

## FILE FOLDER

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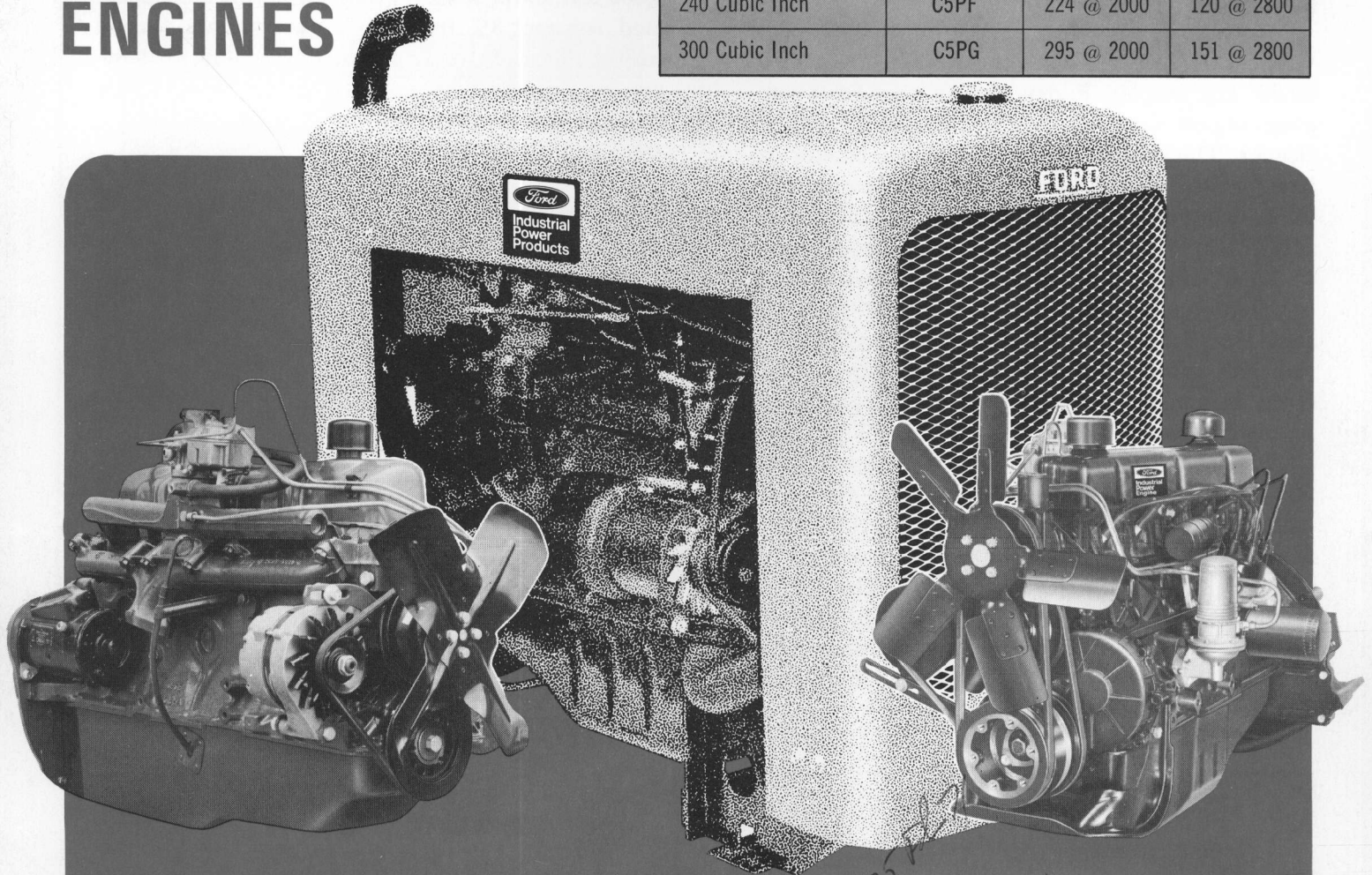
**\*Scanned as next image**

# FORD

## INDUSTRIAL ENGINES

### 6-CYLINDER GASOLINE

DISPLACEMENT	MODEL NUMBER	GROSS TORQUE AT RPM	GROSS HORSEPOWER AT RPM
200 Cubic Inch	200GF	191 @ 2000	99 @ 2800
240 Cubic Inch	C5PF	224 @ 2000	120 @ 2800
300 Cubic Inch	C5PG	295 @ 2000	151 @ 2800



FORD 6-CYLINDER INDUSTRIAL ENGINES ARE DESIGNED TO MEET THE DEMAND FOR COMPACT, HIGH OUTPUT POWER PLANTS. OUTSTANDING DURABILITY results directly from their ability to handle industrial loads easily at low governed engine speeds. ECONOMICAL OPERATION goes hand in hand with short-stroke, low-friction design . . . high efficiency combustion chamber design . . . full-flow, filtered lubrication system . . . and other service-saving features to help keep operating and maintenance expenses to a minimum. MORE DEPENDABLE PERFORMANCE results from industrial duty design features that provide reserve for handling intermittent peak demands as well as normal loads day after day.

- OVERHEAD VALVES
- LARGE BORE, SHORT STROKE
- DEEP, RIGID BLOCK
- HIGH COMPRESSION
- REGULAR FUEL





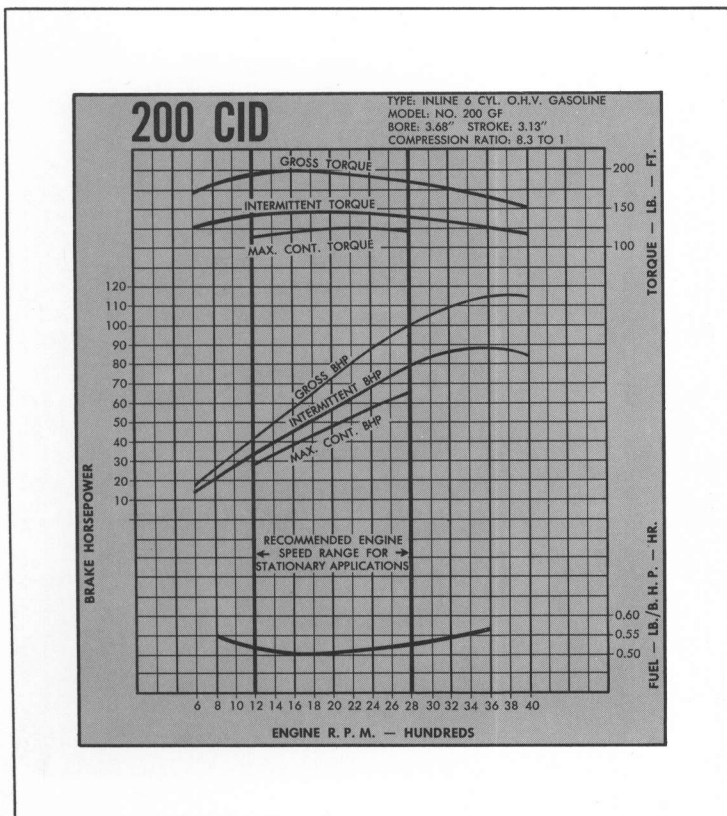
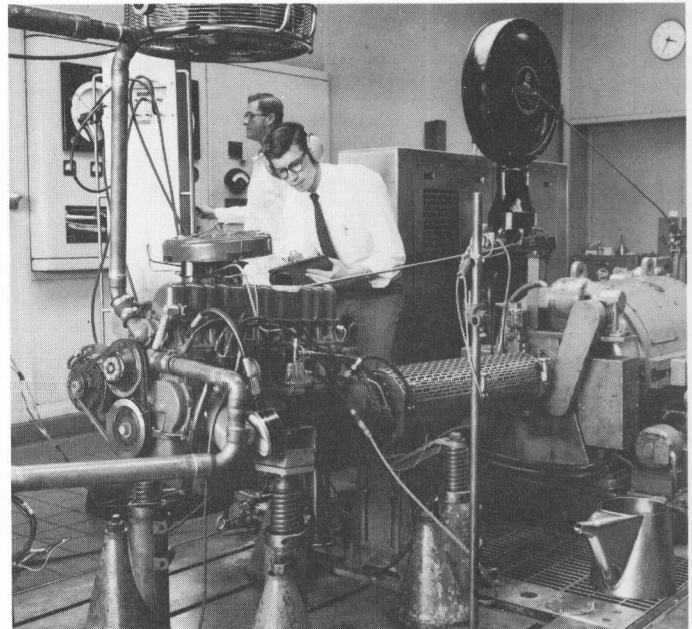
# POWER SPECIFICATIONS . . .

## SOME NOTES ABOUT THE POWER CURVES . . .

**GROSS OUTPUT** — These curves are corrected to 29.92" Hg. and 60° F. dry air. They are for a complete engine assembly less fan, generator and air cleaner. The engine is run with dynamometer exhaust system and optimum spark and fuel settings for best power. **ENGINE INSTALLED OUTPUT (INTERMITTENT)**—These curves are corrected to 29.00" Hg. and 85° F. dry air. They are for a complete engine assembly less fan, but including generator, air cleaner and muffler.\* The engine is run with automatic spark and fuel settings. This is the maximum BHP and torque available for intermittent operation. **MAXIMUM CONTINUOUS OUTPUT**—These curves are corrected to 29.00" Hg. and 85° F. dry air. They represent the maximum BHP and torque recommended for continuous operation of the engines equipped as described for Installed Output. **ACCESSORIES** — The curves should be derated to compensate for any accessories which are added such as hydraulic pumps, air compressors, etc. See tables accompanying power curves for cooling fan power requirements.

**SEVERE OPERATING CONDITIONS**—For each 1,000 feet above sea level that the unit is to be operated, subtract 3% from the horsepower and torque curves. For each 10° F. rise in surrounding air temperature—above that specified in the power curve charts—subtract 1%.

\*Max. of 2" Hg. Back Pressure.



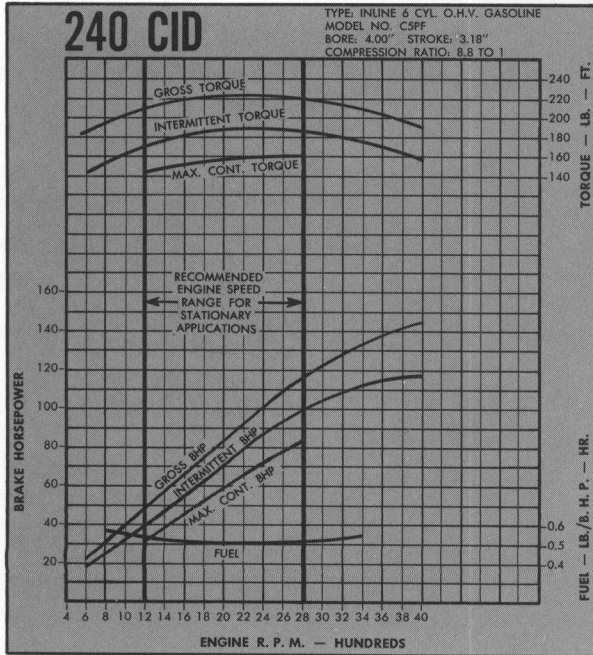
### 200 CID SIX \*

RPM	1200	1600	2000	2400	2800
Gross BHP	42	57	72	86	99
Gross Torque	183	188	191	192	185
Engine Installed BHP (Intermittent)	31	43	56	68	78
Engine Installed Torque (Intermittent)	135	142	146	147	144
Maximum Continuous BHP	27	37	47	58	66
Maximum Continuous Torque	116	122	125	127	122
<b>COOLING FAN POWER REQUIREMENTS (BHP)</b>					
Engine Models	.1	.2	.3	.8	2.0
Power Unit Models	.6	1.4	2.7	4.7	7.4

# Standard Engine Assemblies and Power Units



## 240 CID SIX

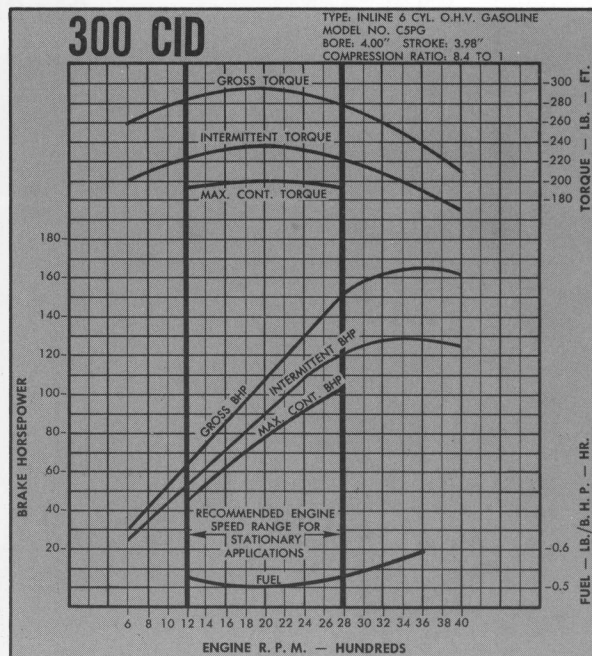


RPM	1200	1600	2000	2400	2800
Gross BHP	48	68	87	104	120
Gross Torque	212	220	224	225	223
Engine Installed BHP (Intermittent)	39	54	71	87	100
Engine Installed Torque (Intermittent)	169	180	187	189	186
Maximum Continuous BHP	33	45	60	73	84
Maximum Continuous Torque	142	151	157	160	159
<b>COOLING FAN POWER REQUIREMENTS (BHP)</b>					
Engine Models	.2	.6	1.2	2.0	3.1
Power Unit Models	.7	1.6	3.1	5.4	8.5

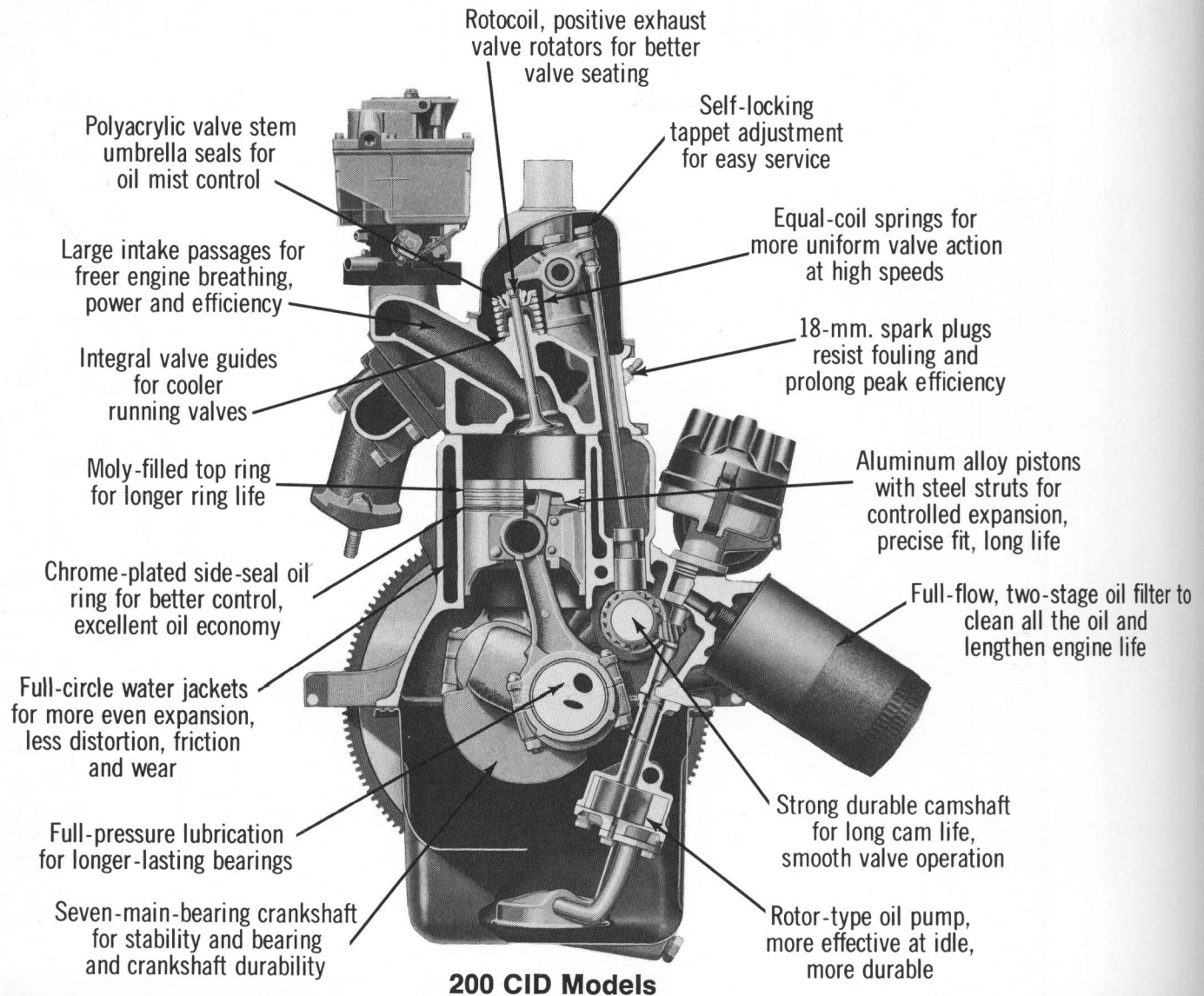
## 300 CID SIX



RPM	1200	1600	2000	2400	2800
Gross BHP	64	86	109	132	151
Gross Torque	281	290	295	294	282
Engine Installed BHP (Intermittent)	53	71	90	108	120
Engine Installed Torque (Intermittent)	225	234	237	232	222
Maximum Continuous BHP	45	62	77	90	101
Maximum Continuous Torque	194	200	200	198	194
<b>COOLING FAN POWER REQUIREMENTS (BHP)</b>					
Engine Models	.2	.6	1.2	2.0	3.1
Power Unit Models	.7	1.6	3.1	5.4	8.5







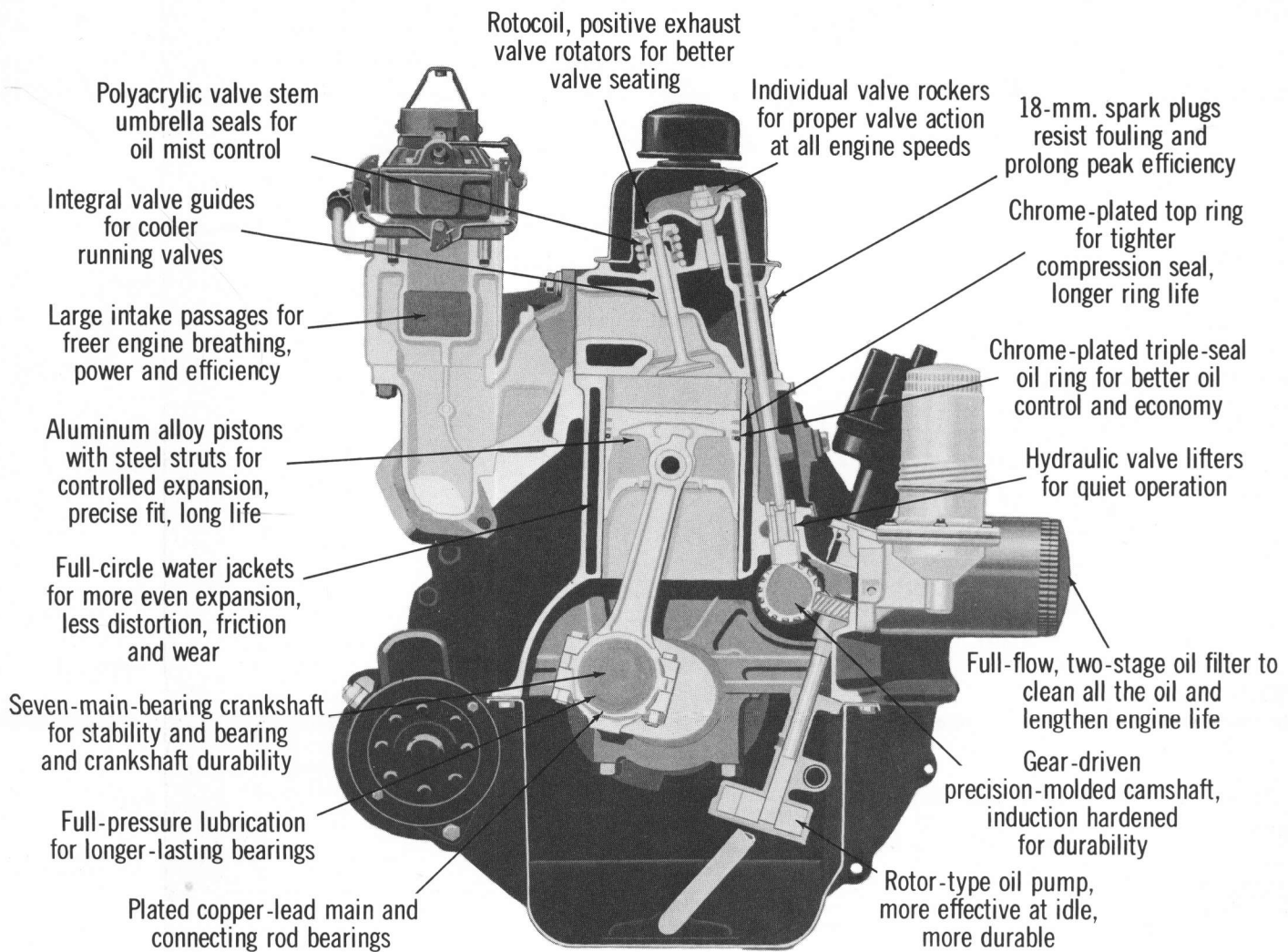
## STANDARD

**STANDARD MODEL  
ENGINE ASSEMBLIES  
INCLUDE:**

- FLYWHEEL AND RING GEAR
- DISTRIBUTOR ASSEMBLY
- IGNITION COIL ASSEMBLY
- SPARK PLUGS AND CABLES
- STARTING MOTOR
- GENERATOR OR ALTERNATOR AND DRIVE BELT
- MANIFOLDS—INTAKE AND EXHAUST
- FAN ASSEMBLY (SUCTION TYPE) AND DRIVE BELT
- CARBURETOR ASSEMBLY
- FUEL PUMP
- CRANKSHAFT DAMPER AND PULLEY
- OIL PUMP
- OIL FILTER ASSEMBLY
- OIL FILLER AND BREATHER CAP
- WATER PUMP ASSEMBLY
- THERMOSTAT
- WATER OUTLET CONNECTION
- ENGINE FRONT SUPPORT\*

\*240/300 CID Models Only

# FEATURES . . . . .



**240/300 CID Models**

# EQUIPMENT

STANDARD MODEL  
POWER UNITS  
INCLUDE THE  
FOLLOWING  
ADDITIONAL ITEMS:

- SHEETMETAL HOUSING
- GENERATOR OR ALTERNATOR REGULATOR
- SKID OR FOOT-TYPE MOUNTING\*\*
- INSTRUMENT PANEL, INCLUDING:
  - IGNITION SWITCH
  - STARTER SWITCH
  - AMMETER OR CHARGING WARNING LIGHT
  - OIL PRESSURE GAUGE OR WARNING LIGHT
  - CARBURETOR CHOKE CONTROL
  - THROTTLE CONTROL
  - WATER TEMPERATURE GAUGE
- WIRING HARNESS
- EXHAUST PIPE ASSEMBLY
- MECHANICAL GOVERNOR
- AIR CLEANER ASSEMBLY
- RADIATOR ASSEMBLY

\*\*200 CID Power Units Available Only as Skid-Mounted.



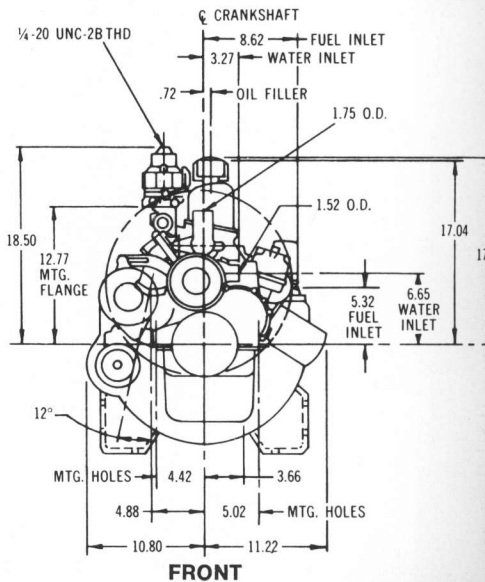
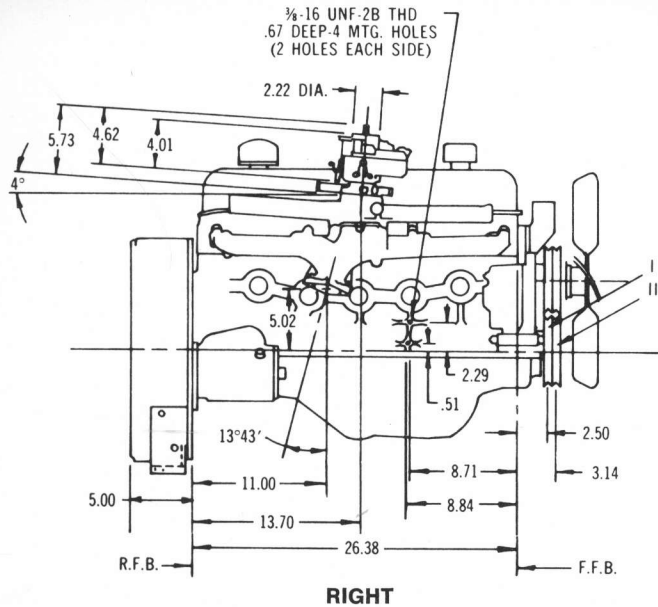
# Standard Engine Assemblies and Power Units

		200 CID	240 CID	300 CID
<b>ENGINE TYPE</b>	In-Line, 6-Cylinder, Overhead Valve	X	X	X
<b>FUEL</b>	Gasoline, Regular Grade	X	X	X
<b>BORE AND STROKE</b>	3.68" x 3.12"	X		
	4.00" x 3.18"		X	
	4.00" x 3.98"			X
<b>DISPLACEMENT</b>	200 Cubic Inches	X		
	240 Cubic Inches		X	
	300 Cubic Inches			X
<b>MEAN COMPRESSION RATIO</b>	8.3:1	X		
	8.8:1		X	
	8.4:1			X
<b>CYLINDER HEADS</b>	High-Grade Cast Iron	X	X	X
<b>CYLINDERS AND CRANKCASE</b>	Cast Iron—Cast Integral	X	X	X
<b>CYLINDER WALL FINISH</b>	Controlled Quality Finish for Uniform Oil Film	X	X	X
<b>PISTONS</b>	Aluminum Alloy, Autothermic Type, Deep Skirt, Cam Ground, Tin-Plated	X	X	X
<b>PISTON RINGS</b>	<b>Top Compression Ring</b> —Cast Iron Alloy, Molybdenum-Filled Groove	X		
	Chrome-Plated Cast Iron Alloy		X	X
	<b>Second Compression Ring</b> —Cast Iron Alloy, Oxide-Coated with Scraper Groove	X		
	Cast Iron Alloy, Phosphate-Coated, with Scraper Groove		X	X
	<b>Oil Control Ring</b> —Steel, Chrome-Plated Rails, with Steel Expander Spacer	X	X	X
<b>CRANKSHAFT</b>	Precision-Molded Alloy Cast Iron, with 7-Bearing Support	X	X	X
<b>MAIN BEARINGS</b>	Replaceable, Steel-Backed, Tin-Plated Aluminum Alloy, Selective Fit	X		
	Replaceable, Steel-Backed, Copper-Lead Alloy, Selective Fit		X	X
<b>CONNECTING ROD BEARINGS</b>	Replaceable, Steel-Backed, Copper-Lead Alloy, Selective Fit	X	X	X
<b>CAMSHAFT</b>	4-Bearing, Precision-Molded Special Alloy Iron, Induction-Hardened	X	X	X
<b>VALVES—INTAKE</b>	S.A.E. #1047 Aluminized Steel	X	X	X
<b>VALVES—EXHAUST</b>	S.A.E. #21-4N Aluminized Steel	X		
	S.A.E. #21-4N Aluminized Steel, Stellite-Faced		X	X
<b>VALVE ROTATION—INTAKE</b>	Ford Free-Turn	X	X	X
<b>VALVE ROTATION—EXHAUST</b>	Positive Roto-Coil Type	X	X	X
<b>VALVE LIFTERS</b>	Hydraulic	X	X	X
<b>LUBRICATION SYSTEM</b>	Full Pressure to All Bearings, Full-Flow Filter, Rotor-Type Internal Oil Pump	X	X	X
<b>OIL CAPACITY</b>	4.5 Quarts Dry—3.5 Quarts Refill	X		
	7 Quarts Dry—6 Quarts Refill		X	X
<b>SPARK PLUGS</b>	18 mm.	X	X	X
<b>ELECTRICAL SYSTEM</b>	12 Volt	X	X	X
<b>IGNITION SYSTEM</b>	Battery	X	X	X
<b>STARTER</b>	Positive-Engagement Type	X	X	X
<b>DISTRIBUTOR</b>	Centrifugal-Vacuum Advance	X	X	X
<b>FIRING ORDER</b>	1-5-3-6-2-4	X	X	X
<b>CHARGING SYSTEM</b>	Alternator: 38 Ampere, 570 Watt	X		
	Generator: 30 Ampere, 450 Watt		X	X
<b>CARBURETOR</b>	1-Venturi, Downdraft	X	X	X
<b>FUEL PUMP</b>	Mechanical Diaphragm Type	X	X	X
<b>COOLING SYSTEM</b>	Series Type	X	X	X
<b>TEMPERATURE CONTROL</b>	Thermostat in Coolant Outlet Connection	X	X	X
<b>WATER PUMP</b>	Prelubricated Centrifugal Type	X	X	X
<b>ENGINE WEIGHT—DRY</b>	337 lb. (Fan to Flywheel, Less Clutch Housing)	X		
	460 lb. (Fan to Flywheel, Less Clutch Housing)		X	
	473 lb. (Fan to Flywheel, Less Clutch Housing)			X

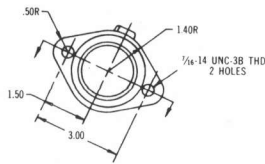
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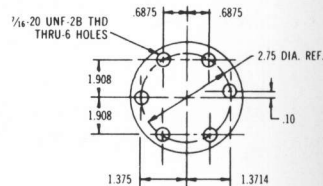
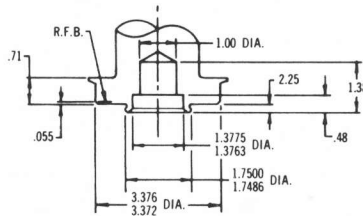
# INSTALL



**200 CUBIC**

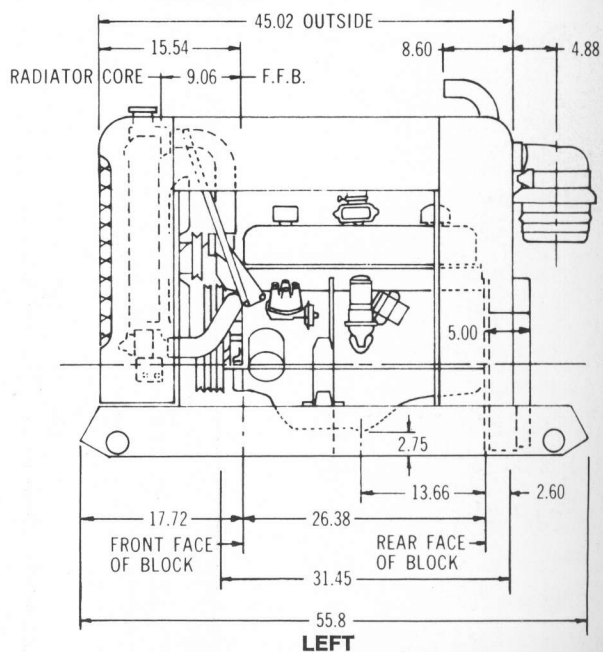
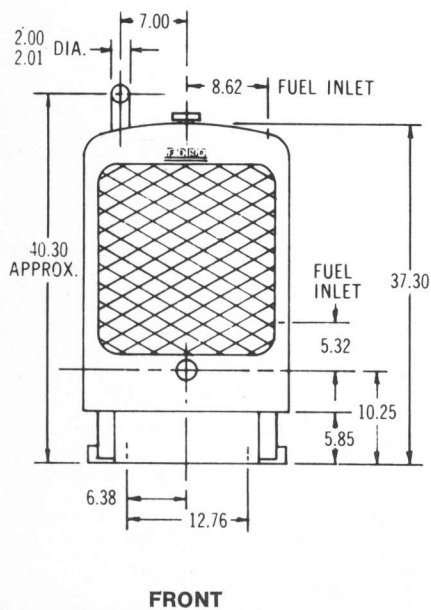


**EXHAUST FLANGE**



**CRANKSHAFT MOUNTING FLANGE**

**200 CUBIC INCH ENGINE**

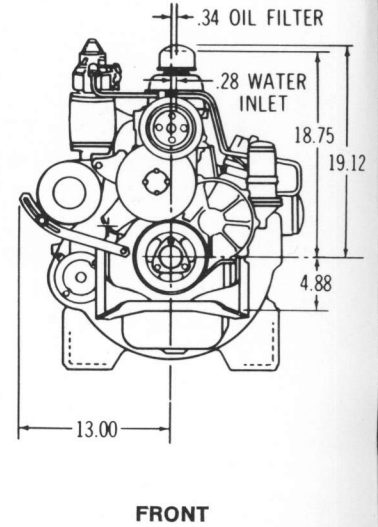
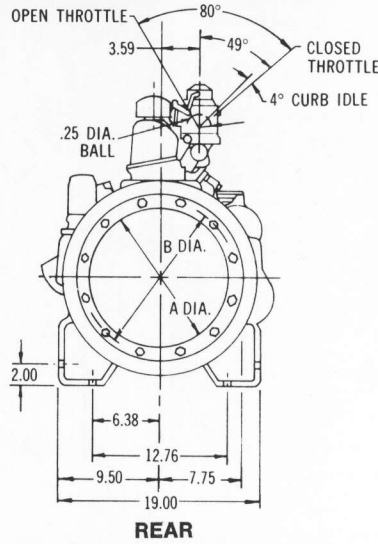
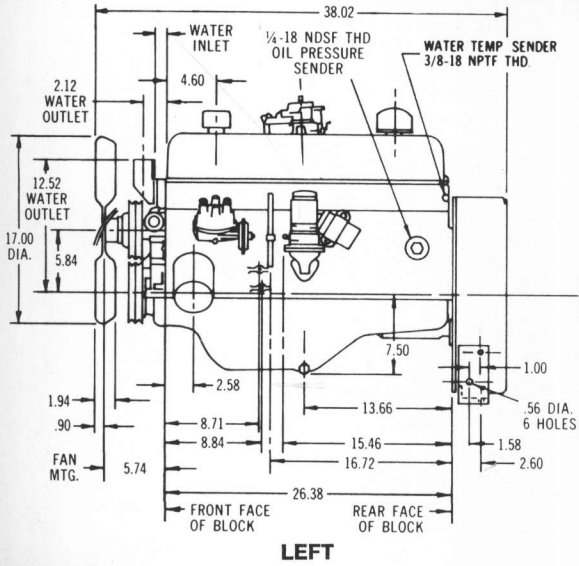


**200 CUBIC INCH ENGINE**

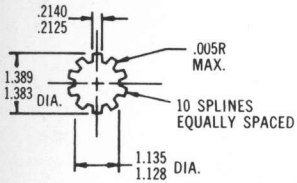


# ATION DIMENSIONS... *Standard Engine*

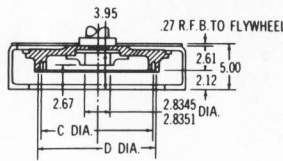
## ENGINE ASSEMBLIES



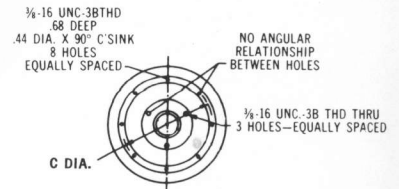
CH ENGINE



FLYWHEEL HSG	B.C. B DIA.	BORE A DIA.
SAE NO. 3	16.870 16.880	16.125 16.128
SAE NO. 4	14.995 15.005	14.250 14.253



ENGINE DISPLACEMENT	CLUTCH SIZE	C DIA.	D DIA.
200	10"	11.625	12.375 12.380
240	10"	11.625	12.375 12.380
300	11.5"	13.125	13.875 13.880



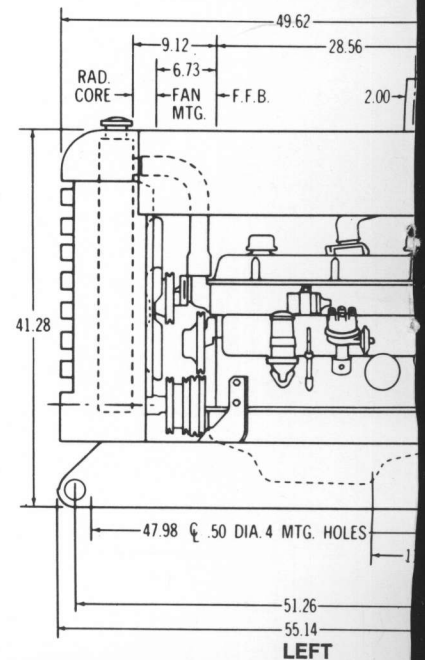
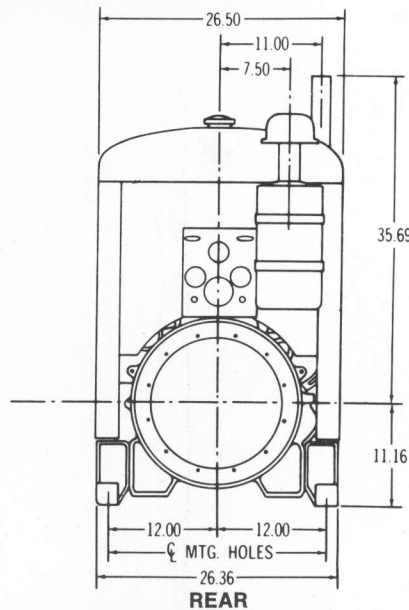
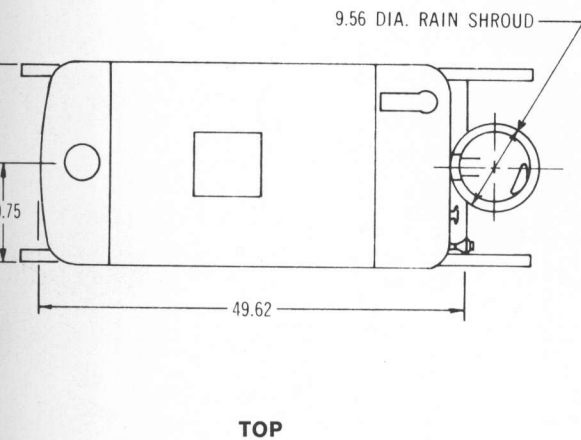
CLUTCH SPLINE

INDUSTRIAL FLYWHEEL W/SAE HSG.

