

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



MARK II UNITORQUE UNITS

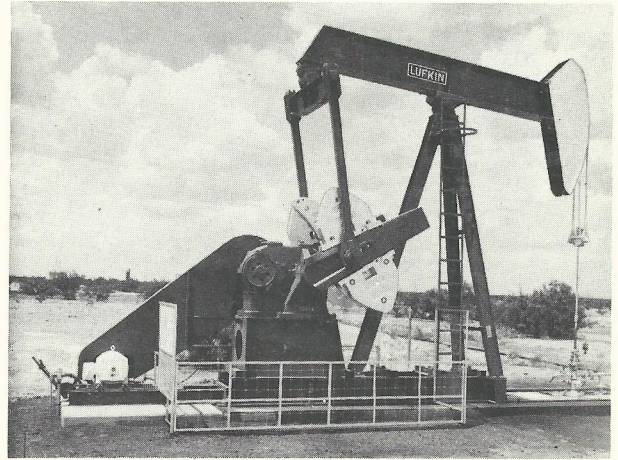
The Mark II unit, due to its unique geometry and phased counterbalance feature, lowers peak torque and horsepower requirements. The unusual geometry of the Mark II produces a somewhat slower up stroke and faster down stroke with reduced acceleration where the load is greatest, resulting in lower peak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

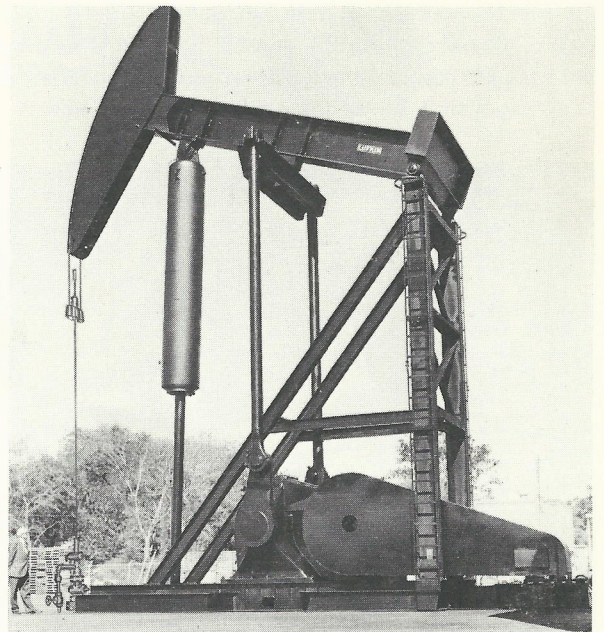


COMPUTER SERVICE IS AVAILABLE TO AID IN SIZING PUMPING UNITS, SUCKER RODS, AND PUMPS TO INSURE MAXIMUM PRODUCTION AND OPTIMUM UTILIZATION OF EQUIPMENT.



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.

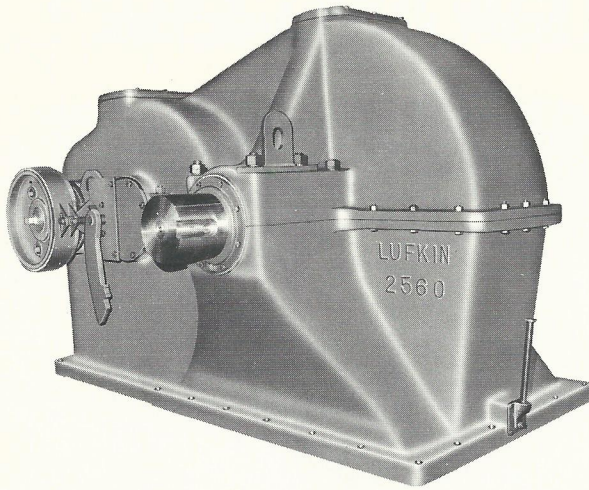
DOUBLE REDUCTION GEAR UNITS

FIGURE 1
2560D Double Reduction Gear Unit

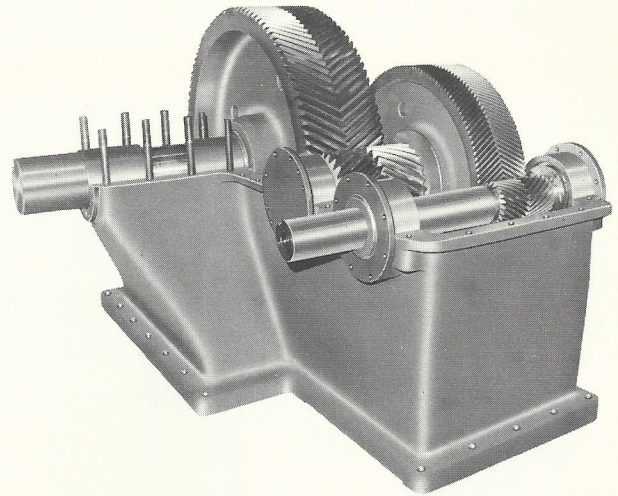


FIGURE 2
2560D Double Reduction Gear Unit, cover removed

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.: 11 $\frac{3}{4}$ "
SHEAVE: 55", 68" P.D.—12D
6-1/2" 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.—10D
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.: 8 $\frac{1}{2}$ " (Mark II, 10 $\frac{1}{2}$ "")
SHEAVE: 35", 68" P.D.—10C
35", 68" P.D.—8D 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
CRANKSHAFT DIA.: 7" (Mark II, 9")
SHEAVE: 34", 40", 47.6", 55.2" P.D.—6D
50", 55-1/4" P.D.—8C, 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.—5D
24", 36", 44", 50", 55.6" P.D.—6C
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.—4D
24", 36", 44", 50" P.D.—6C
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, 8 $\frac{1}{2}$ "")
SHEAVE: 24", 30", 36", 44", 47" P.D.—5C
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.—4C
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.—3C
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.—2C
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.—2C 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:

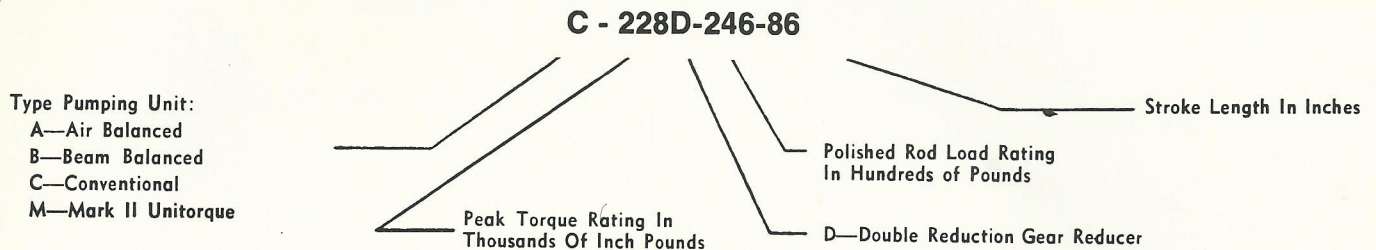
RATING: 40,000 In. Lbs. Peak Torque
RATIO OF GEARS: 29.2
CRANKSHAFT DIA.: 4"
SHEAVE: 20", 24" P.D.—2C
20", 23.3" P.D.—3B, 1-11/16" Bore
GEAR BOX OIL CAPACITY: 7 Gallons

25D GEAR REDUCER:

RATING: 25,000 In. Lbs. Peak Torque
RATIO OF GEARS: 28.9
CRANKSHAFT DIA.: 3"
SHEAVE: 18.4" P.D.—2B, 1 $\frac{3}{8}$ " Bore
GEAR BOX OIL CAPACITY: 5 Gallons

16D GEAR REDUCER

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

EXPLANATION OF PUMPING UNIT DESIGNATIONS**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. Do not use multi-viscosity oils.

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.

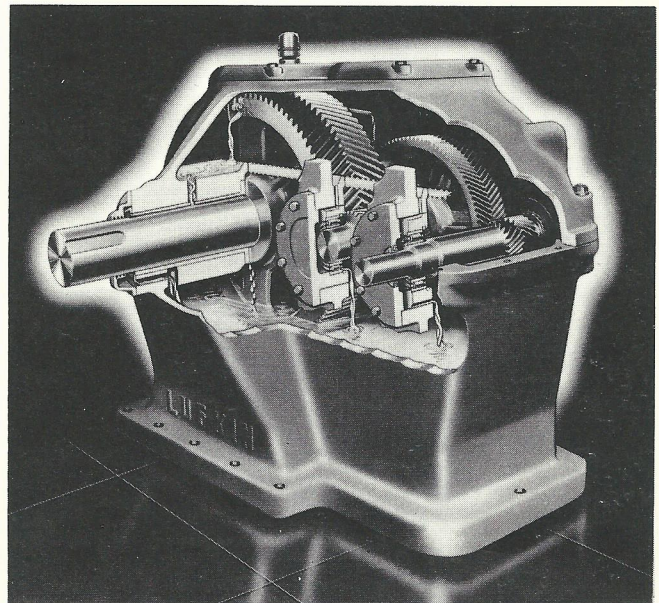


FIGURE 3

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 | 7/8" x 9" Ctrs. | 7/8" x 6 1/2" Ctrs. | 3/4" x 6 1/2" Ctrs. | 3/4" x 6 1/2" Ctrs. | 5/8" x 6 1/2" Ctrs. | 1/2" x 5 1/2" Ctrs. | 1/2" x 5 1/2" Ctrs. | 1/2" x 5 1/2" 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 | 2665 | 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.

