum Available. For Electric Motor Driven Compressors, Use Solid Type Reducer Sheave as Shown in Crank Balance Unit Specifications.

COUNTERBALANCE DATA

Effective Counterbalance In Pounds Based On Average Pressure

UNIT	*Average Pressure, PSIG											
	150	175	200	225	250	275	300	325	350	375	400	410
A-2560D-470-240 A-1824D-470-240 A-1280D-470-240 A-912D-470-240	.....	2,870	5,740	8,610	11,480	14,350	17,220	20,090	22,960	25,830	28,700	29,850
A-1824D-427-216 A-1280D-427-216 A-912D-427-216	920	3,220	5,520	7,820	10,120	12,420	14,720	17,020	19,320	21,620	23,920	24,830
A-1824D-427-192 A-1280D-427-192 A-912D-427-192	3,905	6,475	9,045	11,615	14,185	16,755	19,325	21,895	24,465	27,035	29,605	30,635
A-1280D-305-168 A-912D-305-168 A-640D-305-168	2,810	4,700	6,585	8,475	10,365	12,250	14,140	16,030	17,915	19,805	21,695	22,450
A-912D-427-144 A-640D-427-144	5,240	7,420	9,605	11,785	13,970	16,150	18,335	20,515	22,700	24,880	27,065	27,935
A-640D-305-144 A-456D-305-144	3,520	5,125	6,725	8,330	9,935	11,540	13,145	14,745	16,350	17,955	19,560	20,200
A-640D-365-120 A-456D-365-120	4,725	6,630	8,535	10,440	12,345	14,250	16,155	18,060	19,965	21,870	23,775	24,535
A-456D-256-120 A-320D-256-120	4,035	5,415	6,795	8,175	9,560	10,940	12,320	13,700	15,085	16,465	17,845	18,400
A-320D-305-100	4,855	6,495	8,135	9,775	11,415	13,055	14,695	16,335	17,975	19,615	21,255	21,910
A-228D-173-100	2,925	4,060	5,195	6,335	7,470	8,610	9,745	10,885	12,020	13,160	14,295	14,750
A-228D-246-86	4,045	5,355	6,670	7,980	9,295	10,605	11,920	13,230	14,545	15,855	17,170	17,695
A-160D-200-74	4,410	5,680	6,945	8,215	9,480	10,750	12,015	13,285	14,550	15,820	17,085	17,595
A-114D-173-64	2,760	3,550	4,345	5,135	5,930	6,720	7,515	8,305	9,100	9,890	10,685	11,000

*Pressure Shown is Average Pressure Between Maximum and Minimum and Occurs at Approximately Beam Horizontal Position. For Counterbalance at Other Pressures Use Direct Interpolation.

USEFUL FORMULAS

STROKES PER MINUTE

$$SPM = \frac{RPM}{R} \times \frac{d}{D}$$

Example:

RPM = 1170 Revolutions per minute of prime mover
R = 30.12 (320D Gear Reducer)
d = 12" Pitch Diameter of Prime Mover Sheave
D = 47" Pitch Diameter of Gear Reducer Sheave

$$SPM = \frac{1170}{30.12} \times \frac{12}{47} = 9.9$$

PRIME MOVER SHEAVE DIAMETER

$$d = \frac{SPM \times R \times D}{RPM}$$

Example:

SPM = 12 Strokes Per Minute
R = 30.12 Ratio (320D Gear Reducer)
D = 47" Pitch Diameter of Gear Reducer Sheave
RPM = 1170 Revolutions Per Minute of Prime Mover

$$d = \frac{12 \times 30.12 \times 47}{1170} = 14.5 \text{ Inches}$$

Use nearest size available depending upon belt section and number of grooves in sheave.

BELT VELOCITY

$$v = \frac{\pi \times d \times RPM}{12}$$

Limit Between 2000 and 5000 feet per min.
Belt Velocity less than 2000 FPM results in poor belt life
Belt Velocity greater than 5000 FPM requires dynamically balanced sheaves.