ALL ENGINES

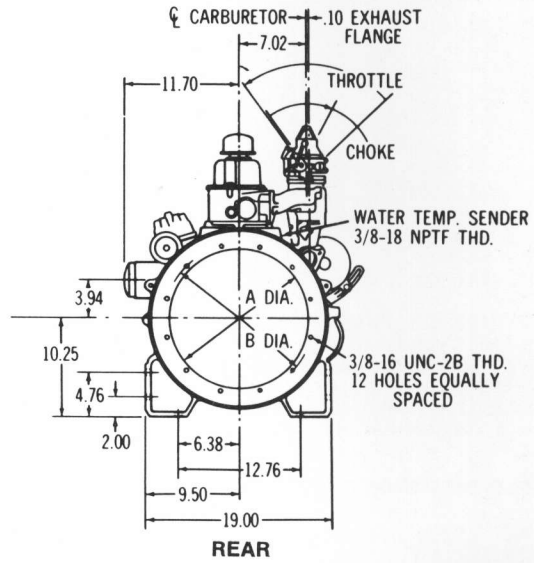
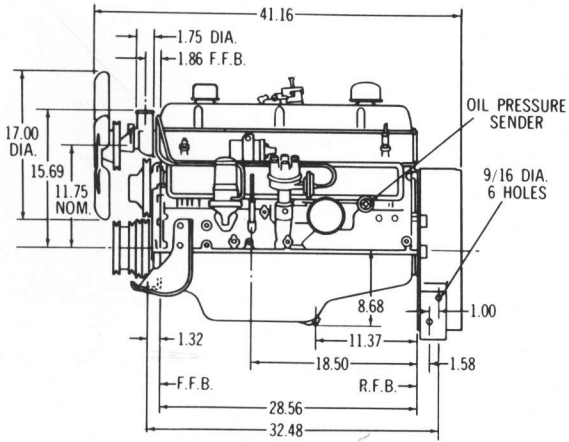
INDUSTRIAL FLYWHEEL

## POWER UNITS



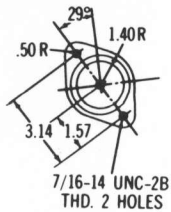
240/300 CID (SKID-MOUNTED)

# Assemblies and Power Units

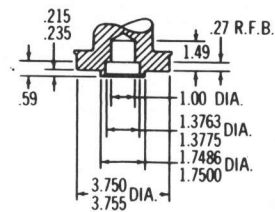


**LEFT**  
**240/300 CUBIC INCH ENGINE**

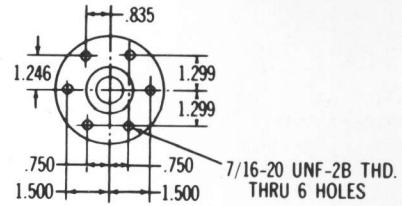
**REAR**



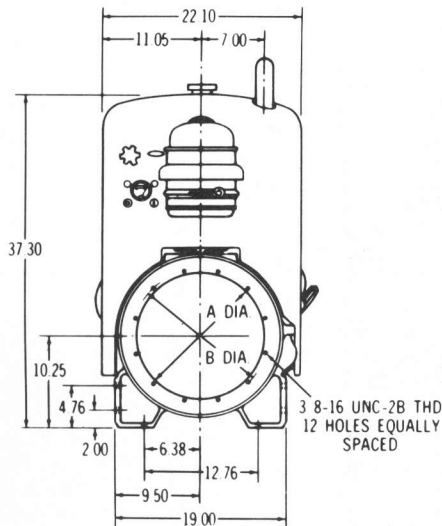
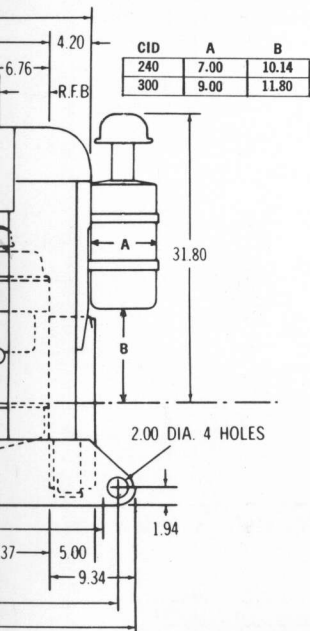
**EXHAUST FLANGE**



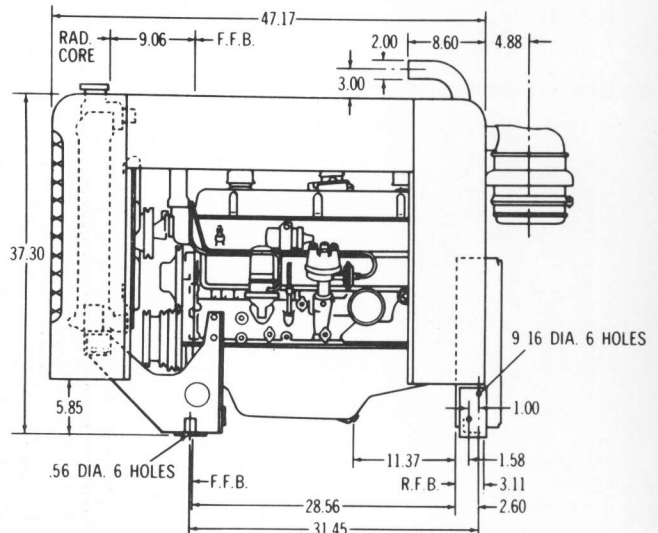
**CRANKSHAFT MOUNTING FLANGE**



**240/300 CUBIC INCH ENGINE**



**REAR**

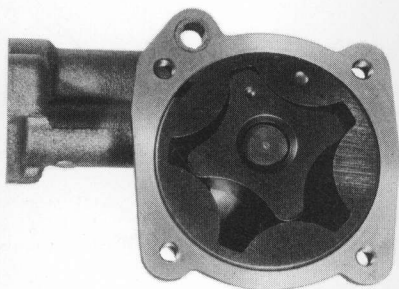


**LEFT**

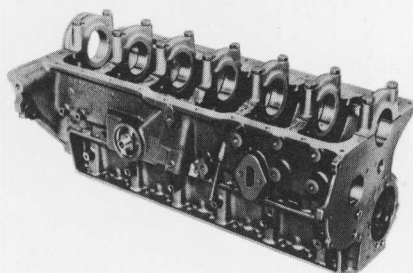
**240/300 CID (FOOT-MOUNTED)**



# STANDARD ENGINE FEATURES



**ROTOR-TYPE OIL PUMP . . .** High volume oil circulation with quiet, rotor-type pump produces more positive supply at all pressure points in lubrication system over the entire operating range from idle to high speeds.



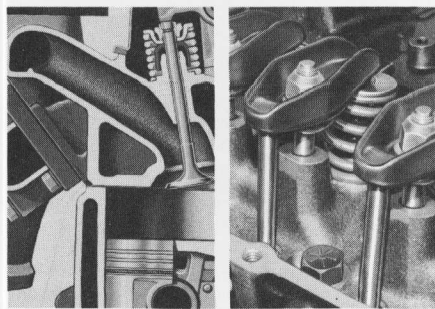
**PRECISION-CAST CYLINDER BLOCK . . .** Ford-pioneered foundry techniques save 50 to 70 pounds over previous six-cylinder blocks. Seven-main-bearing design provides more rigidity for smoother, quieter operation at all speeds.



**SEVEN BEARING CRANKSHAFT—** Specially cast shaft has additional bearing surface for smoother power, longer bearing and crankshaft life. Ford cast alloy crankshaft provides rigidity and improved lubrication characteristics.



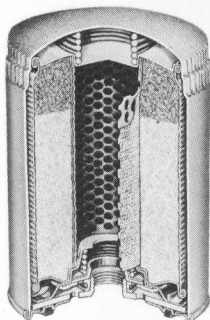
**DEEP-SKIRTED PISTONS . . .** More stable in cylinder bore, reduce wear on bore, piston and rings. Top compression ring on 240/300 CID models has thick chrome plating instead of ordinary flash plate. 200 CID models have a molybdenum-filled groove in the top ring. Oil control rings are chrome faced for long life.



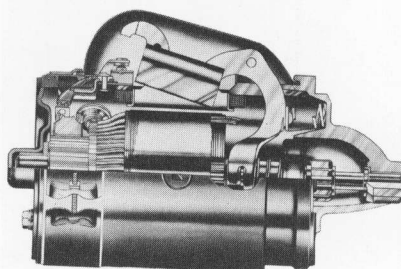
**INTEGRAL INTAKE MANIFOLD — (200 CID SIX) . . .** Provides faster warmup of fuel mixture. Eliminates possibility of manifold gasket leaks. **PEDESTAL-MOUNTED VALVE ROCKER ARMS—(240/300 CID SIXES) . . .** Pedestal rocker arms are self-aligning to minimize wear. Precision castings provide better bearing surfaces and retain lubricant longer than stampings.



**HIGH-LIFT CAMSHAFT . . .** Heavy-duty camshaft is induction hardened, precision-molded alloy iron for long life. High-lift lobes provide wide valve opening for better engine efficiency. Four replaceable bearings, located to minimize deflection, provide accurate valve action and greater durability. Drive is by silent chain on 200 CID models; gears on 240/300 CID models.



**FULL-FLOW OIL FILTER . . .** Has two-section, depth-type filtering element, designed to provide top filtering efficiency, especially with today's multiple-viscosity, high-detergent oils. Easily removed for periodic replacement.



**POSITIVE-ENGAGEMENT STARTER . . .** Drive pinion totally engages before starter torque begins. Pinion remains engaged until engine is started and running. Cuts starter wear and promotes faster, more positive starts.



**HYDRAULIC VALVE LIFTERS . . .** Automatically compensate for wear on valve train parts, maintain correct valve lash clearances for maximum engine efficiency, eliminate need for periodic adjustments. Case-hardened plungers are chrome plated to minimize wear and oil leakdown.

# OPTIONS AND ACCESSORIES

## STANDARD MODEL POWER TRAIN AVAILABILITY

	200 CID		240 CID		300 CID	
	Eng.	Pwr. Unit	Eng.	Pwr. Unit	Eng.	Pwr. Unit
Bell-Type Flywheel and Clutch Housing	X	X	X	X	X	X
SAE #3 Flywheel Housing			X	X	X	X
SAE #4 Flywheel Housing	X	X	X	X	X	X
3-Speed Manual Transmission	X	X	X	X		
4-Speed Manual Transmission	X	X	X	X	X	X
Clutch 11"	X	X	X	X		
Clutch 12"					X	X
Torque Converter and PTO			X	X	X	X
PTO—Spring-Loaded Clutch	X	X	X	X	X	X
Heavy Duty PTO—Over Center Clutch	X	X	X	X	X	X

NOTE: Special models can be engineered to suit special requirements.

## OPTION AVAILABILITY

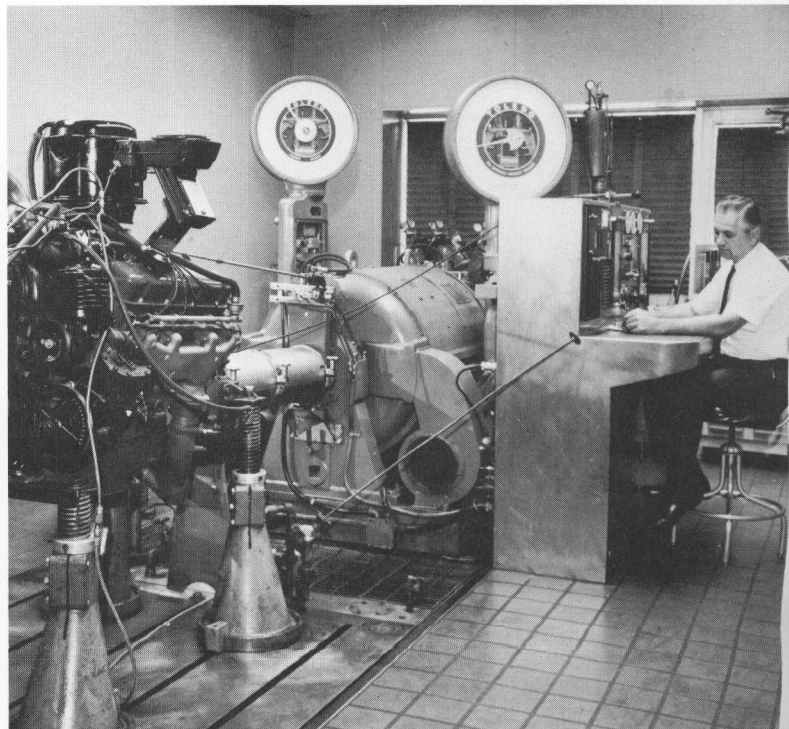
Option No.	Description	200 CID		240/300 CID	
		Eng.	Pwr. Unit	Eng.	Pwr. Unit
1	LPG Fuel System	X	X	X	X
2	Mechanical Governor	X	Std.	X	Std.
3	Velocity Governor	X	X	X	X
5	Parking Brake*	X	X	X	X
8	Side Panels		X		X
9	Natural Gas			X	X
10	Foot Mounting				X
11	Safety Switches		X		X
15	Alternator	Std.	Std.	X	X
16	Hard Faced Valves & Seat Inserts	X	X	X	X
17	Air Cleaner—Hat Type	X	X	X	X
26	Housing & Flywheel for Wet Clutch	X	X	X	X

\*Available on models with transmission only.

## ACCESSORIES

- Engine Hour Meter
- Overspeed Safety Switch
- Electric Fuel Pump
- Tachometer
- Power Steering Pump
- Muffler
- Extra Cooling Fan

# THE FORD QUALITY STORY...



Nowhere along the line, from drawing board to delivery, is more infinite care devoted to the production of engines for industrial use than at Ford Motor Company. Ford's concept of total quality begins with ideas—in research and design, continues with exhaustive testing of prototypes, advances to establishment of manufacturing controls and extends to the provision of expert servicing for the finished product.

## RESEARCH AND ENGINEERING

Ford Motor Company maintains a 720-acre Research and Engineering Center at Dearborn, Michigan staffed by some 12,000 engineers, scientists and designers.

Engine design begins with specific objectives and a few basic guide-lines such as size, weight and power output. The rest comes out of the development and

evaluation of promising ideas. It is Ford's unique talent for practical exploration and testing of new ideas that keeps better ideas on the move . . .

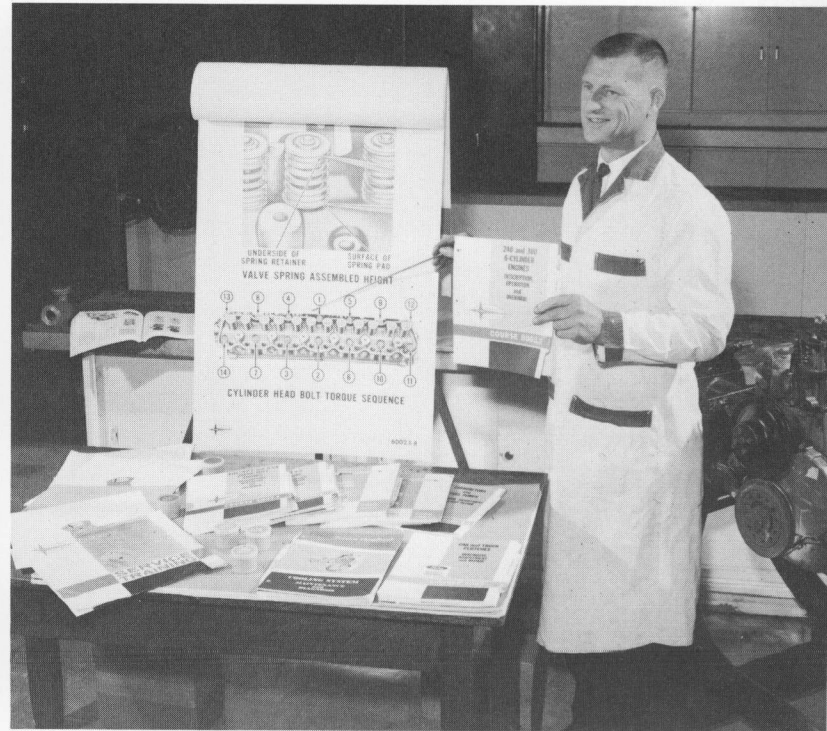
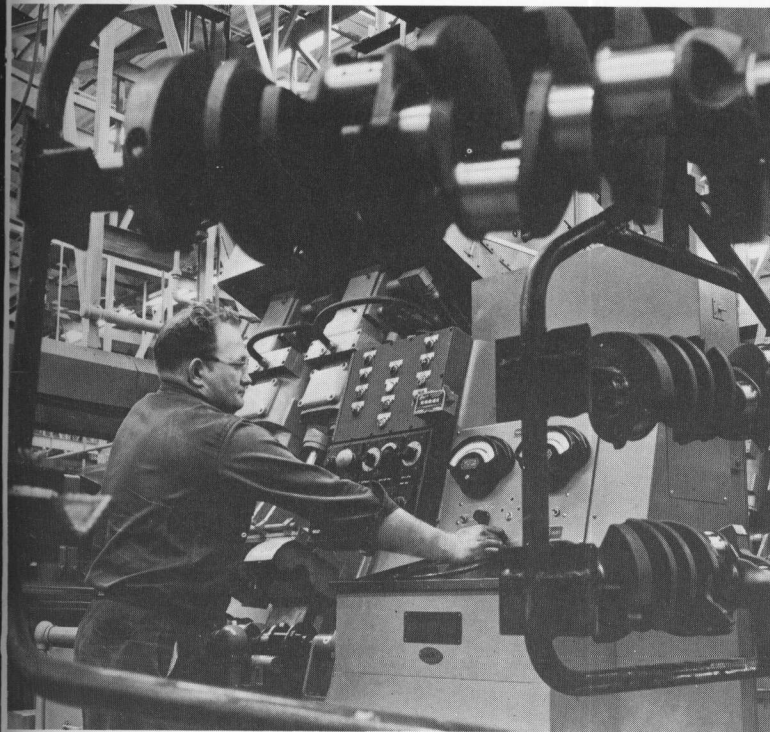
. . . to measure wall thicknesses in cylinder blocks, for example, Ford uses an electronic "sonar scanner" that quickly reveals dimensions within thousandths of an inch at any point. This check is used to ensure that the designed wall thickness is faithfully reproduced in the manufacturing process.

. . . a load simulator provides the inertial forces of a set of pistons and connecting rods while precision instruments check for amount and angle of crankshaft imbalance, if any.

. . . a distortion analyzer is used to measure effects on cylinder wall and bearing bore axes and shape as heads, manifolds and oil pan are bolted in place.



# From Drawing Board to Delivery



... a Ford first is the use of photo-elastic plastic in "photographing"—via polarized light—the location, pattern and severity of strains which are introduced into components during assembly and operation of the engine.

... a special honing machine can copy any production-engine cylinder honing technique so that experimental data is extremely precise, and so that no variance in performance characteristics is experienced from lab to assembly-line.

## PRODUCTION AND SERVICE

It is especially significant that Ford engineering-and-design experimental development work is correlated to actual in-use conditions . . . and that experimental data gathered with infinite patience and care is accurately translated into production specifications and techniques. This "realistic" de-

sign philosophy assures production of engines that will perform with the characteristics established in the laboratory. In production, as in engineering, only the finest of precision equipment is used to assure strict adherence to highest production standards.

And then, with so many precautions already taken, Ford makes certain that its engines may be properly maintained and serviced wherever they may be in use. A nationwide network of parts depots and Industrial Power Products Distributors stock and distribute replacement parts, all made to the extreme close tolerances of original equipment components. In addition, Ford continuously strives to maintain a high level of service competence through service training programs for its distributors and dealers. From drawing board to delivery, you can put your faith in Ford.

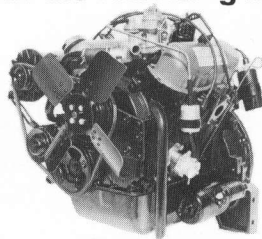
# FORD POWER SELECTOR

DISP	TYPE	FUEL	HORSEPOWER RANGE AT VARIOUS RPMs																					
			20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230
91	V-4	G	-----*																					
104	V-4	G	-----*																					
134	4	G	-----																					
172	4	D	-----																					
172	4	G	-----																					
242	4	D	-----																					
200	6	G	-----																					
240	6	G	-----																					
330	6	D	-----																					
363	6	D	-----																					
300	6	G	-----																					
330	V-8	G	-----																					
361	V-8	G	-----																					
391	V-8	G	-----																					
477	V-8	G	-----																					
534	V-8	G	-----																					

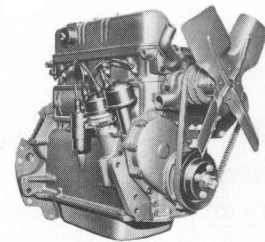
Intermittent H.P. ---  
 Continuous H.P. —  
 \*Not recommended for continuous full-load applications

## The Engines shown above are grouped in the following brochures

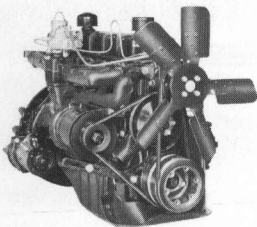
- 91/104 Cubic Inch V-4 Gasoline
- 134/172 Cubic Inch 4-Cylinder Gasoline  
172 Cubic Inch 4-Cylinder Diesel
- 200/240/300 Cubic Inch 6-Cylinder Gasoline
- 242 Cubic Inch 4-Cylinder Diesel  
330/363 Cubic Inch 6-Cylinder Diesel
- 330/361/391 Cubic Inch V-8 Gasoline
- 477/534 Cubic Inch V-8 Gasoline



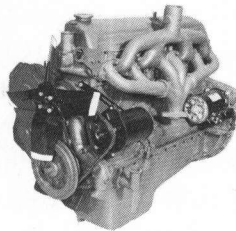
91/104 Cubic Inch V-4 (Gasoline)



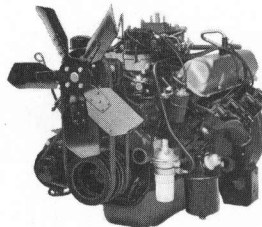
134 Cubic Inch 4 Cyl. (Gasoline)  
172 Cubic Inch 4 Cyl. (Gasoline/Diesel)



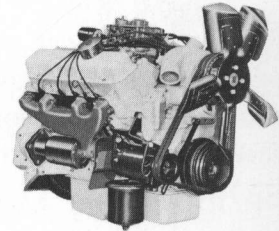
200/240/300 Cubic Inch 6 Cyl. (Gasoline)



242 Cubic Inch 4 Cyl. (Diesel)  
330/363 Cubic Inch 6 Cyl. (Diesel)



330/361/391 Cubic Inch V-8 (Gasoline)



477/534 Cubic Inch V-8 (Gasoline)

**SOLD AND SERVICED BY**

FORD INDUSTRIAL  
POWER PRODUCTS



CORBIN CONSTRUCTION COMPANY, INC.

General Contractors

P. O. BOX 471

DUNN, NORTH CAROLINA 28334

Date 10 September 1971 Job No.

TO Captain W. F. Russell, Jr., CEC, USN Resident Officer in Charge of Construction Marine Corps Base, Camp Lejeune, North Carolina

CONTRACT: N62470-70-C-0939 Water Treatment Plant, Wells and Distribution System

Gentlemen:

We are sending you { herewith under separate cover } five Layne-Atlantic prints of Sheet No. Brochure Model 91 DF Auxiliary prints of Sheet No. Well Pump Motors samples

These are: (As checked below).

- 1. For approval. Please return corrected prints.
2. Revised and for final approval. Please return correct prints.
3. [X] For your Files and use on job
4. Approved for fabrication-Please forward correct prints.
5.

Remarks: In conformance with Section 11A.3.11

Handwritten notes: 1 copy to field, 1 copy to Lantlin, 1 copy to [unclear], 9/13/71, 2

ROUTING ORDE: INT table with rows 1-5 and columns ORIG, INT. Row 1: 60, W. Row 2: 510.

C. C.

Yours Truly, CORBIN CONSTRUCTION CO., INC. APPROVAL SECTION

Drwgs. Enclosed Five brochures

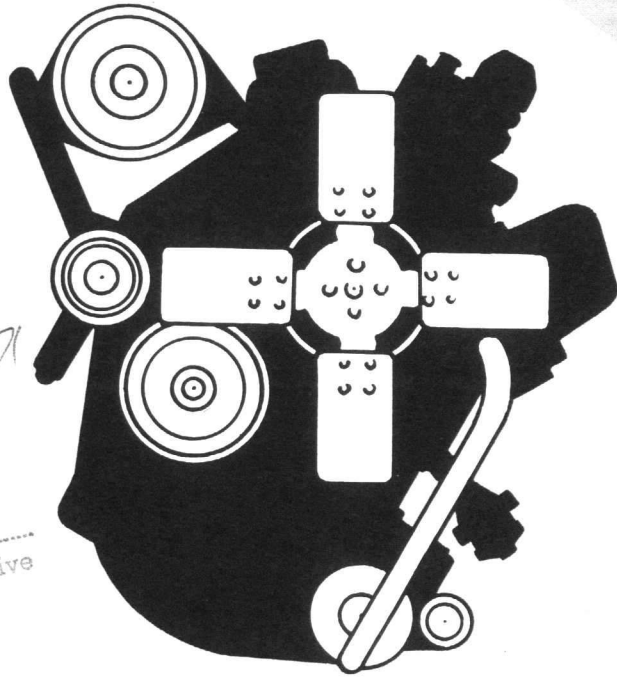
By: [Signature] Quality Control Representative







# V-4'S 91 104



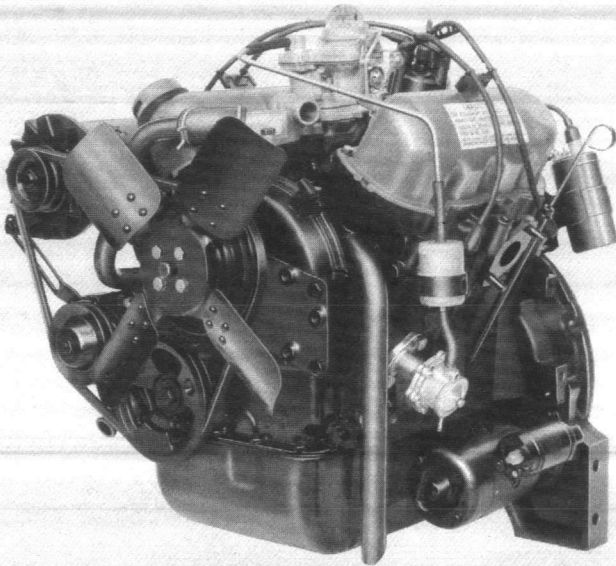
Date: 9/27/71  
APPROVED  
Subject To Meet Of  
Job Plans & Specifications  
By: *[Signature]*  
Quality Control Representative

# FORD V-4 CYLINDER 91 AND 104 SERIES ENGINES

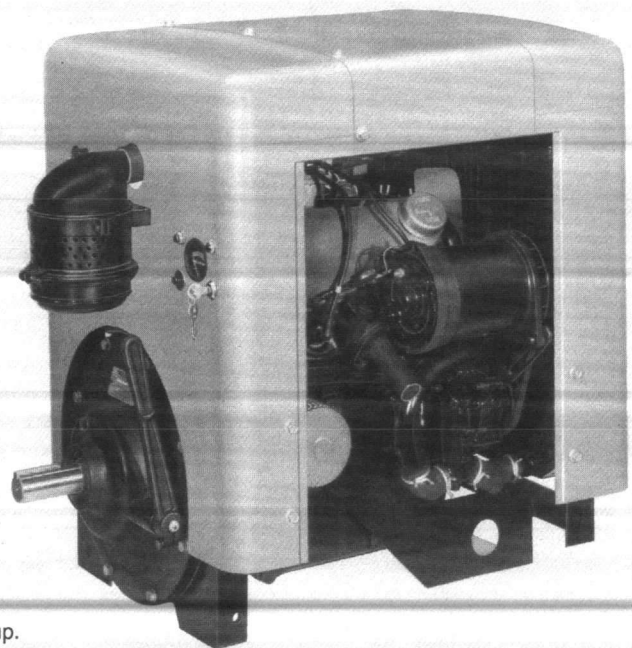
**Advanced Ford engine design meets today's demands for maximum performance, economy and reliability.** Combining the compactness of air-cooled design with the reliability of a water-cooled engine, Ford V-4's are unique among industrial en-

gines. With wide operating range they meet a wide variety of applications. Where low weight, small size and excellent torque and horsepower characteristics in medium to high operating speeds are required, Ford V-4's are your best buy.

- **Modern overhead valve, large bore—short stroke design**
- **Precision-molded cast alloy crankshaft**
- **Replaceable tin-plated, steel-backed, copper-lead alloy main and connecting rod bearing inserts**
- **Tin-plated autothermic aluminum alloy pistons**
- **Chrome-plated piston rings**
- **Gear-drive camshaft**
- **Silicon-chrome alloy exhaust valves**
- **SAE 1047 aluminized intake valve**
- **Pressurized, filtered lubrication**
- **Centrifugal type water pump**
- **Uses regular gasoline**
- **20-amp generator**



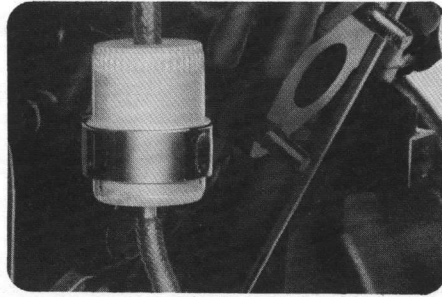
Ford 91 and 104 models are available as engine or power unit assembly with or without clutch; SAE #5 flywheel housing; with or without power take-off; with transaxle combination incorporating 4-speed transmission; with or without housing for 3-speed transmission.



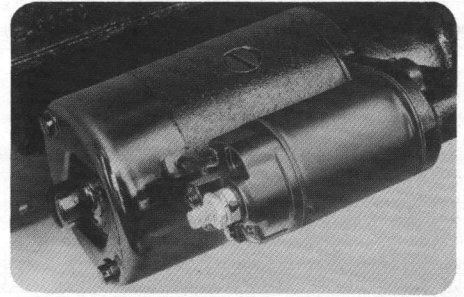
Typical closed power unit setup.



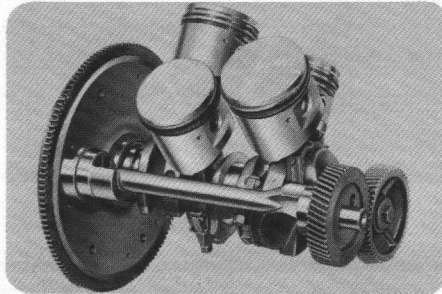
**Your best buy for big power in a small package. Here are some reasons why:**



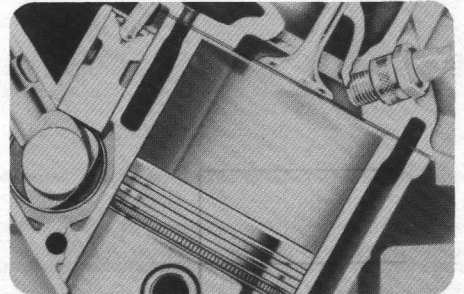
In-line fuel filter does a thorough filtering job, traps foreign particles and provides a clean supply of fuel to the engine. The throwaway filter is economical and easily replaced, being in a readily accessible position.



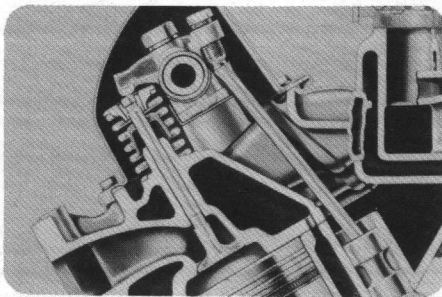
Positive engagement starter is spring-loaded for smooth engagement between starter pinion and flywheel ring gear. This design provides greater dependability, longer gear and starter life.



Engine balancer is a special internal balance shaft, gear-driven by the crankshaft. It eliminates vibrations at all speeds—prolongs engine life and promotes steady, quiet performance.



Large bore, short stroke design delivers more power with less piston travel. Ford's modern short-stroke efficiency cuts fuel costs, extends ring and cylinder wall life by reducing friction and wear.



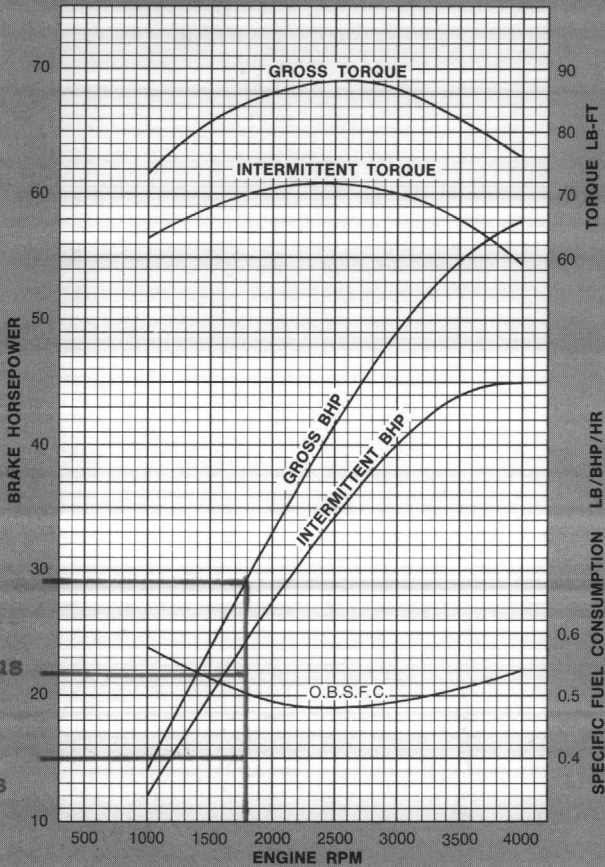
Overhead valves of a tough heat-resistant alloy resist warping and improve volumetric efficiency. Free-turning design makes for more even valve wear—extends valve life and reduces chance of sticking.



Hat-type oil-bath air cleaner provides highly efficient filtering—protects engine from abrasive dust particles. Rain shroud provides protection against weather... prevents dilution of oil.

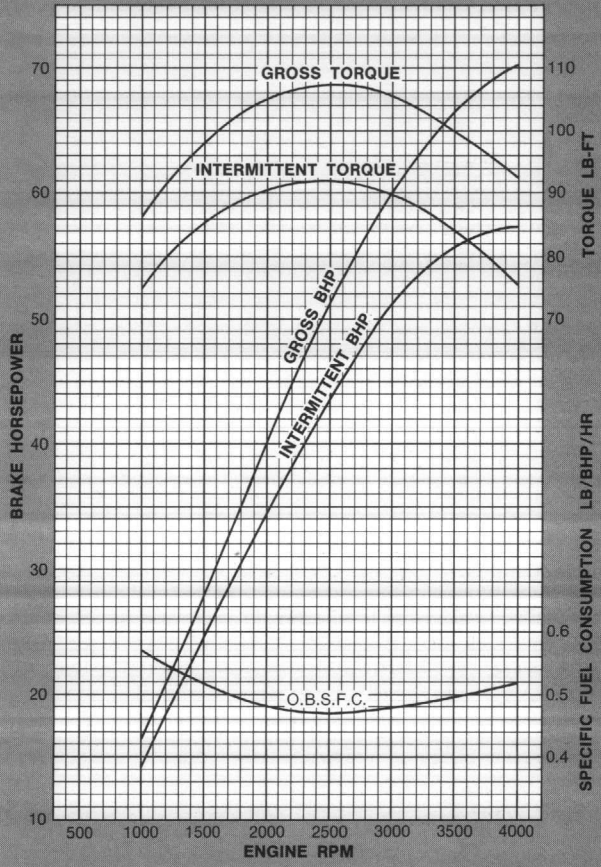
# OHV FOUR CYL. 91

OHV FOUR CYL. 91  
 BORE 3.54 IN. STROKE 2.32 IN.  
 COMPRESSION RATIO 8.3:1



# OHV FOUR CYL. 104

OHV FOUR CYL. 104  
 BORE 3.54 IN. STROKE 2.63 IN.  
 COMPRESSION RATIO 9:1



**Special note—Gross output curves** are corrected to 29.92 in. Hg and 60 deg. F. dry air. They are for a complete engine assembly less fan, generator and air cleaner. The engine is run with dynamometer exhaust system and optimum spark and/or fuel settings for best power.

**Engine installed output (intermittent) curves** are corrected to 29 in. Hg and 85 deg. F. dry air. They are for a complete engine assembly less fan, but including generator, air cleaner and muffler.\* The engine is run with automatic spark and/or fuel settings. This is

the maximum BHP and torque available for intermittent operation. **Accessories**—The curves should be derated to compensate for any accessories which are added such as hydraulic pumps, air compressors, etc. *See tables below for cooling fan power requirements.* **Severe operating conditions**—For each 1,000 feet above sea level that the unit is to be operated, subtract 3% from the horsepower and torque curves. For each 10 deg. F. rise in surrounding air temperature above that specified in the power curve charts, subtract one per cent (1%) from the horsepower and torque curves.

\*Max. of 2 in. Hg back pressure.

### BHP losses due to fan

Engine rpm	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000
Engine	0.1	0.2	0.3	0.6	1.0	1.5	2.2	2.9
Power unit	0.1	0.2	0.3	0.6	1.0	1.5	2.2	2.9



## Power curves (see special note, facing page)

### Model 091GF

Engine rpm	1,000	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000
Gross bhp	14	17.6	25.5	33	40	46.5	51.5	55.5	58
Gross torque	73.5	77	83.5	86.5	87.5	88	84.5	81	76
Engine installed bhp (intermittent)	12	15	21	27	33	38	42	44.5	45
Engine installed torque (intermittent)	63	65.5	69	71	72	71	69	65	59
<b>Model 104GF</b>									
Gross bhp	16.5	21	30.5	40	49	57	63	67.5	70.5
Gross torque	86.5	92	100	105	107	107	103.5	98.5	92.5
Engine installed bhp (intermittent)	14.2	18.3	26.5	34.5	42	48.5	53.5	56.5	57.5
Engine installed torque (intermittent)	75	80	87	90.5	92	91	88	82	75.5

## Specifications

Model 091GF, displacement	91 cu. in.	Oil capacity, dry	3½ qt
Model 104GF, displacement	104 cu. in.	Refill	3 qt
Type	V-4, 60° OHV	Electrical system	12-volt standard
Fuel	regular gasoline	Ignition system	battery source
Bore and stroke (model 091GF)	3.54 in. x 2.32 in.	Starter motor	positive engagement
Bore and stroke (model 104GF)	3.54 in. x 2.63 in.	Distributor	vacuum advance type
Compression ratio (model 091GF)	8.3:1 nominal	Spark plugs	14 mm—AG22 power type
Compression ratio (model 104GF)	9:1 nominal	Firing order	1-3-4-2
Pistons	autothermic aluminum alloy, tin-plated	Generator	20 amp (15-volt)
Piston rings	top compression ring chrome-plated; chromed triple-seal oil ring	Temperature control	thermostat in intake manifold
Crankshaft	precision-molded cast iron alloy	Water pump	prelubricated centrifugal
Exhaust valve rotation	free turn	Engine weight, dry, fan to flywheel	
Main bearings	steel-backed replaceable insert copper-lead alloy, tin-plated	Model 091GF	267 lbs
Connecting rod bearings	copper-lead	Model 104GF	267 lbs
Camshaft	precision-molded special cast iron, gear driven	Overall dimensions	
Valves, exhaust	sil-chrome	Length, fan to flywheel	21.04 in.
Valves, intake	SAE 1047 aluminized	Width, generator bracket to dipstick	24.50 in.
Lubrication	rotor-type pump; full pressure feed to all bearings, full-flow filter	Height, oil pan to carburetor	24.81 in.
		Maximum operating angles, standard front sump oil pan	30 deg. all directions

**Ford engine assemblies include the following components as standard equipment**—oil pump • oil filter • oil filler and valve chamber breather cap • oil pressure sender • carburetor • fuel filter • fan • fan belt • cylinder water outlet connection • thermostat • water pump • heater indicator bulb • generator • distributor • ignition coil • spark plugs, cables • starting motor • internal balance shaft • intake manifold • clutch pilot bearing • flywheel and ring gear.