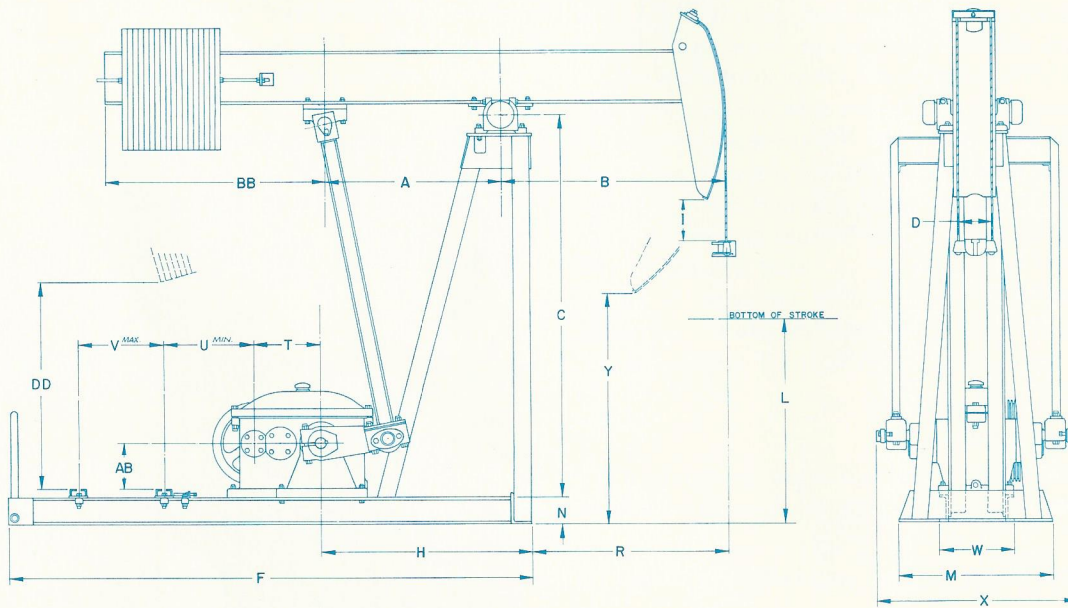


FIGURE 4

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 | 14 1/2 | 43 3/4 | 40 3/4 | 10 | 43 | 20 | 24 1/4 | 39 3/4 | 25 | 57 1/2 | 69 3/4 | 14 3/4 | 7'-1" | 47 1/4 |
| B-57D-109-42 | " | 56 | " | 6 1/2 | " | " | 15 1/2 | 51 | " | " | 35 | " | " | " | " | " | 75 1/2 | " | 6'-6" | 50 |
| *B-40D-76-42 | " | " | 8'-2 1/2" | " | 11'-8 1/2" | 61 | 42 | 38 1/2 | " | 8 | 41 | 17 1/2 | 19 | 34 1/4 | 20 | 50 3/4 | 67 | 10 3/4 | 63 | 50 3/4 |
| *B-40D-89-36 | " | 48 | " | " | " | " | 13 | 50 1/2 | " | 33 | 33 | " | " | " | " | " | 72 1/2 | " | 61 1/2 | 51 1/4 |
| B-25D-67-36 | 32 | 48 | 7'-0 1/2" | " | 10'-4" | 48 | 34 1/2 | 31 | 6 | 6 | 34 | 13 1/2 | 18 | 39 | 16 3/4 | 45 | 56 1/2 | 12 | 54 1/2 | 45 |
| B-25D-53-30 | 33 | 41 1/4 | 70 1/2 | 5 1/2 | 9'-7" | 39 | 6 | 35 | 28 1/2 | " | 35 1/4 | " | " | " | " | " | 48 | " | 40 | 34 3/4 |
| B-16D-53-30 | " | " | " | " | 8'-0 1/2" | " | " | 35 | " | 5 | 35 1/4 | 12 3/4 | 10 1/2 | 25 1/4 | 13 3/4 | 35 | 47 | 8 1/2 | " | " |
| B-16D-53-24 | " | 33 | " | " | " | " | 12 1/2 | 35 3/4 | " | " | 27 | " | " | " | " | " | 52 1/2 | " | 36 | 36 1/4 |

* Base Shown Is For Electric Motor Only, For Gas Engine Drive Dim. "F" is 13'-4", Dim. "U" Is 19, and Dim. "V" Is 53 3/4.

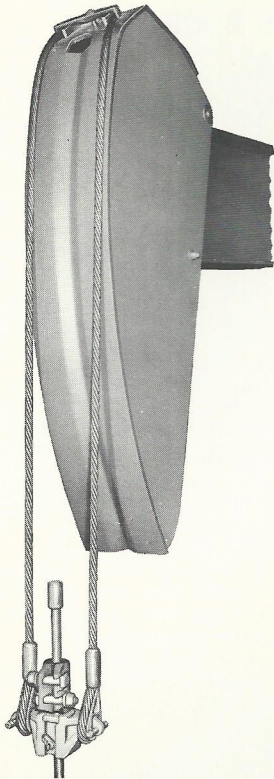


FIGURE 5
HORSEHEAD AND WIRE LINE ASSEMBLY
 Easily aligned with polished rod without disconnecting well load. One-piece arc plate is used for greater strength.

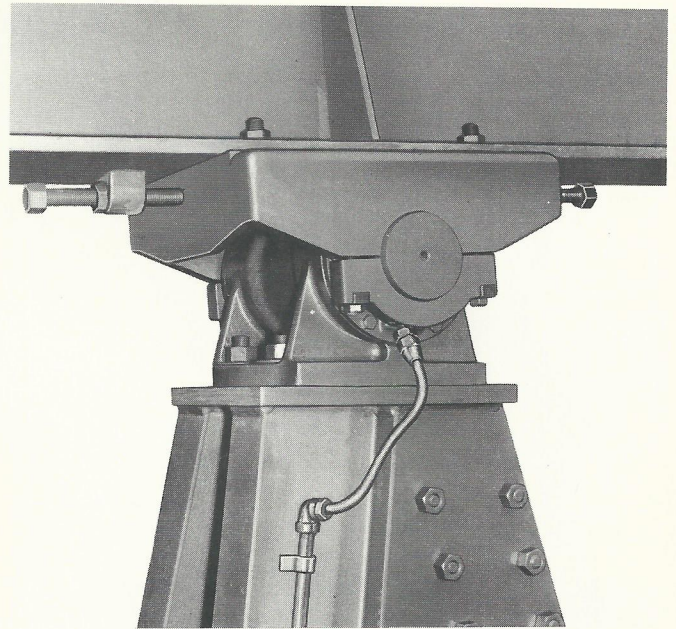


FIGURE 6
CENTER BEARING ASSEMBLY
 Furnished with roller bearings on some C-114D and all larger sizes.

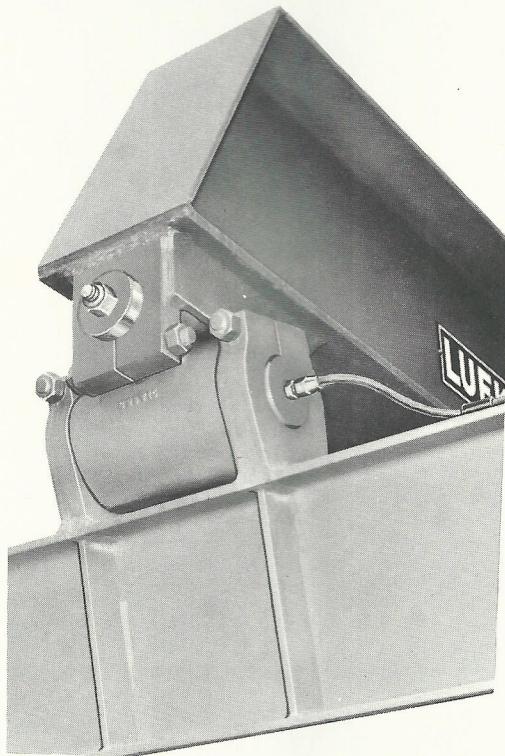


FIGURE 7
CRANK BALANCED UNIT EQUALIZER BEARING ASSEMBLY
 Furnished with roller bearings on all sizes. Cross-pin type connection to walking beam is utilized.

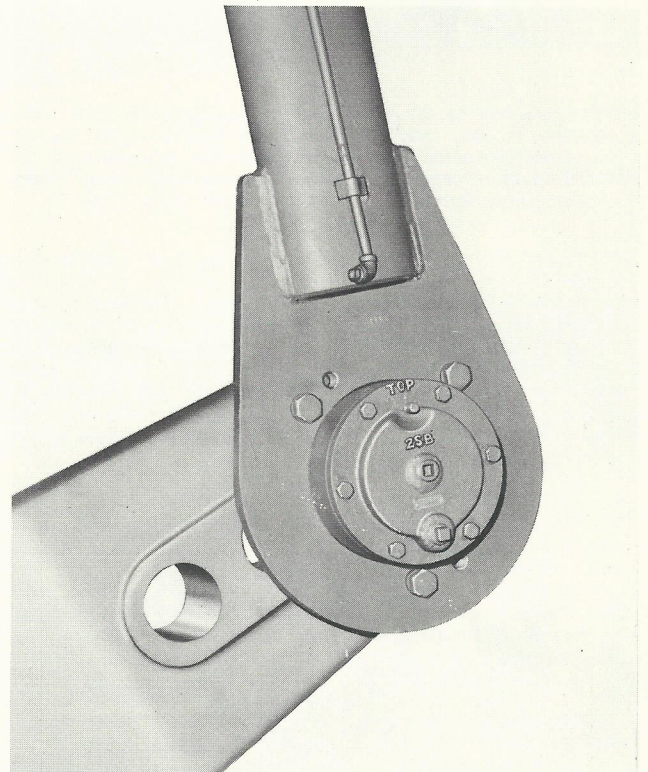


FIGURE 8
CRANK PIN ASSEMBLY
 Furnished with roller bearings on some C-114D and all larger sizes.

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

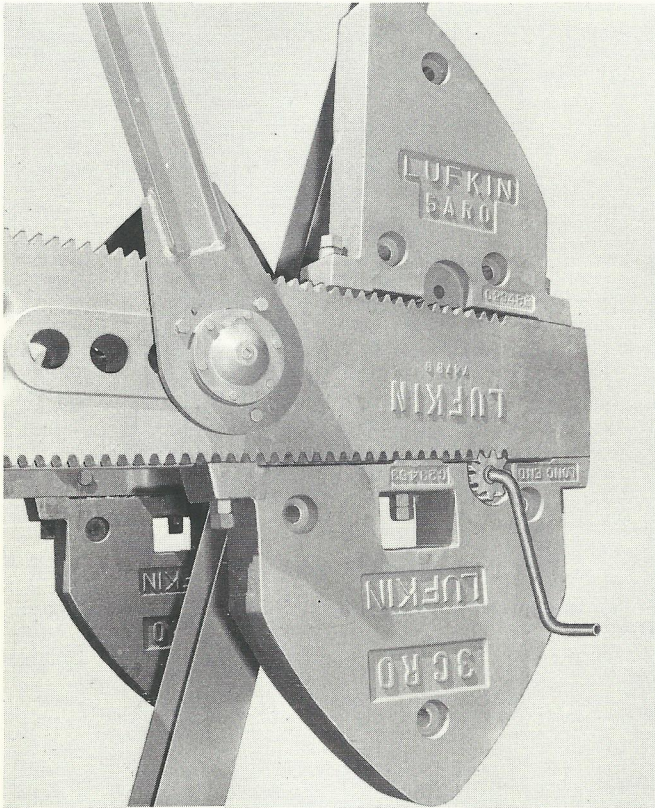


FIGURE 9—illustrating the wide range of counterweight sizes which can be used on one crank. Different size counterweights are not normally furnished or recommended for the same unit.
NOTE: Removable pinion (with crank handle attached) is used to adjust all counterweights.

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.

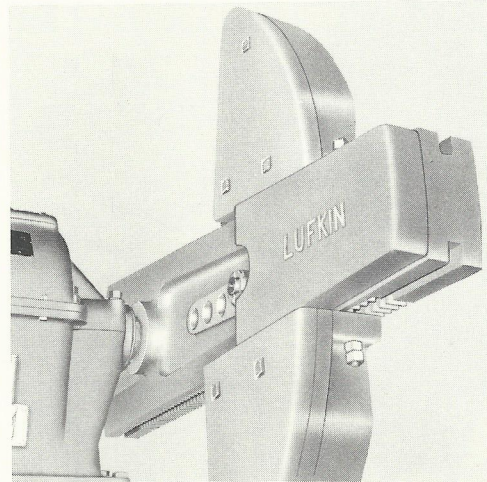
The Trout Counterbalanced Crank, using sliding weights to change the counterbalance effect, is an Original Lufkin Feature. Moving the counterweights has been made even safer and easier by the addition of a rack and pinion.

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.