Example:

d = 14.5 Inch Pitch Diameter
RPM = 1170 Revolutions per minute of Prime Mover

$$v = \frac{3.1416 \times 14.5 \times 1170}{12} = 4441 \text{ FPM}$$

CENTER DISTANCE

$$CD = \sqrt{\left(U + \frac{V}{2}\right)^2 + (AB - b)^2}$$

$$\text{also} = \sqrt{\left(UU + \frac{VV}{2}\right)^2 + (AA - b)^2}$$

Example:

Assume Hi-Prime Electric Motor
Driven C-320D-256-100 Conventional Unit

UU = 30.375 (See General Dimensions)
VV = 34.25 (See General Dimensions)
AA = 53 (See General Dimensions)
b = 8 (Assume 25 HP, Frame 324T Motor)

$$CD = \sqrt{\left(30.375 + \frac{34.25}{2}\right)^2 + (53 - 8)^2}$$

CD = 65.43 Inches

BELT LENGTH

$$PL = 2\,CD + 1.57\,(D + d) + \frac{(D - d)^2}{4 \times CD}$$

Example:

CD = 65.43 Inch Center Distance of Shafts
D = 47 Inch Pitch Diameter of Gear Reducer Sheave
d = 14.5 Inch Pitch Diameter of Prime Mover Sheave

$$PL = 2 \times 65.43 + 1.57\,(47 + 14.5) + \frac{(47 - 14.5)^2}{4 \times 65.43}$$

PL = 231.45 Inches

Use C225 or D225 Belts Depending on Sheaves Selected.

HORSEPOWER OF PRIME MOVER

For High Slip Electric Motors and Slow Speed Engines

$$HP = \frac{BPD \times Depth}{56000}$$

For Normal Slip Electric Motors and Multi-cylinder Engines

$$HP = \frac{BPD \times Depth}{45000}$$

Multiply HP by 0.8 for Mark II Units

Example:

BPD = 217 @ 100% pump efficiency

Depth = 5600 Feet pump setting

Assume High Slip (Nema D) Motor)

$$HP = \frac{217 \times 5600}{56000} = 21.7, \text{ use 25 HP Motor}$$

Maximum Strokes Per Minute Based on the Free Fall Speed of the Rod

Conventional Units

$$SPM = .7\sqrt{\frac{60000}{L}}$$

Air Balanced Units

$$SPM = .63\sqrt{\frac{60000}{L}}$$

Mark II Units

$$SPM = .56\sqrt{\frac{60000}{L}}$$

Example:

Assume C-320D-256-100 Unit

$$SPM = .7\sqrt{\frac{60000}{100}} = 17.15 \text{ SPM Maximum}$$

DEFINITION OF SYMBOLS USED:

SPM = Strokes Per Minute
RPM = Revolutions Per Minute of Prime Mover
R = Gear Reducer Ratio
D = Gear Reducer Sheave Pitch Diameter, Inches
d = Prime Mover Sheave Pitch Diameter, Inches
v = Belt Velocity, Feet per Minute
π = 3.1416 (Pi)
PL = Belt Pitch Length, Inches
CD = Shaft Center Distance, Inches
U = See General Dimensions
V = See General Dimensions
AB = See General Dimensions
UU = See General Dimensions
VV = See General Dimensions
AA = See General Dimensions
b = Prime Mover Backing (Vertical Distance from Mounting Feet to Center to Shaft), In.
HP = Horsepower
BPD = Barrels Per Day at 100% Pump Efficiency
Depth = Pump Setting, Feet
L = Stroke Length, Inches