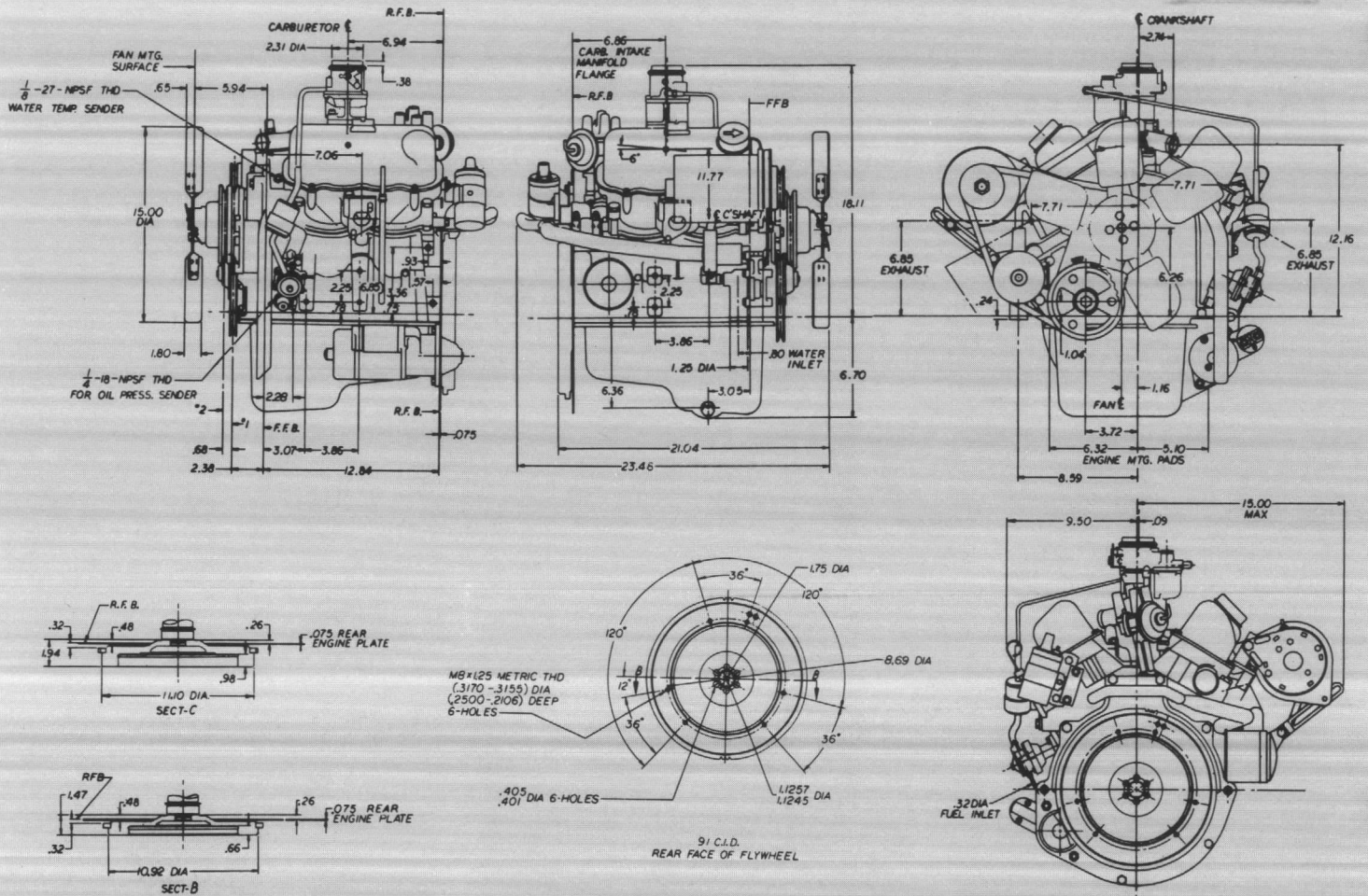
**Open power units** (in addition to the engine compo-

nents listed above)—front radiator support • radiator, hoses and cap • voltage regulator • wiring harness • mechanical governor • two stub exhaust pipes • SAE #5 housing • rear engine plate • instrument panel including ignition switch • starter switch • oil pressure light • carburetor choke control • throttle control • generator light • temperature gauge.

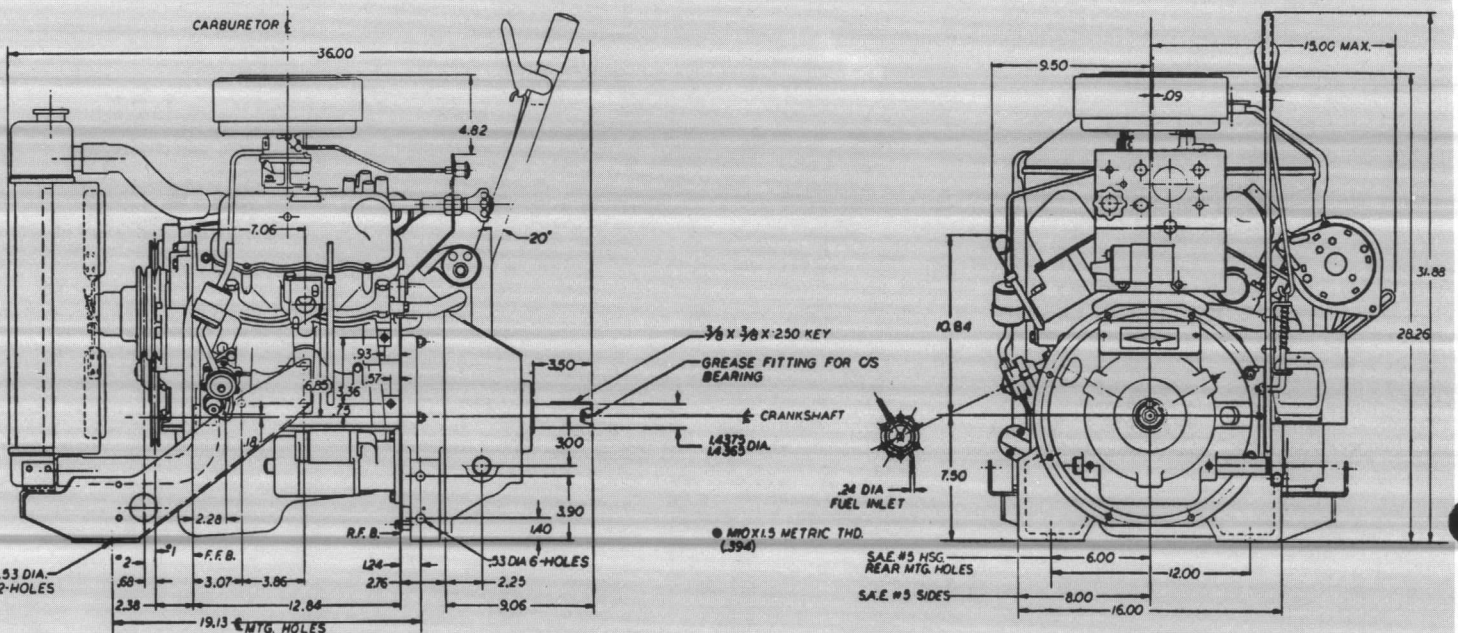
**Closed power units** (in addition to open power unit components listed)—sheet metal enclosure and supports • air horn • remote oil-bath air cleaner.



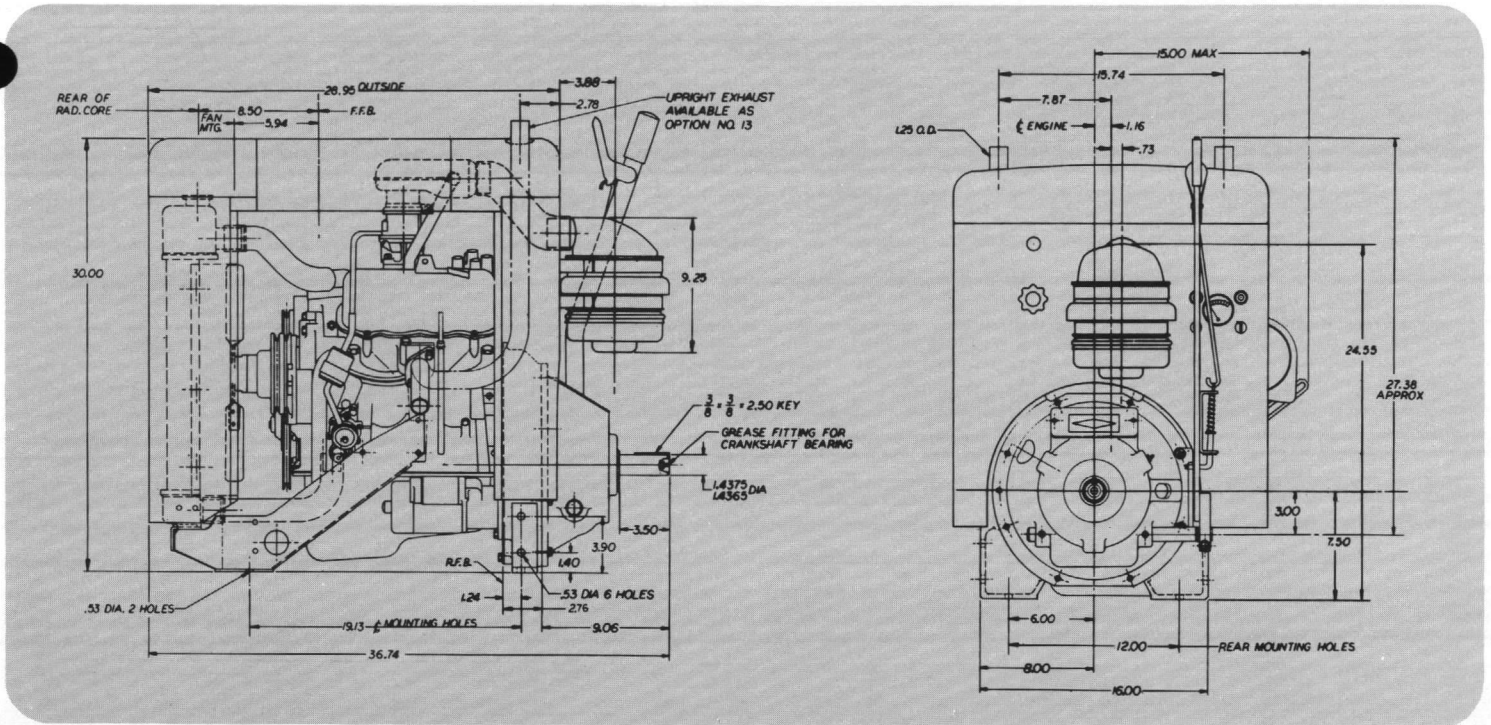
# Ford 91, 104 industrial engine dimensions.



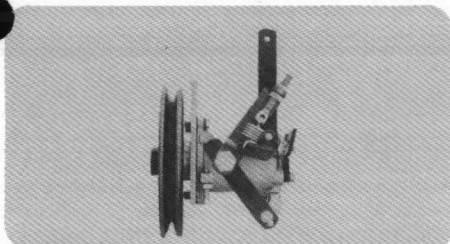
# Open power unit with power take-off.



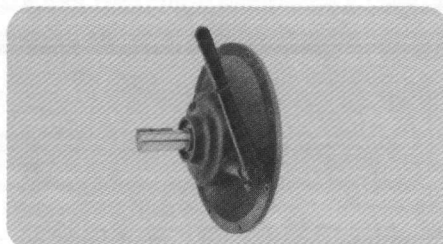
# Closed power unit with power take-off.



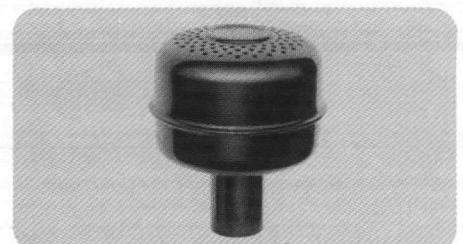
# Ford engine accessories match your work exactly.



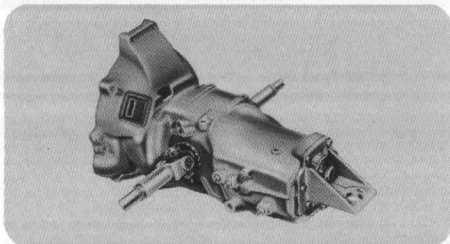
Centrifugal-type belt-driven governor provides positive control throughout power curve range, operates at fixed or variable speeds.



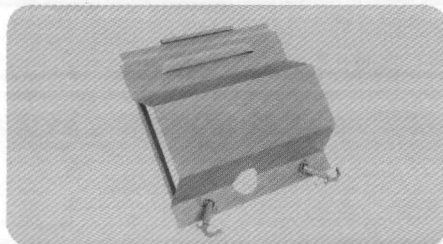
Heavy-duty spring-loaded clutch power take-off with double-row bearing for heavy radial belt loading or other drives.



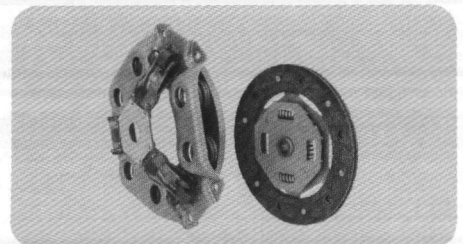
Simple, efficient muffler design provides quiet operation with minimum back pressure. Strong heavy-gauge steel construction.



Compact transaxle design permits power removal from either or both sides. Remote shift standard.



Side panel is available with closed power units for added safety and protection from extreme weather conditions.



Efficient 7 1/2-in. clutch with six high-rate pressure plate springs for smooth positive engagement and longer clutch life.

**Other Ford accessories include:**  
 • pusher-type fan • heavy-duty converter and housing • stack type air cleaner

*The specifications in this folder were in effect at the time it was approved for printing. Ford Industrial Engine and Turbine Operations, Village Plaza, 23400 Michigan Avenue, Dearborn, Michigan 48124, whose policy is one of continuous improvement, reserves the right, however, to discontinue models or change specifications, design or prices at any time without notice and without incurring any obligation. EFD 8786 IET*





## Ford Power

**You can take it to  
parts unknown and  
still get the parts.**

A Ford industrial engine never leaves home.

Wherever you take it after you buy it, it's surrounded by the family: the nationwide network of Ford parts and supply centers.

Whether you use Ford Power for construction, materials handling, mining, farming, marine, irrigation, air compression or any other application, you're never far from parts or service should you ever need them.

Every gas and diesel engine in the long Ford line—from the 79 all the way up to the 534 CID—has the same universal parts availability.

See your Ford Industrial Power Products Distributor soon and let him show you how practical and profitable it is to use Ford Power.

Parts and service are just part of the story.

*The Turbines Are Coming.*

**See your nearby Industrial Power Products Distributor.  
He is listed in the Yellow Pages.**

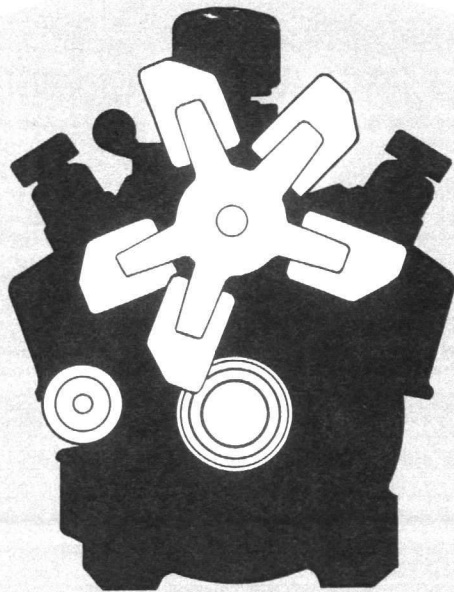






# SUPERDUTY

→ \* 477 \* ←  
534



Date: 25 Feb 71

APPROVED

Subject To Meet Or  
Exceed Class Specifications

By: *DAK*  
Chief, Control Department

## FORD V-8 CYLINDER 477 AND 534 SERIES ENGINES

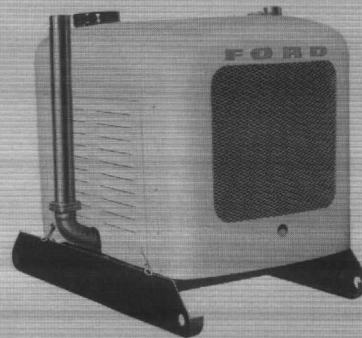
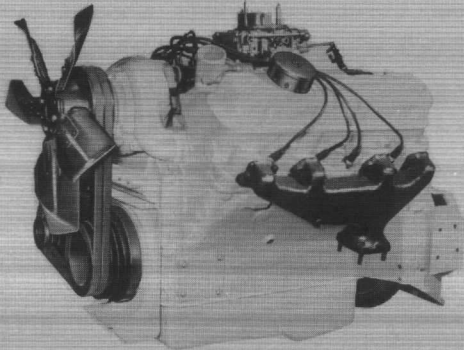
Ford Superduty engines are built to handle big jobs more dependably, efficiently and economically! They feature direct-flow induction, large main bearings, autothermic four-ring pistons, extra capacity oil reservoir with plate-type internal oil cooler and

- **Modern large bore, short stroke engine design**
- **Dynamically balanced crankshaft** has increased rigidity for less vibration . . . greater engine smoothness
- **Large replaceable main bearings** (steel-backed copper-lead alloy) keep unit-loading pressure low for sustained bearing life and durability
- **Autothermic four-ring turbulence-top pistons** with integral steel strut for strength and durability
- **Durable high-lift camshaft** contoured to reduce valve seating velocities for extended valve life
- **Cast iron piston top ring groove insert** for long life
- **Chrome-plated piston rings** for tighter compression seal and resistance to wear
- **Large dished-type intake valves** with positive rotators are self-cleaning, seat tighter, last longer
- **Integral valve guides** for cooler valve operation and valve stem durability
- **Special alloy intake and exhaust valve seat inserts** for maximum wear resistance

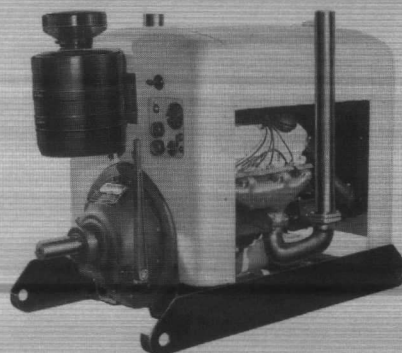
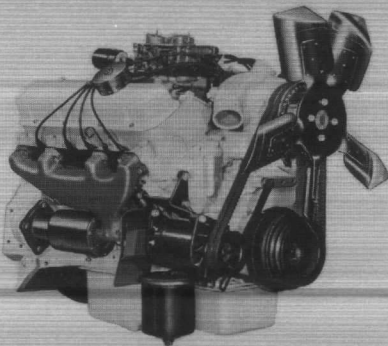
three-stage cooling with two thermostats . . . and other plus features that make these engines Superduty power plants. Exceptionally high torque over the low and medium-speed range is a performance characteristic. Others are:

- **Sodium cooled exhaust valves**
- **Tungsten-cobalt alloy valve facings** for long valve and seat life
- **Full pressure lubrication** for longer-lasting moving engine components
- **Dependable rotor-type oil pump** for increased oil pressure at all engine speeds
- **Gear-driven camshaft** for durability and timing accuracy
- **Wide-contact timing gears** for reduced tooth loading, greater durability
- **Oil pan with deep reservoir, baffle and rear sump** provides oil supply to block-mounted internal pump at all times
- **Plate-type internal oil cooler** to reduce oil temperatures, minimize carbon formation, maintain oil film strength, extend oil change interval and increase engine life
- **Special full flow two stage oil filtration system**
- **Gear-driven mechanical overspeed governor** for engine protection.

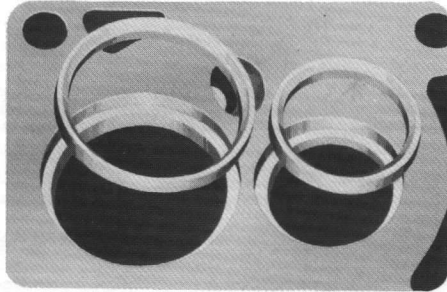
### FORD 477 GASOLINE ENGINE AND POWER UNIT



### FORD 534 GASOLINE ENGINE AND POWER UNIT



**Big power to handle big jobs with Ford efficiency, dependability, economy! Here are some reasons why:**



Durable valve seat inserts. Intake and exhaust inserts are hard-faced with long-wearing metal alloys to give maximum wear resistance. Integral valve guides with water jacketed guides and seats.

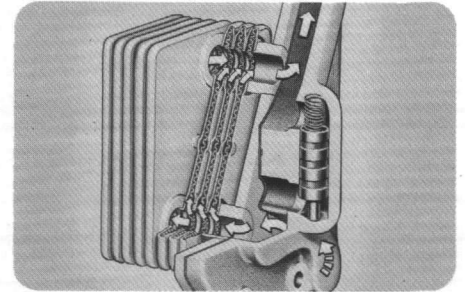
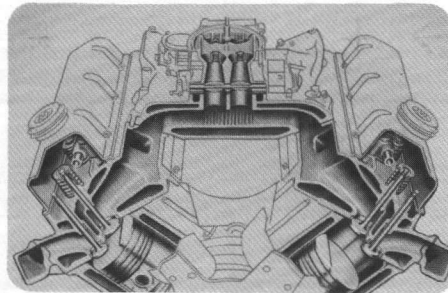


Plate-type internal oil cooler. Reduces oil temperatures to minimize carbonization, keep greater oil film strength, prolong life of moving parts, extend time between oil changes. Easily accessible.



Short stroke design. Delivers more power with less piston travel, reduces internal friction for long engine life and greater fuel and oil economy. Turbulence-Top pistons are super-fitted aluminum-alloy 4-ring type, designed for high-turbulence power.

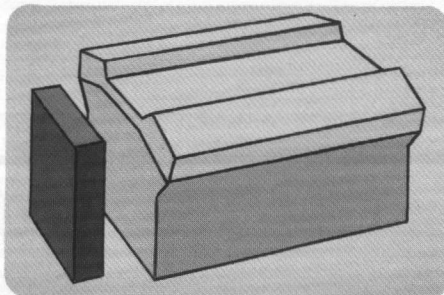


Submerged type fuel pump. Big capacity electric fuel pump mounted in fuel tank delivers a constant supply of fuel. It minimizes vapor lock, as only liquid fuel under pressure is delivered to the carburetor. Not dependent on engine rpm for output.

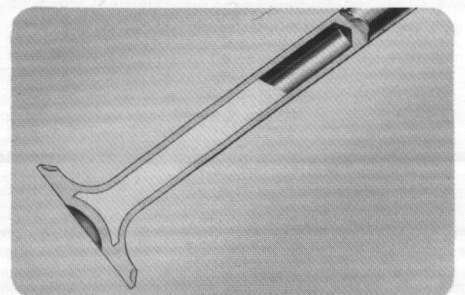
### Advanced 3-stage parallel flow cooling.

1. Head—for cold starts, thermostats are closed, coolant is pumped through the cylinder heads and manifold jacket, returning to the pump. This preheats the fuel-air mixture for efficient burning and greater power. Fast block warm-up provides better lubrication.

2. Head and block—at 140 deg. back thermostat opens allowing coolant to circulate more rapidly through the block. The coolant flows through head, block and intake manifold jacket but the closed front thermostat prevents it from flowing through the radiator.



3. Complete cooling—at 160 deg. the front thermostat opens allowing the coolant (12,600 gal./hr) to flow through the radiator and the entire cooling system. Approximately half of the coolant is directed to the heads and half to the block.



Sodium-cooled exhaust valves. Hollow and partially-filled with powdered sodium. This feature, combined with integral valve guides, allows valve heads to operate up to 225 deg. cooler. Results in cleaner-running longer-lasting valves and seats.

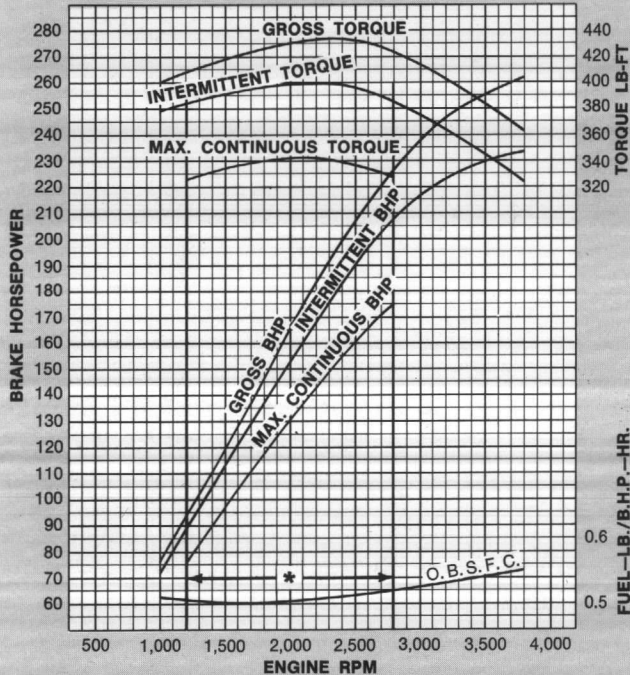


## \* 477 CU. IN. V-8 \*

## 534 CU. IN. V-8

### 477 CU. IN. V-8

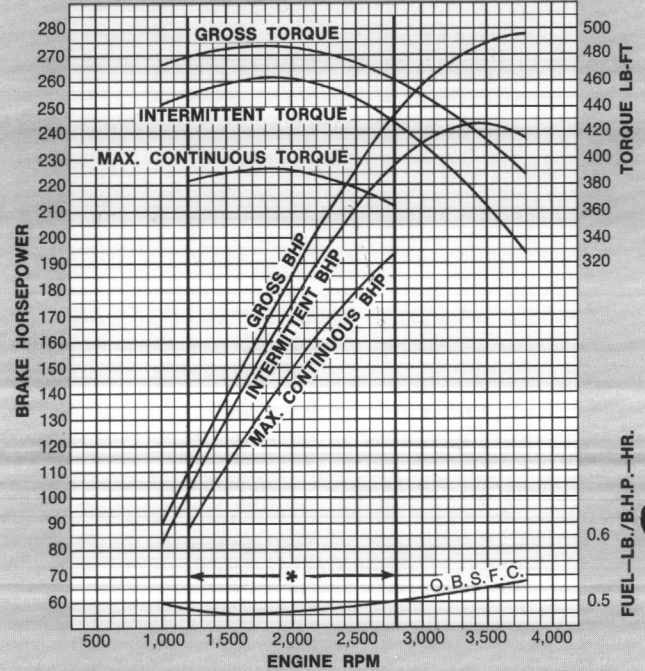
BORE 4.50 IN. STROKE 3.75 IN.  
COMPRESSION RATIO 7.5 : 1



\* RECOMMENDED ENGINE SPEED RANGE FOR STATIONARY APPLICATIONS

### 534 CU. IN. V-8

BORE 4.50 IN. STROKE 4.20 IN.  
COMPRESSION RATIO 7.5 : 1



\* RECOMMENDED ENGINE SPEED RANGE FOR STATIONARY APPLICATIONS

**Special note**—gross output curves are corrected to 29.92 in. Hg and 60 deg. F. dry air. They are for a complete engine assembly less fan, generator and air cleaner. The engine is run with dynamometer exhaust system and the optimum spark and fuel settings for best power. Engine-installed output (intermittent) and maximum continuous output curves are corrected to 29 in. Hg and 85 deg. F. dry air. Engine is equipped with exhaust system, generator, less fan, with automatic spark and fuel settings.

**Accessories**—the curves should be derated to compensate for any accessories which are added such as hydraulic pumps, air compressors, etc. See tables below for cooling fan power requirements. **Severe operating conditions**—for each 1,000 ft above sea level that the unit is to be operated, subtract 3 per cent from the horsepower and torque curves. For each 10 deg. F. rise in surrounding air temperature above that specified in the power curve charts, subtract one per cent (1%) from the horsepower and torque curves.

### BHP losses due to fan

Engine rpm .....	1,200	1,600	2,000	2,400	2,800
Engine .....	0.8	1.9	3.6	8.8	12.0
Power unit .....	1.8	3.4	6.5	11.5	15.5

# POWER CURVES—see special note, facing page

Engine—477 cu. in. V-8									
Engine rpm	1,000	1,200	1,600	2,000	2,400	2,800	3,200	3,600	3,800
Gross BHP	76	93	128	164	198	226	246	258	262
Gross torque	400	408	420	430	433	424	404	376	362
Engine—534 cu. in. V-8									
Engine rpm	1,000	1,200	1,600	2,000	2,400	2,800	3,200	3,600	3,800
Gross BHP	90	109	148	184	218	246	266	276	278
Gross torque	472	478	486	484	477	460	436	403	384

## SPECIFICATIONS

Model B8PM, displacement . . . . . 477 cu. in.  
 Model B8PN, displacement . . . . . 534 cu. in.  
 Type . . . . . V-8, 90 deg., overhead valve  
 Fuel . . . . . gasoline  
 Bore and stroke, 477 CID model . . . . . 4.5 in. x 3.75 in.  
 534 CID model . . . . . 4.5 in. x 4.20 in.  
 A.M.A. hp . . . . . 64.7  
 Compression ratio . . . . . 7.5:1  
 Cylinder heads . . . . . special alloy, stress-relieved aluminum lacquer-coated steel head gasket  
 Cylinder and Crankcase . . . . . cast integral  
 Cylinder wall finish . . . . . controlled quality finish for uniform oil film  
 Pistons . . . . . aluminum alloy, step-type machined head with integral cast-iron top ring groove insert and steel strut, 3 grooves, 4 rings  
 Piston rings . . . . . 3 compression (top 2, chrome-plated), 1 oil control, chrome-plated.  
 Oil control rings . . . . . wedge channel expander  
 Crankshaft . . . . . forged alloy steel with 5-bearing support; externally balanced  
 Main and connecting rod bearings . . . . . replaceable steel backed, copper-lead alloy selective fit  
 Camshaft . . . . . 5 bearing, precision-molded special alloy iron  
 Valves, exhaust . . . . . concave-head, tungsten-cobalt faced, sodium-filled.

Valves, intake . . . . . concave-head, tungsten-cobalt faced  
 Valve rotation . . . . . positive type  
 Intake valve seat inserts . . . . . tungsten-chromium-molybdenum alloy  
 Exhaust valve seat inserts . . . . . tungsten-cobalt alloy  
 Lubrication . . . . . full pressure to all bearings; full-flow filter; internal oil cooler; rotor-type internal oil pump  
 Oil capacity . . . . . 11 qt dry—9 qt refill  
 Spark plugs . . . . . turbo-action, 18 mm  
 Electrical system . . . . . 12 volt  
 Ignition . . . . . battery  
 Distributor . . . . . mechanical-centrifugal  
 Firing order . . . . . 1-5-4-8-6-3-7-2  
 Generator . . . . . 40-amp, 600-watt  
 Alternator (optional) . . . . . 65-amp, 975-watt  
 Carburetor . . . . . four-venturi downdraft  
 Fuel pump . . . . . electrical submerged type  
 Cooling system . . . . . parallel-flow, 3-stage; 46 qt capacity with power unit  
 Temperature control . . . . . thermostats in rear of intake manifold and in intake manifold outlet to radiator  
 Water pump . . . . . high-volume centrifugal pre-lubricated  
 Engine weight (dry, fan to flywheel less clutch housing) approx . . . . . 1,032 lbs

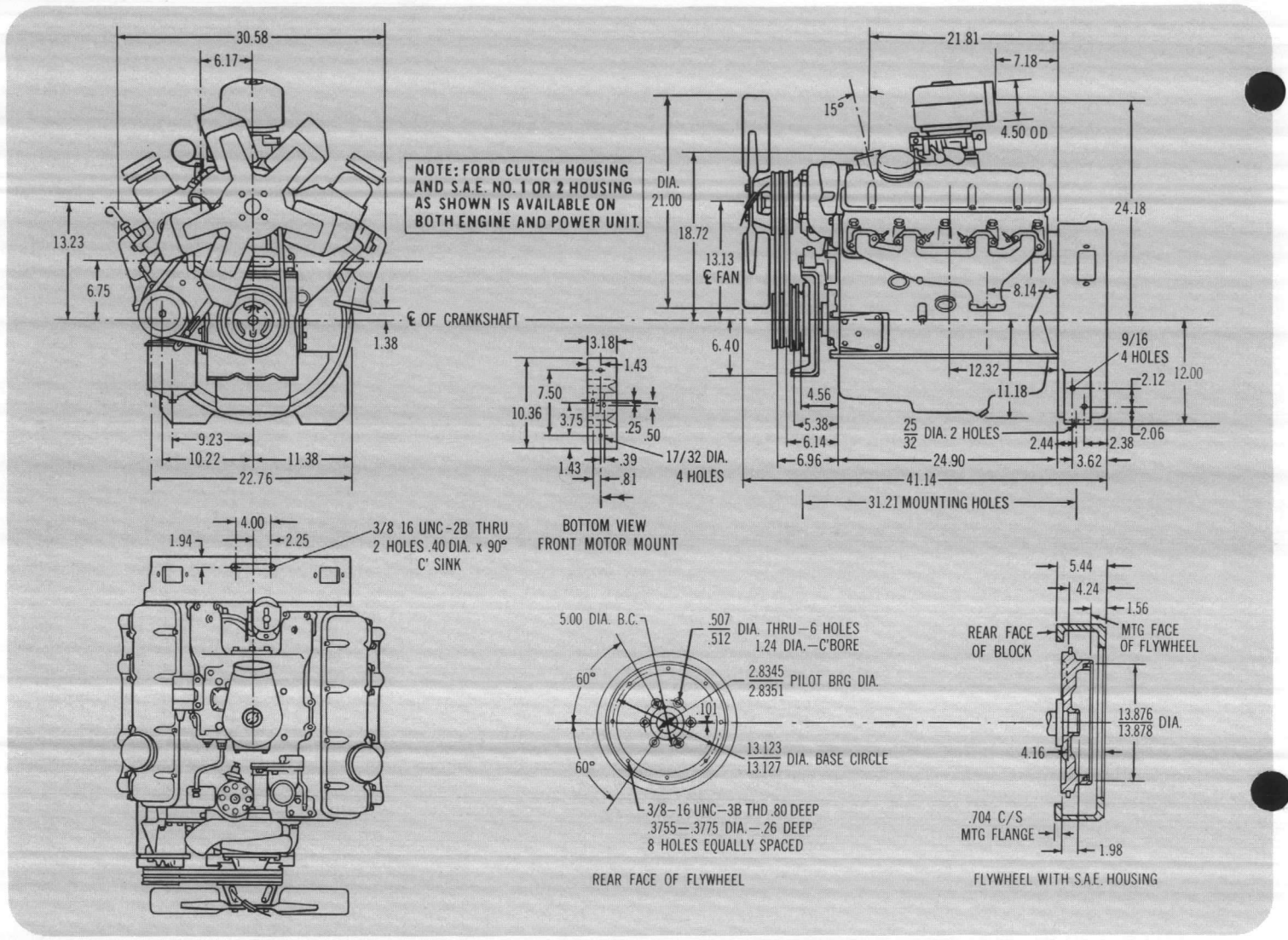
**Ford industrial engines include the following components as standard equipment**—rotor-type oil pump • oil cooler • pressure sending unit • oil filler and breather cap • oil filter • ignition coil • starting motor • generator • 12-volt electrical system • distributor • spark plugs and cables • carburetor • mechanical governor • water pump • thermostat • suction-type fan • fan belt • cylinder head water outlet connection • electric fuel pump • intake and exhaust manifolds

• crankshaft pulley and damper • flywheel and ring gear • front engine mount • heat indicator bulb.

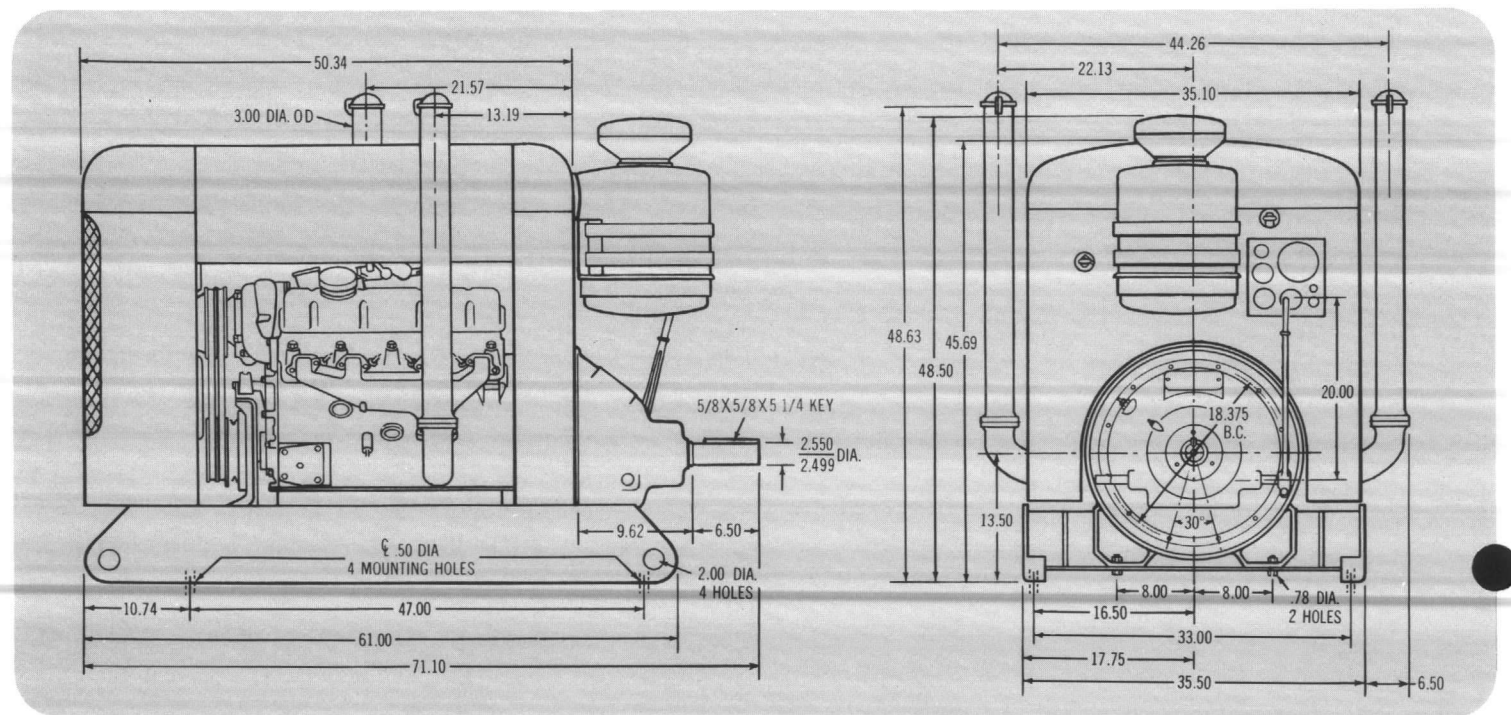
**Power units** include the above and the following—flywheel housing • sheetmetal housing (with side panels available at extra cost) • skid-type mounting • instrument panel including ignition switch, starter switch, ammeter, oil pressure gauge, carburetor choke control, throttle control, tachometer, water temperature gauge • wiring harness • battery tray and cables.



# Ford 477, 534 engine dimensions



# Ford 477, 534 power unit dimensions





# An inside look at the famed Ford V-8 engine design

Durable high-lift camshaft reduces valve seating velocities for extended valve life.

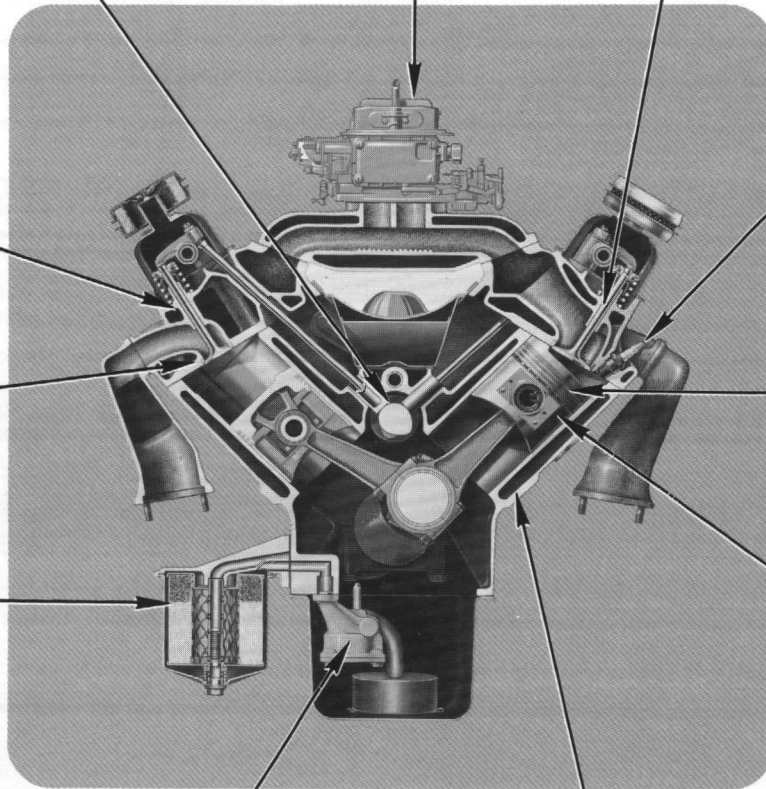
Four-venturi carburetor provides efficient performance, adjusts precisely, automatically to operating conditions.

Large dished type intake valves with positive rotators are self-cleaning, seat tightly.

Integral valve guides for cooler valve operation and valve stem durability.

Intake and exhaust valve seat inserts, sodium-cooled exhaust valves with tungsten-cobalt alloy facings lengthen valve and seat life.

Two-qt, two-state, full-flow oil filter protects engine against contaminants.



18 mm spark plugs positioned over center of mass of combustion chamber afford excellent firing efficiency; have water-jacketed bosses for improved cooling; resist fouling up to three times longer than ordinary plugs.

Top two compression rings and oil ring are chrome-plated for tighter compression seal and wear resistance.

Four-ring, machined-head, turbulence-top pistons with cast-iron insert in top ring groove lengthens life; integral steel struts control expansion.

Full pressure lubrication with internal rotor-type oil pump protects engine.

Serpentine cylinder walls with full-circle water jackets control temperature precisely, provide uniform expansion and transfer combustion heat quickly to lengthen engine life.