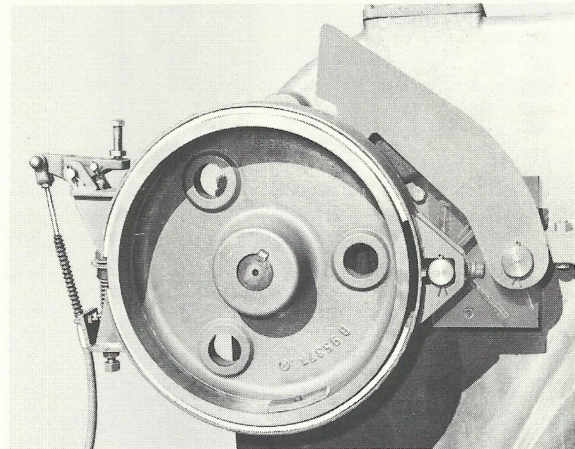
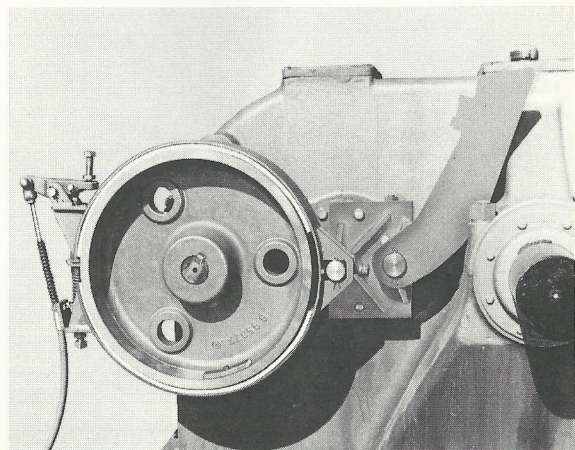
Rack and pinion type cranks are regularly furnished on the C-40D assemblies and larger.

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 SEVENTY THOUSAND LUFKIN PUMPING UNITS.

**FIGURE 10**

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

**FIGURE 11a**
Engaged Position**FIGURE 11b**
Disengaged Position**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.

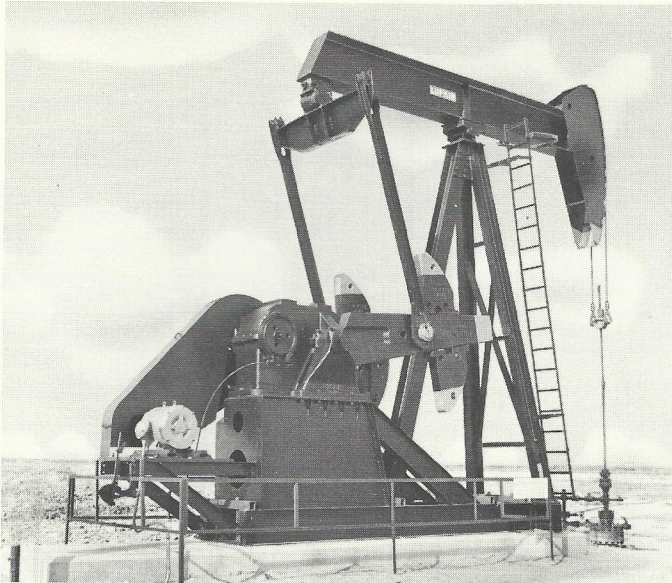


FIGURE 12

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.

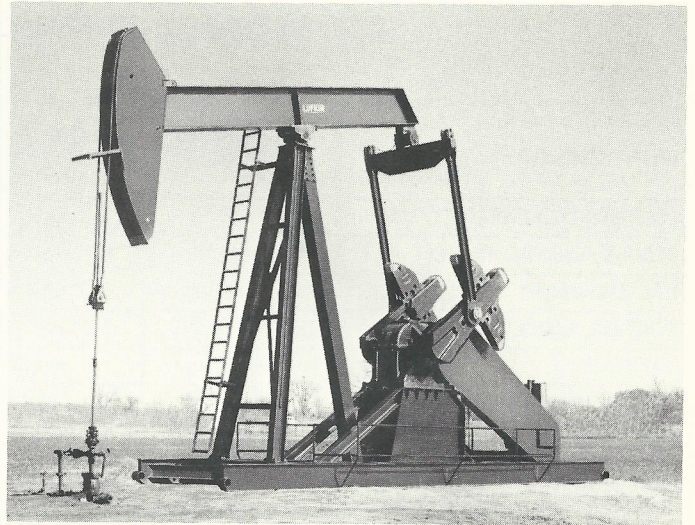


FIGURE 13

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 "UNISET" 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.

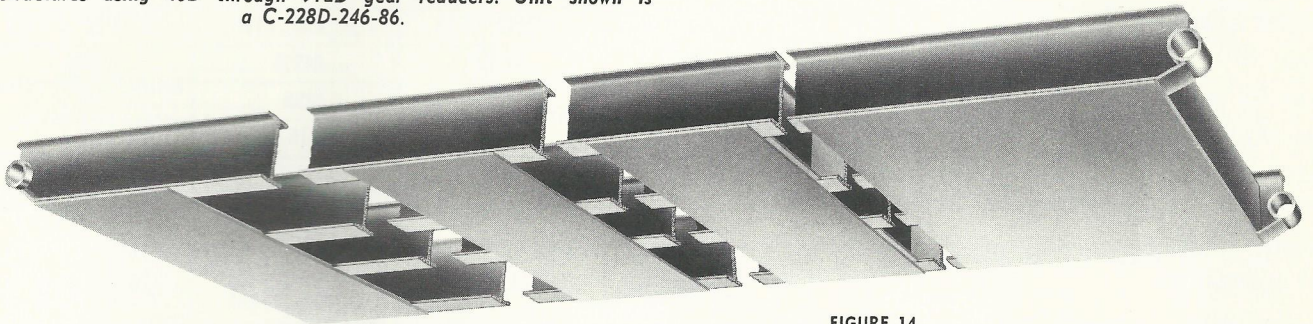


FIGURE 14

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 | 1 $\frac{3}{8}$ " x 16" CTRS. | 1 $\frac{1}{4}$ " x 16" CTRS. | 1 $\frac{3}{8}$ " x 16" CTRS. | 1 $\frac{3}{8}$ " x 16" CTRS. | 1 $\frac{1}{4}$ " x 16" CTRS. |
| CRANKS | 94110B | 94110B | 94110B | 94110B | 94110B |
| CRANK PIN BEARING | 1SB | 1SB | 1SB | 1SB | 1SB |
| EQUALIZER BEARING | OR | OR | OR | OR | OR |
| CENTER BEARING | OTG | OTG | OTG | OTG | 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 | 1 $\frac{1}{4}$ " x 16" CTRS. | 1 $\frac{3}{8}$ " x 12" CTRS. | 1 $\frac{1}{4}$ " x 12" CTRS. | 1 $\frac{1}{8}$ " x 12" CTRS. | 1 $\frac{1}{8}$ " x 12" CTRS. |
| CRANKS | 94110B | 94110B | 8495B | 8495B | 8495B |
| CRANK PIN BEARING | 1SB | 1SB | 2SB | 2SB | 2SB |
| EQUALIZER BEARING | OR | OR | OR | 1R | 1R |
| CENTER BEARING | 1TG | OTG | 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 | 1 $\frac{1}{4}$ " x 12" CTRS. | 1 $\frac{1}{8}$ " x 12" CTRS. | 1 $\frac{1}{8}$ " x 12" CTRS. | 1 $\frac{1}{8}$ " x 12" CTRS. | 1 $\frac{1}{8}$ " 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 | 1 $\frac{1}{8}$ " x 12" CTRS. | 1 $\frac{1}{8}$ " x 12" CTRS. | 1 $\frac{1}{8}$ " x 12" CTRS. | 1 $\frac{1}{8}$ " 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, 51 | 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. |
| WIRESLINE 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. |
| WIRESLINE HANGER | 1" x 9" CTRS. | $\frac{7}{8}$ " x 9" CTRS. | $\frac{7}{8}$ " x 9" CTRS. | $\frac{3}{4}$ " x 9" CTRS. | $\frac{7}{8}$ " 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. |
| WIRESLINE HANGER | $\frac{7}{8}$ " x 9" CTRS. | $\frac{7}{8}$ " x 9" CTRS. | $\frac{7}{8}$ " x 9" CTRS. | $\frac{3}{4}$ " x 6 $\frac{1}{2}$ " CTRS. | $\frac{3}{4}$ " x 6 $\frac{1}{2}$ " 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. |
| WIRESLINE HANGER | $\frac{3}{4}$ " x 6 $\frac{1}{2}$ " CTRS. | $\frac{5}{8}$ " x 6 $\frac{1}{2}$ " CTRS. | $\frac{5}{8}$ " x 6 $\frac{1}{2}$ " CTRS. | $\frac{5}{8}$ " x 6 $\frac{1}{2}$ " CTRS. | $\frac{1}{2}$ " x 6 $\frac{1}{2}$ " 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 $19550 + \frac{3}{4} (23665 - 19550) = 22635$ pounds. With this same combination of weights, the counterbalance effect in the 106" stroke is $[22635 - (-520)] \times 144/106 + (-520) = 30935$ 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**