LUFKIN PUMPING UNITS NOMENCLATURE

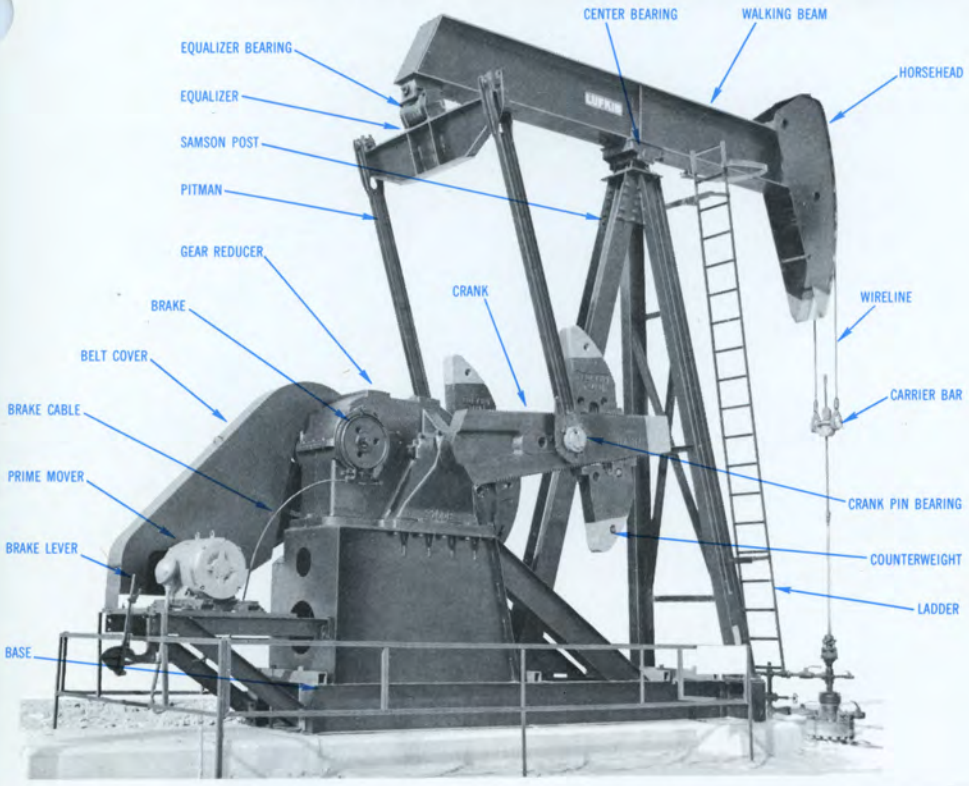

FIGURE 33

Conventional Pumping Unit Nomenclature

Reprints Available
Request Forms
F-1079 for Conventional Pumping Unit,
F-1080 for Mark II Pumping Unit, and
F-1081 for Air Balanced Pumping Unit

Also Available in Spanish

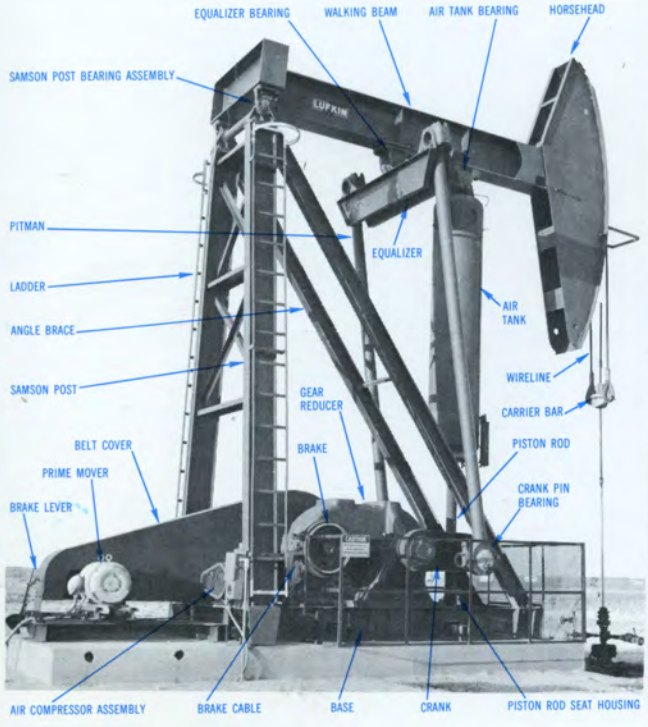

FIGURE 34

Air Balanced Pumping Unit

FIGURE 35

Mark II Pumping Unit

Printed in U.S.A.