## Accessories available for 477, 534 engines

Engine hour-meter • tachometer • 11½-in. clutch  
• 13-in. clutch • heavy-duty 5-speed transmission  
• Triple Drive Range Transmatic with a 6-speed automatic torque converter • power-steering pump  
• high-capacity air cleaner • heavy-duty alternator

• high-capacity radiator • 23-in. diameter, 5-bladed fan where extra cooling effort is required • fuel tank with submerged electric fuel pump • instrument panel with standard switches and gauges • air brake compressor.

*The specifications in this folder were in effect at the time it was approved for printing. Ford Industrial Engine and Turbine Operations, Village Plaza, 23400 Michigan Avenue, Dearborn, Michigan 48124, whose policy is one of continuous improvement, reserves the right, however, to discontinue models or change specifications, design or prices at any time without notice and without incurring any obligation. EFD 8787 IET*



## Ford Power

**You can take it to parts unknown and still get the parts.**

A Ford industrial engine never leaves home.

Wherever you take it after you buy it, it's surrounded by the family: the nationwide network of Ford parts and supply centers.

Whether you use Ford Power for construction, materials handling, mining, farming, marine, irrigation, air compression or any other application, you're never far from parts or service should you ever need them.

Every gas and diesel engine in the long Ford line—from the 79 all the way up to the 534 CID—has the same universal parts availability.

See your Ford Industrial Power Products Distributor soon and let him show you how practical and profitable it is to use Ford Power.

Parts and service are just part of the story.

*The Turbines Are Coming.*

**See your nearby Industrial Power Products Distributor.  
He is listed in the Yellow Pages.**



**Industrial  
Power  
Products**





**WATER LUBRICATED**

# **VERTICAL TURBINE PUMPS**

**FOR WATER WELLS**

**Serving Cities, Factories,  
and all kinds of Industries**



Date: 2/5/77  
APPROVED  
Subject To Meet Or  
Job Plans & Specifications  
By: [Signature]  
Quality Control Representative



# LAYNE

## VERTICAL TURBINE PUMP

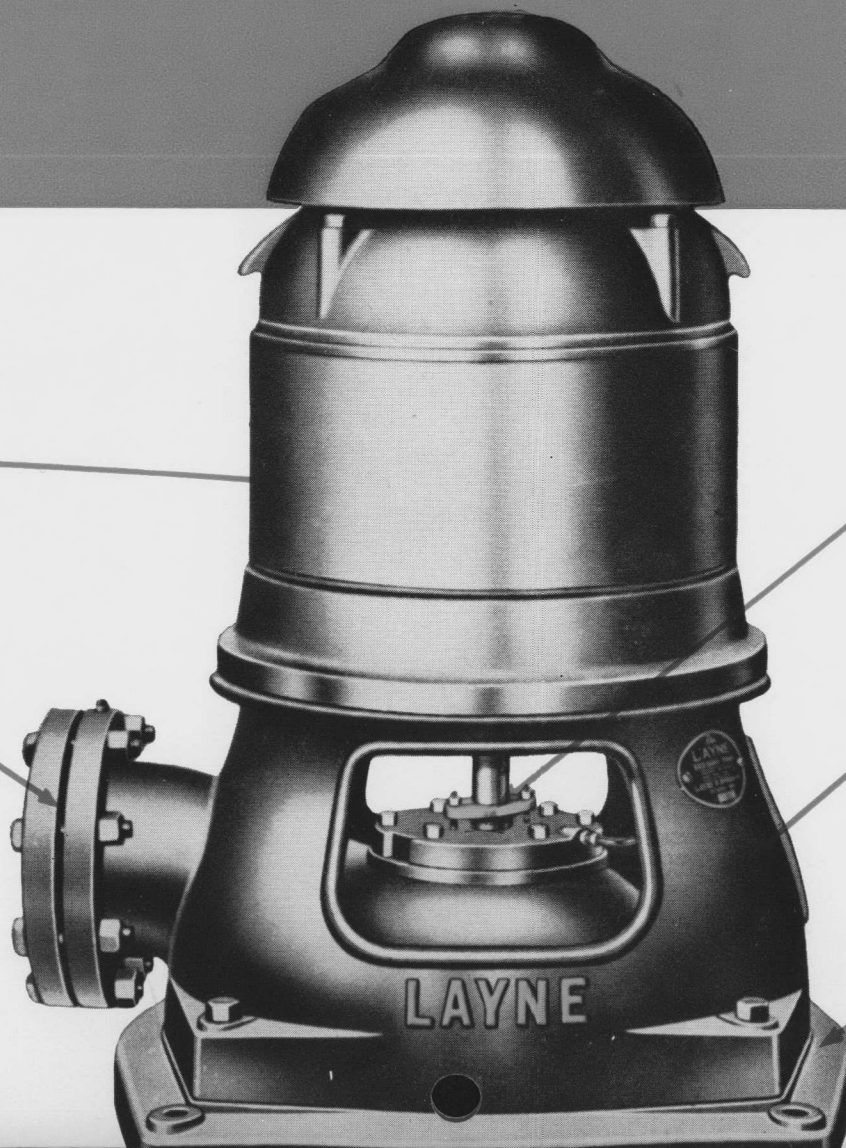
● **ELECTRIC MOTOR**, vertical hollow shaft type of any standard make.

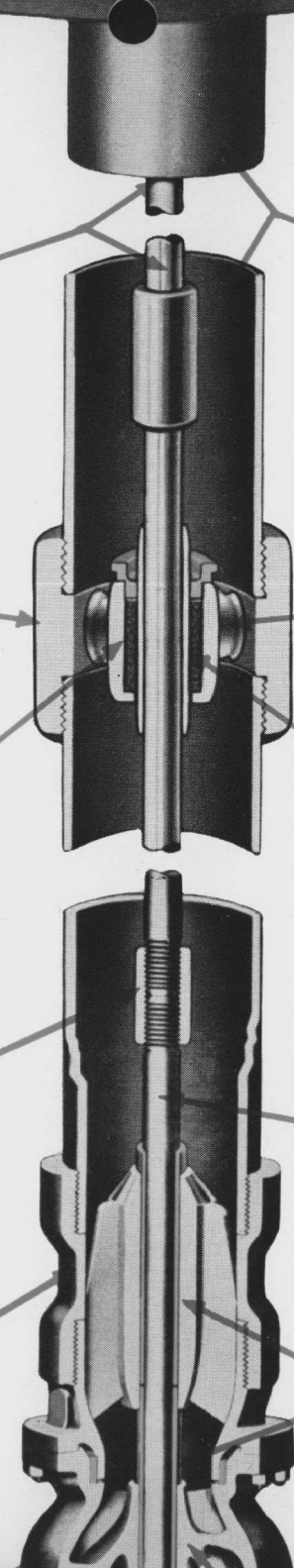
● **DISCHARGE OUTLET**, above-ground type, fitted with standard companion flange. Underground discharge outlet can be furnished if required.

● **STUFFING BOX** or **PACKING GLAND** designed for vertical shaft operating at relatively high speed.

● **PUMP DRIVE HEAD** of heavy cast iron, rugged design with low center of gravity. Drive heads are available for any kind of power application.

● **BASE PLATE**, separate from pump drive head, made of heavy cast iron. Separate base plates are not standard equipment but are furnished on special order.





● **LINE SHAFT** is highest grade carbon steel stock, turned, ground and polished. Standard lengths are 10-feet, and both ends are faced and threaded in lathes. Size of shaft is determined by the horsepower and pump speed. Shaft made of special alloys for severe or unusual conditions furnished at extra cost.

● **COLUMN or DISCHARGE PIPE** supports the pump bowls and conducts the water to the surface of the ground. It also centers and supports the line shaft. It is **STANDARD WEIGHT STEEL PIPE**, fabricated in 10-foot lengths with ends threaded and faced. Column pipe is furnished in sizes giving proper velocity of water without excess friction loss.

● **DISCHARGE PIPE COUPLINGS** are extra heavy semi-steel, with aligning spider cast integrally. All pipe connections are butt joint insuring proper alignment.

● **ALIGNING SPIDERS** are cast in the combination column coupling, are full streamlined and are spaced at 10-foot intervals. The rubber shaft bearing is mounted in the spider hub.

● **RUBBER BEARINGS** are extra length, made of highest grade cutless rubber, with inside bearing surface fluted to insure maximum lubrication by the water. They are retained in the spider hub by a positive screw lock.

● **SHAFT SLEEVES** are **MONEL METAL** affixed to the line shaft opposite the rubber bearings.

● **SHAFT COUPLINGS** are made from solid steel shafting stock, bored, threaded and finished all over on special lathes. Each is carefully balanced. No set screws, bolts or pins are used.

● **IMPELLER SHAFT** is over-size, made of selected stainless steel shaft stock. It connects with the line shaft and extends through the pump bowl. The impellers are affixed with collets. No keyways or keys are necessary.

● **ADAPTER CASTING** connects the top stage of the pump bowl with the discharge pipe. It is designed with vanes which straighten the flow of water from the pump bowl, delivering it to the discharge column with minimum turbulence.

● **SLEEVE BEARINGS** in adapter and throughout the entire pump bowl are made of plastic bronze, extra long for added wearing life.

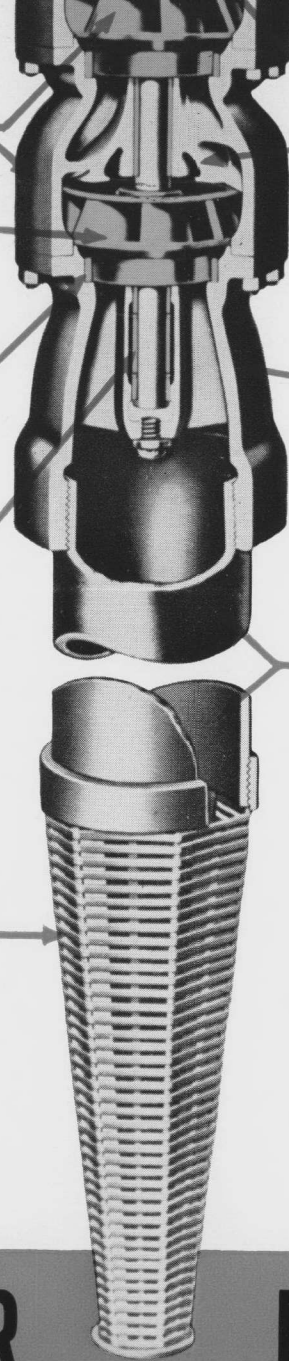
● **BOWL STAGES** or **SECTIONS** make up the complete bowl. The size and number of stages required depend upon the amount of water, the pumping head and pump speed.

● **IMPELLERS** are fully enclosed, bottom suction, non-overloading type. They are made of phosphor bronze, hand finished, and accurately balanced.

● **WEAR RINGS** are fitted in each stage. They are made of phosphor bronze and are removable so new rings may be installed when required.

● **SUCTION NOZZLE BUSHING** is plastic bronze, sleeve type and extra long and rugged.

● **SUCTION STRAINER** is steel and designed for use with vertical turbine pumps. The cone type is standard but flat or basket type is available for special conditions.



● **DIFFUSER VANES** are designed in conformance with the most modern practices in hydro-dynamics. The proportions are accurately calculated for minimum loss of applied energy.

● **SUCTION NOZZLE** is venturi type with streamline vanes. It conducts the water from the suction pipe to the eye or suction of the lowest impeller and delivers it without swirls or eddies.

● **SUCTION PIPE** for standard pumps consists of 10-feet of standard weight steel pipe.

The manufacturer reserves the right to change, alter or in any way improve the product with equal or better materials other than those stated, or, if for some reason, the materials are not available.

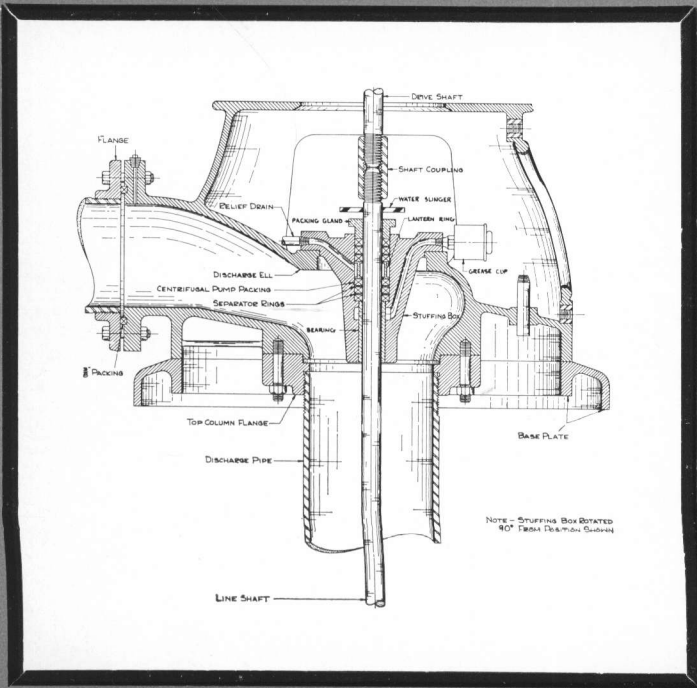
● WATER LUBRICATED



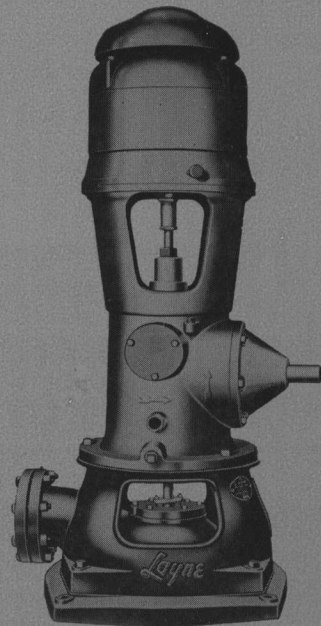
# PUMP DRIVE HEADS

## A TYPE FOR EVERY REQUIREMENT

The most commonly used pump drive heads are those shown on this page and the head shown on the large illustration on the inside of this folder. All Layne Pump Drive Heads have low center of gravity and plenty of iron for rugged strength. The design is simple and all adjustments are made easily and quickly. Only minimum care and attention is required after the pump is installed.



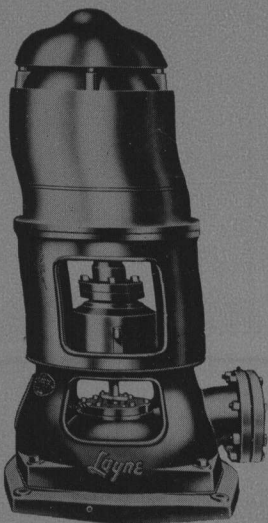
Construction details of Type TF drive head. This is the head shown on the full length illustration inside this folder. It is the basic part of all standard drive heads.



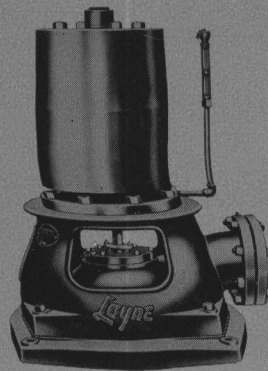
Type TF-GD combination drive head for electric motor and standby engine drive through right angle gear.

## SPECIAL DRIVE HEADS

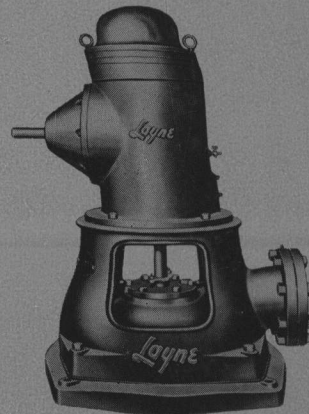
Supplementing the complete line of standard pump drive heads is a line of special heads. These are for unusual conditions or power applications. Available are heads for Underwriters' Fire Pumps, combination electric motor and direct connected engine drive, vertical steam turbine drive, combination electric motor and belt drive, heads for exceedingly heavy duty and others. Usually it is possible to design and furnish heads for any condition.



Type MA head with thrust bearing assembly, motor support and flexible coupling for mounting solid shaft motor.

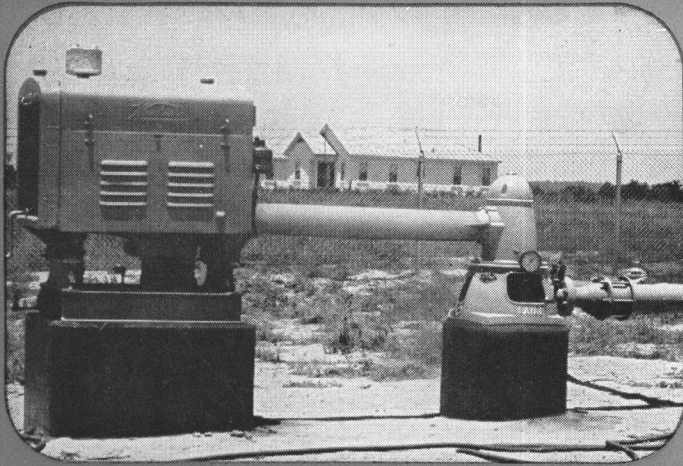


Type BF drive head has pulley and thrust bearing assembly for belt drive. Either flat or grooved pulleys furnished.

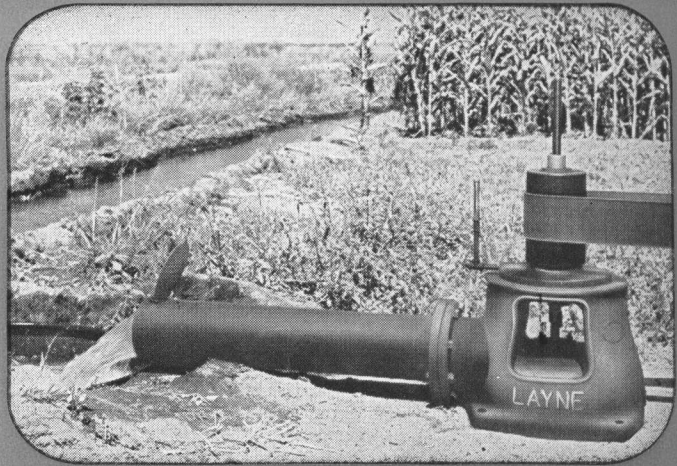


Type TF-GD head for direct engine drive through right angle gears.

*"Better Built  
for Better Service"*



This direct connected engine drive through right angle gears is used extensively where there is no electric power.



Engine driven pump using one-quarter turn belt drive. A popular drive in agricultural irrigation work.

# LAYNE VERTICAL TURBINE PUMPS

**A Dependable and Efficient Line of Pumps  
Used Throughout the Entire World**

**APPLICATIONS**—For over 75 years Layne Pumps have been used for pumping water for cities, towns and villages; by industries of all sizes and kinds; by railroad systems; by farmers, agriculturalists and planters for irrigating crops—in fact, by all who use water for any purpose—in quantity, large or small.

Layne Short Coupled Pumps also are used for

pumping water from lakes, reservoirs or streams. They are particularly desirable for this kind of pumping duty because fluctuations of water level do not interfere with operation of the pump. They also are used for mine drainage and sub-surface drainage. Since the driver is installed at the surface above high water level, the pumping units cannot drown out.

**SIZES AND CAPACITIES**—The sizes of Layne Pumps depend upon quantity of water, speed of pump and the pumping head. Required inside well diameters range from 4-inches for the smallest pump up to 42-inches for the largest pump. There are many intermediate sizes. Capacities range from 50 U. S. gallons a minute up to 30,000 U. S. gallons a minute. Total pumping heads vary from the lift in the well or shaft only up to seven or eight hundred feet. The amount of setting (discharge column) depends upon the distance to the pumping water level.

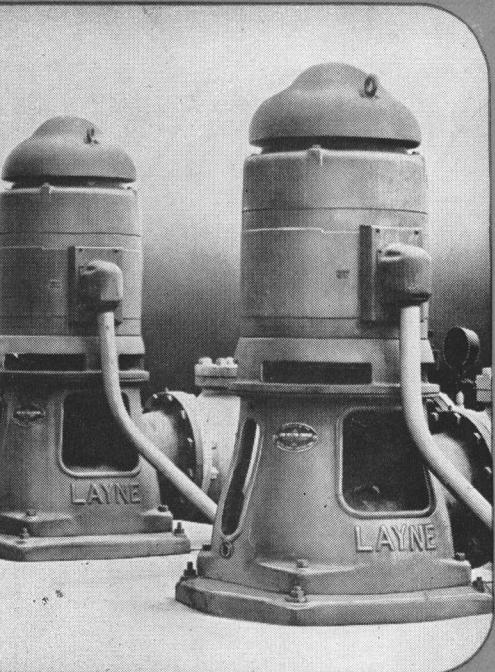
Beginning at the surface or the top of the pump, the following component parts make up a complete pump:

(a) The pump drive head which consists of the discharge ell and outlet, the stuffing box or packing gland and the thrust bearing assembly, when one is necessary. The drive head supports the entire pump which is suspended in the well or shaft.

(b) The discharge column consisting of suction pipe and connections, the line shafting with couplings, bearings and supporting members. The length of discharge column is governed by the distance from the pump drive head to the pumping water level.

(c) The pump bowl, made up of discharge and suction nozzles, intermediate bowls or stages, including impellers, bowl bushings, wearing rings and impeller shaft. The number of stages (bowls) depends upon the pump bowl size (diameter), speed of rotation, amount of water pumped and the total pumping head. The bowl usually is equipped with 10 feet of suction pipe.

If you have a pumping problem, write the factory giving operating conditions. Recommendations and estimates will be sent. No obligation whatever.



Special installation with hollow shaft vertical motor. Standard unit where electric power is available.

**LAYNE & BOWLER, INC.**  
GENERAL OFFICES, MEMPHIS, TENN. 38108  
Offices and Representatives Throughout the World









TOP COVER  
is lightweight,  
easily removed

UNIQUE LOCK BAR  
holds shaft during  
adjustment

LUBRISCOPE  
combined gauge and  
rapid oil fill

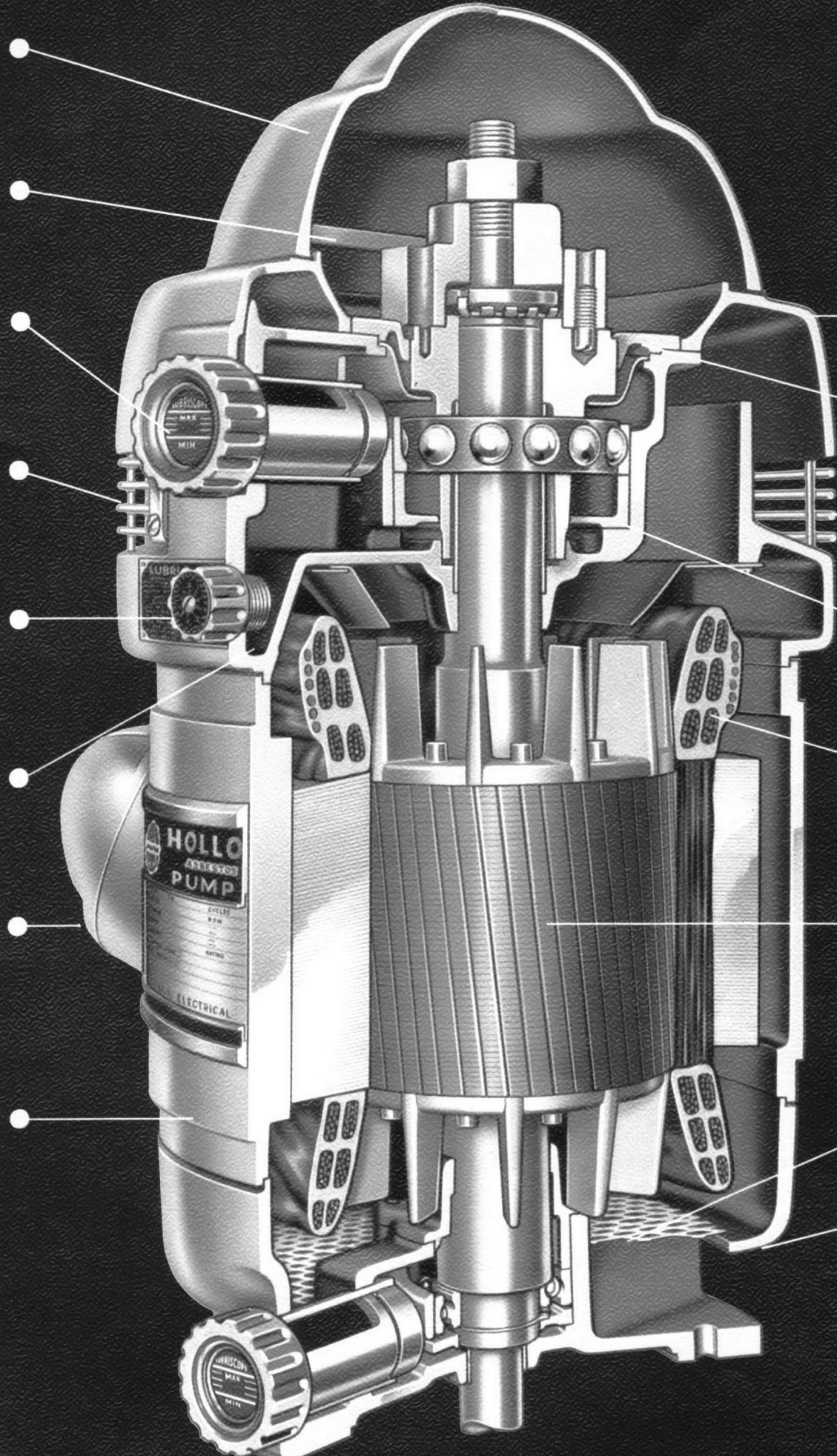
PROTECTIVE GRILLE  
prevents entrance of  
leaves, papers, etc.

OIL CHANGE RECORD  
dial indicates date of  
last oil change

SEDIMENT SUMP  
collects grit particles  
for easy drain

SPLIT TYPE OUTLET  
BOX  
provides easy motor  
connection

NORMALIZED CASTINGS  
maintain accuracy  
of machining



# The story behind the new U.S. Holloshaft Motor

## for Industry

## Agriculture

## Municipalities

● TOP COWL  
motor remains  
protected during  
adjustment

● BEARING COVER  
protects bearing  
during pump  
adjustment

● LARGE AIR OPENING  
reduces intake  
velocity

● PROVISION FOR  
STACKED BEARINGS  
extra heavy thrust  
easily obtained

● ASBESTOS-PROTECTED  
WINDINGS  
non-carbonizing  
asbestos extends life

● SOLID CAST  
ALUMINUM ROTOR  
with integral fan,  
provides indestructible  
structure

● RODENT GUARD  
prevents damage due  
to entry of  
small animals

● IMPROVED WINDING  
PROTECTION  
meets NEMA  
Weather-Protected  
Type I requirements

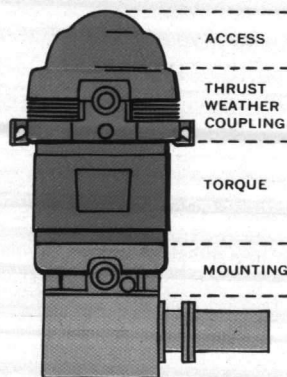
TYPE HU  
OIL LUBRICATED  
7½ to 125 H.P.

This new motor has a combination of features that will appeal to pump users as a practical solution to their past problems. Our concept for this new motor began with the wishes and suggestions of pump users and recognition of the increasing importance and wider use of turbine pumps. To this was added the NEMA rerate program which acknowledged electrical progress by obtaining more HP in a given frame. All of these pointed to the need for a new motor which would combine the best of the past with the possibilities for the future.

As we talked to pump users about their motor needs, we discovered what was important to them — “keep your heavy duty thrust bearing” — “make oil filling easier” — “protect against entry of rodents” — “provide even better weather protection” — “make installation more foolproof” and many others. Our task was to translate these desires into a practical motor construction, completely functional and yet with an enduring, distinctive styling which would harmonize with modern pump designs.

As the new design evolved, it began to show the influence of these objectives. From drawings to mock-up to prototype to production, each step refined the original concepts and brought forth the motor you see here.

**PRINCIPLES OF DESIGN OF THIS NEW MOTOR...** A new relationship between function and form is introduced in Holloshaft design. Each zone is proportioned according to purpose: The top is small for easy access, below this are the essential elements of thrust bearing, coupling, air intake and weather protection which call for large space. The center section develops the driving torque and by using the latest re-rated designs can be made smaller than former models. The base is made small to permit use of compact pump head designs. These principles enable the new Type HU motor to take advantage of modern electrical design progress with improved mechanical ruggedness and protection.

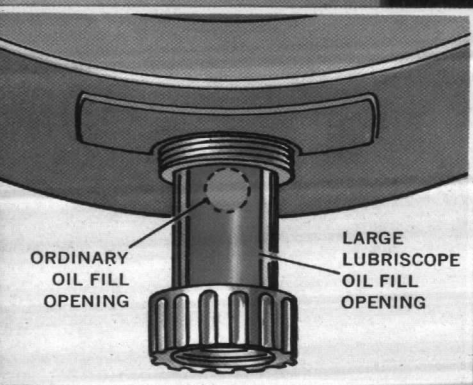




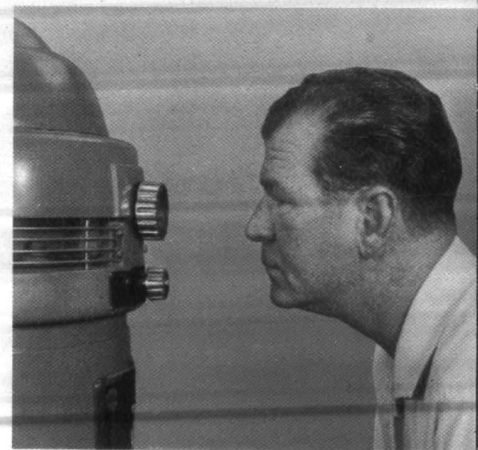
# U.S. MOTORS INTRODUCES... LUBRISCOPE



SEE THE OIL LEVEL AND OIL CONDITION AT A GLANCE



NEW  
LUBRISCOPE  
MAKES  
OIL FILLING  
FAST AND  
EASY



**OIL LEVEL EASILY CHECKED...** Observe oil level and condition through glass window gauge. Maximum and minimum levels are both clearly marked to indicate safe operating range.



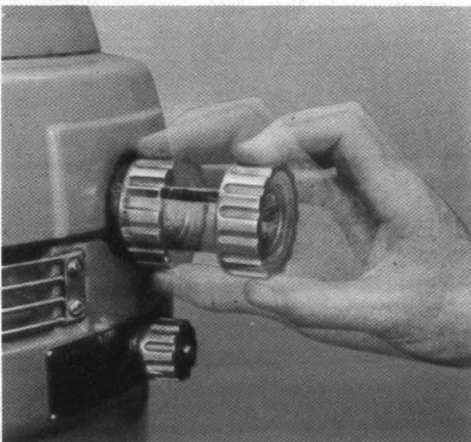
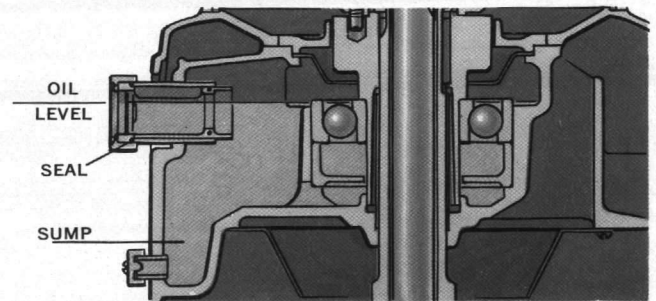
## faster oil fill...visible level...anti-spill!

Here is the answer to the spillage problem... and to the demand for faster oil-fill. U.S. Holloshaft introduces Lubriscope—a new kind of oil-fill, and a new standard of lubrication performance. Both the top thrust bearing and the lower guide bearing have the new Lubriscope system. The Lubriscope oil-fill pulls out to provide a large opening extending throughout its length, instead of the usual small fill-hole. This reduces spillage and gives you faster pouring and faster fill, with no need for funnels, spout cans, etc. Lubriscope, in its extended position, provides ample clearance so that any oil spillage or overflow will drop

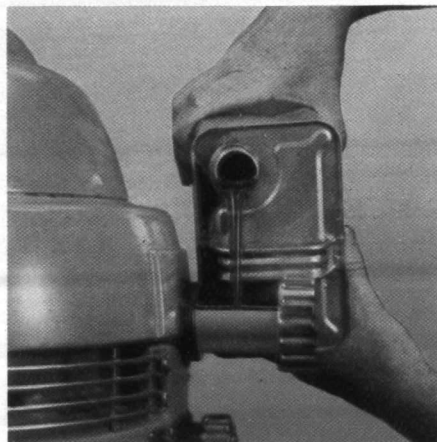
clear of motor. The large Lubriscope fill opening permits wiping the glass window from inside, so that even after years of service, you can still have clear view of oil level. No tools are necessary to open or close oil fills and drains, as they are designed to be hand-tightened. Use of silicone rubber seals permanently prevents oil leakage. Oil is metered to bearings from a large oil reservoir. A convenient dial date record permits ready check of lubrication period. Lubriscope is another U.S. first—the answer to pump operators' requests for a better oil-fill system, brought to reality by U.S. engineering.

### LARGE OIL RESERVOIR PROVIDES AMPLE LUBRICANT — COOLER, CLEANER RUNNING

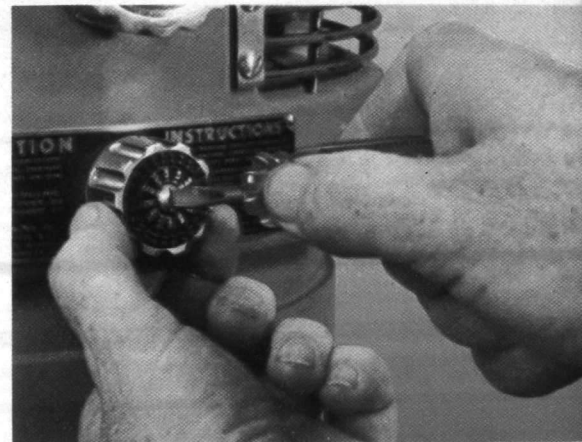
U.S. Holloshaft's large oil reservoir, with ample gravity sump, provides extra volume of lubricant in circulation through the bearing, resulting in less frequent oil turn and cooler operation. Sump collects contaminants and keeps oil cleaner, requiring less frequent oil change. Oil is metered to thrust bearing. Lubriscope's silicone rubber seals prevent leakage.



**NO NEED FOR WRENCHES...** When oil filling is desired, turn and pull out Lubriscope. Drawer-like action exposes large fill opening. No tools needed. Whether Lubriscope is retracted or extended, silicone rubber seals prevent leakage.



**FAST POURING — NO MESS...** Pour oil into large Lubriscope opening. Fast fill. Ample clearance, so that any spill drops clear of motor and pump. After filling, push Lubriscope in and lock by turning.



**OIL CHANGE RECORD ON MOTOR...** Change date record on the convenient stainless steel dial below Lubriscope. No more guesswork or doubt as to oil change date — no searching for records.

# WEATHER PROTECTION

## New U.S. Hollowshaft Motors are WEATHER-PROTECTED... BETTER-PROTECTED

COLD AIR ENTERS HERE

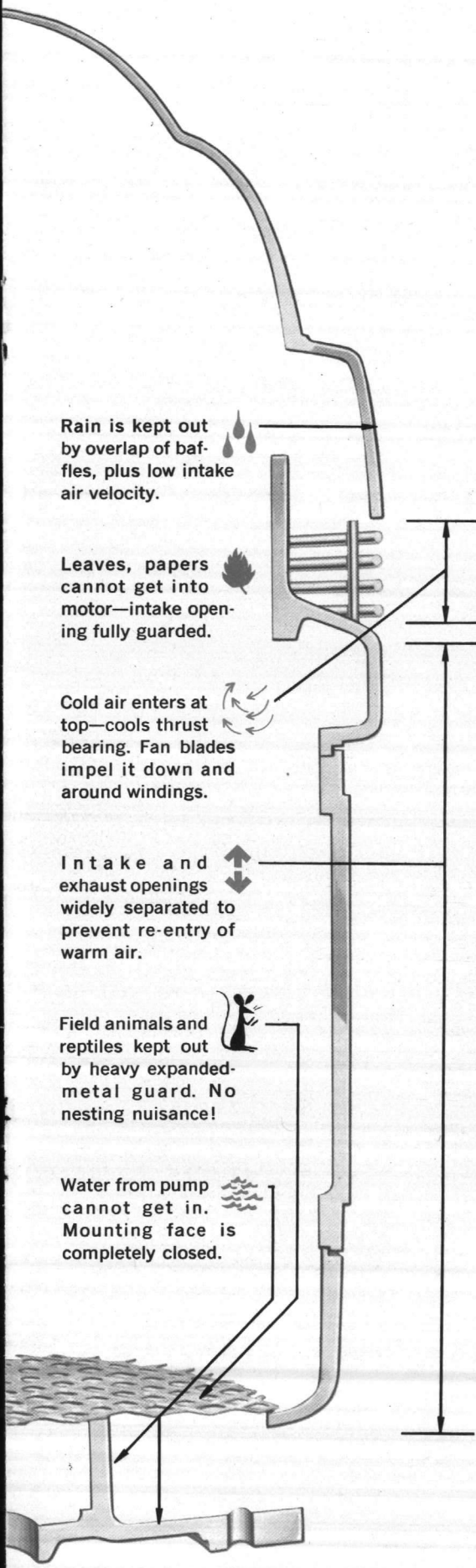
**NEW U.S. HOLLOWSHAFT EXCEEDS NEMA SPECIFICATIONS FOR WEATHER-PROTECTED TYPE I...** By definition, NEMA Weather-Protected Type I is an open motor with its ventilating passages so constructed as to minimize the entrance of rain, snow, and airborne particles to the electric parts. Its ventilated openings must be so constructed as to prevent the passage of a cylindrical rod  $\frac{3}{4}$  inch in diameter. The new U.S. Hollowshaft *more than fulfills* these requirements. A new baffle design gives unusual protection to windings at both top and bottom of the motor. Besides the overlapped baffle at the inlet, low air velocity intake—made possible by the motor's larger diameter at top—protects against dripping water or foreign matter being sucked into motor. The exhaust is completely screened and baffles curve under windings to protect against wind driven rain.

### DOWNDRAFT VENTILATION

Cold air enters the motor above the thrust bearing, and is directed down and around the bearing for maximum cooling effect upon this vital element. The integral fan blades on the rotor whirl the air rapidly down over the windings, cooling the rotor and providing a cool air current for the motor interior.

The air intake is widely separated from the exhaust, located at the bottom of the motor, so that warm exhaust air cannot mingle with intake air and thus be recirculated. Exhaust air is expelled downward and outward, further insuring against re-entry.

WARM AIR EXPELLED HERE



Rain is kept out by overlap of baffles, plus low intake air velocity.

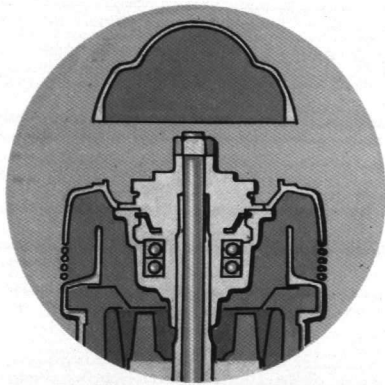
Leaves, papers cannot get into motor—intake opening fully guarded.

Cold air enters at top—cools thrust bearing. Fan blades impel it down and around windings.

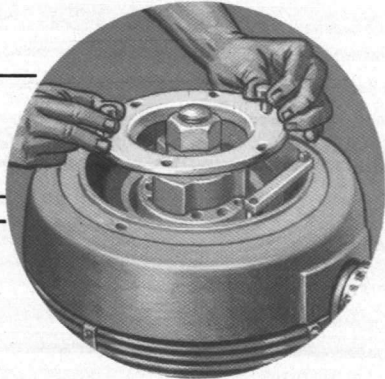
Intake and exhaust openings widely separated to prevent re-entry of warm air.

Field animals and reptiles kept out by heavy expanded-metal guard. No nesting nuisance!

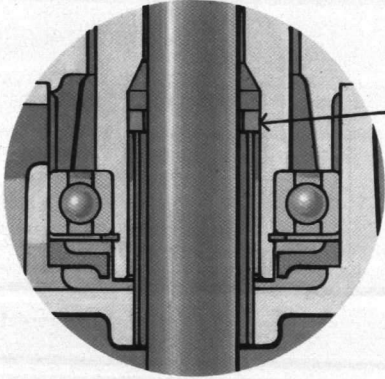
Water from pump cannot get in. Mounting face is completely closed.