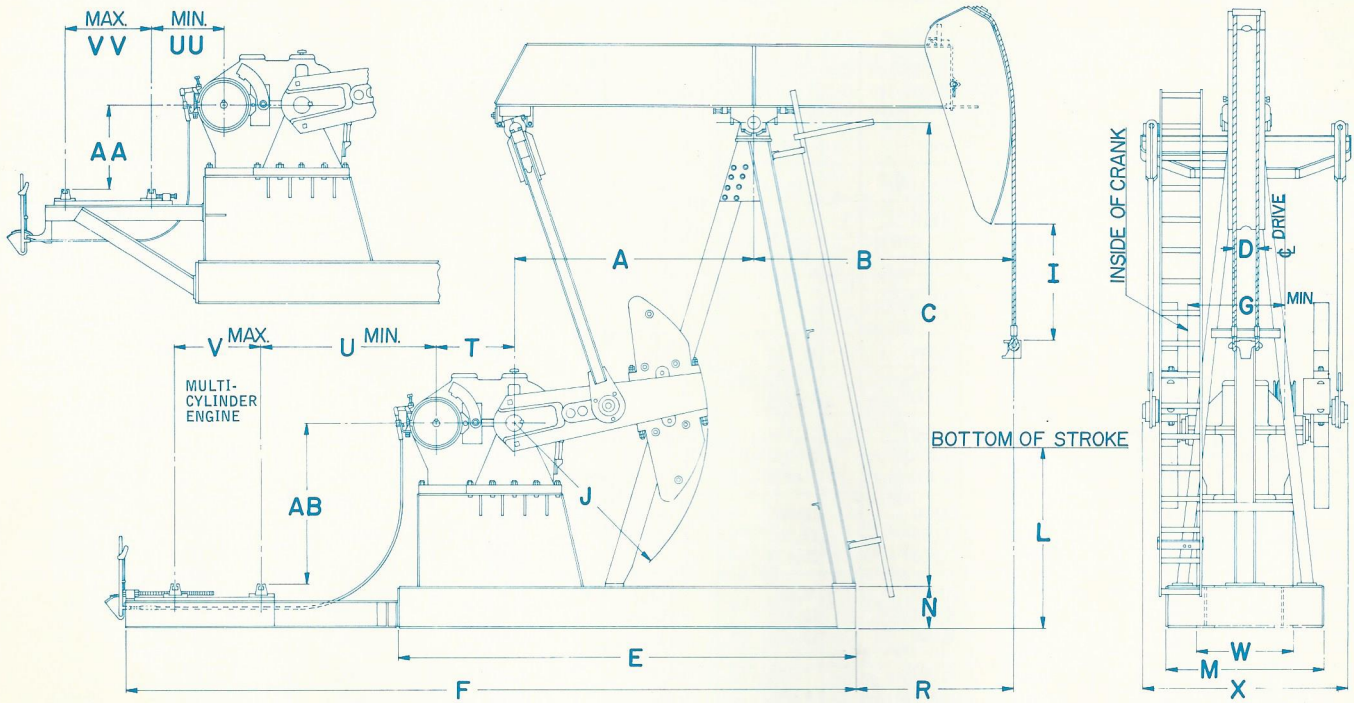


FIGURE 17

| 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" | 53½" | 20½" | 110" | 62½" | 6'-3¾" | 16" | 13'-9½" | 48½" | 87½" | 52" | 46¾" | 8'-2½" | 51¾" | 91" | 19¼" | 57" |
| C-912D-305-168 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| C-912D-427-144 | " | 15'-0" | " | " | " | " | " | 33¾" | " | 74½" | " | " | 11'-3½" | " | " | " | " | " | " | " | " | " |
| C-912D-365-144 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| C-640D-365-168 | " | 17'-6" | " | " | 18'-6" | 29'-7" | 51½" | 20½" | " | 62½" | " | " | 13'-9½" | 41½" | 91" | " | " | " | " | " | " | 23" |
| C-640D-305-168 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| C-640D-365-144 | " | 15'-0" | " | " | " | " | " | 33¾" | " | 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" | " | 76" | " | " | 8'-1" | 51½" | 76" | 26¾" | 37¾" |
| C-456D-305-168 | 10'-0" | 17'-6" | 20'-6" | 16" | 18'-6" | 29'-7" | 51½" | 20½" | 110" | 62½" | 6'-3¾" | " | 13'-9½" | 38¾" | 94" | " | " | 8'-2½" | 51¾" | 91" | 26" | 57" |
| 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" | " | 79" | " | " | 8'-1" | 51½" | 76" | 30" | 37" |
| 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" | 98½" | " | 43" | 7'-3½" | 53½" | 93" | 31" | 48¼" |
| C-320D-256-120 | 9'-3" | 12'-11" | 18'-0" | 12" | 17'-0½" | 27'-4½" | " | 26" | 95" | 75¾" | 69¾" | " | 9'-5½" | " | 83½" | 53" | " | 7'-2" | 53¾" | 79" | " | 33¼" |
| 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" | " | 66½" | " | " | " | 36¾" | 62" | " | " |
| 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" | 38¾" | 26" | 95" | 75½" | 69¾" | 16" | 9'-5½" | 30" | 87" | 53" | 37" | 6'-6½" | 53¾" | 79" | 27¾" | 33¼" |
| C-228D-213-100 | 8'-0" | 10'-9" | 15'-0" | " | 14'-9½" | 24'-3" | 39½" | 12" | 78" | 63" | 57¾" | " | 7'-8½" | " | 70" | " | " | " | 36¾" | 62" | " | " |
| C-228D-173-100 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| C-228D-246-86 | 9'-3" | 9'-3" | 18'-0" | " | 16'-5½" | 27'-4" | 38¾" | 60¾" | 95" | 75½" | 69¾" | " | 69½" | " | 87" | " | " | " | 53¾" | 79" | " | " |
| C-228D-213-86 | 8'-0" | " | 15'-0" | " | 14'-9½" | 24'-3" | 39½" | 24½" | 78" | 74½" | 57¾" | " | 6'-2½" | " | 70" | " | " | " | 36¾" | 62" | " | " |
| C-228D-200-74 | " | 8'-0" | " | 9" | " | " | " | 35¾" | " | 77¼" | " | " | 59½" | " | " | " | " | " | " | " | " | " |
| C-228D-173-74 | 7'-0" | " | 13'-0" | " | 13'-5" | 22'-10½" | " | 17¼" | 68" | 68¾" | 51¾" | 12" | 64" | " | " | " | " | " | 27" | 52¼" | " | " |
| C-160D-173-100 | 8'-0" | 10'-9" | 15'-0" | 12" | 14'-5" | 23'-2" | 33½" | 12" | 78" | 63" | 57¾" | 16" | 7'-8½" | 26" | 74½" | 50" | 32" | 70½" | 42¼" | 68" | 26½" | 34¾" |
| 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" | 68¾" | 51¾" | 12" | 64" | " | 63½" | " | " | " | 32¼" | 58¼" | 26¼" | " |
| 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" | 53¾" | 50¾" | " | 62¾" | " | 52½" | " | " | " | 33½" | 46½" | 17" | 30¾" |
| C-114D-119-86 | 7'-0" | 9'-3" | 12'-9¾" | 12" | 12'-7" | 21'-10½" | 29¾" | 15½" | 68" | 54" | 51¾" | " | 6'-7" | 24" | 71" | " | 25" | 66¾" | 27¼" | 53¼" | 23" | 34¾" |
| C-114D-143-74 | " | 8'-0" | " | 9" | " | " | " | 17¼" | " | 66¼" | " | " | 64" | " | " | " | " | " | " | " | " | " |
| C-114D-173-64 | " | 7'-0" | " | " | " | " | " | 26¾" | " | 66½" | " | " | 52" | " | " | " | " | " | " | " | " | " |
| C-114D-143-64 | 6'-0" | " | 11'-0" | " | 10'-8¼" | 18'-6¼" | " | 18¾" | 56" | 53¼" | 50¾" | " | 62¾" | " | 43½" | " | " | " | 28½" | 41¼" | 13½" | 30¾" |
| 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" | " | 49" | " | " | 67¼" | " | 35¼" | " | " |
| C-80D-119-64 | " | 7'-0" | " | " | " | 17'-4½" | " | 14" | " | 40" | " | " | 63" | 22" | 51" | " | " | " | 22½" | " | 15½" | " |
| C-80D-133-54 | " | 6'-0" | " | " | " | " | " | 14¾" | " | 49¼" | " | " | 51" | " | " | " | " | " | " | " | " | " |
| C-80D-119-54 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| C-80D-133-48 | " | 5'-4" | " | " | " | " | " | 15¼" | " | 54½" | " | " | 43" | " | " | " | " | " | " | " | " | " |
| C-80D-109-48 | 4'-8" | " | 8'-9" | " | 9'-3¾" | 16'-8½" | 30¾" | " | 46" | 43¾" | 40¾" | " | " | " | 45½" | " | " | 65¼" | 18½" | 31¼" | " | " |
| C-57D-76-54 | " | 6'-0" | " | " | " | " | 26" | 13" | " | 39" | " | " | 51" | 20" | 47½" | " | " | 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" | " | " | " | " | 58" | 16½" | 29¼" | " | " |
| C-57D-76-42 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| C-40D-76-48 | " | 5'-4" | " | 9" | 7'-9" | 13'-6" | 23¾" | 14½" | " | 35¼" | " | " | 57" | 17½" | 49" | 43" | 20" | 51" | 10¾" | 35¾" | 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" | " | " | " | 13¾" | 53" | " | 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" | " | " | " | " | " | " | 27¾" | " | " |
| C-25D-53-30 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |

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

LUFKIN MARK II UNITORQUE PUMPING UNITS

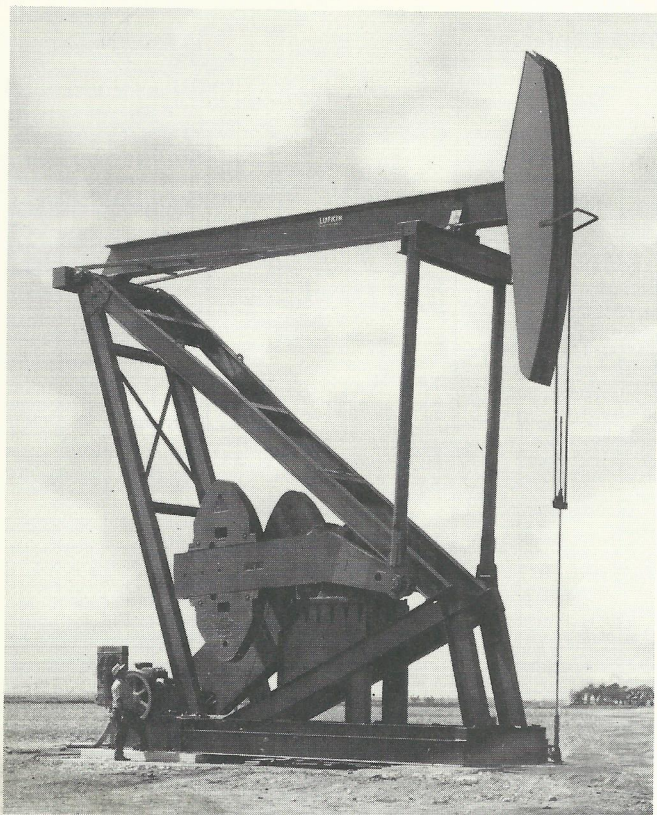


FIGURE 18

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

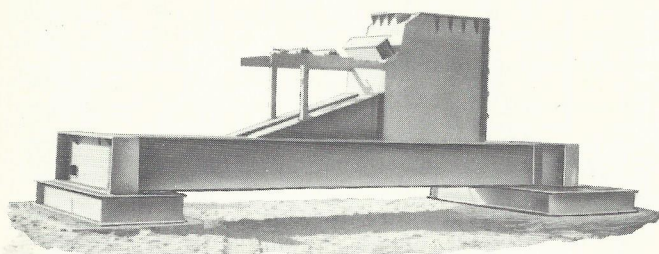


FIGURE 20

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.

THE UNITORQUE GEOMETRY

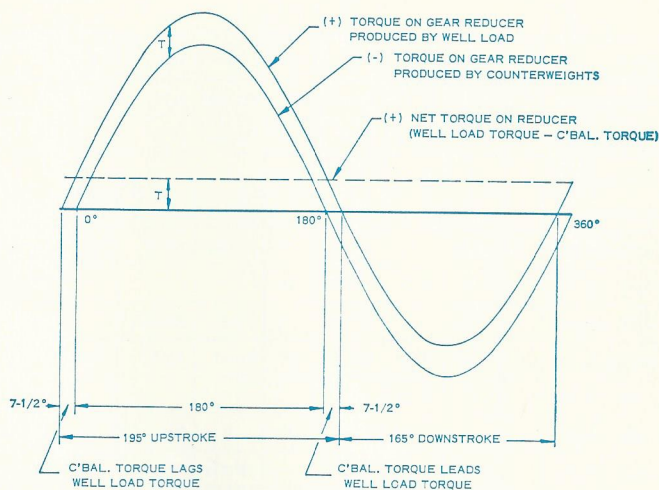


FIGURE 19

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 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 downstroke 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-1824D-427-216 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 | C22 C |
| WIRELINE HANGER | 1½" x 16" Ctrs. | 1½" x 16" Ctrs. | 1½" x 16" Ctrs. | 1½" x 16" Ctrs. | 1½" 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-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 | 1½" x 12" Ctrs. | 1¼" x 12" Ctrs. | 1½" x 9" Ctrs. | 1½" x 12" Ctrs. | 1¼" x 12" Ctrs. | 1½" 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 | 1½" x 9" Ctrs. | 1¼" x 12" Ctrs. | 1½" x 9" Ctrs. | 1½" x 9" Ctrs. | 1½" 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**