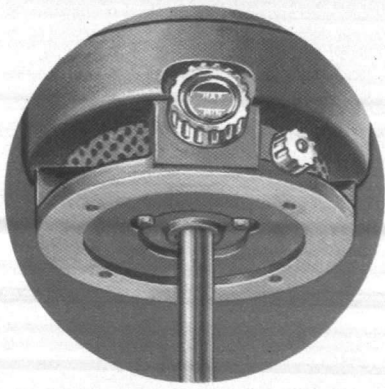
**INTERIOR OF MOTOR REMAINS PROTECTED WHEN COVER IS REMOVED...** Tools, nuts, bolts, and other small objects are prevented from falling into motor during installation or adjustment. No fishing or disassembly to recover lost articles...no damage from undetected objects when motor is started!



**BEARING COVER...** Thrust Bearing is protected during shaft adjustment from chips, dirt, grit, or other particles that could get into the bearing, causing premature failure.



**NEW ROTATING SEAL...** Protects lower guide-bearing against entrance of sand through opening of hollowshaft due to sandstorms or conditions encountered during handling and transportation.



**COMPLETELY CLOSED MOUNTING FACE KEEPS WATER OUT...** In the event of leakage of the pump shaft seal, water cannot spray up onto the motor windings. Mounting registers are machined for perfect setting and concentric alignment with pump head.



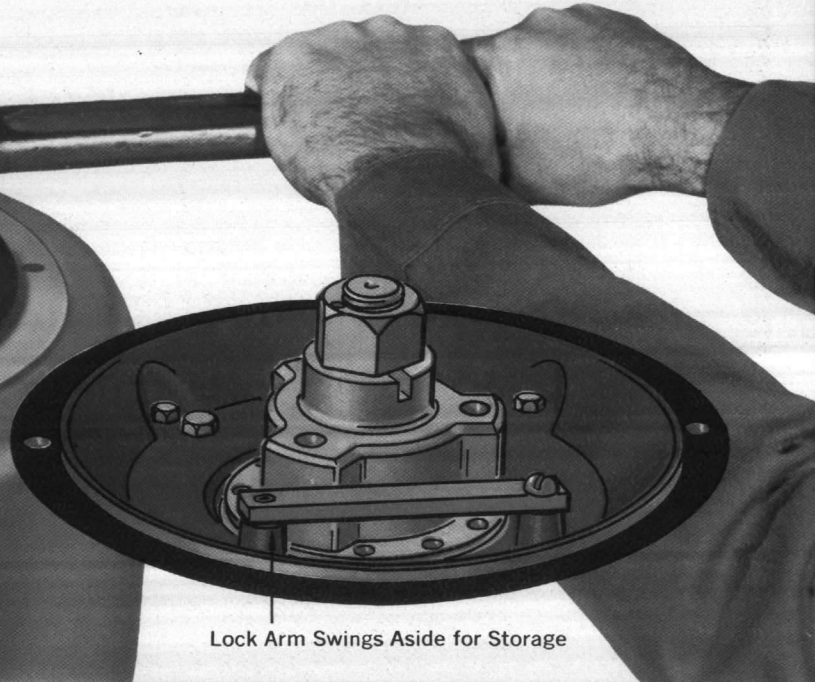
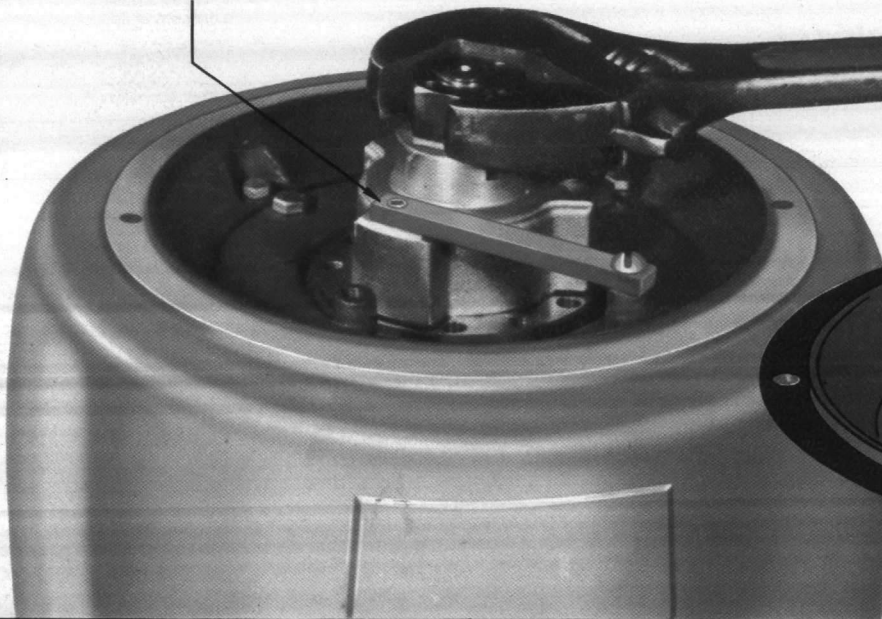
# CONVENIENCE

## features make U.S. Holloshaft

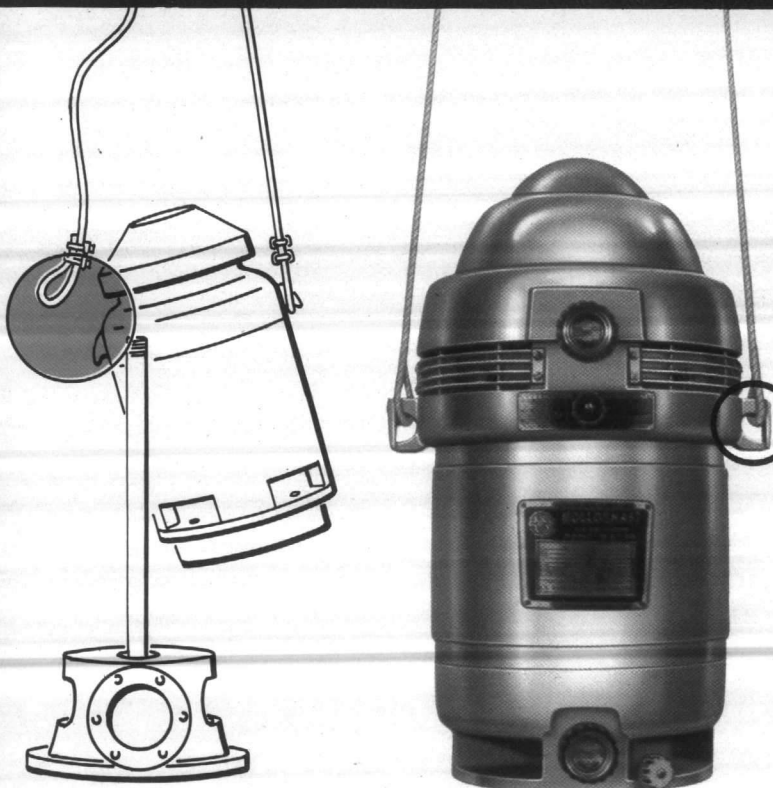
**EXCLUSIVE U. S. PIVOTED LOCK ARM . . . HOLDS SHAFT DURING ADJUSTMENT . . . TAKES PLACE OF EXTRA HELPER . . .** To prevent rotation during adjustment it is no longer necessary to have a helper hold the motor shaft with a wrench.

You merely release one end of the new *exclusive* U.S. Lock Arm from its convenient storage position on the motor, swing it over to engage with the coupling—then make the shaft adjustment quickly and *easily* by yourself!

Lock Arm Holds Shaft Against Rotation

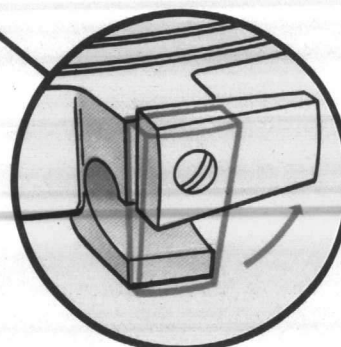


Lock Arm Swings Aside for Storage

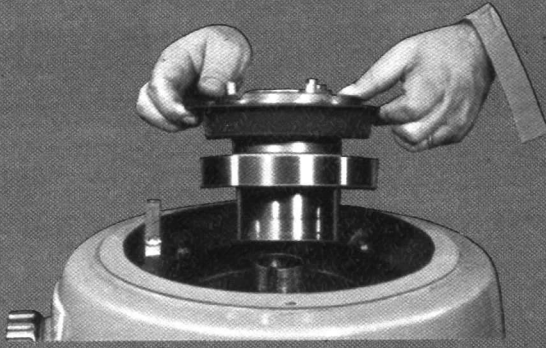


## No more slip outs!

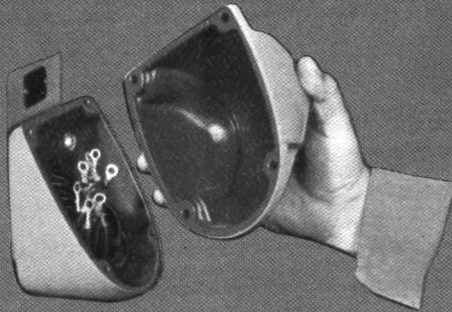
**ESCAPE-PROOF LIFTING LUGS SWING ASIDE TO TAKE SLING . . .** Another U.S. exclusive! On ordinary motors, when motor is pulled aside to clear pump head, hazard of hoist sling slip out is ever-present. This U.S. Holloshaft lifting lug is designed to give positive assurance against a hoist sling slipping out. Gravity swings the retainer into closed position after sling is inserted.



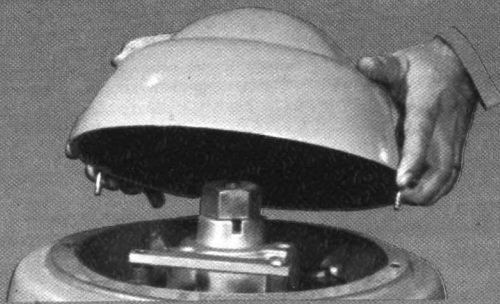
easy to install, maintain



**THRUST BEARING SLEEVE MOUNTED FOR EASY REMOVAL . . .** Sleeve mounted thrust bearing easily lifted free of motor. It is located at the *top* of the motor to make it possible to remove bearing without motor disassembly.

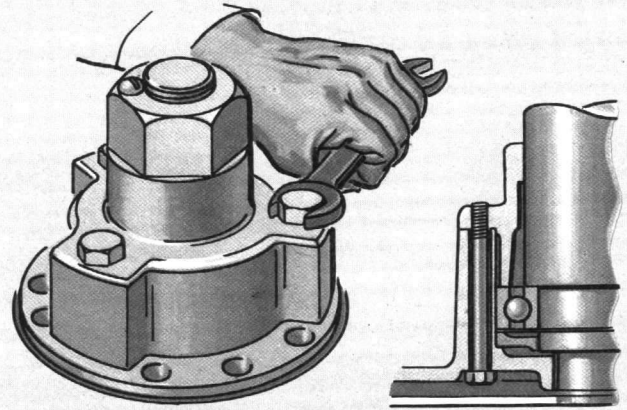


**LARGE CAST-IRON CONDUIT BOX . . .** The heavy-duty split dome conduit box gives convenient access to leads and terminals. Ample room makes connections easy. A special gasket seals and positions leads for easy identification. Box can be rotated in 90° steps to facilitate conduit connection.



**SMALL LIGHT-WEIGHT COVER EASY TO LIFT . . .** Only the motor cover need be removed to provide access to the adjusting nut, backstop, and thrust bearing. This small, light-weight motor cover is gasket-sealed and releases easily after bolts are loosened. Captive bolts cannot get loose.

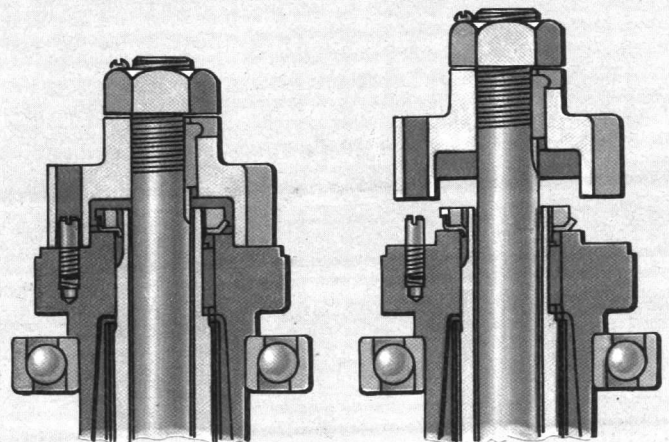
## PROTECTIVE DEVICES against starting upthrust and reversal damage



UPPER ASSEMBLY

LOWER ASSEMBLY

**HOLD-DOWN BOLTS PROTECT AGAINST MOMENTARY UP THRUST . . .** In some shallow settings, the pump may develop a momentary upthrust during starting. The Holloshaft motor is designed so that its lower bearing cannot lift. To prevent upward movement of the pump shaft, it is only necessary to install hold-down bolts in the coupling.



ENGAGED

DISENGAGED

**REVERSE PROTECTION COUPLING DISENGAGES PUMP IF MOTOR IS REVERSED . . .** Pump couplings may unscrew and cause damage if motor is reversed. The U. S. Reverse Protection Coupling is designed so that unscrewing of the pump shaft causes the drive coupling to rise and disengage from motor.



# BALANCE

## U. S. refines balance of motor after assembly

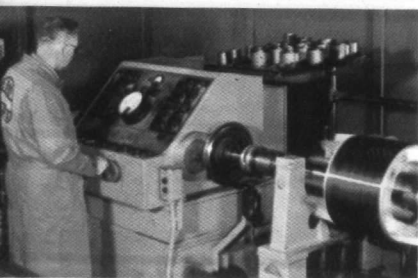
U. S. Holloshaft is the only motor designed with *provision* for final balancing to split-hair precision *after assembly*. Sensitive vibrometer detects slightest vibration, enabling operator to make the correction

needed. Holloshaft motors are balanced on a three-point support to over-all vibration amplitude of less than .00084" — to assure smooth running, trouble-free performance, and long life.



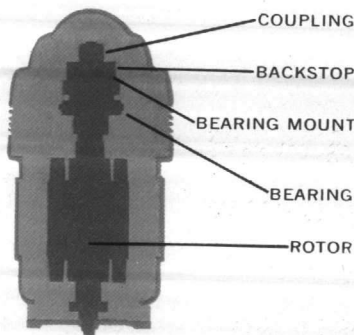
Maximum allowable vibration .00084"

### AT U.S. ALL ROTATING COMPONENTS ARE ELECTRICALLY BALANCED

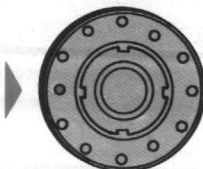


All rotating components are subjected to individual balancing tests and corrections. Rotor, thrust bearing mount, coupling, and backstop are dynamically balanced and corrected. Above, dynamic balance of rotor assembly is being perfected on an electronically controlled machine which measures correction required.

### ONLY U. S. HOLLOSHAFT MOTORS RECEIVE THESE EXTRA BALANCING REFINEMENTS



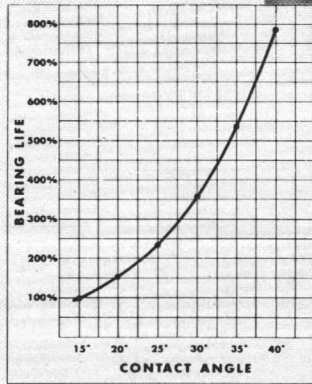
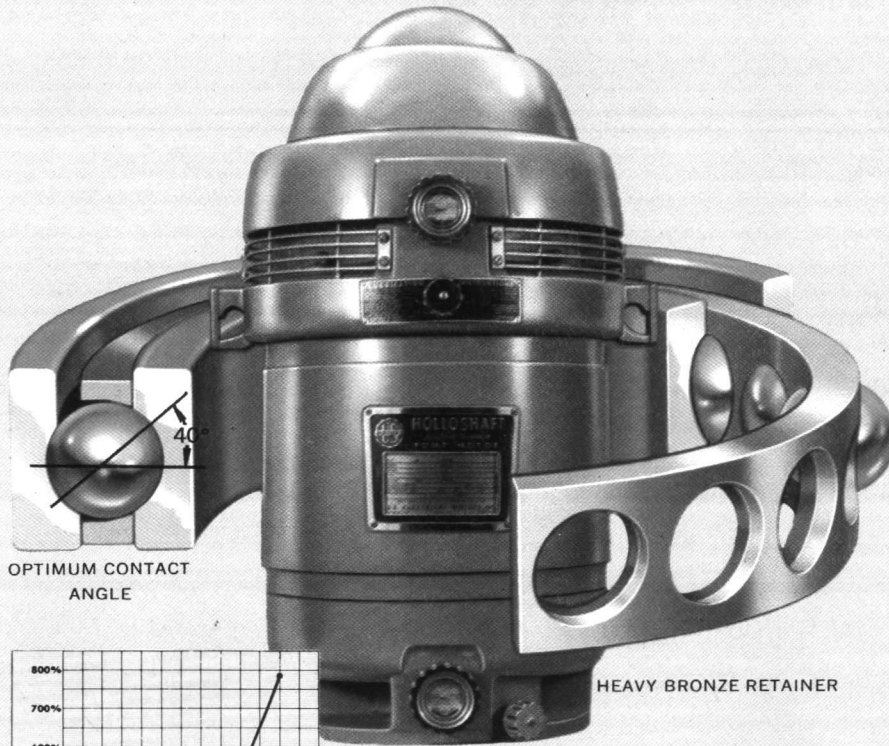
Normal tolerances of component parts may result in cumulative error leading to imbalance of the over-all assembly. Only U. S. Holloshaft design provides recesses to allow this imbalance to be corrected in assembled motor.



Balance of assembled motor is corrected by tamping micrometric lead weights permanently into recesses in the bearing mount.

# RUGGED THRUST BEARING

## 5 REASONS why U. S. Thrust Bearings Last Longer



◀ **OPTIMUM THRUST ANGLE OF CONTACT MEANS LONGER BEARING LIFE...** Thrust bearings are made in a range of contact angles of 15° to 40°. U.S. provides bearings at the top of this range, for longest thrust bearing life.

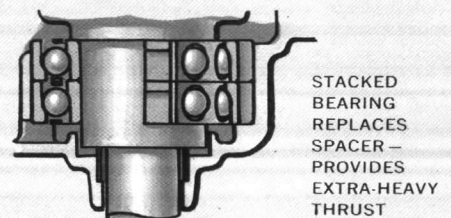
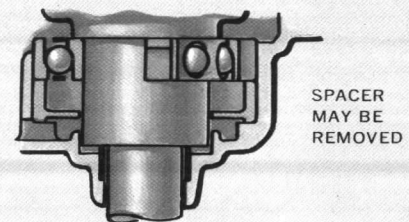
THRUST BEARING LIFE VS. CONTACT ANGLE  
Source: Capacity Formula, Anti-Friction Bearing Manufacturers Association

... Thrust bearing life is influenced by many factors. It is dependent upon bearing selection, internal motor design and external conditions. U. S. has designed the Holloshaft motor *around* the load-carrying thrust bearing. The following five reasons show why thrust bearings last longer in U.S. motors:

1. U. S. starts with the *right bearing construction* having the optimum contact angle of 40°, and with a heavy bronze ball retainer. Maximum ball diameter reduces stress and prolongs life;
2. U. S. designs the motor *ventilation* so that cool air flows in above and is directed over the bearing, thus insuring cool operation;
3. U. S. *normalizes* the motor castings so that internal stresses cannot develop and cause warpage. Alignment of bearings is maintained;
4. U. S. provides a *large oil reservoir* with sump for ample bearing lubricant supply. This results in cooler running, cleaner oil, less frequent oil-change requirement; and
5. U. S. balances all rotating components, then *refines the over-all balance* of the assembled motor to eliminate harmful vibration and lateral stresses, thus increasing bearing life.

### THRUST BEARINGS MAY BE STACKED FOR EXTRA-HEAVY DUTY

For all normal service, the Holloshaft motor's standard thrust bearing is ample. Should it ever become necessary to change the pump bowl setting to a lower or receded water level, or if the pump originally requires more bearing capacity than for normal service, Holloshaft design has provision for using stacked bearings. Space for stacking is obtained simply by removing spacer ring. Angular contact bearings for stacking are specially made to work in tandem. They are accurately ground so that they will share the load between them. Stacked bearings may be used for increased load capacity and increased operating life.

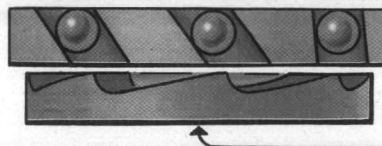
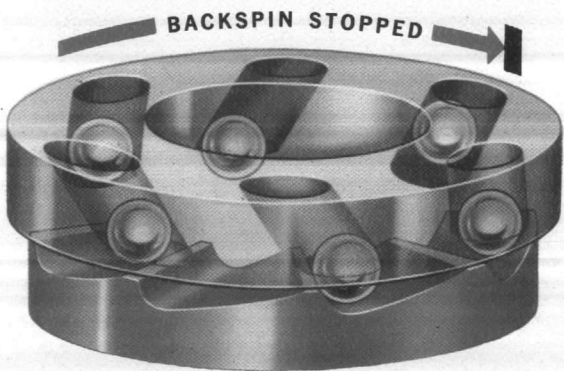
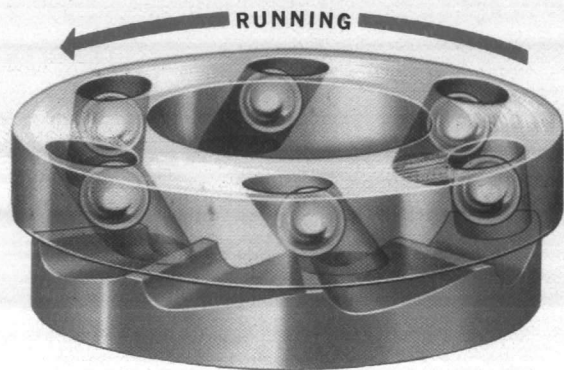




# BALLOMATIC BACKSTOP

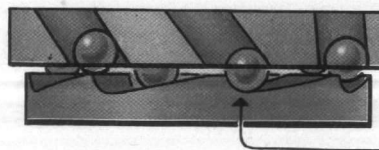
**locks shaft quickly and positively against backspin**

The ball type backstop, pioneered by U. S. Motors, is now accepted as the most dependable device for preventing turbine pump backspin, caused by water column receding when motor current ceases. When motor starts, the balls are disengaged—being thrown outward and upward at a compound angle, and held there by centrifugal force.



SIDE VIEW—RUNNING  
STATIONARY RATCHET

Just before rotation ceases, gravity pulls balls downward to ratchet, and motor reversal is prevented.



SIDE VIEW—STOPPED  
BALLS LOCKED  
AGAINST RATCHET

(BALLOMATIC BACKSTOP IS OPTIONAL EQUIPMENT)

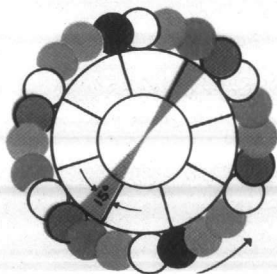


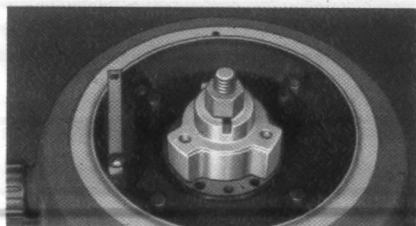
DIAGRAM OF VERNIER DESIGN

**THE BALLOMATIC VERNIER PRINCIPLE—minimum reverse movement... minimum reverse momentum!**

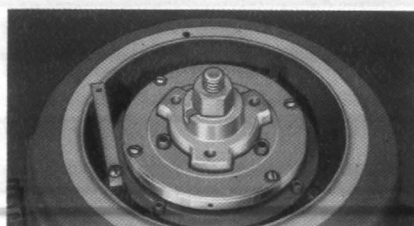
Utilizing a non-matching number of ball-channels and ratchet teeth, the Ballomatic backstop works on the vernier principle. In the 1½ to 5 h.p. range, 6 balls and 8 ratchet teeth (see diagram) provide 24 lock-positions, limiting maximum reversal

to 15°. Two opposite balls engage teeth. On higher horsepower motors, as many as 12 balls and 14 teeth provide 84 lock-positions, limiting maximum reversal to approximately 4½°. Minimizing reversal minimizes momentum and shock on engaging.

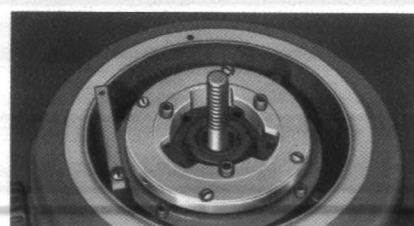
**BALLOMATIC IS INDEPENDENT OF COUPLING—either can be removed without disturbing the other!**



**MOTOR WITH COUPLING ONLY ... NO BALLOMATIC.** Photo shows standard motor with coupling before Ballomatic backstop is installed.

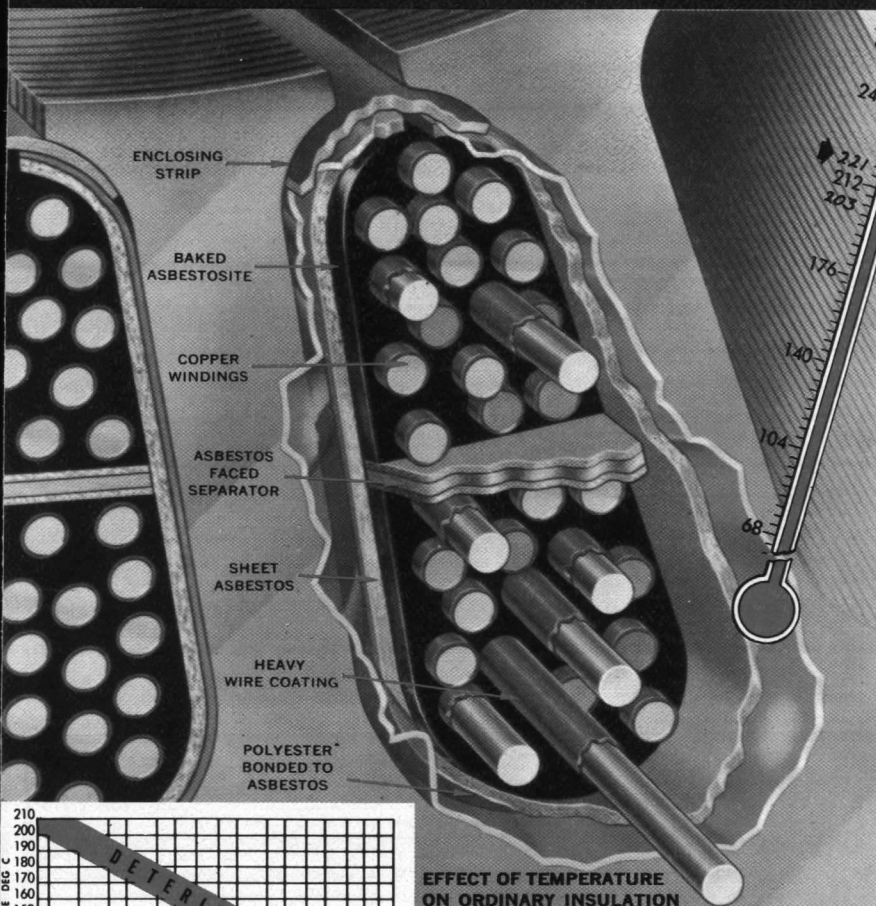


**MOTOR WITH BOTH COUPLING AND BALLOMATIC.** Here the Ballomatic backstop has been installed without disturbing the coupling or pump setting.



**MOTOR WITH BALLOMATIC ONLY ... NO COUPLING.** Similarly, the above photo shows how coupling may be removed without disturbing Ballomatic backstop.

# ASBESTOS PROTECTED WINDINGS



## LONGER MOTOR LIFE WITH NATURE'S NON-CARBONIZING INSULATION

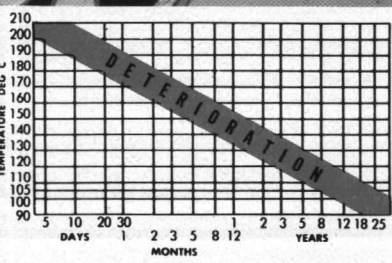
... Motors are rated 40°C. rise according to NEMA standards. This is the temperature rise by thermometer on the outside of coils or core at rated load. But there is a 15% service factor which increases the temperature rise to 50°C. To find the actual maximum *internal* temperature, 15°C. is allowed, also the surrounding temperature of 40°C. maximum, thus giving 105°C. total or 221°F. Several conditions may cause even this temperature to be exceeded, such as low voltage, overload, unbalanced line voltage, recirculation of air due to restricted space, clogging of air passage, deposits of oil, dirt, etc. Records of insurance companies, rewind shops and maintenance departments indicate burnouts as a most common cause of motor failure.

## EACH WIRE ISOLATED WITH INORGANIC ASBESTOS

... Being inorganic, asbestos will not deteriorate, regardless of time and temperatures. ONLY U. S. protects all windings with asbestos! In the U. S. patented process, electric vibration of windings assures that *each wire* is completely covered with non-carbonizing non-organic asbestos.

### EFFECT OF TEMPERATURE ON ORDINARY INSULATION

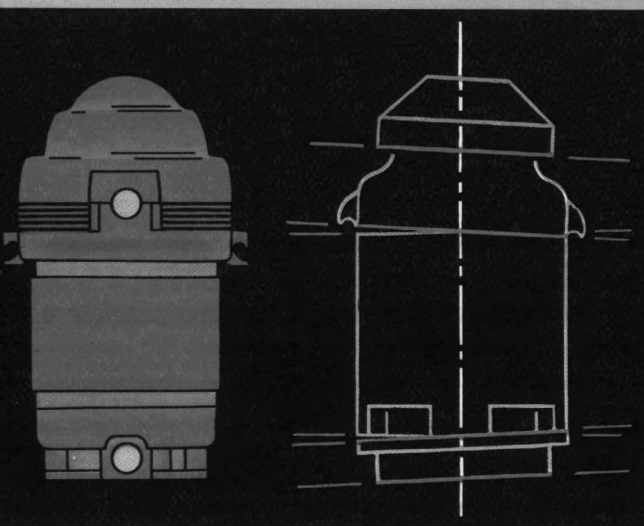
Life of ordinary organic material such as paper and cloth at 105°C. (221°F) is 7 years. The rate of deterioration increases with temperature. Insulation carbonizes, reducing its physical strength and changing it from insulator to conductor. RESULT: MOTOR BURN-OUT!



## NORMALIZING

**of castings assures precision and permanent alignment**

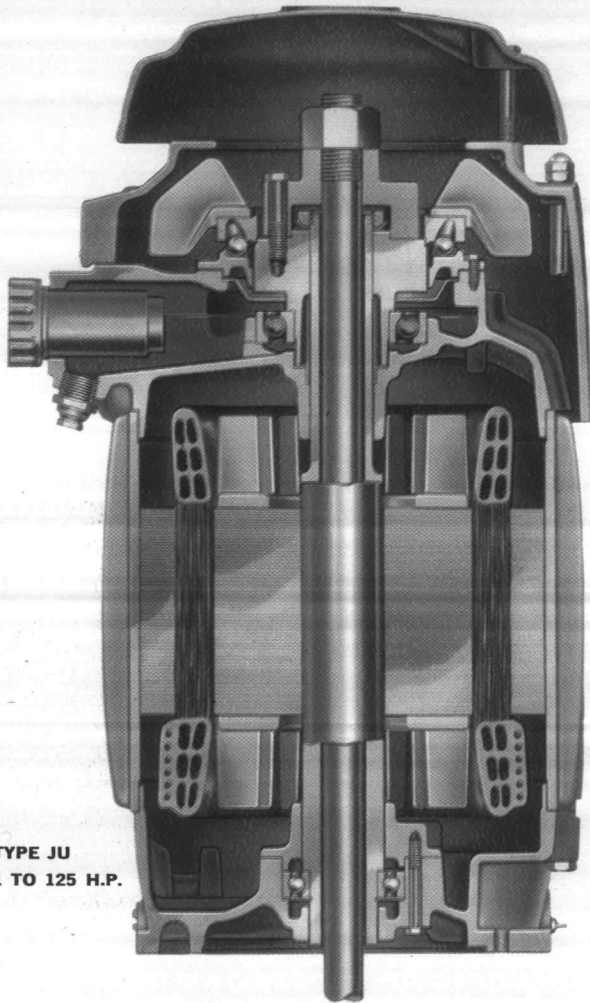
**HEAT SEASONING REMOVES STRESSES** ... Like fine precision parts in giant telescopes, artillery, machine tools—U. S. motor castings are normalized. Heat seasoning insures precision and permanent alignment. Internal stresses that would otherwise distort the casting are removed before machining, so that every part retains its accuracy for life ... and motor longevity is accordingly increased.





## TOTALLY-ENCLOSED TYPE

for severe conditions



TYPE JU  
1 TO 125 H.P.

In many industrial applications, it has been found that enclosed motors provide the solution to difficult environmental conditions. Designed to cope with adverse, but non-explosive atmospheres, the new JU Totally-Enclosed Holloshaft provides, in addition to the HU Holloshaft features, a rugged enclosure which completely excludes harmful contaminants. If you have an application in which dirt, moisture, acid or alkali is present in such quantities that passage of outside air through the motor must be prevented, the Totally-Enclosed Holloshaft is for you.

### SPECIAL FEATURES OF THE TOTALLY-ENCLOSED HOLLOSHAFT:

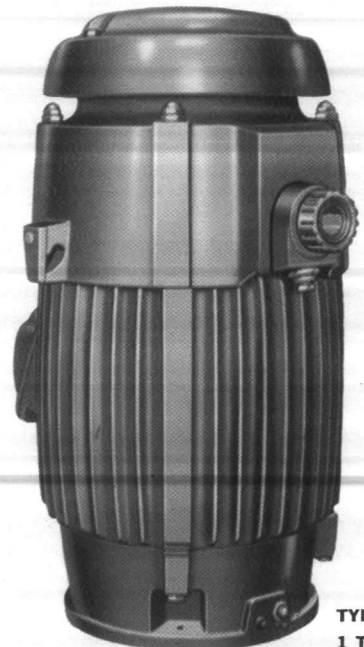
- **COOLING FAN**  
provides forced draft
- **LUBRISCOPE**  
clear view, fast oil-fill
- **THRUST BEARING AT TOP OF MOTOR**  
oil lubricated above 5 h.p.
- **COOLING RIBS**  
for rapid heat dissipation
- **ALL CAST-IRON EXTERIOR**  
corrosion resistant, rigid
- **NORMALIZED CASTINGS**  
heat-treated to prevent warping
- **RERATED MOTOR**  
compact, space-saving
- **BALLOMATIC BACKSTOP**  
(optional) locks shaft quickly, positively against backspin
- **LUBRIFLUSH SYSTEM AT LOWER BEARING**  
transverse lubrication flushes out old grease
- **MOMENTARY UPTHRUST PROTECTION**  
hold-down bolt prevents shaft upward motion at starting
- **CONDENSATION DRAIN**  
collects and drains internal moisture
- **SAFETY-LOCK LIFTING LUGS**  
prevent escape of hoist sling
- **NON-REVERSE COUPLING**  
disengages pump if motor is reversed
- **ASBESTOS PROTECTED WINDINGS**  
non-organic asbestos cannot carbonize—protects against motor burn-out

## EXPLOSION-PROOF TYPE

### for Hazardous Fume or Dust Conditions

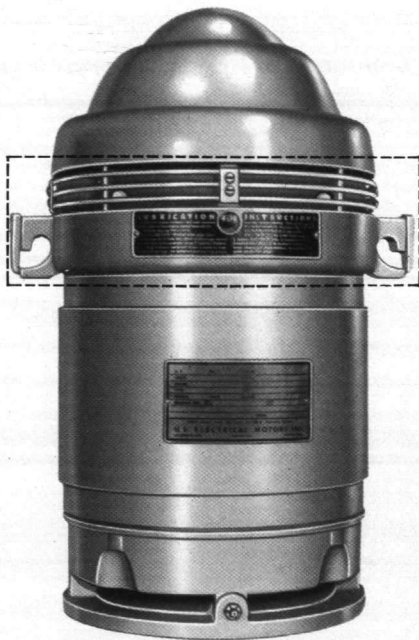
Where explosive atmospheres prevail, safety precautions or required compliance with national and local codes necessitates the use of explosion-proof motors. The Explosion-Proof Holloshaft Motor is designed for locations in which hazards are present due to the use, handling, or storage of volatile liquids... highly inflammable gases... explosive dusts and other dangerous substances. It

complies with Underwriters' specifications and carries the approved label of the National Board of Fire Underwriters. Exceeds Class I, Group D, specifications for explosive, inflammable gas conditions, and Class II, Groups F and G, for combustible dust. Besides the Totally-Enclosed features listed above, the Explosion-Proof Type EU has optional Spark-Resistant Backstop.



TYPE EU  
1 TO 125 H.P.

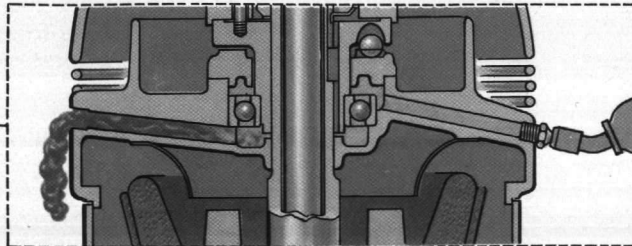
## GREASE-LUBRICATED MODEL 1½ TO 5 H.P.



The smaller, grease-lubricated models of U. S. Holloshaft Pump Motors retain most of the features of the larger horsepower type—such as the Rerated Frame for compactness, the Grille Screen, the Thrust Bearing located at the top of the motor, the pivoted Shaft Lock Arm, Weather Protection, the optional Ballomatic Backstop, and others. Grease lubrication, at both top and lower bearings, is the famous U. S. Lubriflush system.

### U. S. EXCLUSIVE LUBRIFLUSH TRANSVERSE LUBRICATION SYSTEM

Lubriflush provides up to *12 times* the volume of grease that can be accommodated in ordinary bearing lubrication system. With Lubriflush *transverse* lubrication, old worn-out grease is completely flushed out by new grease. With the advent of new varieties of modern greases having different chemical bases—many of which will not mix without becoming unsafe for bearing lubrication—the *complete* flush provided by Lubriflush becomes an important safety feature. Old and new greases never mix!



Cross section of portion in dotted rectangle

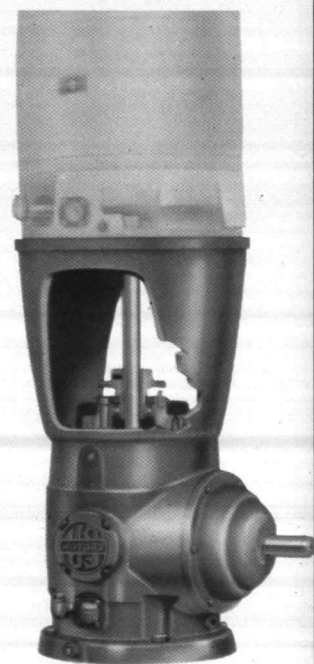
Lubriflush provides complete flush—old grease forced out

## OTHER U.S. PRODUCTS SERVE THE PUMP INDUSTRY

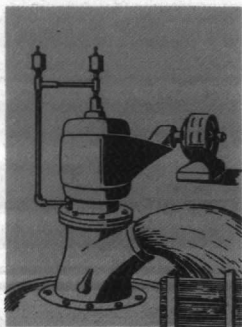


**FOR NON-ELECTRICAL SERVICE, U. S. HOLLOSHAFT RIGHT-ANGLE GEAR DRIVES . . .** Where electricity is unavailable or uneconomical, engine-driven pumping power is made readily applicable by U. S. Holloshaft Right-Angle Gear Drives. It is compact and weatherproof. U. S. makes its own gears, for top efficiency and long life. Other features: Visolube observable lubrication with constantly cycling oil, Normalized Castings, Accessible Thrust Bearing at top of drive, Back-stop, and Momentary Upthrust Protection.

**FOR 24-HOUR STANDBY SERVICE . . . U. S. HOLLOSHAFT COMBINATION GEAR DRIVES . . .** For municipal water supply stations, sewage plants, fire-fighting, and other installations where continuous service is essential—this combination gear drive provides rapid shift from motor drive to auxiliary engine drive in the event of power failure. The combination gear drive has all the features of the right-angle gear drive (above).





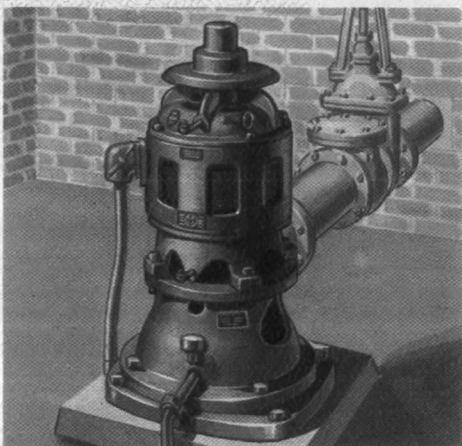


1908

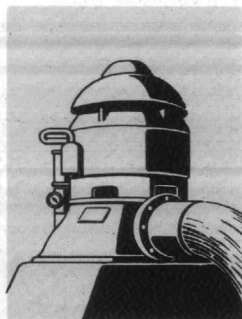


1918

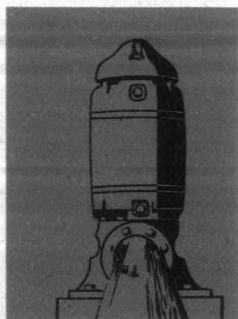
for half a century  
**U.S. MOTORS**  
have led the way in  
pump motor progress



1922 INTRODUCED WORLD'S FIRST VERTICAL  
HOLLOSHAFT TYPE PUMP MOTOR



1930



1947



## NEW U.S. HOLLOSHAFT MOTORS

YEARS AHEAD FOR YEARS TO COME

Years ahead in design, U. S. Hollowshaft Motors are the result of the accumulated know-how of a half-century of leadership in the pump motor field. Here is a truly different and completely functional design,

from top to bottom. U. S. Motors' long experience in sensing and fulfilling the needs of the turbine pump industry has made possible this revolutionary motor that will be years ahead for years to come.



**U.S. ELECTRICAL MOTORS Inc.**

PACIFIC PLANT: Los Angeles 54, California (Box 2058) ATLANTIC PLANT: Milford, Connecticut

ALBANY 3, N. Y.  
ATLANTA, Ga.  
BAKERSFIELD, Calif.  
BALTIMORE 4, Md.  
BOSTON 16, Mass.  
BUFFALO 14, N. Y.  
CHARLOTTE, N. C.

CHICAGO 34, Ill.  
CINCINNATI 37, Ohio  
CLEVELAND 14, Ohio  
COLUMBUS, Ohio  
DALLAS, Texas  
DAVENPORT, Iowa  
DENVER 16, Colo.

DETROIT 4, Mich.  
FRESNO 1, Calif.  
HASTINGS, Neb.  
HOUSTON, Texas  
INDIANAPOLIS, Ind.  
KALAMAZOO, Mich.  
KANSAS CITY, Kan.

LUBBOCK, Texas  
MEMPHIS, Tenn.  
MILWAUKEE 3, Wis.  
NEWARK 4, N. J.  
NEW ORLEANS 24, La.  
NEW YORK 6, N. Y.  
PHILADELPHIA 2, Pa.

PHOENIX, Ariz.  
PITTSBURGH 22, Pa.  
RICHMOND 26, Va.  
SACRAMENTO 8, Calif.  
ST. PAUL 4, Minn.  
SALT LAKE CITY 11, Utah  
MOTORS U. S. DE MEXICO, S. A.—MONTERREY, MEXICO

SAN FRANCISCO 7, Calif.  
SAN JOSE 10, Calif.  
SEATTLE 4, Wash.  
STOCKTON, Calif.  
SYRACUSE 4, N. Y.  
TAMPA 11, Fla.

Finish water pump	LAYNE + BOWLER, INC	- 3 & 4 shop drawing and performance curve	Section 11A.4
Back wash pump		- shop drawing and performance curve	Section 11A.4
Right angle gear drive	← AMARILLO GEAR CO		Section 11A.3.10
Finish water pump		- 1 & 2 shop drawing and performance curve	Section 11A.4
Ford industrial motor	FORD INDUSTRIAL POWER PRODUCTS		Section 11A.3.11
Hollow shaft pump motor	U.S. HOLLOSHAFT		Section 11A.3.9
Well pumps, vertical turbine	LAYNE + BOWLER, INC		Section 11A.3





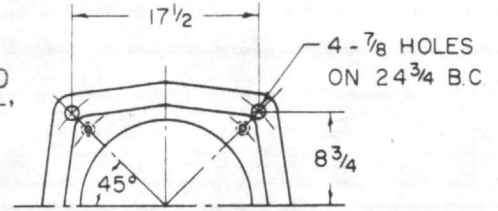
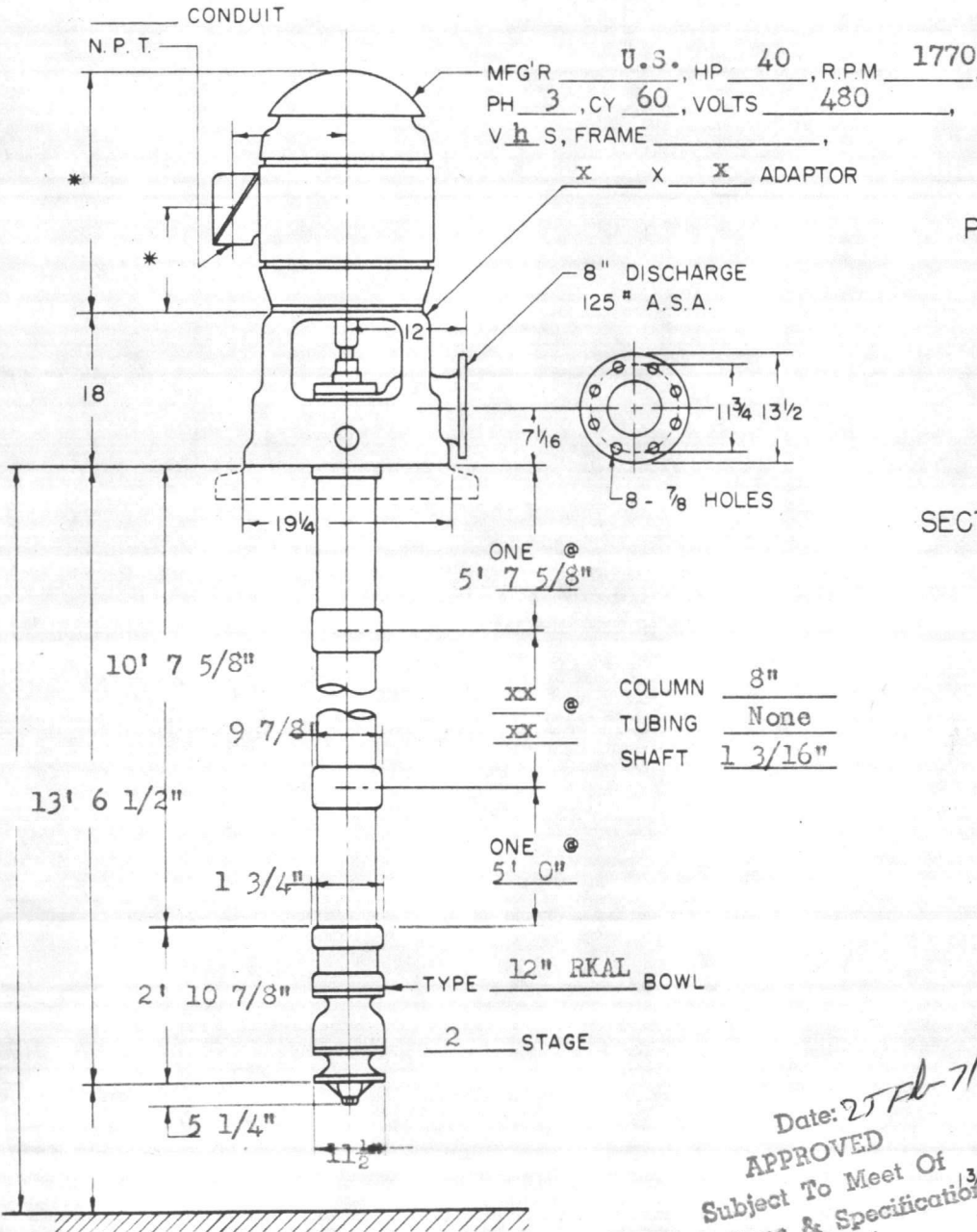
# INSTALLATION PLAN

## TYPE RF 816 DISCHARGE HEAD

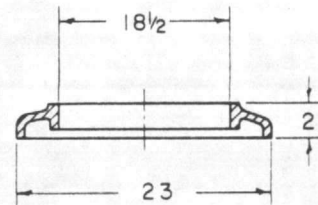
LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE



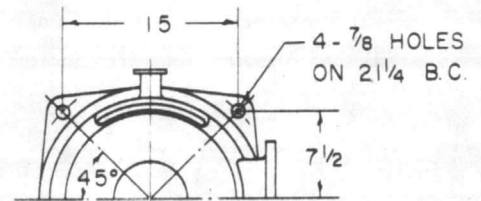
USE THESE DIMENSIONS ONLY  
WHEN CERTIFIED BY FACTORY



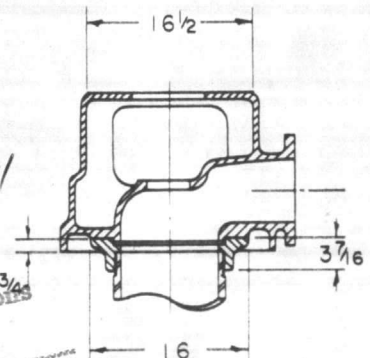
PLAN OF BASE PLATE



SECTION THRU BASE PLATE



PLAN OF HEAD



SECTION THRU ELL

Date: 2/16/71  
APPROVED  
Subject To Meet Of  
Job Plans & Specifications  
By: [Signature]  
Quality Control Representative

Corbin Construction Company

CUSTOMER: _____	YOUR NO: <u>N-195-70</u>	G.P.M: <u>750</u>
LOCATION: <u>Camp LeJeune, North Carolina</u>	OUR NO: <u>7E 71H-112</u>	T.D.H: <u>130</u>
FOR APPROVAL: <u>Tom Morrow</u>	PUMP NO: <u>65089-90</u>	R.P.M: <u>1770</u>
CERTIFIED: _____	DATE: <u>1/6/71</u>	B.H.P: _____

\* INCLUDES 3" HIGH MOTOR ADAPTOR WHEN USED





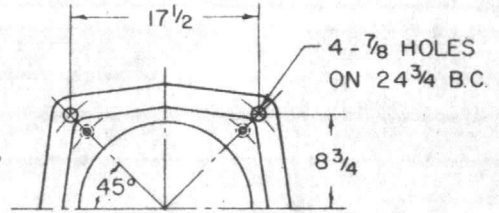
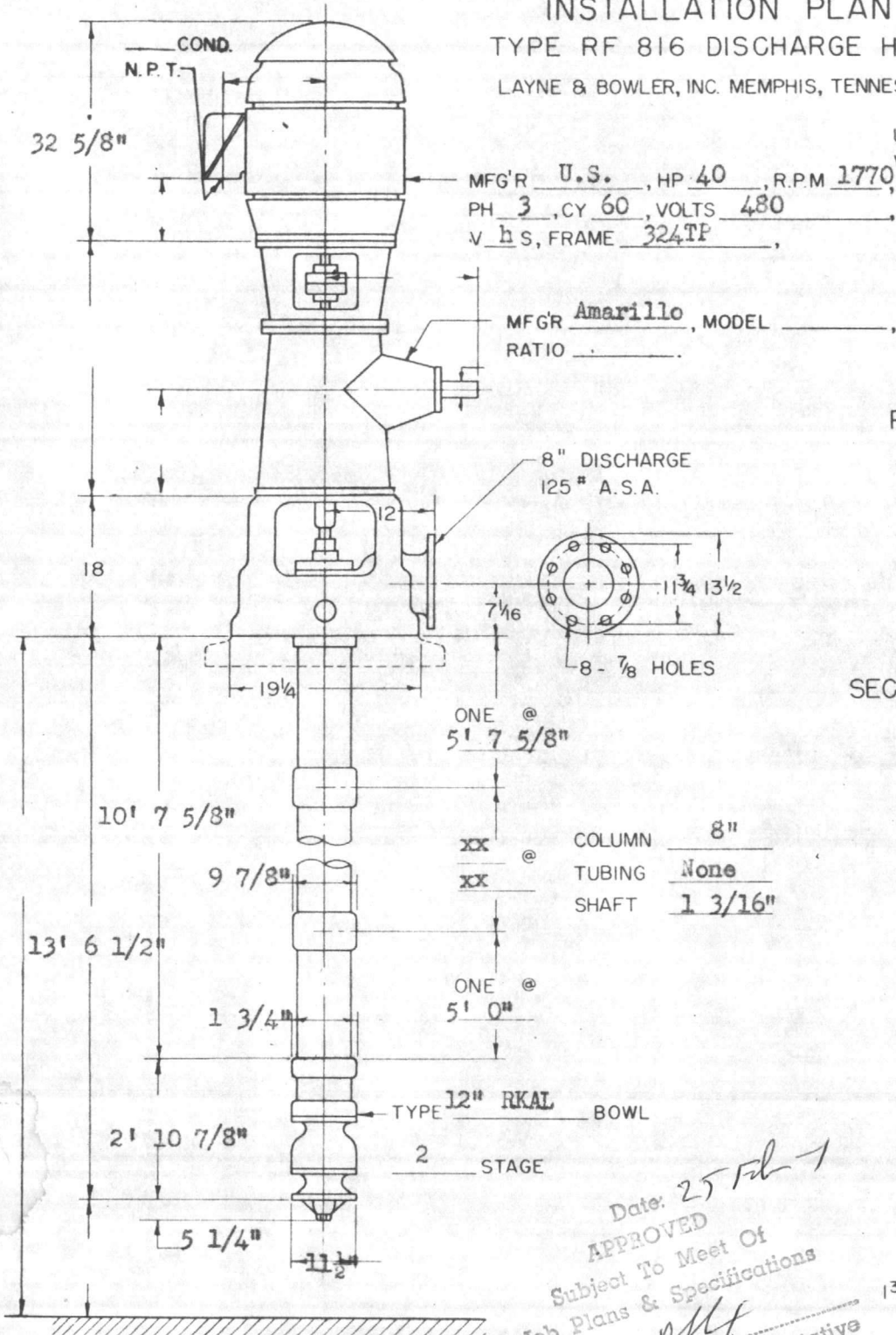


# INSTALLATION PLAN

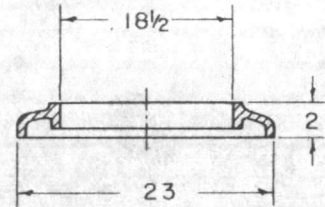
## TYPE RF 816 DISCHARGE HEAD

LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE

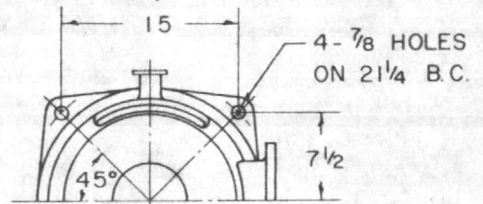
USE THESE DIMENSIONS ONLY  
WHEN CERTIFIED BY FACTORY



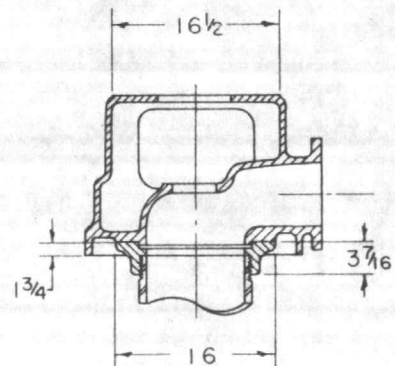
PLAN OF BASE PLATE



SECTION THRU BASE PLATE



PLAN OF HEAD



SECTION THRU ELL

Date: 25 Feb 71

APPROVED

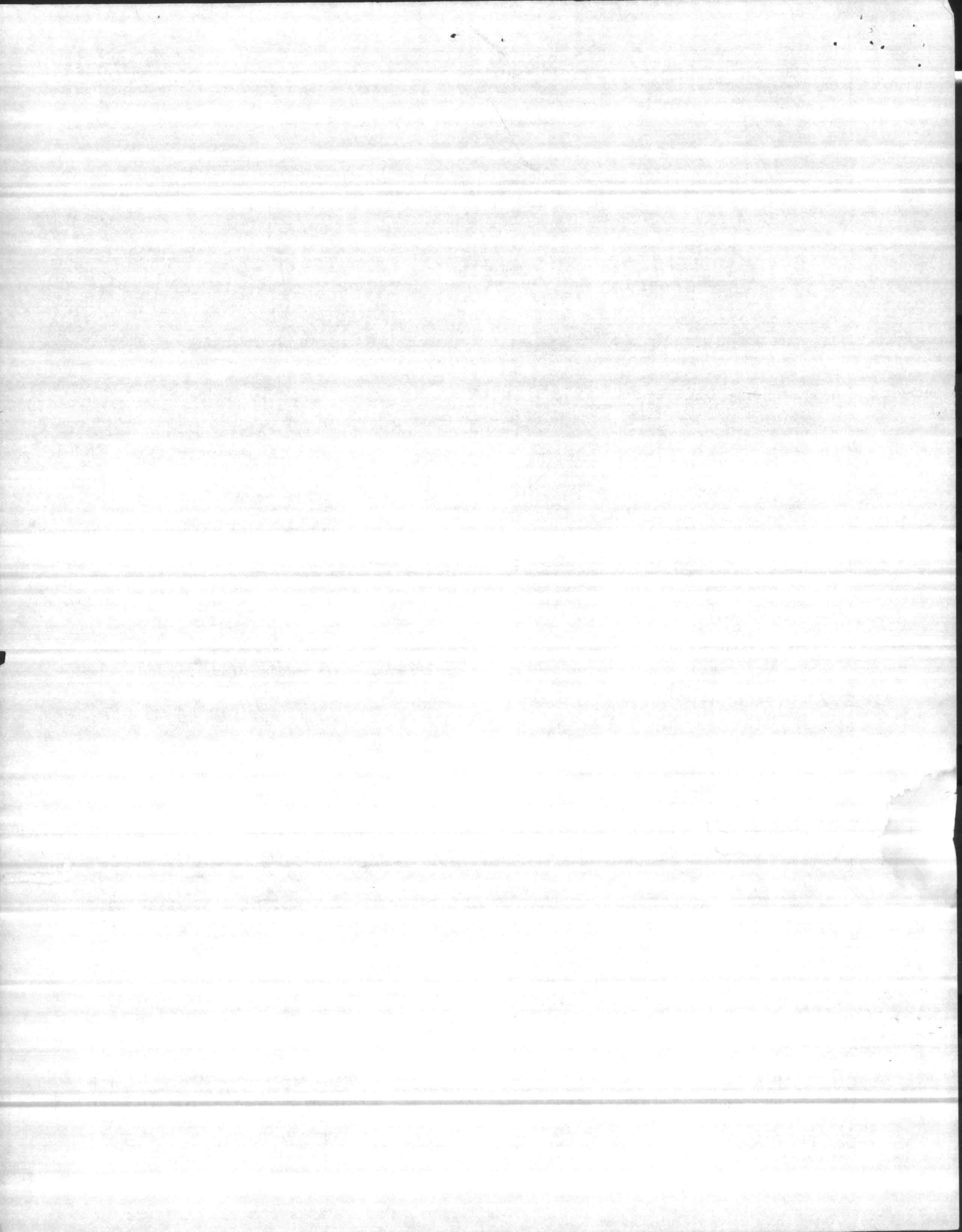
Subject To Meet Of  
Job Plans & Specifications

By \_\_\_\_\_  
Quality Control Representative

Corbin Construction Company

CUSTOMER: _____	YOUR NO: <u>N-195-70</u>	G. P. M: <u>78 750</u>
LOCATION: <u>Camp LeJeune, North Carolina</u>	OUR NO: <u>71H-112</u>	T. D. H: <u>130</u>
FOR APPROVAL: <u>Tom Morrow</u>	PUMP NO: <u>65090</u>	R. P. M: <u>1770</u>
CERTIFIED: _____	DATE: <u>1/13/71</u>	B. H. P: _____





THESE CURVES SHOW THE GENERAL SHAPE OF THE PUMP BOWL CHARACTERISTICS UNDER SHOP TESTS AT THE CONSTANT SPEED INDICATED. A TOLERANCE OF PLUS OR MINUS 2% MUST BE ALLOWED IN THE GUARANTEED CAPACITY, HEAD, AND EFFICIENCY AT THE RATED POINT WHEN PUMPING NON-GASEOUS WATER, FREE FROM DETRITUS, AT A TEMPERATURE NOT OVER 86° FAHR., AND WITH THE LOWEST IMPELLER SUBMERGED.

FOR

ADDRESS

TYPE OF PUMP FIG. *RKAL* R.P.M. *1770*

SIZE OF PUMP *12* IN. *2* STAGES *6A13* IMPELLER *STD*

FIELD PERFORMANCE

THE FIELD PERFORMANCE AS SHOWN BELOW, MAKES ALLOWANCE FOR ALL THE HYDRAULIC AND MECHANICAL LOSSES IN THE COLUMN AND SHAFT OF THE INSTALLATION ACCORDING TO THE STANDARDS OF THE HYDRAULIC INSTITUTE. THE FIELD PUMPING HEAD IS THE LIFT FROM THE WELL PLUS THE DISCHARGE HEAD MEASURED AT THE DISCHARGE CONNECTION AT THE SURFACE.

COLUMN INS. LENGTH FT. SHAFT DIA.

CAPACITY U.S. GPM. FIELD PUMPING HEAD

FIELD B.H.P. FIELD EFFICIENCY

MOTOR EFF. WIRE TO WATER EFFICIENCY

NOTES

*PT1818A*  
*77,905\**

TOTAL HEAD IN FEET  
220  
200  
180  
160  
140  
120  
100

PER CENT EFFICIENCY  
90  
80  
70  
60  
50  
40  
30  
20  
10

*HEAD - CAPACITY*

*% EFFICIENCY*

Date: *25 APR 71*

APPROVED

Subject to Meet Of  
Job Plans & Specifications

By *[Signature]*  
Quality Control Representative

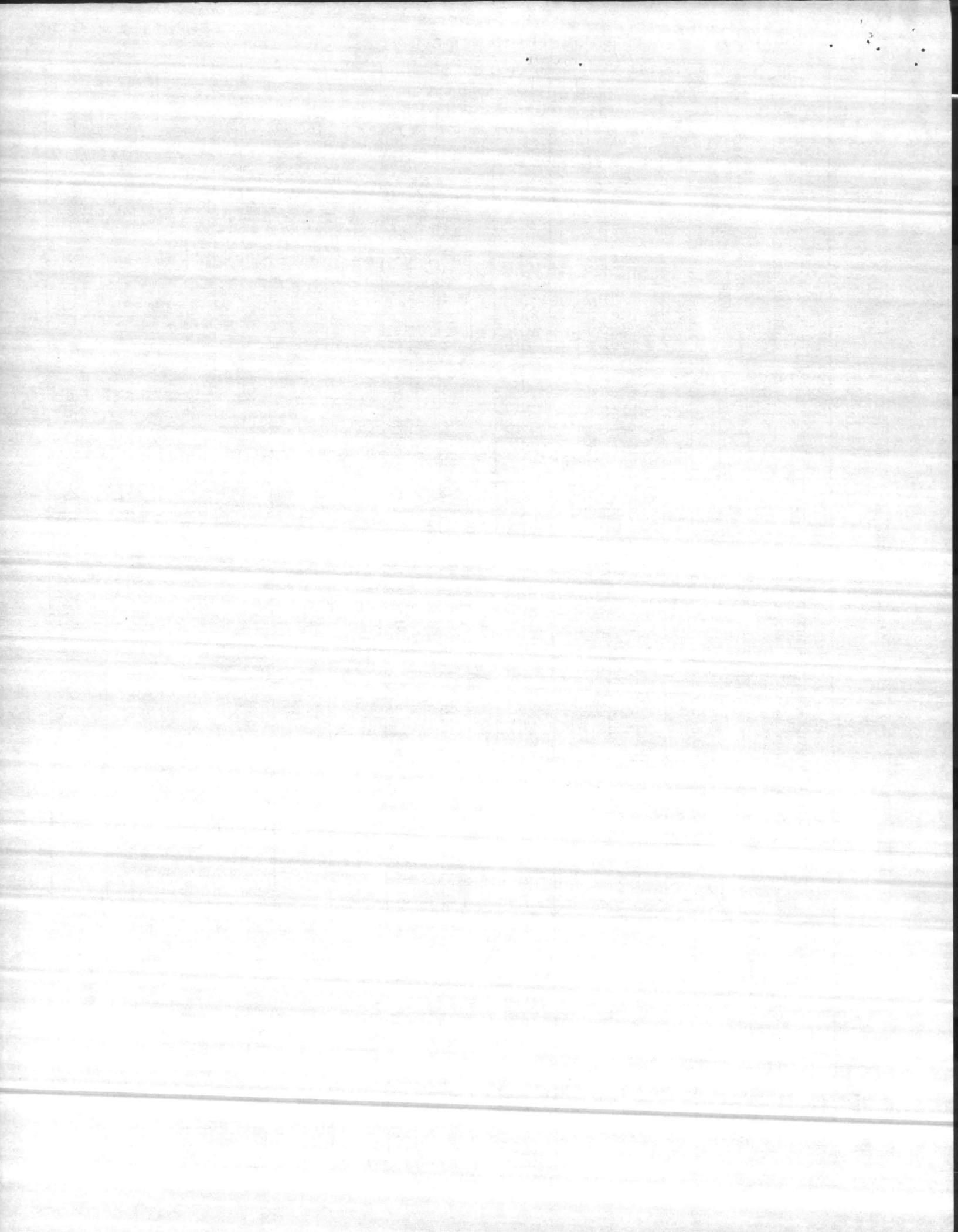
*B.H.P. SP. GR. = 1.0*

*40*  
*20*  
HORSE POWER

*200* *400* *600* *800* *1000* *1200*

U. S. GALLONS PER MINUTE



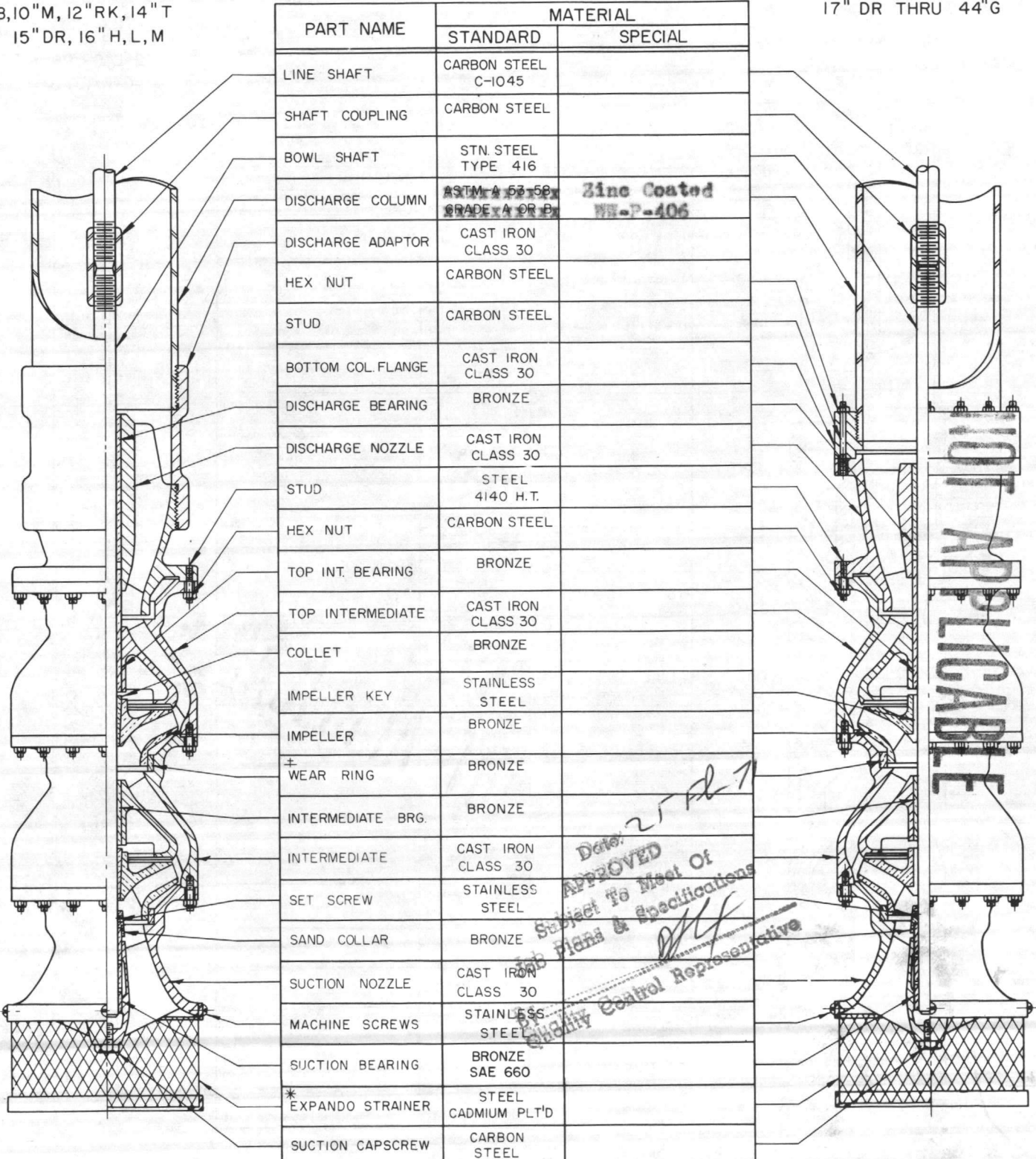


# VERTICAL TURBINE PUMP SHORT COUPLED

OPEN LINE SHAFT WITH DISCHARGE NOZZLE  
LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE

7" B, 10" M, 12" RK, 14" T  
15" DR, 16" H, L, M

17" DR THRU 44"G



PART NAME	MATERIAL	
	STANDARD	SPECIAL
LINE SHAFT	CARBON STEEL C-1045	
SHAFT COUPLING	CARBON STEEL	
BOWL SHAFT	STN. STEEL TYPE 416	
DISCHARGE COLUMN	ASTM A 53-58 GRADE A OR B	Zinc Coated WH-P-406
DISCHARGE ADAPTOR	CAST IRON CLASS 30	
HEX NUT	CARBON STEEL	
STUD	CARBON STEEL	
BOTTOM COL. FLANGE	CAST IRON CLASS 30	
DISCHARGE BEARING	BRONZE	
DISCHARGE NOZZLE	CAST IRON CLASS 30	
STUD	STEEL 4140 H.T.	
HEX NUT	CARBON STEEL	
TOP INT. BEARING	BRONZE	
TOP INTERMEDIATE	CAST IRON CLASS 30	
COLLET	BRONZE	
IMPELLER KEY	STAINLESS STEEL	
IMPELLER	BRONZE	
± WEAR RING	BRONZE	
INTERMEDIATE BRG.	BRONZE	
INTERMEDIATE	CAST IRON CLASS 30	
SET SCREW	STAINLESS STEEL	
SAND COLLAR	BRONZE	
SUCTION NOZZLE	CAST IRON CLASS 30	
MACHINE SCREWS	STAINLESS STEEL	
SUCTION BEARING	BRONZE SAE 660	
* EXPANDO STRAINER	STEEL CADMIUM PLTD	
SUCTION CAPSCREW	CARBON STEEL	

\* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER

± NOT FURNISHED ON 7"B



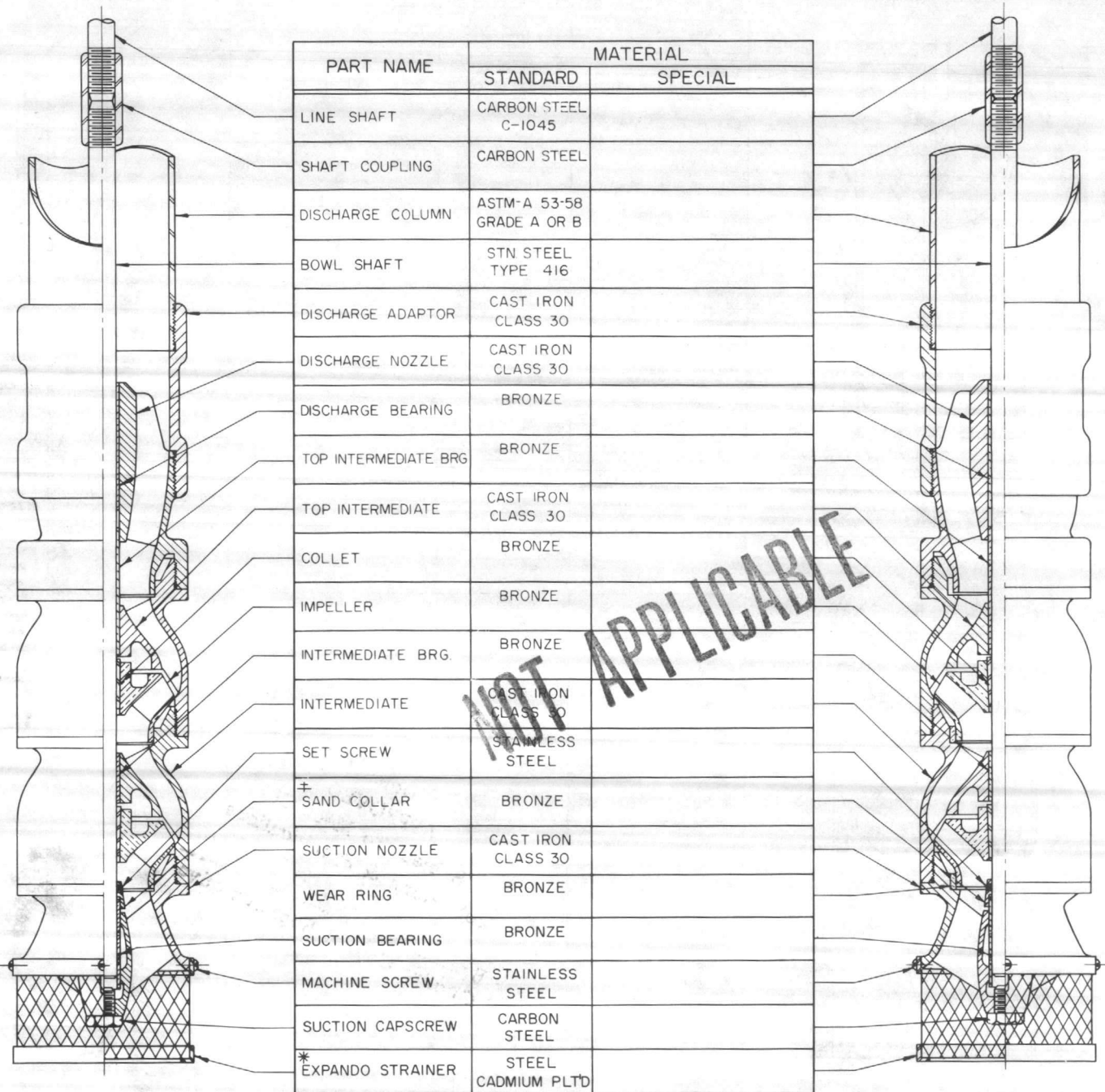


# VERTICAL TURBINE PUMP SHORT COUPLED

OPEN LINE SHAFT WITH DISCHARGE NOZZLE  
LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE

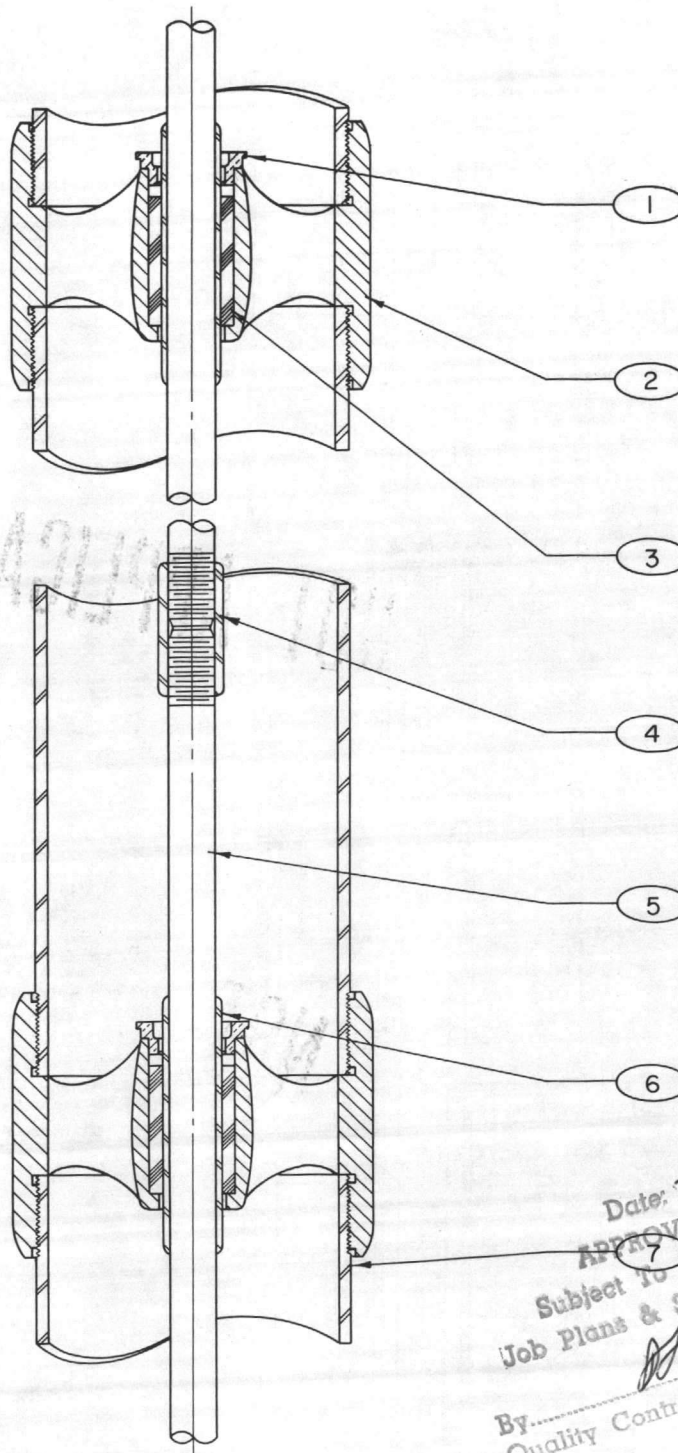
6" DR, RK, M

8" B, DR, PR, RK, T, UR  
10" RK, T, U-12" T, UR



\* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER  
± HARD RUBBER USED ON 8" BOWLS

DISCHARGE COLUMN ASSEMBLY  
SCREWED COUPLED - OPEN LINE SHAFT



Date: 25 Feb 71  
 APPROVED  
 Subject To Meet Of  
 Job Plans & Specifications  
 By: [Signature]  
 Quality Control Representative

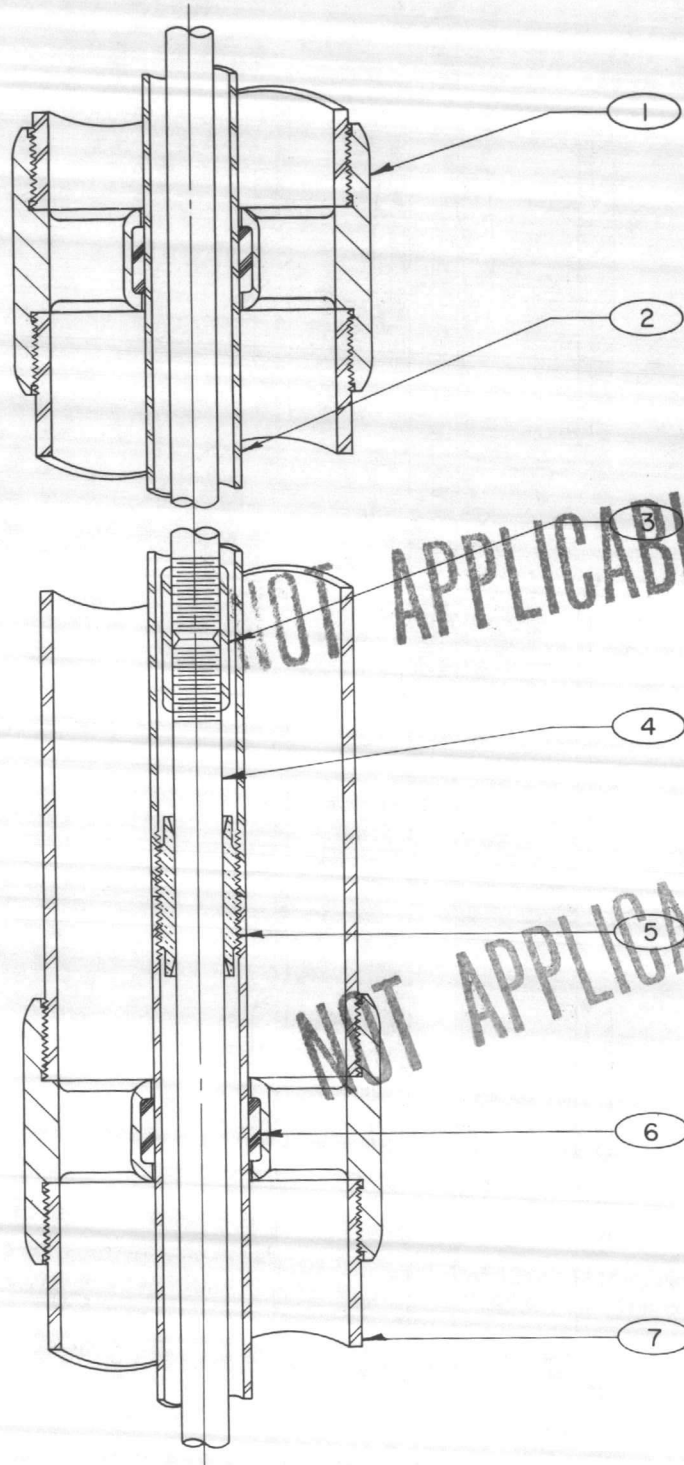
ITEM NO.	DESCRIPTION
1	LOCK RING
2	COMBINATION COUPLING
3	RUBBER BEARING
4	SHAFT COUPLING

ITEM NO.	DESCRIPTION
5	LINE SHAFT
6	MONEL SLEEVE
7	COLUMN PIPE

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.