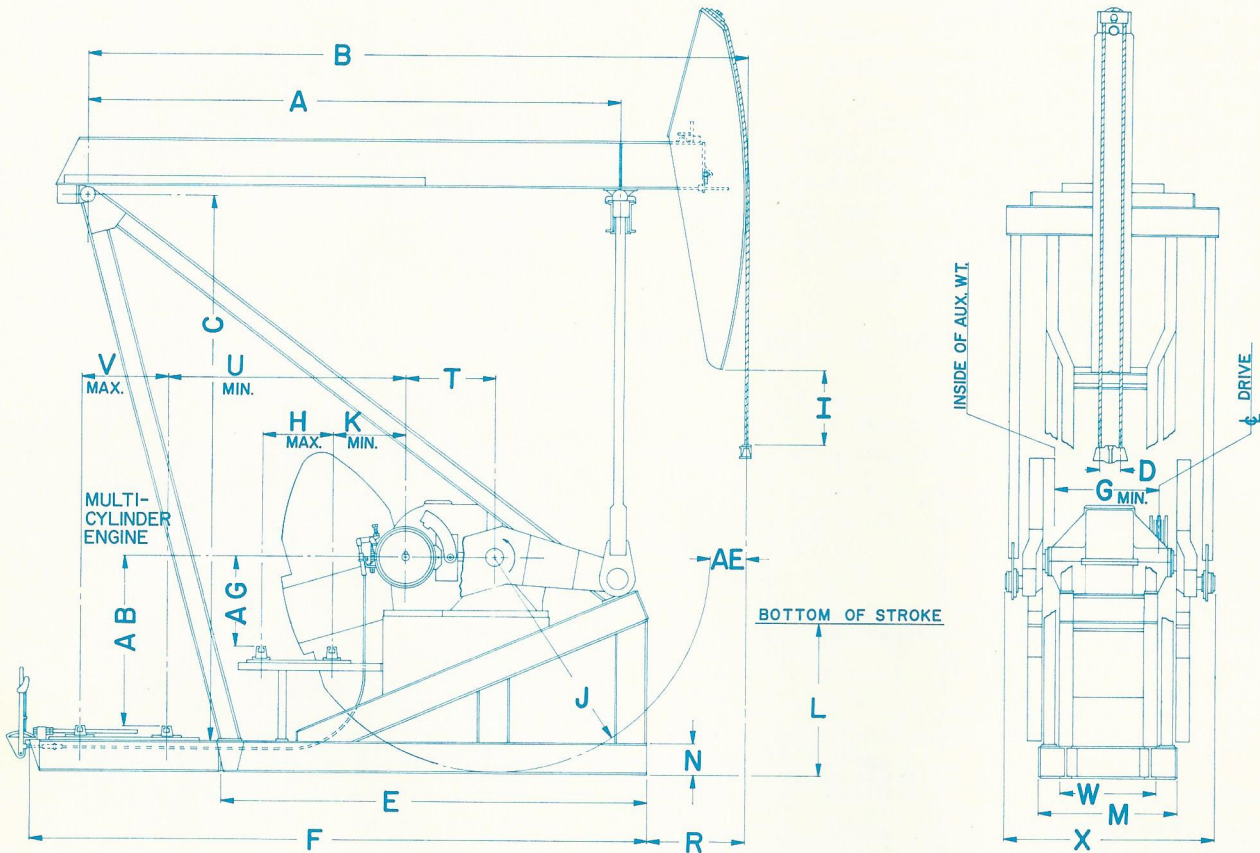


FIGURE 22

| 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-1824D-427-216 | 25'-6" | 32'-0" | 27'-5 ⁷ / ₈ " | 16" | 18'-7" | 25'-2 ¹ / ₂ " | 67" | 55" | 47 ¹ / ₄ " | 130" | 25 ³ / ₈ " | 68 ⁷ / ₈ " | 8'-5" | 18" | 45" | 58 ⁷ / ₈ " | 10'-8 ⁷ / ₈ " | 48 ¹ / ₂ " | 48 ¹ / ₂ " | 10'-4" | 9'-6" | 26" | 51" | |
| M-1280D-427-216 | " | " | " | " | " | " | 57 ⁵ / ₈ " | " | " | 31 ³ / ₄ " | " | 8'-0" | " | " | " | 52 ¹ / ₂ " | 11'-3 ³ / ₄ " | " | " | 9'-6" | " | " | " | |
| M-1280D-427-192 | " | " | " | " | " | " | " | " | 72 ¹ / ₂ " | " | " | 71 ¹ / ₄ " | " | " | " | " | " | " | " | 9'-6" | " | " | " | |
| M-912D-305-216 | " | " | " | " | " | " | 54" | 51 ³ / ₄ " | 47 ¹ / ₄ " | " | 23" | 68 ³ / ₈ " | " | " | " | 48 ¹ / ₂ " | " | " | " | 9'-1" | " | " | 59 ¹ / ₂ " | |
| M-912D-305-192 | " | " | " | " | " | " | " | 72 ¹ / ₂ " | " | " | " | 71 ¹ / ₄ " | " | " | " | " | " | " | " | " | " | " | " | |
| M-912D-365-168 | 22'-6" | 27'-10" | 23'-0 ³ / ₈ " | 12" | 18'-2 ³ / ₄ " | 24'-10 ¹ / ₄ " | " | 46 ³ / ₄ " | 42 ³ / ₄ " | 108" | 25 ¹ / ₂ " | 71 ¹ / ₂ " | 6'-9 ¹ / ₂ " | 16" | 48" | " | 9'-2" | " | 50" | 8'-9" | 7'-8" | 19" | 46 ¹ / ₂ " | |
| M-912D-305-168 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-912D-365-144 | 21'-6" | 26'-0" | 21'-0 ⁷ / ₈ " | " | " | " | " | " | 40" | " | " | 75 ¹ / ₈ " | " | " | 42 ¹ / ₂ " | " | " | " | " | " | " | " | 13 ¹ / ₂ " | " |
| M-912D-305-144 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | 8'-7 ³ / ₈ " | " | " | " | " |
| M-640D-305-192 | 25'-6" | 32'-0" | 27'-5 ⁷ / ₈ " | 16" | 18'-7" | 25'-2 ¹ / ₂ " | 50 ¹ / ₄ " | 51 ³ / ₄ " | 72 ¹ / ₂ " | 130" | 26 ⁵ / ₈ " | 71 ¹ / ₄ " | 8'-0" | 18" | 45" | 41 ¹ / ₂ " | 11'-3 ³ / ₄ " | " | 48 ¹ / ₂ " | 8'-9" | 9'-6" | 26" | 60 ¹ / ₂ " | |
| M-640D-305-168 | 22'-6" | 27'-10" | 23'-0 ³ / ₈ " | 12" | 18'-2 ³ / ₄ " | 24'-10 ¹ / ₄ " | " | 46 ³ / ₄ " | 42 ³ / ₄ " | 108" | 27 ⁷ / ₈ " | 71 ¹ / ₂ " | 6'-9 ¹ / ₂ " | 16" | 48" | " | 9'-2" | " | 50" | 8'-5" | 7'-8" | 23 ³ / ₈ " | 46 ¹ / ₂ " | |
| M-640D-365-144 | 21'-6" | 26'-0" | 21'-0 ⁷ / ₈ " | " | " | " | " | " | 40" | " | " | 75 ¹ / ₈ " | " | " | 42 ¹ / ₂ " | " | " | " | " | " | " | 18" | " | " |
| M-640D-305-144 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | 8'-3 ³ / ₈ " | " | " | " | " |
| M-640D-256-144 | " | " | " | 9" | " | " | " | " | 44 ¹ / ₄ " | " | " | 71 ¹ / ₈ " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-640D-305-120 | " | " | " | 12" | " | " | " | " | 64 ³ / ₄ " | " | " | 75 ¹ / ₈ " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-456D-305-192 | 25'-6" | 32'-0" | 27'-5 ⁷ / ₈ " | 16" | 18'-7" | 25'-2 ¹ / ₂ " | " | 51 ³ / ₄ " | 72 ¹ / ₂ " | 130" | 29 ³ / ₄ " | 71 ¹ / ₄ " | 8'-0" | 18" | 45" | 38 ³ / ₈ " | 11'-3 ³ / ₄ " | " | 48 ¹ / ₂ " | 8'-9" | 9'-6" | 26" | 60 ¹ / ₂ " | |
| M-456D-305-168 | 22'-6" | 27'-10" | 23'-0 ³ / ₈ " | 12" | 18'-2 ³ / ₄ " | 24'-10 ¹ / ₄ " | " | 46 ³ / ₄ " | 42 ³ / ₄ " | 108" | 31" | 71 ¹ / ₂ " | 6'-9 ¹ / ₂ " | 16" | 48" | " | 9'-2" | " | 50" | 8'-5" | 7'-8" | 23 ³ / ₈ " | 46 ¹ / ₂ " | |
| M-456D-365-144 | 21'-6" | 26'-0" | 21'-0 ⁷ / ₈ " | " | " | " | " | " | 40" | " | " | 75 ¹ / ₈ " | " | " | 42 ¹ / ₂ " | " | " | " | " | " | " | 18" | " | " |
| M-456D-305-144 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-456D-256-144 | " | " | " | 9" | " | " | " | " | 44 ¹ / ₄ " | " | " | 71 ¹ / ₈ " | " | " | " | " | " | " | " | " | 8'-3 ³ / ₈ " | " | " | " |
| M-456D-365-120 | " | " | " | 12" | " | " | " | " | 64 ³ / ₄ " | " | " | 75 ¹ / ₈ " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-456D-305-120 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | 8'-5" | " | " | " |
| M-456D-256-120 | " | " | " | 9" | " | " | " | " | 69" | " | " | 71 ¹ / ₈ " | " | " | " | " | " | " | " | " | 8'-3 ¹ / ₂ " | " | " | " |

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

(Units on this page are designed to be installed on "two point" foundations. See figures 18, 20, & 21.)

**MARK II PUMPING UNIT ASSEMBLIES
GENERAL DIMENSIONS**

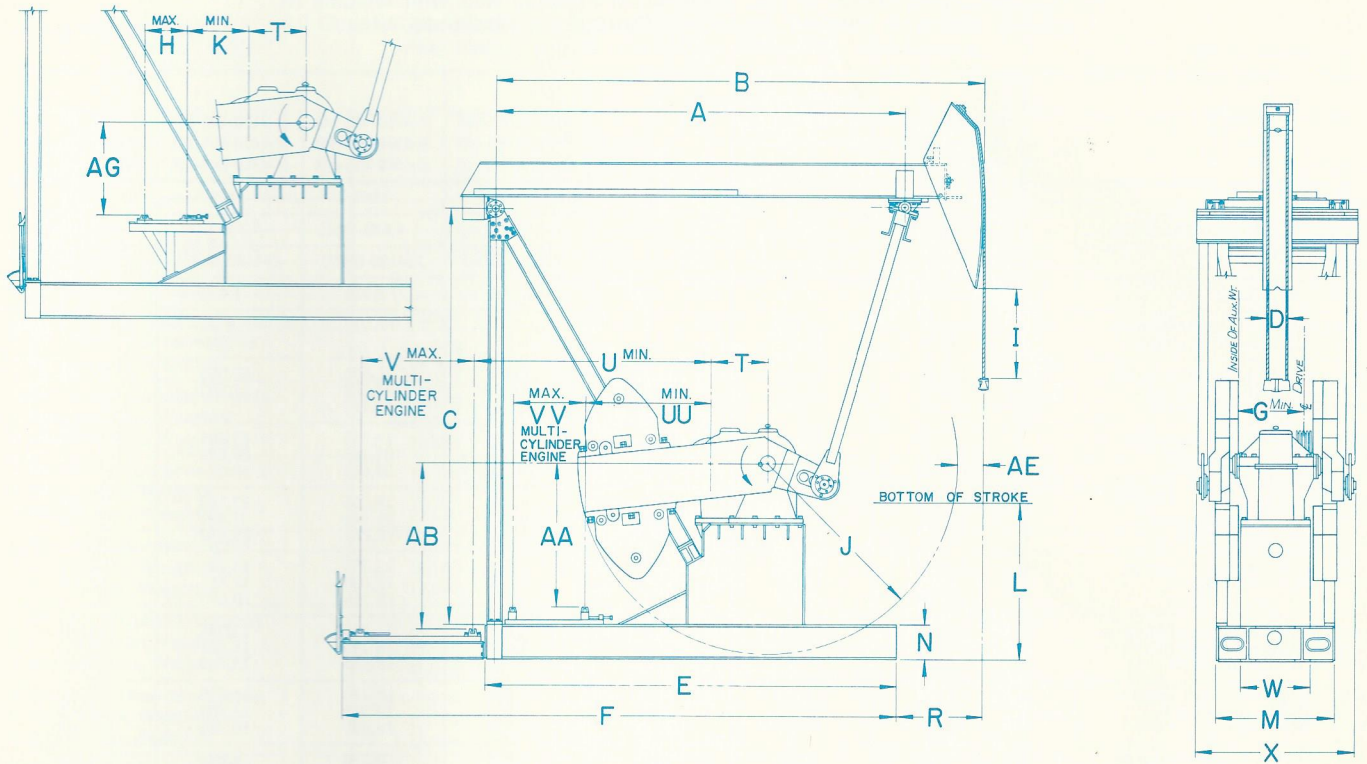


FIGURE 23

| 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'-0 7/8" | 9" | 21'-3 1/2" | 29'-2" | 44 1/2" | 33 3/4" | 44 1/4" | 108" | 35 3/8" | 79 3/8" | 69 3/4" | 24" | 60" | 34" | 9'-4 3/4" | 68 1/2" | 43 1/2" | 7'-4 3/8" | 7'-2" | 9'-0 1/4" | 18" | 46 1/4" | 7'-4" | 51 1/2" |
| M-320D-305-120 | " | " | " | 12" | " | " | " | " | 64 3/4" | " | " | 83 1/4" | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-320D-256-120 | " | " | " | 9" | " | " | " | " | 69" | " | " | 79 3/8" | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-320D-213-120 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-320D-305-100 | " | " | " | 12" | " | " | " | " | 7'-1" | " | " | 82 3/4" | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-320D-256-100 | " | " | " | 9" | " | " | " | " | 7'-5" | " | " | 79 3/8" | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-228D-256-120 | " | " | " | " | " | " | 38 7/8" | 29 3/4" | 69" | " | 41 1/8" | " | " | " | " | 30" | " | " | 37" | 6'-9 3/8" | " | " | " | 47 7/8" | 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'-8 3/8" | " | 15'-6 1/2" | 21'-0" | " | 30 3/4" | 40 3/4" | 86 3/8" | 22 1/4" | 75 3/8" | 57" | " | 39" | " | 8'-7 3/4" | 51 1/2" | " | 6'-8 3/8" | " | 6'-3" | 11 3/8" | 40 1/2" | " | " |
| M-228D-213-86 | " | " | " | " | " | " | " | " | " | " | " | 73 3/4" | " | " | 21" | " | " | " | " | " | " | " | " | " | " | " |
| M-228D-200-74 | " | " | " | " | " | " | " | " | 52 1/2" | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-228D-173-74 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-160D-213-86 | " | " | " | " | " | " | 32 7/8" | 33 3/4" | 40 3/4" | " | 24 1/8" | 72 3/8" | 54" | " | " | 26" | 8'-11 3/4" | " | 32" | 6'-0 3/8" | " | " | " | 38 3/8" | " | " |
| M-160D-173-86 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-160D-200-74 | " | " | " | " | " | " | " | " | 52 1/2" | " | " | 73 3/4" | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-160D-173-74 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| M-114D-143-86 | 13'-6" | 15'-9" | 12'-3 1/2" | " | 13'-0 3/4" | 18'-6 1/4" | 29 3/8" | 30" | 14 1/4" | 62" | 20 1/8" | 55 3/8" | 42 3/4" | 16" | 32" | 24" | 8'-0 1/2" | " | 25" | 67 3/8" | " | 50" | 16" | 31 1/8" | " | " |
| M-114D-173-74 | 15'-6" | 18'-6" | 15'-8 3/8" | " | 15'-6 1/2" | 21'-0" | " | 30 3/4" | 52 1/2" | 86 3/8" | 28" | 73 3/4" | 54" | 21" | 39" | " | 9'-1 3/4" | " | " | 69" | " | 6'-3" | 11 3/8" | 43 3/4" | " | " |
| M-114D-143-74 | 13'-6" | 15'-9" | 12'-3 1/2" | " | 13'-0 3/4" | 18'-6 1/4" | " | 30" | 26 1/2" | 62" | 20 1/8" | 55 3/4" | 42 3/4" | 16" | 32" | " | 8'-0 1/2" | " | " | 67 3/8" | " | 50" | 16" | 31 1/8" | " | " |
| M-114D-173-64 | " | " | " | " | " | " | " | " | 20 1/2" | " | " | 70 3/8" | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| 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.
 (Units on this page are designed to be installed on "two point" foundations. See figures 18, 20, & 21.)

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-1824D-427-216 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 4 No. 130D Counterweights | 21,605 32,550 | 24,850 36,775 | ..... | ..... | ..... | ..... | ..... |
| 4 No. OORO Counterweights 4 No. OOS Aux. Weights 8 No. OOS Aux. Weights | 17,990 22,855 27,720 | 20,920 26,215 31,510 | 16,040 20,740 25,440 | 16,565 21,265 25,965 | 21,690 27,300 32,910 | 22,065 27,680 | 22,355 |
| 4 No. ORO Counterweights 4 No. OS Aux. Weights 8 No. OS Aux. Weights | 15,935 20,605 25,275 | 18,675 23,760 28,850 | 14,055 18,565 23,075 | 14,575 19,090 23,605 | 19,315 24,700 30,085 | 19,695 25,080 | 19,985 |
| 4 No. OARO Counterweights 4 No. OAS Aux. Weights 8 No. OAS Aux. Weights | 13,595 17,225 20,855 | 16,130 20,085 24,040 | 11,945 15,500 19,055 | 12,470 16,025 19,580 | 16,795 21,040 25,285 | 17,180 21,425 25,670 | 17,470 21,710 |
| 4 No. 1RO Counterweights 4 No. 1S Aux. Weights 8 No. 1S Aux. Weights | 10,970 13,770 16,570 | 13,275 16,340 19,365 | 9,400 12,145 14,890 | 9,925 12,670 15,415 | 13,755 17,035 20,315 | 14,135 17,415 20,695 | 14,425 17,705 |
| 4 No. 2RO Counterweights 4 No. 2S Aux. Weights 8 No. 2S Aux. Weights | 9,430 12,135 14,840 | 11,590 14,535 17,480 | 7,895 10,560 13,225 | 8,420 11,085 13,750 | 11,965 15,145 18,325 | 12,345 15,525 18,705 | 12,635 15,815 *18,995 |
| 4 No. 3CRO Counterweights 4 No. 3BS Aux. Weights 8 No. 3BS Aux. Weights | 7,910 10,515 13,120 | 9,940 12,775 15,610 | 6,450 9,030 11,610 | 6,975 9,555 12,135 | 10,240 13,320 16,400 | 10,620 13,700 16,780 | 10,910 13,990 *17,070 |
| 4 No. 5ARO Counterweights 4 No. 5A Aux. Weights 8 No. 5A Aux. Weights | 6,200 7,950 9,700 | 8,085 9,985 11,885 | 4,800 6,555 8,310 | 5,325 7,080 8,835 | 8,270 10,365 12,460 | 8,650 10,745 12,840 | 8,940 11,035 *13,130 |
| 4 No. 5CRO Counterweights 4 No. 5C Aux. Weights 8 No. 5C Aux. Weights | 5,050 6,620 8,190 | 6,820 8,530 10,240 | 3,655 5,230 6,805 | 4,180 5,755 7,330 | 6,895 8,780 10,665 | 7,275 9,160 11,045 | 7,565 9,450 *11,335 |
| 4 No. 6RO Counterweights 4 No. 6 Aux. Weights 8 No. 6 Aux. Weights | 4,285 5,190 6,095 | 5,985 6,975 7,965 | 2,880 3,790 4,700 | 3,405 4,315 5,225 | 5,970 7,060 8,150 | 6,350 7,440 8,530 | 6,640 7,730 8,820 |
| 4 No. 7RO Counterweights 4 No. 7 Aux. Weights 8 No. 7 Aux. Weights | 3,400 4,085 4,770 | 5,025 5,770 6,515 | 2,000 2,690 3,380 | 2,525 3,215 3,905 | 4,925 5,745 6,565 | 5,305 6,125 6,945 | 5,595 6,415 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 4 No. 1S Aux. Weights | 19,440 23,980 | 19,670 24,210 | 19,850 24,395 | 19,960 24,505 | 15,600 19,565 | 15,700 19,665 | 15,810 19,775 | 9,525 11,980 |
| 4 No. 2RO Counterweights 4 No. 2S Aux. Weights | 16,955 21,360 | 17,185 21,590 | 17,370 21,775 | 17,480 21,885 | 13,480 17,335 | 13,580 17,435 | 13,690 17,545 | 8,270 10,690 |
| 4 No. 3CRO Counterweights 4 No. 3BS Aux. Weights | 14,560 18,830 | 14,790 19,060 | 14,975 19,245 | 15,085 19,355 | 11,495 15,280 | 11,595 15,380 | 11,705 15,490 | 7,200 9,640 |
| 4 No. 5ARO Counterweights 4 No. 5A Aux. Weights | 11,840 14,740 | 12,070 14,970 | 12,255 15,155 | 12,365 15,265 | 9,190 11,890 | 9,290 11,990 | 9,400 12,100 | 5,880 7,650 |
| 4 No. 5CRO Counterweights 4 No. 5C Aux. Weights | 9,935 12,545 | 10,165 12,775 | 10,350 12,960 | 10,460 13,070 | 7,495 9,860 | 7,595 9,955 | 7,705 10,070 | 4,770 6,375 |
| 4 No. 6RO Counterweights 4 No. 6 Aux. Weights 8 No. 6 Aux. Weights | 8,655 10,160 11,665 | 8,885 10,390 11,895 | 9,070 10,575 12,080 | 9,180 10,685 12,190 | 6,435 7,840 9,245 | 6,535 7,940 | 6,645 8,050 | 4,080 5,045 6,010 |
| 4 No. 7RO Counterweights 4 No. 7 Aux. Weights 8 No. 7 Aux. Weights | 7,200 8,340 9,480 | 7,430 8,570 9,710 | 7,615 8,755 9,895 | 7,725 8,865 10,005 | 5,095 6,160 7,225 | 5,195 6,260 | 5,305 6,370 | 3,180 3,925 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" |
| STRUCTURAL 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 | ..... | ..... | ..... | ..... | ..... |
| 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.