DISCHARGE COLUMN ASSEMBLY  
SCREWED TYPE - ENCLOSED LINE SHAFT



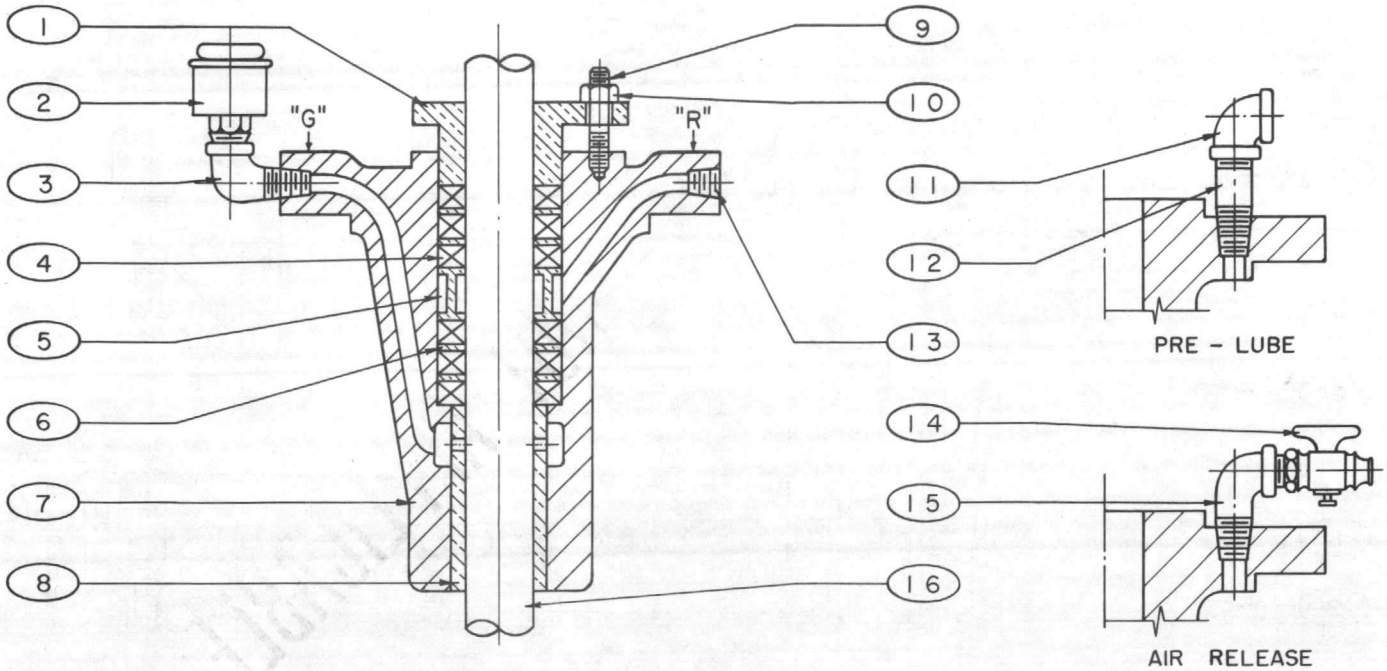
ITEM NO.	DESCRIPTION
1	COMBINATION COUPLING
2	SHAFT TUBING
3	SHAFT COUPLING
4	LINE SHAFT

ITEM NO.	DESCRIPTION
5	SHAFT BOX
6	RUBBER BEARING
7	COLUMN PIPE

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.

# STUFFING BOX ASSEMBLY

-WATER LUBRICATED "RNL" TYPE



AIR RELEASE AND PRE-LUBE USED WHEN APPLICABLE

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	PACKING GLAND	9	STUD
2	GREASE CUP	10	NUT (HEX)
3	STREET ELBOW 90°	11	ELBOW 90°
4	PACKING	12	PIPE NIPPLE
5	LANTERN RING	13	RELIEF PIPE TO WASTE
6	SEPARATOR RING	14	PET COCK
7	STUFFING BOX	15	STREET ELBOW 90°
8	STUFFING BOX BEARING	16	LINE SHAFT

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.

## ASSEMBLY INSTRUCTIONS

FOR SATISFACTORY OPERATION, PACK AS SHOWN ABOVE WITH SEPARATOR RINGS BETWEEN PACKING RINGS. AFTER INSTALLING LOWER THREE PACKING RINGS AND LANTERN RING, IT WOULD BE ADVISABLE TO TAMP THIS LOWER SET TO RELIEVE THE FORCE REQUIRED TO TAMP IT WITH PACKING GLAND AND TOP THREE RINGS.

FOR ORIGINAL INSTALLATION, FILL GREASE CUP ONCE AND DISCHARGE CONTENTS INTO BOX. REFILL AND APPLY GREASE DURING OPERATION AT RATE OF ONE TURN EVERY 24 HOURS.

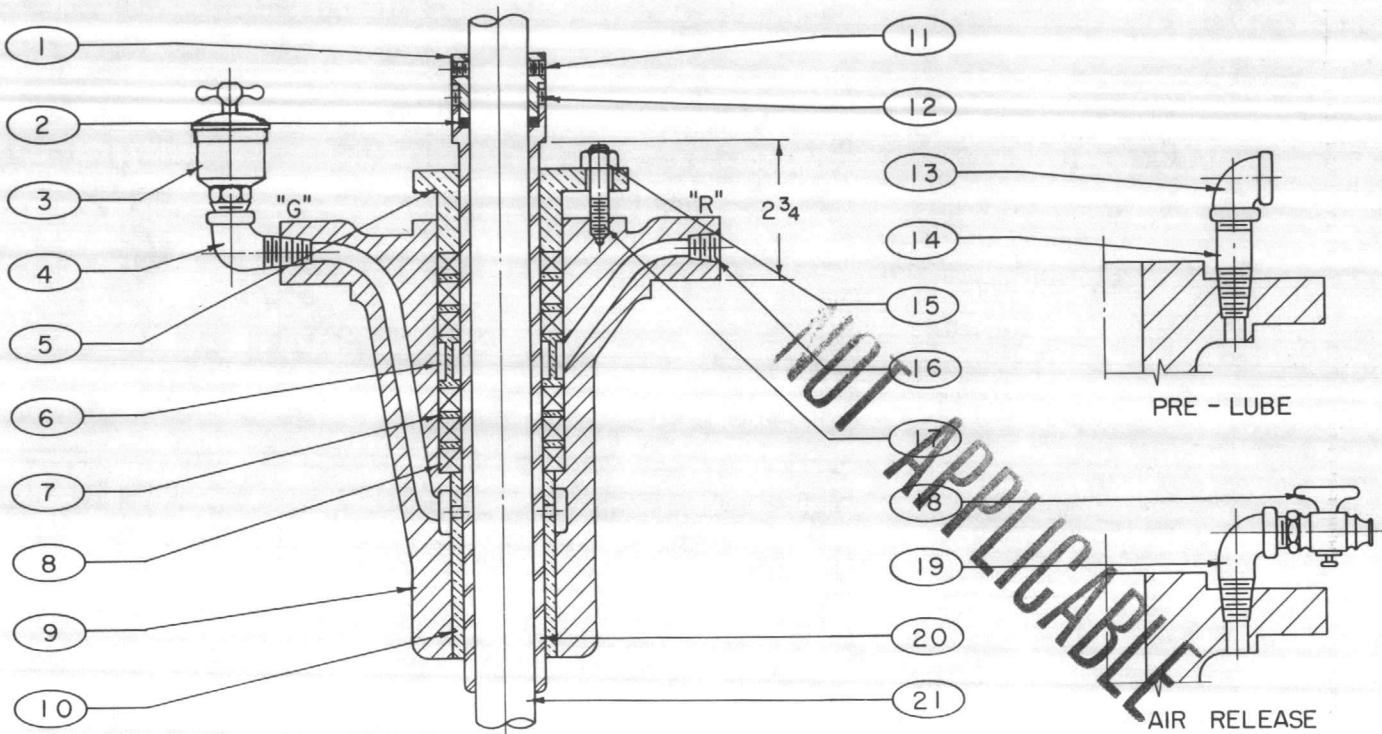
ON ORIGINAL INSTALLATION, THE PACKING GLAND SHOULD BE TIGHTENED WELL TO SET PACKING AND THEN LOOSENED FOR INITIAL OPERATION. AFTER SEVERAL HOURS' OPERATION AND WITH UNIT RUNNING, THE PACKING GLAND SHOULD BE GRADUALLY TIGHTENED TO REDUCE LEAKAGE TO A MINIMUM. "DO NOT TIGHTEN TO STOP ALL LEAKAGE - PACKING IS TO THROTTLE LEAKAGE - NOT STOP IT."

IF, AFTER PACKING ADJUSTMENT, THE TOP THREE RINGS TEND TO RUN DRY OR HOT A VALVE SHOULD BE INSTALLED IN THE RELIEF LINE TO MAINTAIN ENOUGH BACK PRESSURE TO FORCE LEAKAGE THROUGH THIS PACKING SET. THE LEAKAGE MAY BE SO ADJUSTED THROUGHOUT THE LIFE OF THE PACKING.

APPROVED  
 Subject To Meet Of  
 Job Plans & Specifications  
 Quality Control Representative



# STUFFING BOX ASSEMBLY WATER LUBRICATED "RNL" TYPE WITH SLEEVE



ITEM 3 & 4 NOT FURNISHED ON CONDENSATE SERVICE. THIS CONNECTION USED FOR RELIEF, AND ITEM 16 USED FOR WATER SEAL INLET.

AIR RELEASE AND PRE-LUBE USED WHEN APPLICABLE.

ITEM NO.	DESCRIPTION
1	O RING RETAINER
2	O RING
3	GREASE CUP
4	STREET ELBOW 90° 1/4
5	PACKING GLAND
6	LANTERN RING
7	SEPARATOR RING
8	PACKING
9	STUFFING BOX
10	STUFFING BOX BEARING

ITEM NO.	DESCRIPTION
11	SET SCREW, RETAINER
12	SET SCREW, SLEEVE
13	ELBOW 90°
14	PIPE NIPPLE
15	HEX NUT
16	RELIEF, PIPE TO WASTE 1/4
17	STUD
18	BET COCK
19	STREET ELBOW 90°
20	SLEEVE
21	LINE SHAFT

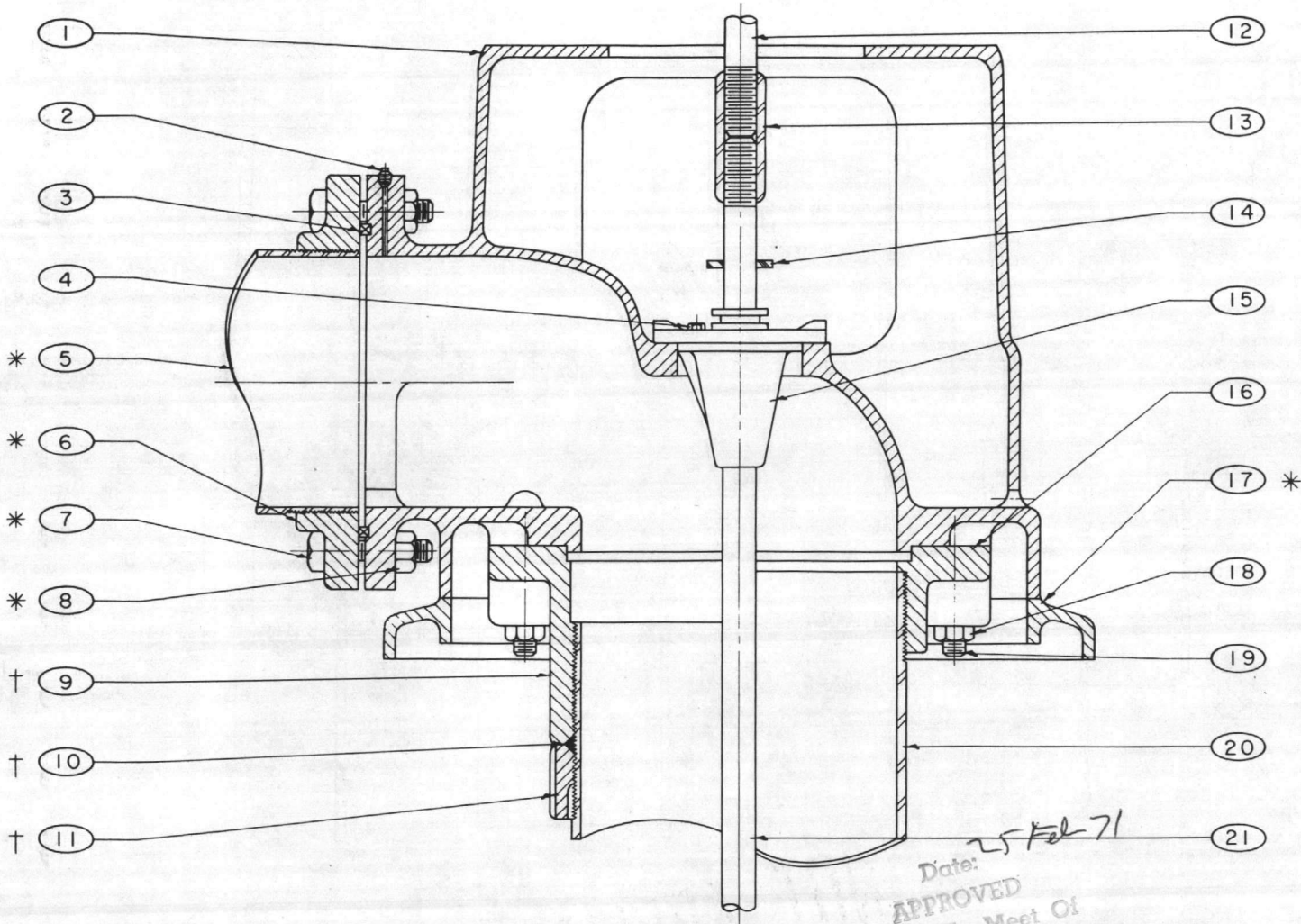
IN ORDERING REPLACEMENT PARTS, SPECIFY PARTS DESCRIPTION AND PUMP SERIAL NO.

### ASSEMBLY INSTRUCTIONS

- STEP 1. SLIDE TWO SEPARATOR RINGS, ONE LANTERN RING, TWO SEPARATOR RINGS IN THAT ORDER ON SHAFT SLEEVE. SLIDE SLEEVE OVER SHAFT UNTIL BOTTOM END ENGAGES STUFFING BOX BEARING.
- STEP 2. ALTERNATELY INSERT PACKING, SEPARATOR RINGS AND LANTERN RING INTO STUFFING BOX BORE AS SHOWN ABOVE.
- STEP 3. LOCATE SLEEVE AT 2 3/4" AS SHOWN ABOVE. INSTALL O RING AND O RING RETAINER. NOW SECURE RETAINER TO SHAFT AND SLEEVE TO RETAINER WITH SET SCREWS.
- STEP 4. FOR ORIGINAL INSTALLATION, THE PACKING GLAND SHOULD BE TIGHTENED WELL TO SET PACKING AND THEN LOOSENED FOR INITIAL OPERATION. FILL GREASE CUP ONCE AND DISCHARGE CONTENTS INTO BOX. REFILL AND APPLY GREASE DURING OPERATION AT RATE OF ONE TURN EVERY 24 HOURS. AFTER SEVERAL HOURS OPERATION AND WITH UNIT RUNNING, THE PACKING GLAND SHOULD BE GRADUALLY TIGHTENED TO REDUCE LEAKAGE TO A MINIMUM. "DO NOT TIGHTEN TO STOP ALL LEAKAGE - PACKING IS TO THROTTLE LEAKAGE - NOT STOP IT".
- STEP 5. IF, AFTER PACKING ADJUSTMENT, THE TOP THREE RINGS TEND TO RUN DRY OR HOT, A VALVE SHOULD BE INSTALLED IN THE RELIEF LINE TO MAINTAIN ENOUGH BACK PRESSURE TO FORCE LEAKAGE THROUGH THIS PACKING SET. THE LEAKAGE MAY BE SO ADJUSTED THROUGHOUT THE LIFE OF THE PACKING.



# TYPE RF DISCHARGE HEAD OPEN LINE SHAFT



Date: 25 Feb 71  
APPROVED  
Subject To Meet Of  
Quality Control

\* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER

ITEM NO.	DESCRIPTION
1	DISCHARGE HEAD
2	PIPE PLUG, PRESSURE GAUGE
3	PACKING, COMPANION FLANGE
4	CAPSCREW, STUFFING BOX
5	DISCHARGE PIPE
6	COMPANION FLANGE
7	MACHINE BOLT, COMPANION FLG.
8	HEX NUT, COMPANION FLANGE
9	ADJ. TOP COLUMN FLANGE
10	PACKING
11	PACKING RING

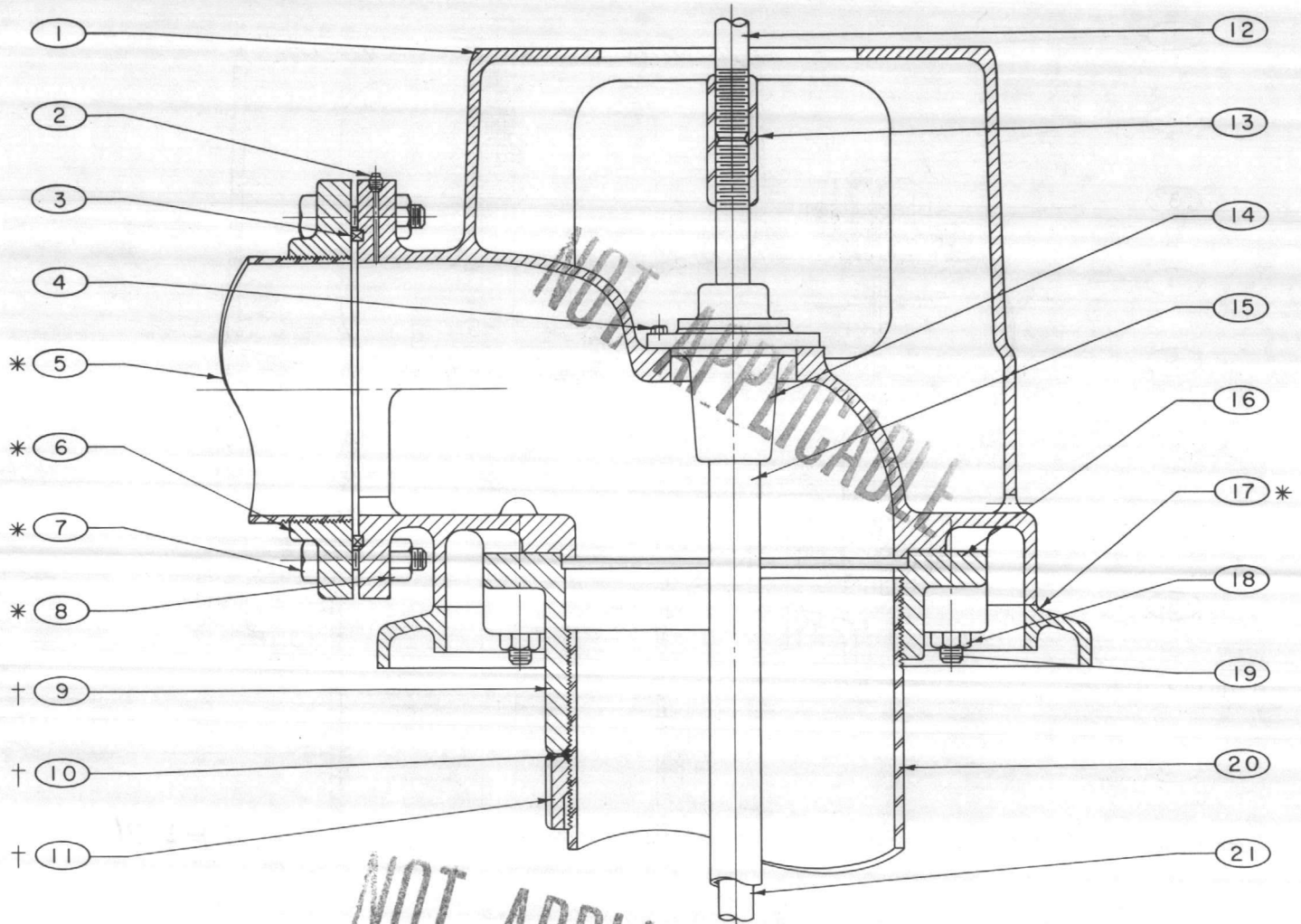
† USED FOR UNDERGROUND DISCHARGE

ITEM NO	DESCRIPTION
12	MOTOR DRIVE SHAFT
13	HEAD COUPLING
14	WATER SLINGER
15	STUFFING BOX, ASSEMBLY
16	TOP COLUMN FLANGE
17	BASE PLATE
18	HEX NUT
19	STUD
20	TOP COLUMN PIPE
21	LINE SHAFT, TOP PIECE

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.



TYPE RF DISCHARGE HEAD  
ENCLOSED LINE SHAFT



\* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER

ITEM NO.	DESCRIPTION
1	DISCHARGE HEAD
2	PIPE PLUG, PRESSURE GAUGE
3	PACKING, COMPANION FLANGE
4	CAPSCREW, STUFFING BOX
5	DISCHARGE PIPE
6	COMPANION FLANGE
7	MACHINE BOLT, COMPANION FLG.
8	HEX NUT, COMPANION FLANGE
9	ADJ. TOP COLUMN FLANGE
10	PACKING
11	PACKING RING

† USED FOR UNDERGROUND DISCHARGE

ITEM NO.	DESCRIPTION
12	MOTOR DRIVE SHAFT
13	HEAD COUPLING
14	STUFFING BOX (ASSEMBLY)
15	TUBING
16	TOP COLUMN FLANGE
17	BASE PLATE
18	HEX NUT
19	STUD
20	TOP COLUMN PIPE
21	LINE SHAFT, TOP PIECE

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.

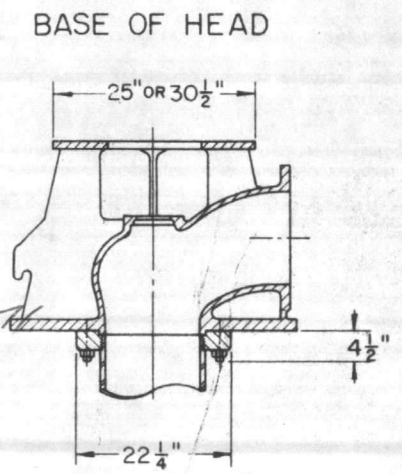
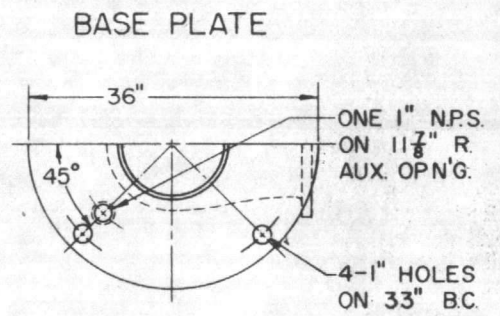
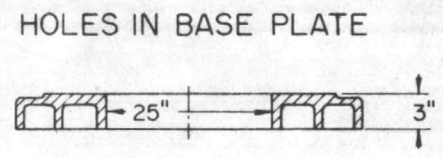
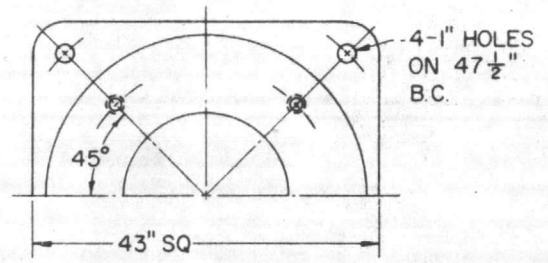
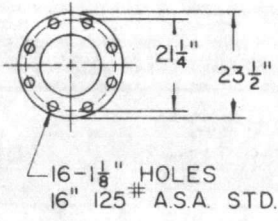
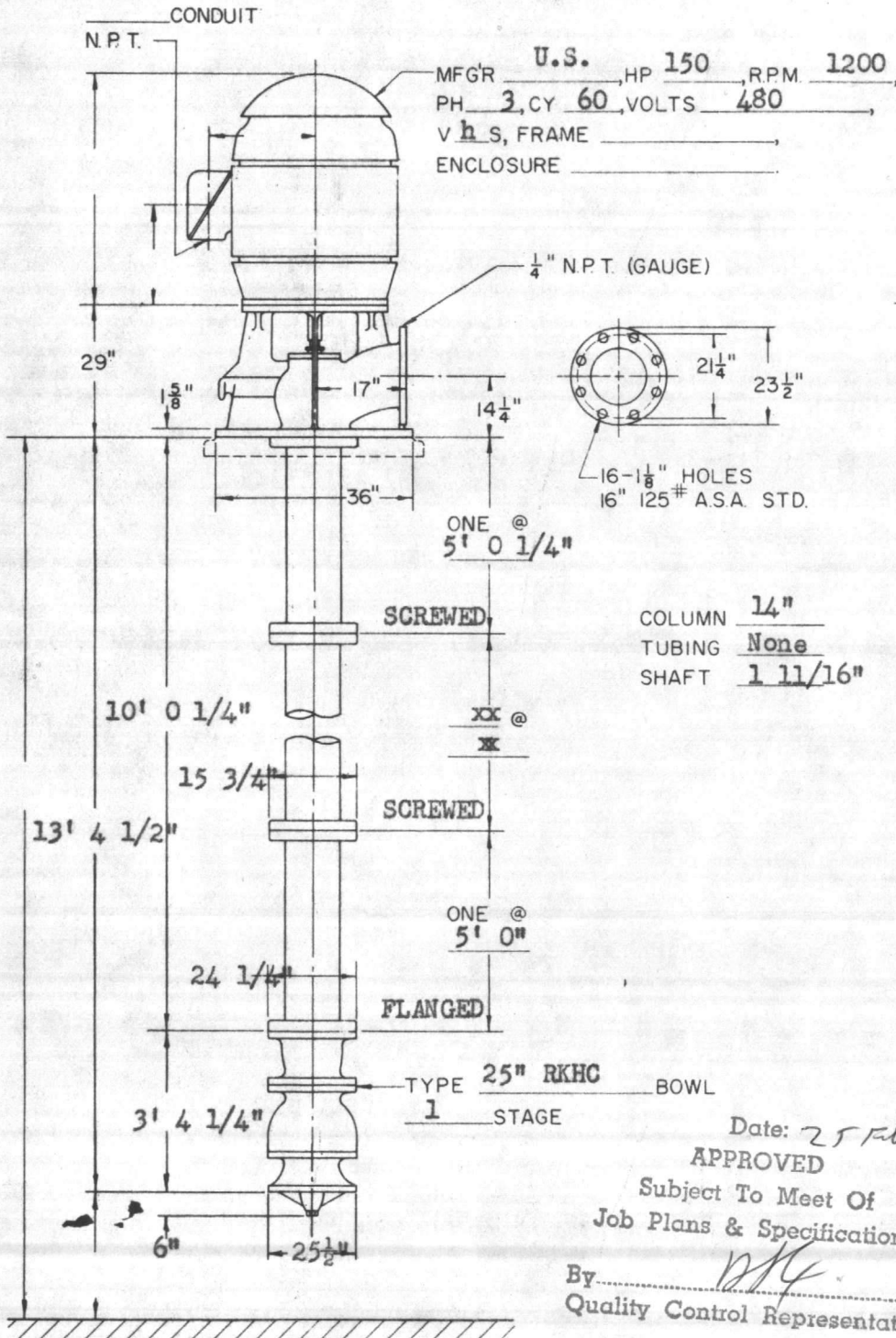
# INSTALLATION PLAN

## TYPE TL1625R DISCHARGE HEAD

LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE

~~Back~~  
  
*Back mach.*

USE THESE DIMENSIONS ONLY  
WHEN CERTIFIED BY FACTORY



COLUMN 14"  
 TUBING None  
 SHAFT 1 11/16"

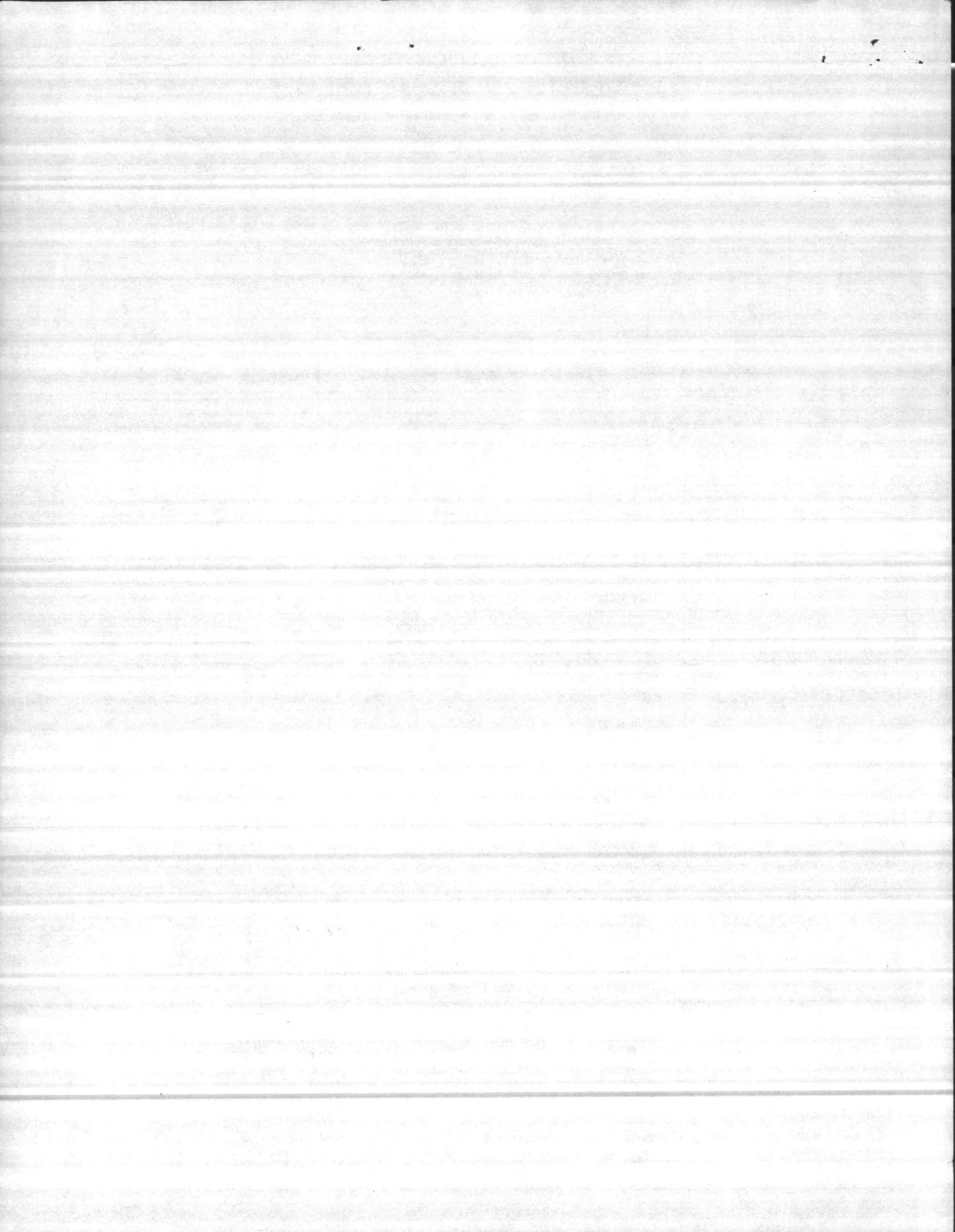
Date: 25 Feb 71  
 APPROVED  
 Subject To Meet Of  
 Job Plans & Specifications  
 By: [Signature]  
 Quality Control Representative

SECTION THRU HEAD

Corbin Construction Co.

CUSTOMER: _____	YOUR NO: <u>N-197-70</u>	G.P.M: <u>7500</u>
LOCATION: <u>Camp LeJeune, North Carolina</u>	OUR NO: <u>78H-114</u>	T.D.H: <u>50</u>
FOR APPROVAL: <u>Tom Morrow</u>	PUMP NO: <u>65093</u>	R.P.M: <u>1170</u>
CERTIFIED: _____	DATE: <u>1/7/71</u>	B.H.P: _____





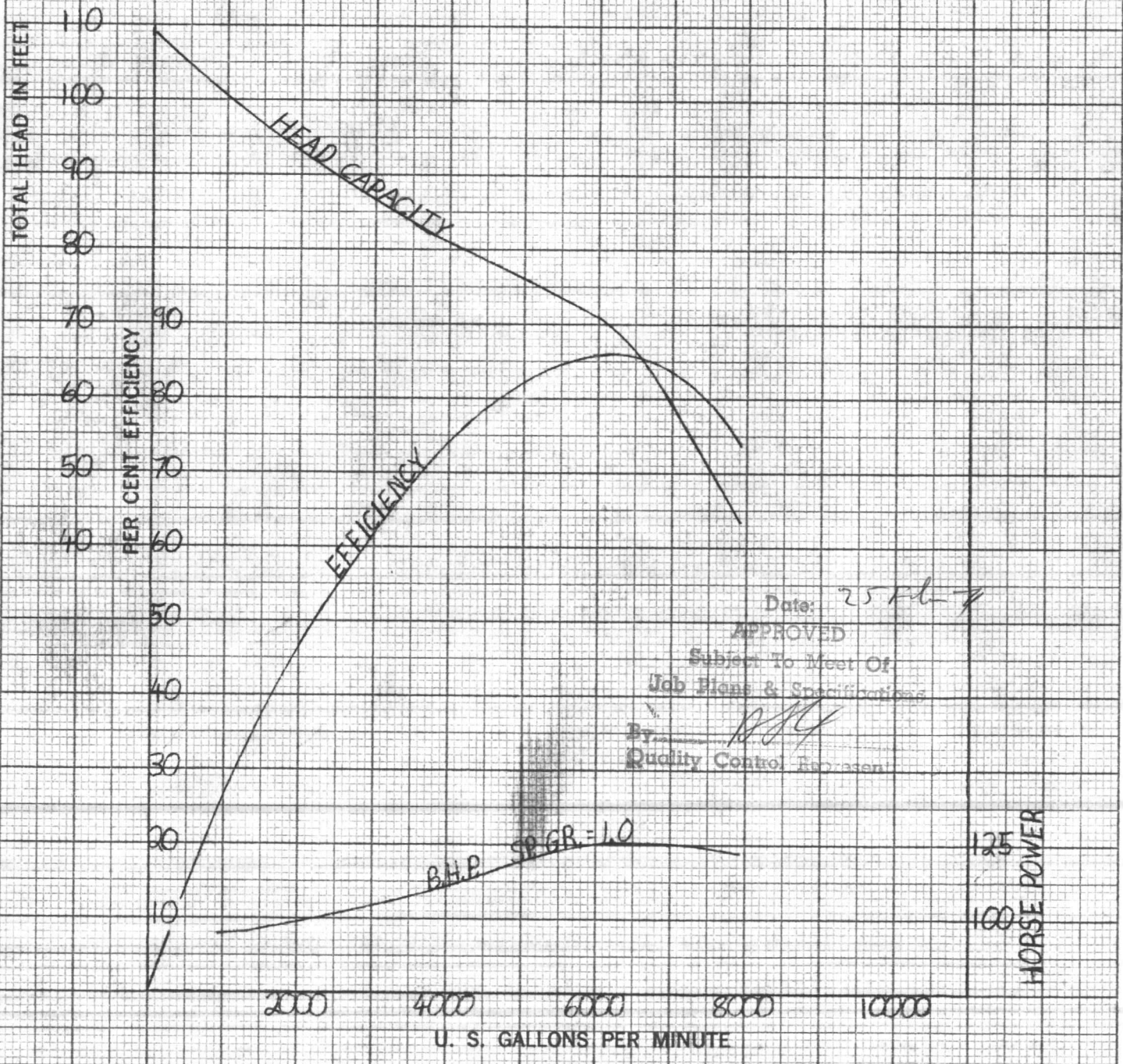
THESE CURVES SHOW THE GENERAL SHAPE OF THE PUMP BOWL CHARACTERISTICS UNDER SHOP TESTS AT THE CONSTANT SPEED INDICATED A TOLERANCE OF PLUS OR MINUS 2% MUST BE ALLOWED IN THE GUARANTEED CAPACITY HEAD AND EFFICIENCY AT THE RATED POINT WHEN PUMPING NON-GASEOUS WATER FREE FROM DETRITUS, AT A TEMPERATURE NOT OVER 86° FAHR. AND WITH THE LOWEST IMPELLER SUBMERGED.

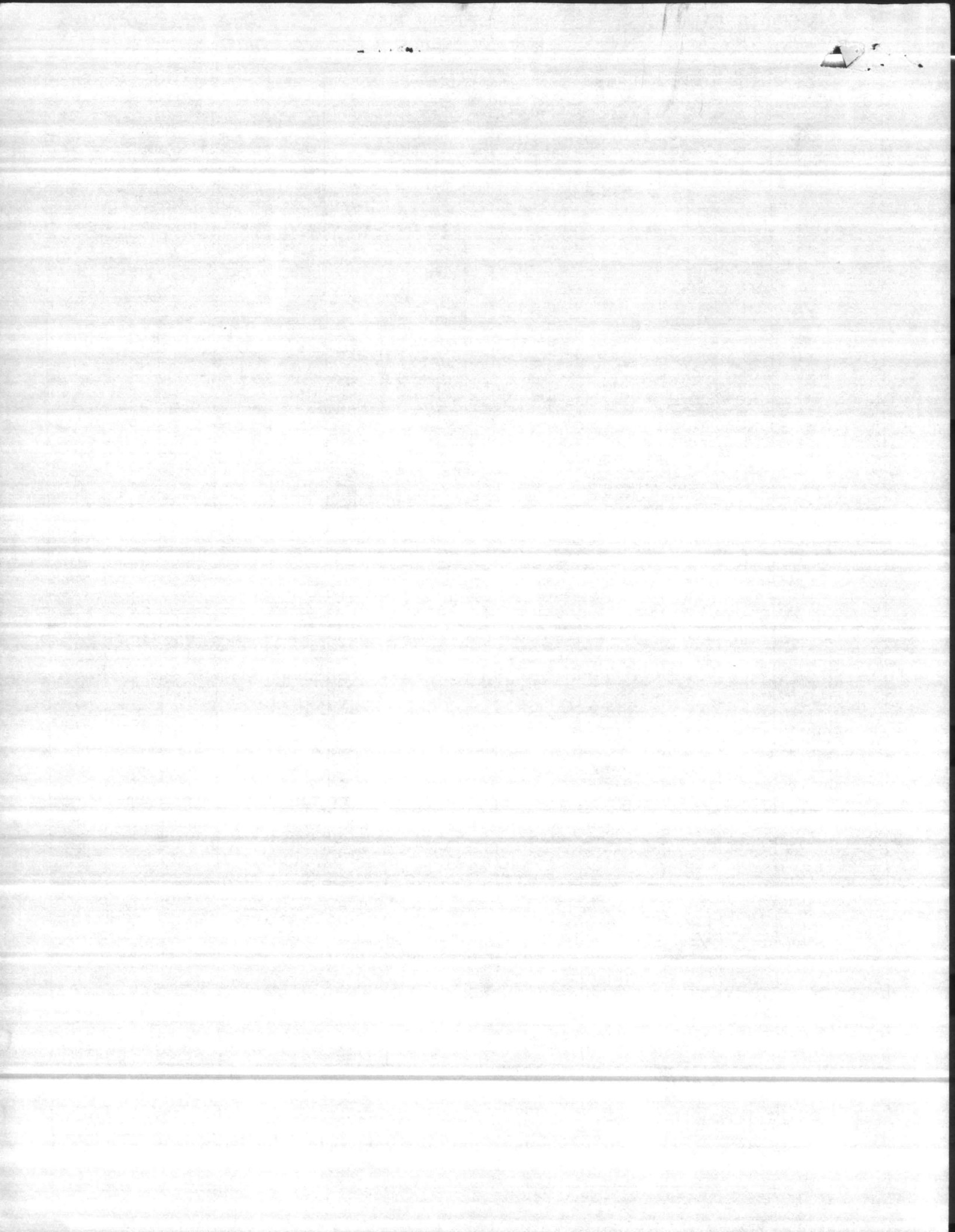
FOR \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
TYPE OF PUMP FIG. **RKHC** R.P.M. **1200**  
SIZE OF PUMP **25** INS. **2** STAGES **2RK27** IMPELLER -  
FIELD PERFORMANCE

THE FIELD PERFORMANCE AS SHOWN BELOW, MAKES ALLOWANCE FOR ALL THE HYDRAULIC AND MECHANICAL LOSSES IN THE COLUMN AND SHAFT OF THE INSTALLATION ACCORDING TO THE STANDARDS OF THE HYDRAULIC INSTITUTE. THE FIELD PUMPING HEAD IS THE LIFT FROM THE WELL PLUS THE DISCHARGE HEAD MEASURED AT THE DISCHARGE CONNECTION AT THE SURFACE.