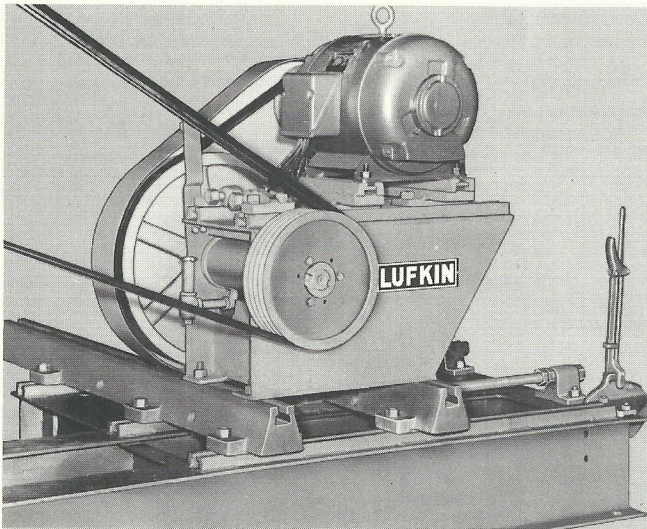


FIGURE 24

This assembly utilizes an electric motor and counter-shaft 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

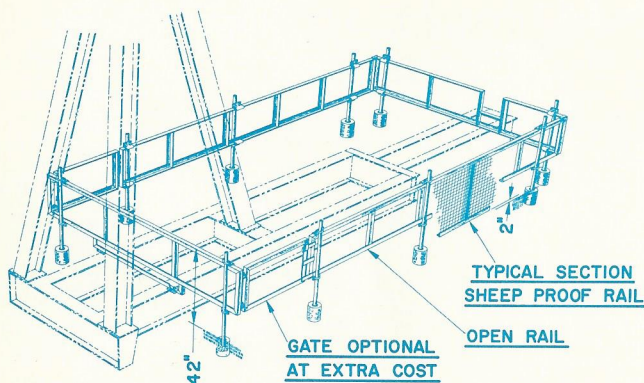


FIGURE 27

RAIL TYPE CRANK GUARDS

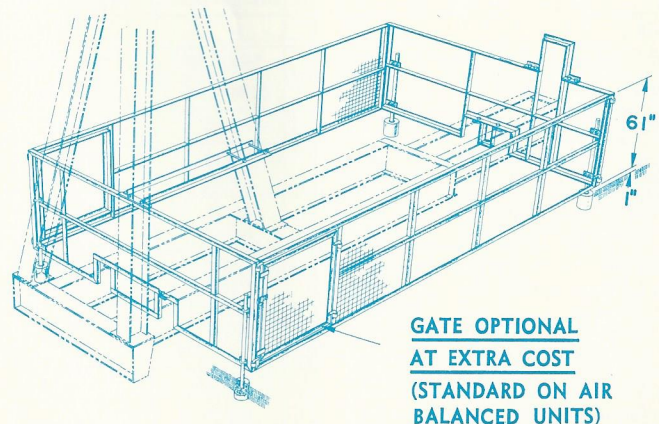


FIGURE 28

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.

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 |
|-----------|--------|
| 3/4" | 6" |
| 1" | 10" |
| 1 1/4" | 12" |
| 1 1/2" | 12" |

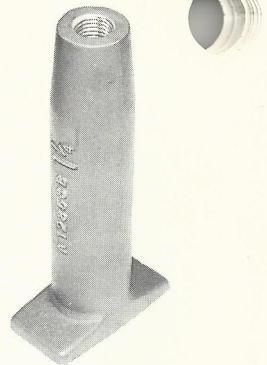


FIGURE 25

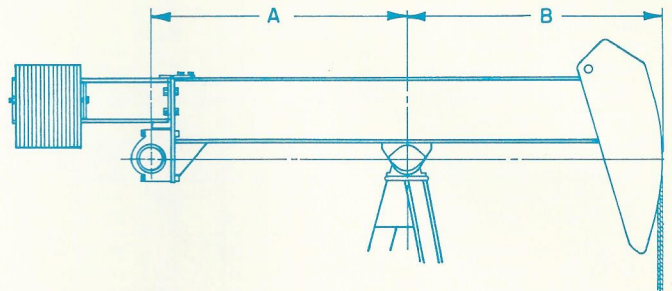


FIGURE 26

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" | $2600(A+28") \div B$ |
| 60" | 4000 | 40" | $4000(A+40") \div B$ |

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

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.

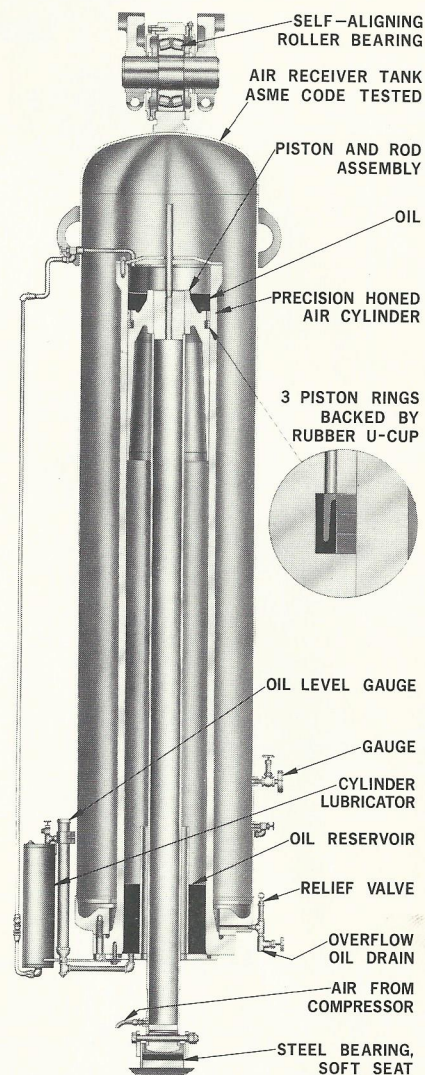


FIGURE 29



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.

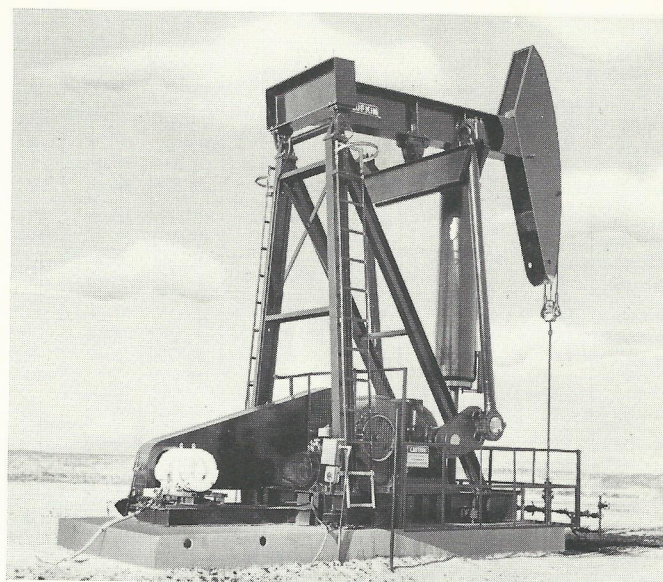


FIGURE 31

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

**LUFKIN AIR BALANCED PUMPING UNITS
GENERAL DIMENSIONS**

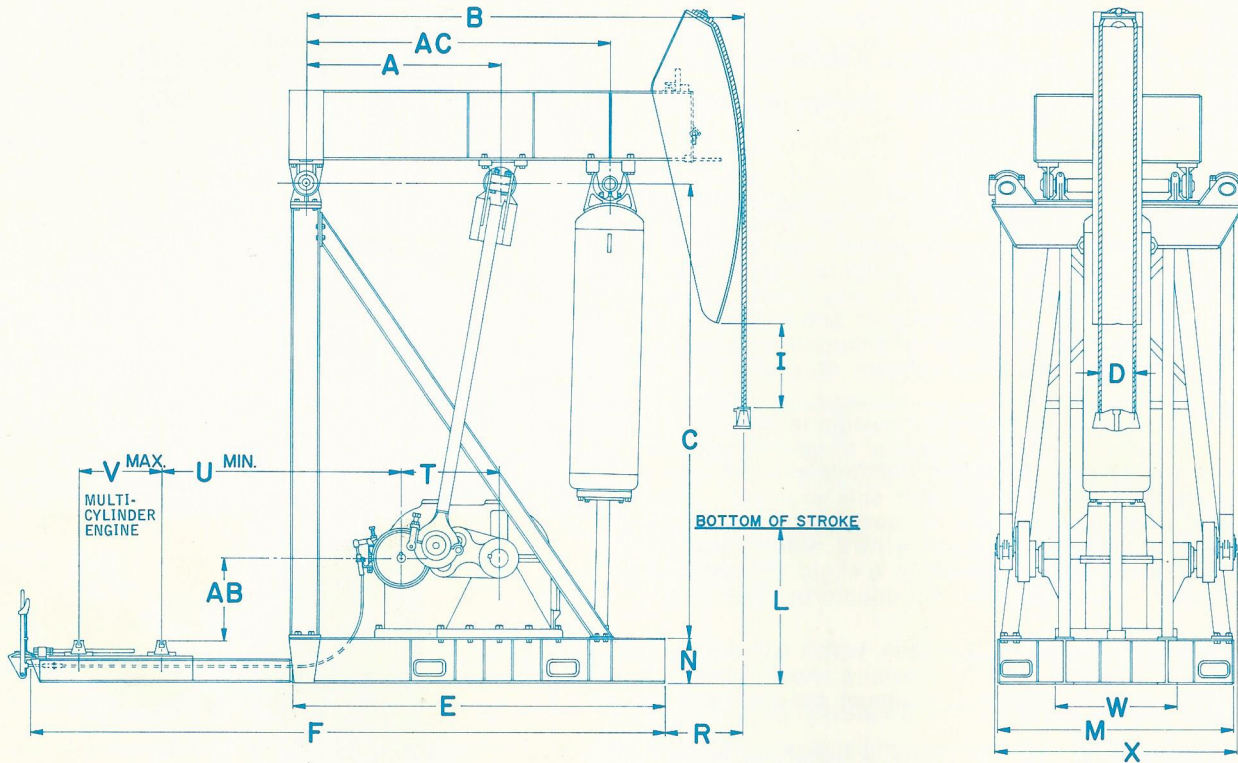


FIGURE 32

| 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" | 51 ¹¹ / ₁₆ " | 70" | 7'-9½" | 44¾" | 66¾" | 10'-10½" | 36" | 19'-5½" |
| A-1824D-470-240 | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | " |
| A-1824D-427-216 | 10'-1½" | 25'-8" | 23'-6" | " | 22'-0½" | 29'-9¾" | 18¾" | 57¼" | 8'-0" | " | 48" | 58¾" | 8'-8½" | " | 50¼" | 9'-7½" | 30" | " |
| A-1824D-427-192 | " | 23'-0" | 21'-0" | " | 19'-4¾" | 27'-1¾" | 17½" | 52" | 7'-11½" | " | " | " | 8'-1" | 41" | " | " | 34¾" | 14'-3½" |
| A-1280D-470-240 | 11'-2½" | 28'-0" | 25'-3½" | " | * | 32'-0" | 16" | 57½" | 8'-0" | " | 51 ¹¹ / ₁₆ " | 52½" | 9'-3" | 44¾" | " | 9'-1½" | 30" | 19'-5½" |
| A-1280D-427-216 | 10'-1½" | 25'-8" | 23'-6" | " | 22'-0½" | 29'-9¾" | 18¾" | 57¼" | 7'-11½" | " | 48" | " | 8'-7¾" | 41" | " | " | 34¾" | 14'-3½" |
| A-1280D-427-192 | " | 23'-0" | 21'-0" | " | 19'-4¾" | 27'-1¾" | 17½" | 52" | " | " | " | " | " | 44¾" | " | " | " | " |
| A-1280D-305-168 | 7'-4" | 19'-3" | 20'-4" | " | 14'-10½" | 22'-0½" | 16" | 66½" | " | 16½" | 59" | " | 6'-0" | " | " | 8'-11½" | 38½" | 10'-11½" |
| A-912D-470-240 | 11'-2½" | 28'-0" | 25'-3½" | " | * | 32'-0" | " | 57½" | 8'-10" | 21" | 51 ¹¹ / ₁₆ " | 48½" | 9'-7" | " | 50" | 8'-6½" | 24" | 19'-5½" |
| A-912D-427-216 | 10'-1½" | 25'-8" | 23'-6" | " | 22'-0½" | 29'-9¾" | 18¾" | 57¼" | " | " | 48" | " | 9'-2" | " | " | " | 28¾" | 14'-3½" |
| A-912D-427-192 | " | 23'-0" | 21'-0" | " | 19'-4¾" | 27'-1¾" | 17½" | 52" | " | " | " | " | " | " | " | " | " | " |
| A-912D-305-168 | 7'-4" | 19'-3" | 20'-4" | " | 14'-10½" | 22'-0½" | 16" | 66½" | " | 16½" | 59" | " | 6'-4" | " | " | 8'-4½" | 32½" | 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" | " | 30½" | " |
| 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" | " | 71½" | " | " | " | " | 9'-10" |
| A-640D-365-120 | " | 14'-7" | 15'-7" | " | 10'-11¼" | 18'-1¼" | 22" | 49½" | " | " | 47½" | " | " | " | " | " | " | " |
| A-456D-305-144 | " | 17'-4" | 17'-10" | " | 12'-11¼" | 20'-1¼" | 12½" | 62½" | " | " | 57" | 38¾" | 6'-2" | " | " | " | " | " |
| A-456D-365-120 | " | 14'-7" | 15'-7" | " | 10'-11¼" | 18'-1¼" | 22" | 49½" | " | " | 47½" | " | " | " | " | " | " | " |
| A-456D-256-120 | 69" | 15'-4" | " | " | 11'-11¼" | 19'-1" | 14½" | 57" | 7'-1½" | " | " | " | " | " | " | " | " | 8'-8" |
| A-320D-256-120 | 70" | " | " | " | 11'-3¼" | 18'-11¼" | " | " | " | " | 53" | 34" | 6'-6" | " | 43¼" | 7'-3½" | " | 8'-11" |
| A-320D-305-100 | " | 12'-11" | 13'-4" | " | 10'-0¼" | 17'-8¾" | 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'-8¾" | 29½" | 7'-3½" |
| A-228D-246-86 | " | 10'-11" | " | " | " | " | " | 52¼" | " | " | " | " | " | " | " | " | " | " |
| A-160D-200-74 | 50" | 10'-0" | 11'-9" | " | 7'-11" | 14'-6¾" | 16½" | 51" | " | 9¾" | 35½" | 26" | 57" | 43½" | 32" | 69¾" | 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" | 66¾" | 13¾" | 6'-0½" |

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

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# | 1¾" x 16" | 68" (12D) | OT | E32 | P19 | 334 |
| A-1824D-470-240 | " | " | " | " | " | 40, 46, 51, 55, 68 (10D) | " | 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 (8D) | " | " | " | " |
| 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 (6D) | " | " | " | 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# | " | " | " | " | " | " |
| A-912D-427-144 | 42,700 | 144-120-100 | " | 27 x 14 @ 161# | " | " | " | " | " | 232 |
| A-640D-305-168 | 30,500 | 168-141-118 | " | 27 x 12 @ 146# | " | 28, 34, 40, 46, 51 (5D) | " | " | " | " |
| A-640D-427-144 | 42,700 | 144-120-100 | " | 27 x 14 @ 161# | " | " | " | " | " | " |
| A-640D-305-144 | 30,500 | 120-100-86 | 12 | 27¾ x 12¾ @ 146# | 1¼" x 12" | " | " | " | P18 | 326 |
| A-640D-365-120 | 36,500 | " | " | " | " | " | " | " | " | " |
| A-456D-305-144 | 30,500 | 144-120-100 | " | " | " | 28,34,40,46,51 (4D or 6C) | " | " | " | " |
| 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 (5C or 4D) | 2T | E22 | " | " |
| A-320D-305-100 | 30,500 | 100-86-74 | " | " | " | " | " | " | " | " |
| A-228D-173-100 | 17,300 | " | 10 | 21 x 12 @ 101# | 1½" x 12" | 24¼, 30, 36, 41¼ (4C or 3D) | " | " | 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 (3C or 2D) | 3TA | E19 | P16 | " |
| A-114D-173-64 | 17,300 | 64-54 | 8 | 16 x 8½ @ 67# | 1" x 9" | 19¼, 24, 29¼, 33¼ (2C) | " | 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

*These values are approximate
 For High Slip (Nemad) Electric Motors and Slow Speed Engines

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

For Normal Slip Electric Motors and Multi-cylinder Engines

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

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)

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

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

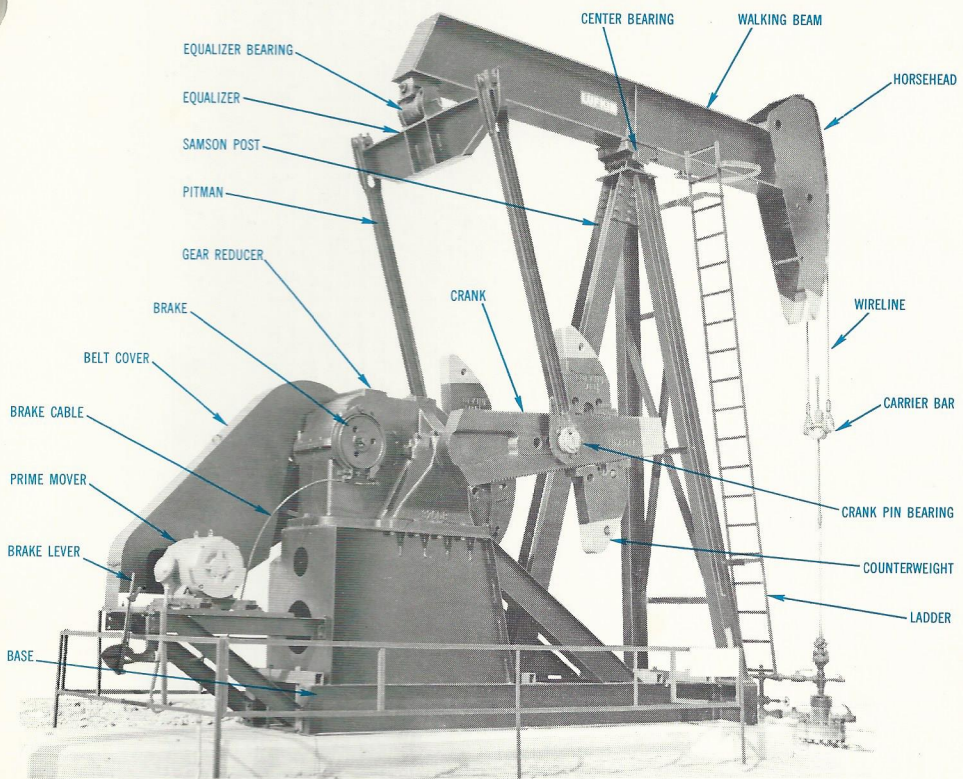


FIGURE 33
Conventional Pumping Unit Nomenclature

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

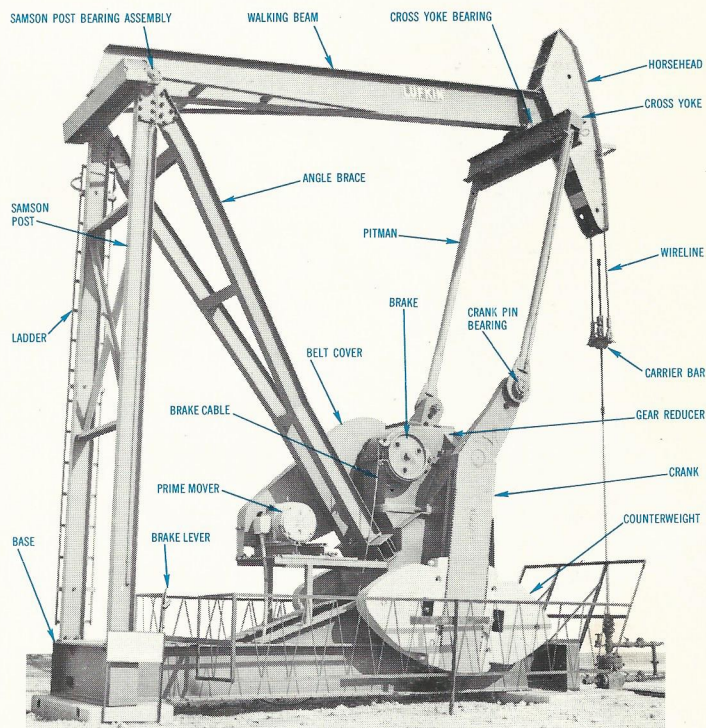
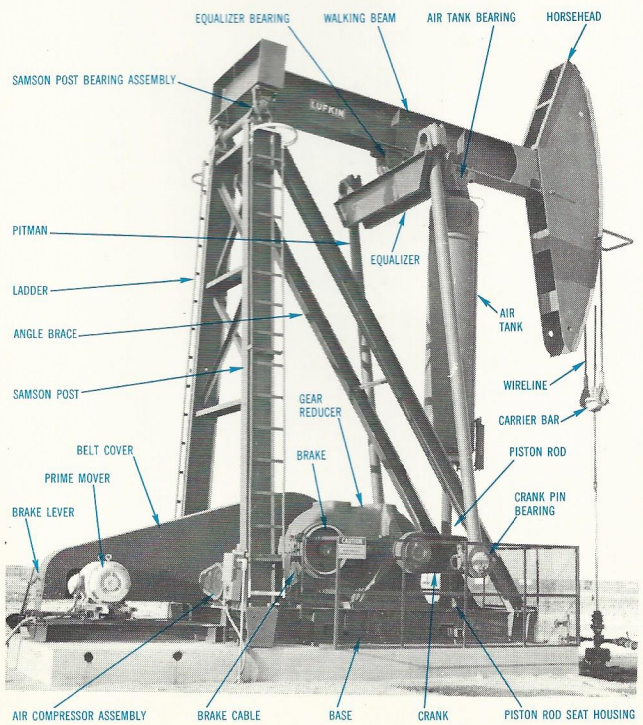


FIGURE 35
Mark II Pumping Unit



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