COLUMN	INS.	LENGTH	FT.	SHAFT DIA.
CAPACITY	U. S. GPM. FIELD PUMPING HEAD			
FIELD B.H.P.	FIELD EFFICIENCY			
MOTOR EFF.	WIRE TO WATER EFFICIENCY			
NOTES.				

$\eta = 0.93$







3+4

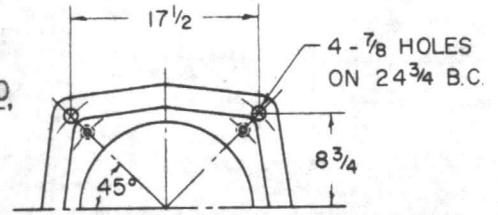
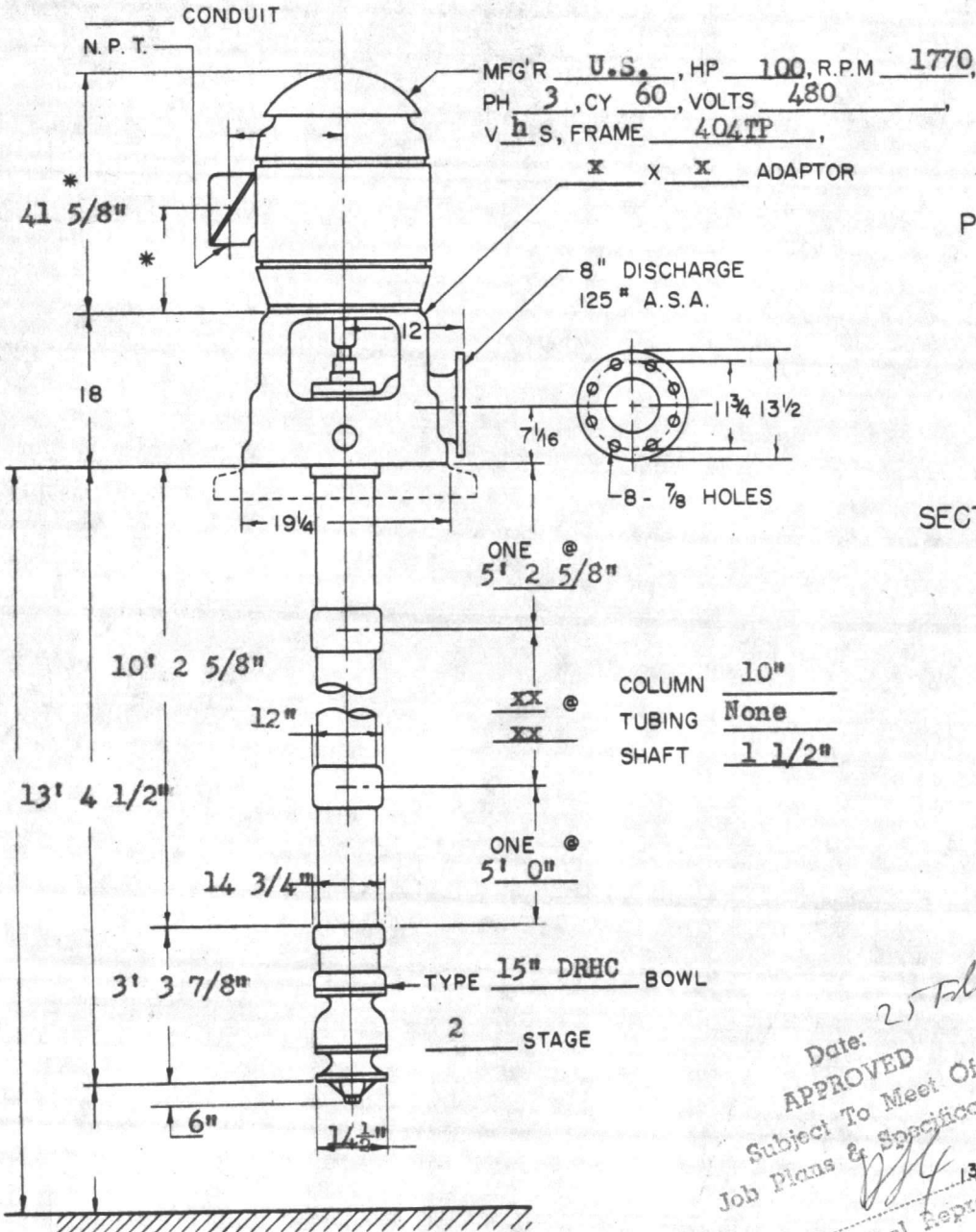
# INSTALLATION PLAN

## TYPE RF 816 DISCHARGE HEAD

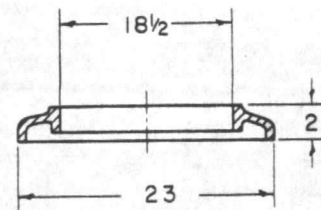
LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE



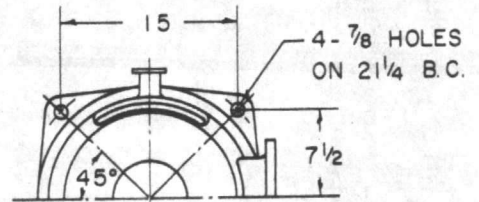
USE THESE DIMENSIONS ONLY  
WHEN CERTIFIED BY FACTORY



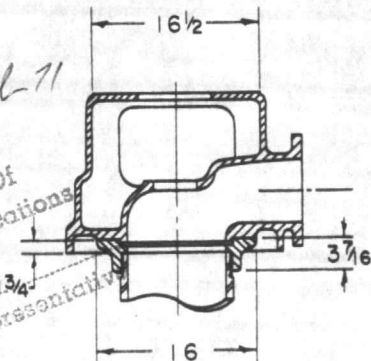
PLAN OF BASE PLATE



SECTION THRU BASE PLATE



PLAN OF HEAD



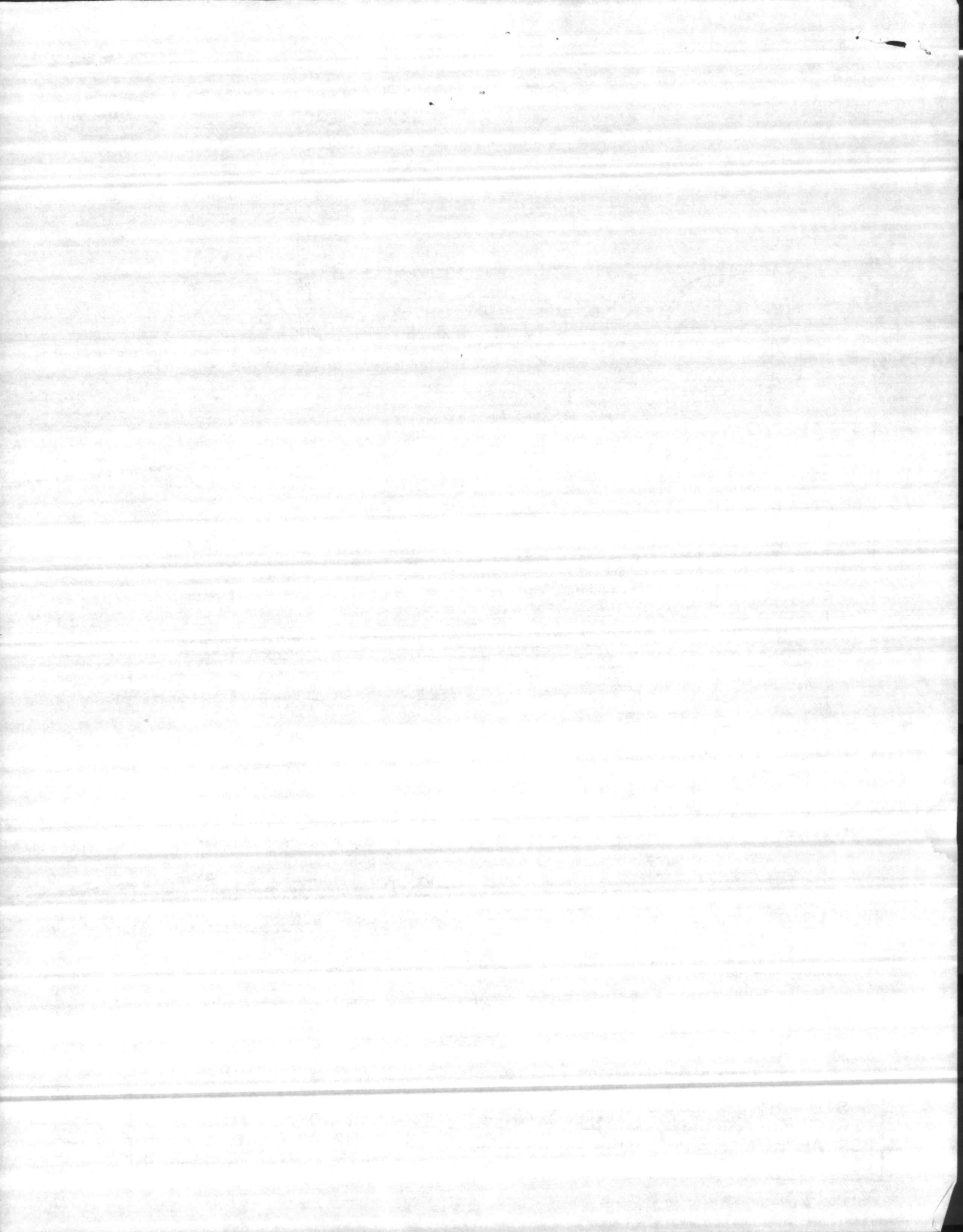
SECTION THRU ELL

Date: 25 Feb 71  
APPROVED  
Subject To Meet Of  
Job Plans & Specifications  
By: [Signature]  
Quality Control Representative

Corbin Construction Company

CUSTOMER: _____	YOUR NO: <u>N-196-7-</u>	G. P. M: <u>1500</u>
LOCATION: <u>Camp LeJeune, North Carolina</u>	OUR NO: <u>71H-113</u>	T. D. H: <u>165</u>
FOR APPROVAL: <u>Tom Morrow</u>	PUMP NO: <u>65092</u>	R. P. M: <u>1770</u>
CERTIFIED: <u>T</u>	DATE: <u>1/13/71</u>	B. H. P: _____

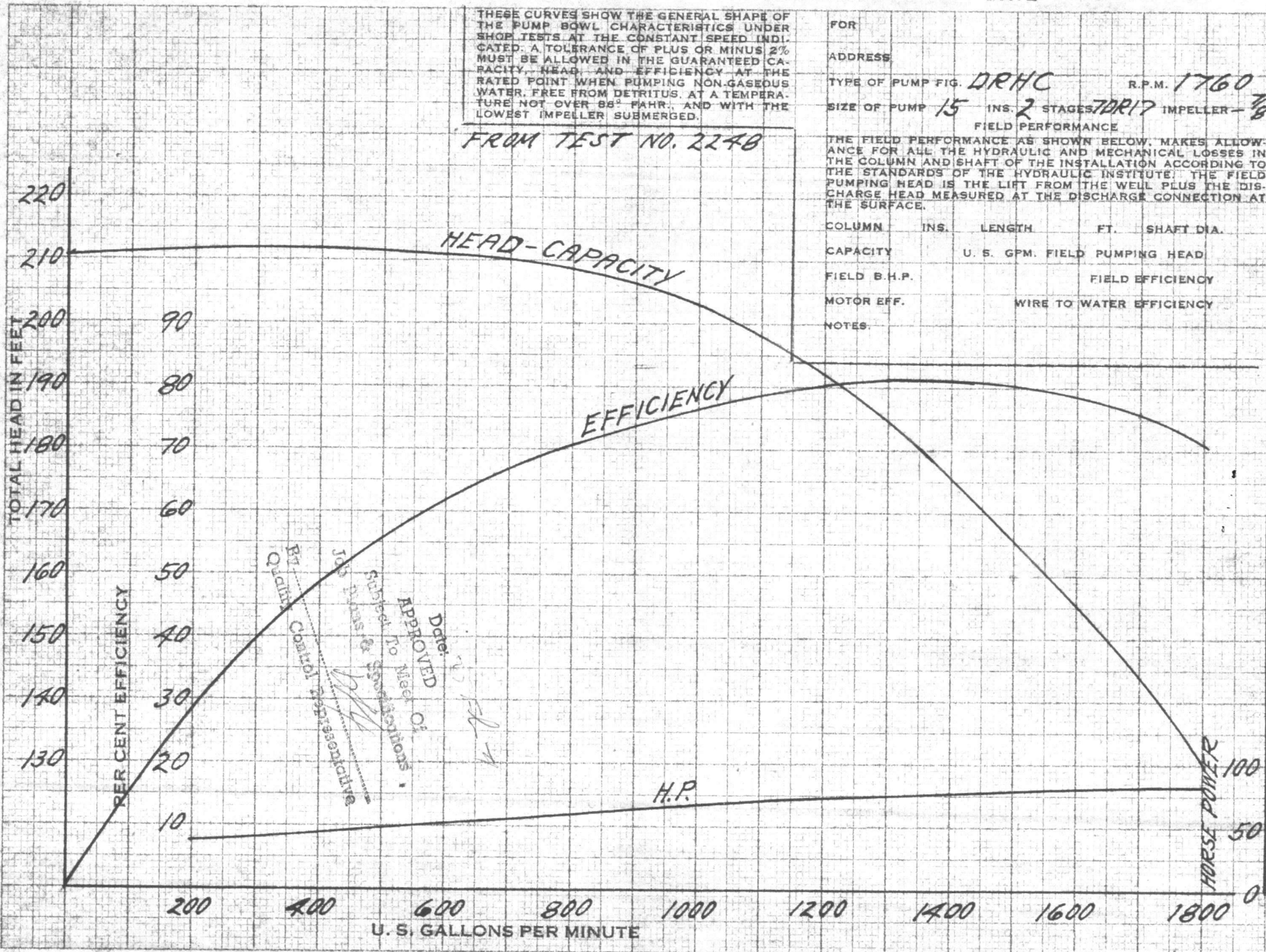
\* INCLUDES 3" HIGH MOTOR ADAPTOR WHEN USED



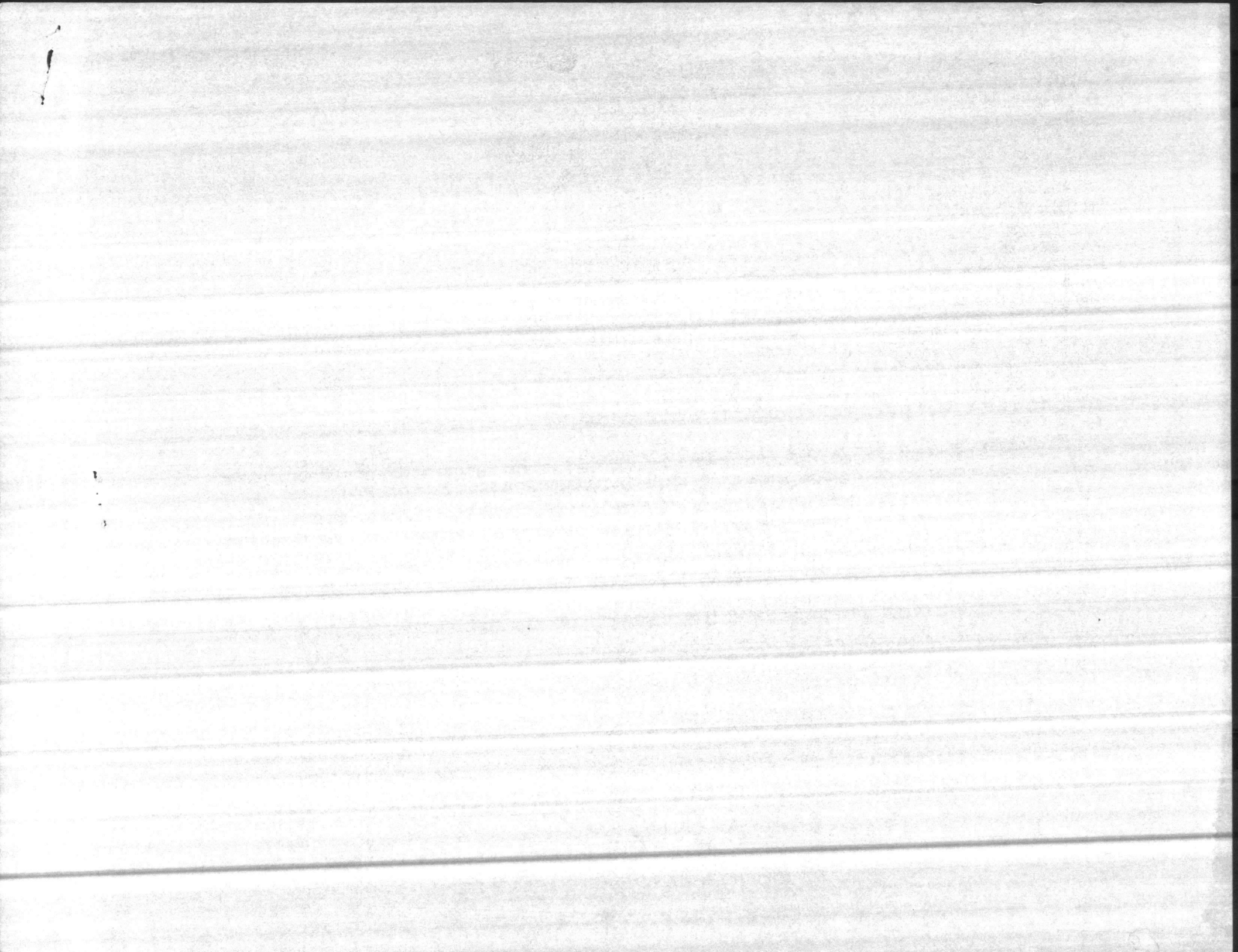
THESE CURVES SHOW THE GENERAL SHAPE OF THE PUMP BOWL CHARACTERISTICS UNDER SHOP TESTS AT THE CONSTANT SPEED INDICATED. A TOLERANCE OF PLUS OR MINUS 2% MUST BE ALLOWED IN THE GUARANTEED CAPACITY, HEAD, AND EFFICIENCY AT THE RATED POINT WHEN PUMPING NON-GASEOUS WATER, FREE FROM DETRITUS, AT A TEMPERATURE NOT OVER 86° FAHR., AND WITH THE LOWEST IMPELLER SUBMERGED.

FROM TEST NO. 2248

FOR \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
TYPE OF PUMP FIG. DRHC R.P.M. 1760  
SIZE OF PUMP 15 INS. 2 STAGES 7DR17 IMPELLER - 7/8  
FIELD PERFORMANCE  
THE FIELD PERFORMANCE AS SHOWN BELOW, MAKES ALLOWANCE FOR ALL THE HYDRAULIC AND MECHANICAL LOSSES IN THE COLUMN AND SHAFT OF THE INSTALLATION ACCORDING TO THE STANDARDS OF THE HYDRAULIC INSTITUTE. THE FIELD PUMPING HEAD IS THE LIFT FROM THE WELL PLUS THE DISCHARGE HEAD MEASURED AT THE DISCHARGE CONNECTION AT THE SURFACE.  
COLUMN INS. LENGTH FT. SHAFT DIA. \_\_\_\_\_  
CAPACITY U. S. GPM. FIELD PUMPING HEAD \_\_\_\_\_  
FIELD B.H.P. \_\_\_\_\_ FIELD EFFICIENCY \_\_\_\_\_  
MOTOR EFF. \_\_\_\_\_ WIRE TO WATER EFFICIENCY \_\_\_\_\_  
NOTES \_\_\_\_\_







CUSTOMER: LAYNE-ATLANTIC CO.

**AMARILLO RIGHT ANGLE GEAR DRIVE**

CUSTOMER ORDER NO.: N-199-70 (ITEM 1 of 2)

**COMBINATION DRIVE - VERTICAL HOLLOW SHAFT**

CUSTOMER JOB: \_\_\_\_\_

MODEL: C 40 B RATIO 1:1 SERIAL NO. \_\_\_\_\_

ROTATION: STANDARD

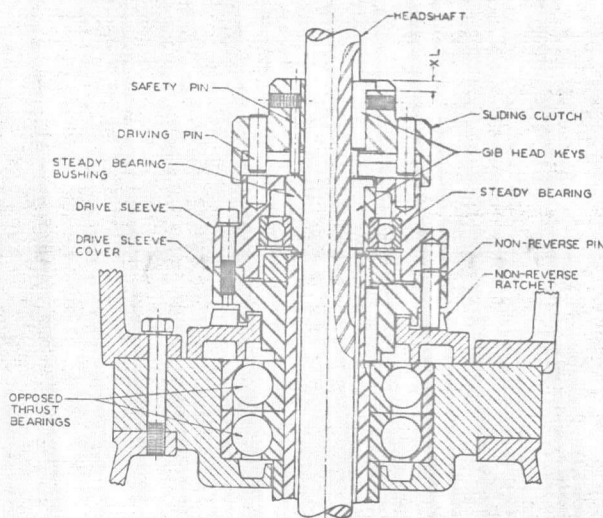
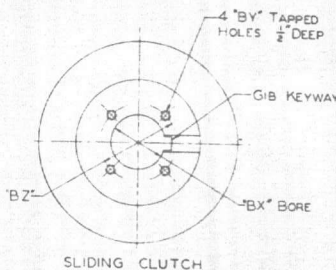
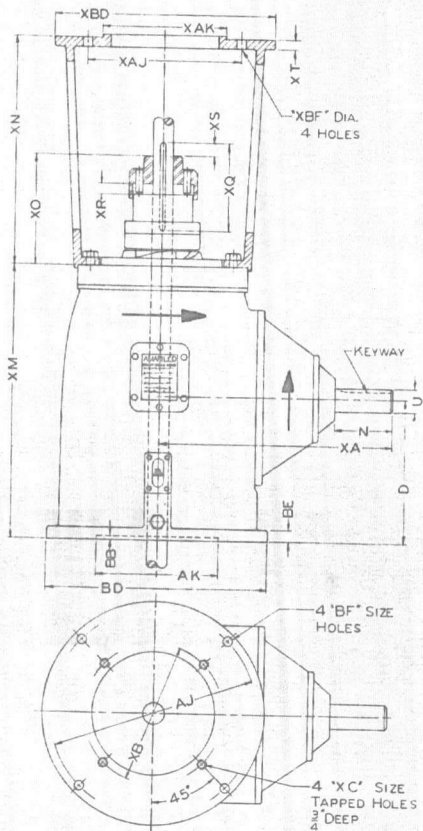
DRIVE SHAFT NO. WL 27 LENGTH 36"

DRIVE FLANGE BORE 1 1/2" K. W. 3/8 x 3/16

MARKS: \_\_\_\_\_

ENGINE FLANGE BORE ROUGH BORED K. W. \_\_\_\_\_

SPECIAL FEATURES: \_\_\_\_\_



**COUPLING DIMENSIONS**

BX BORE	GIB	BY	BZ
3/4	.751	3/16 X 3/32	10-32
7/8	.876	1/4 X 1/8	10-32
1	1.001	1/4 X 5/8	10-32
1 1/8	1.188	1/4 X 1/8	1/4 -20
1 1/4	1.251	1/4 X 5/8	1/4 -20
1 7/8	1.438	3/8 X 3/16	1/4 -20
1 1/2	1.501	3/8 X 3/16	1/4 -20
1 5/8	1.688	3/8 X 1/8	1/4 -20
1 3/4	1.751	3/8 X 1/8	1/4 -20
1 15/16	1.938	1/2 X 1/4	1/4 -20
2	2.188	1/2 X 1/4	3/8 -16
2 1/8	2.438	5/8 X 1/8	3/8 -16
2 1/4	2.688	5/8 X 1/8	3/8 -16

**TOLERANCES**

- \*AK\* DIMENSION: 8.250 DIA. +.003, -.000; 13.500 DIA. +.005, -.000; 22.000 DIA. +.005, -.000
- \*BX\* DIMENSION: 1/2 DIA. AND SMALLER +.001, -.000; LARGER THAN 1/2 DIA. +.0015, -.000
- \*U\* DIMENSION: 1/2 DIA. AND SMALLER ±.0003; LARGER THAN 1/2 DIA. ±.0005

MODEL	D	N	HORIZONTAL SHAFT U		AJ	AK	BB	BD	BE	BF	XA	XB	XC	XL	XM	XN	XO	XQ	XR	XS	XT	XAJ	XAK	XBD	XBF
			NOMINAL	ACTUAL																					
C 20	6 3/4	2	1 1/4	1.249	5/16 X 5/32	9 1/8	8.250	3/16	10	5/8	7/16	10 7/8		9 3/32	12 1/4	12 1/2	5 1/2	5 1/4	1/2	1 1/2	7/16				
C 40A	8 1/2	4	1 1/2	1.499	3/8 X 3/16	9 1/8	8.250	1/4	12	7/8	7/16	15 5/8		9 3/32	16 3/16	16	6 1/2	7	5/8	2	5/8				
C 40B	8 1/2	4	1 1/2	1.499	3/8 X 3/16	14 3/4	13.500	1/4	16 1/2	7/8	11/16	15 5/8		9 3/32	16 3/16	16	6 1/2	7	5/8	2	5/8	14 3/4	13 1/2	16 1/2	1 1/8
C 60	11 1/2	4	1 1/2	1.499	3/8 X 3/16	14 3/4	13.500	1/4	16 1/2	7/8	11/16	16 3/4		9 3/32	20 1/4	18	7 13/16	7 3/4	3/4	2 1/4	3/4				
C 80	11 1/2	4	1 7/8	1.874	3/8 X 3/16	14 3/4	13.500	1/4	16 1/2	7/8	11/16	16 3/4		9 3/32	20 3/8	18	8 3/8	7 3/4	3/4	2 1/4	3/4				
C 100	11 1/2	4	1 7/8	1.874	3/8 X 3/16	14 3/4	13.500	1/4	16 1/2	7/8	11/16	16 3/4		9 3/32	20 3/8	18	8 3/8	7 3/4	3/4	2 1/4	3/4				
C 150	13 3/4	5 1/4	2 7/16	2.436	5/8 X 5/16	18 1/4	13.500	1/2	20	1 1/8	11/16	20 3/4	14 1/2	9 3/32	25 5/8	20	9	10	7/8	2 3/4	7/8				
C 200	13 3/4	5 1/4	2 7/16	2.436	5/8 X 5/16	18 1/4	13.500	1/2	20	1 1/8	11/16	20 3/4	14 1/2	9 3/32	25 5/8	20	9	10	7/8	2 3/4	7/8				
C 275	16	6	2 15/16	2.936	3/4 X 3/8	23	13.500	1/2	24 1/2	1 1/8	13/16	14 3/4	14 3/4	9 3/32	30 3/4	27	12 1/2	11 1/2	1 1/8	3 1/2	1				
C 375	16	6	2 15/16	2.936	3/4 X 3/8	23	13.500	1/2	24 1/2	1 1/8	13/16	14 3/4	14 3/4	9 3/32	30 3/4	27	12 1/2	11 1/2	1 1/8	3 1/2	1				
C 450	16	6			3/4 X 3/8	23	13.500	1/2	24 1/2	1 1/8	13/16	14 3/4	14 3/4	9 3/32	30 3/4	27	12 1/2	11 1/2	1 1/8	3 1/2	1				
C 600	18	6	3 3/4	3.749	7/8 X 7/16	23	13.500	1/2	24 1/2	1 1/8	13/16	14 3/4	14 3/4	9 3/32	30 3/4	27	12 1/2	11 1/2	1 1/8	3 1/2	1				
C 750	21	8	4	3.998	1 X 1/2	28 3/4	22.000	1/2	30 1/2	1 1/4	1 1/2	36 7/8	26 3/4	9 3/32	42	30	16 1/4	15	1 3/16	4	1 1/4				

DATE: 2-1-71  
APPROVED: \_\_\_\_\_

BY: Phillip L. Hood

DATE: 1-14-71

**AMARILLO GEAR COMPANY**  
P. O. BOX 1789, TELEPHONE 806-373-7491  
AMARILLO, TEXAS 79105  
Subject To Meet Of Plans & Specifications  
Quality Control Representative





CORBIN CONSTRUCTION COMPANY, INC.

General Contractors

11A

P. O. BOX 471

DUNN, NORTH CAROLINA 28334

Date 26 February 1971 Job No.

TO Captain W. F. Russell, Jr., CEC, USN Resident Officer in Charge of Construction Marine Corps Base, Camp Lejeune, North Carolina

CONTRACT: N62470-70-C-0939 Water Treatment Plant, Wells and Distribution System

Gentlemen:

We are sending you { herewith under separate cover } five prints of Sheet No. see below prints of Sheet No. samples

These are: (As checked below).

- 1. For approval. Please return corrected prints.
2. Revised and for final approval. Please return correct prints.
3. [X] For your Files and use on job
4. Approved for fabrication - Please forward correct prints.
5.

Remarks: In conformance with:

Table with 2 columns: Description and Section. Includes items like 'Finish water pump - 3 & 4 shop drawing and performance curve' and 'Well pumps, vertical turbine'.

Handwritten notes: 1 Copy to Field, 2 Copy to Reports, 2/26/71

ROUTING ORDER table with columns for order number and name (CRIG, INT).

C. C.

Yours Truly,

CORBIN CONSTRUCTION CO., INC. APPROVAL SECTION

Drwgs. Enclosed Thirty-five

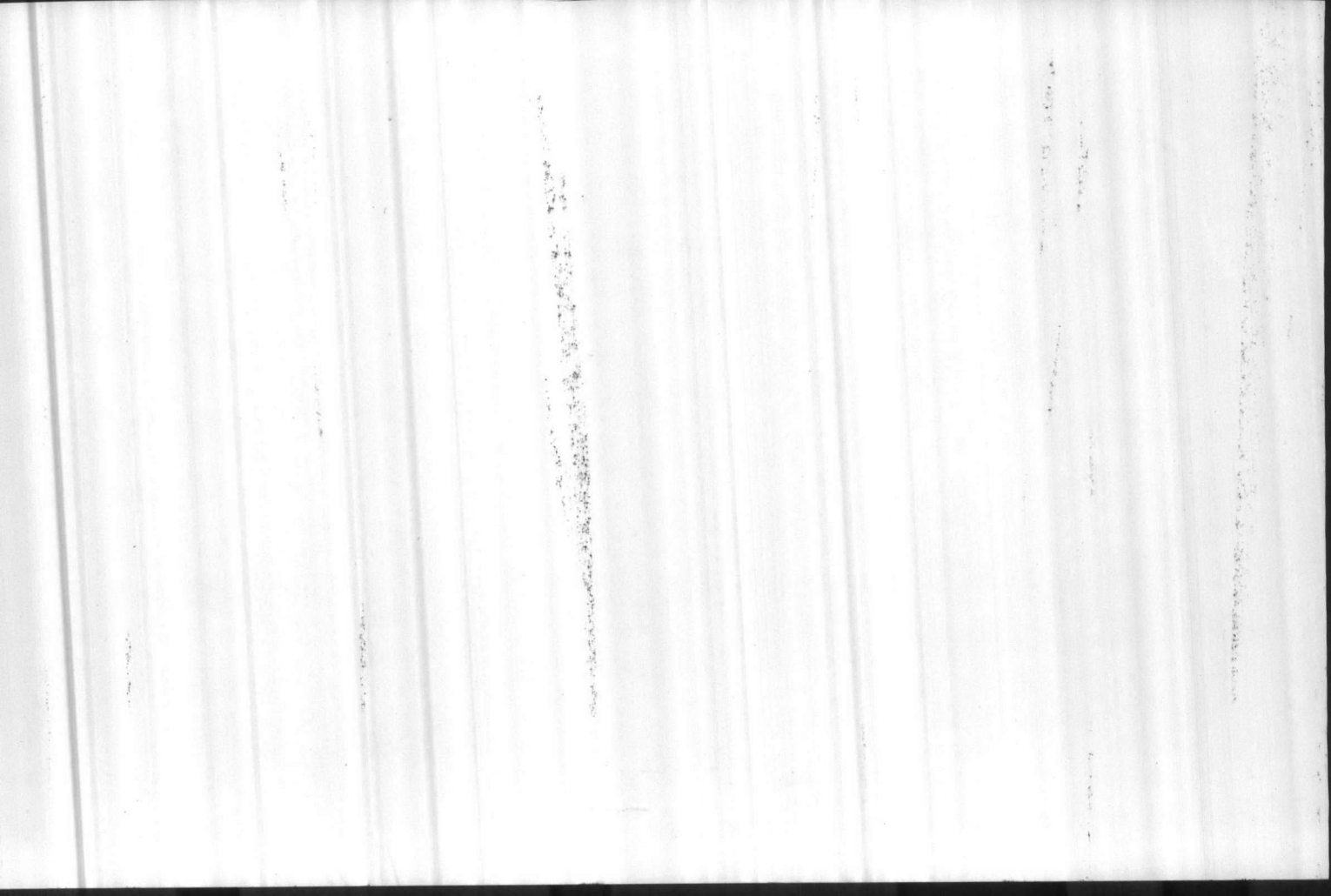
By: [Signature] Quality Control Representative

PLEASE ACKNOWLEDGE RECEIPT OF THE ABOVE PROMPTLY



Finish water pump	- 3 & 4 shop drawing and performance curve	Section 11A.4
Back wash pump	- shop drawing and performance curve	Section 11A.4
Right angle gear drive		Section 11A.3.10
Finish water pump	- 1 & 2 shop drawing and performance curve	Section 11A.4
Ford industrial motor		Section 11A.3.11
Hollow shaft pump motor		Section 11A.3.9
Well pumps, vertical turbine		Section 11A.3





34X

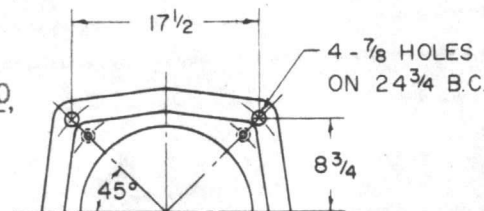
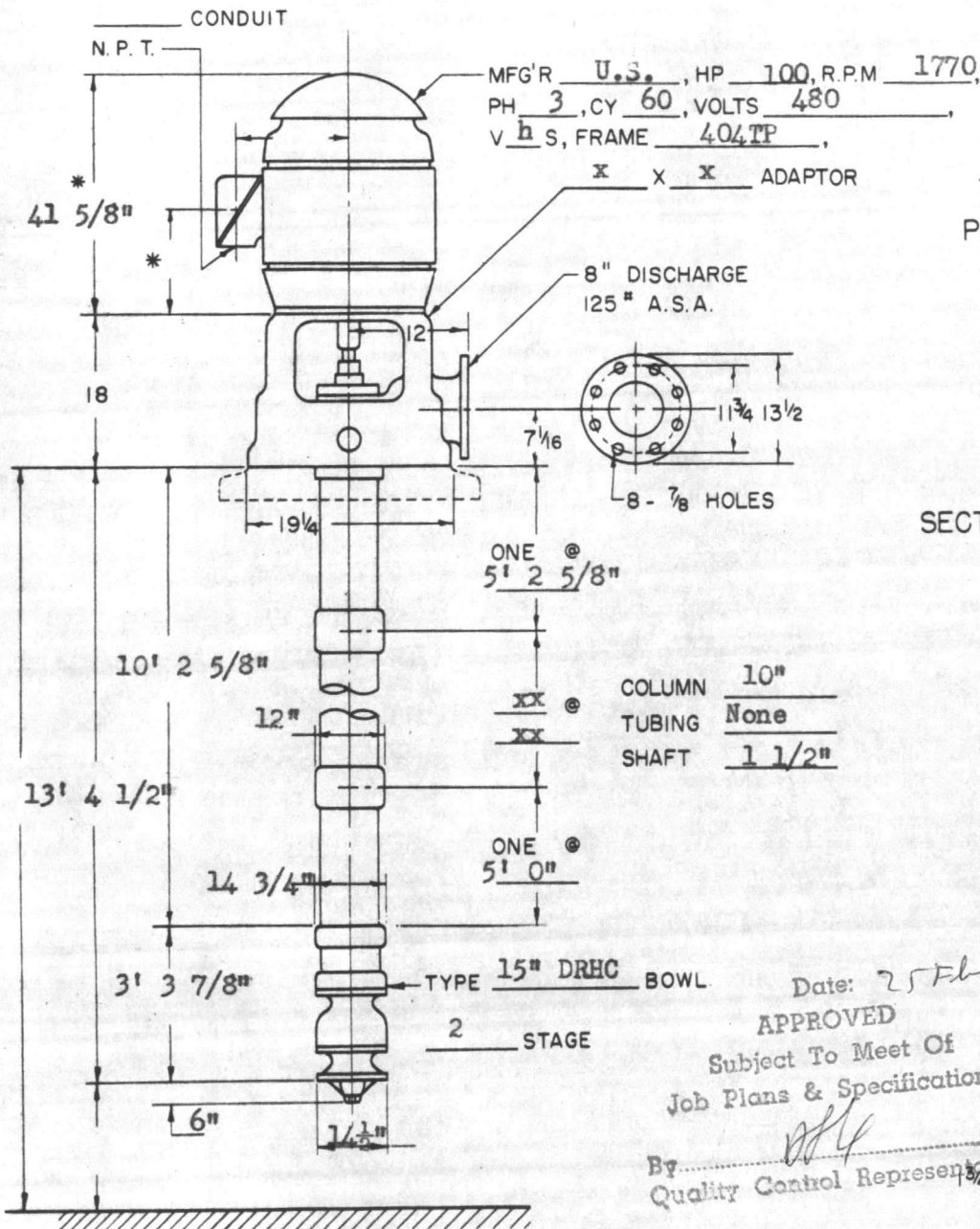
# INSTALLATION PLAN

## TYPE RF 816 DISCHARGE HEAD

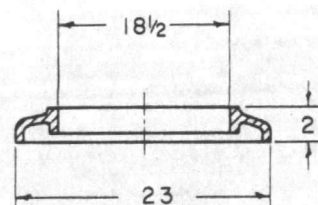
LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE



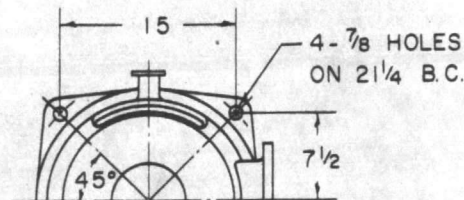
USE THESE DIMENSIONS ONLY  
WHEN CERTIFIED BY FACTORY



PLAN OF BASE PLATE

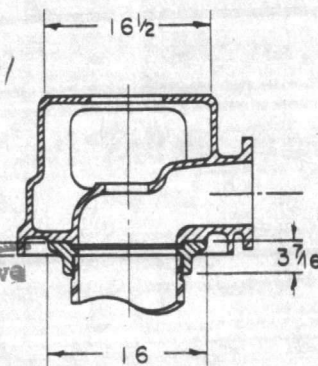


SECTION THRU BASE PLATE



PLAN OF HEAD

Date: 25 Feb 71  
APPROVED  
Subject To Meet Of  
Job Plans & Specifications  
By: [Signature]  
Quality Control Representative

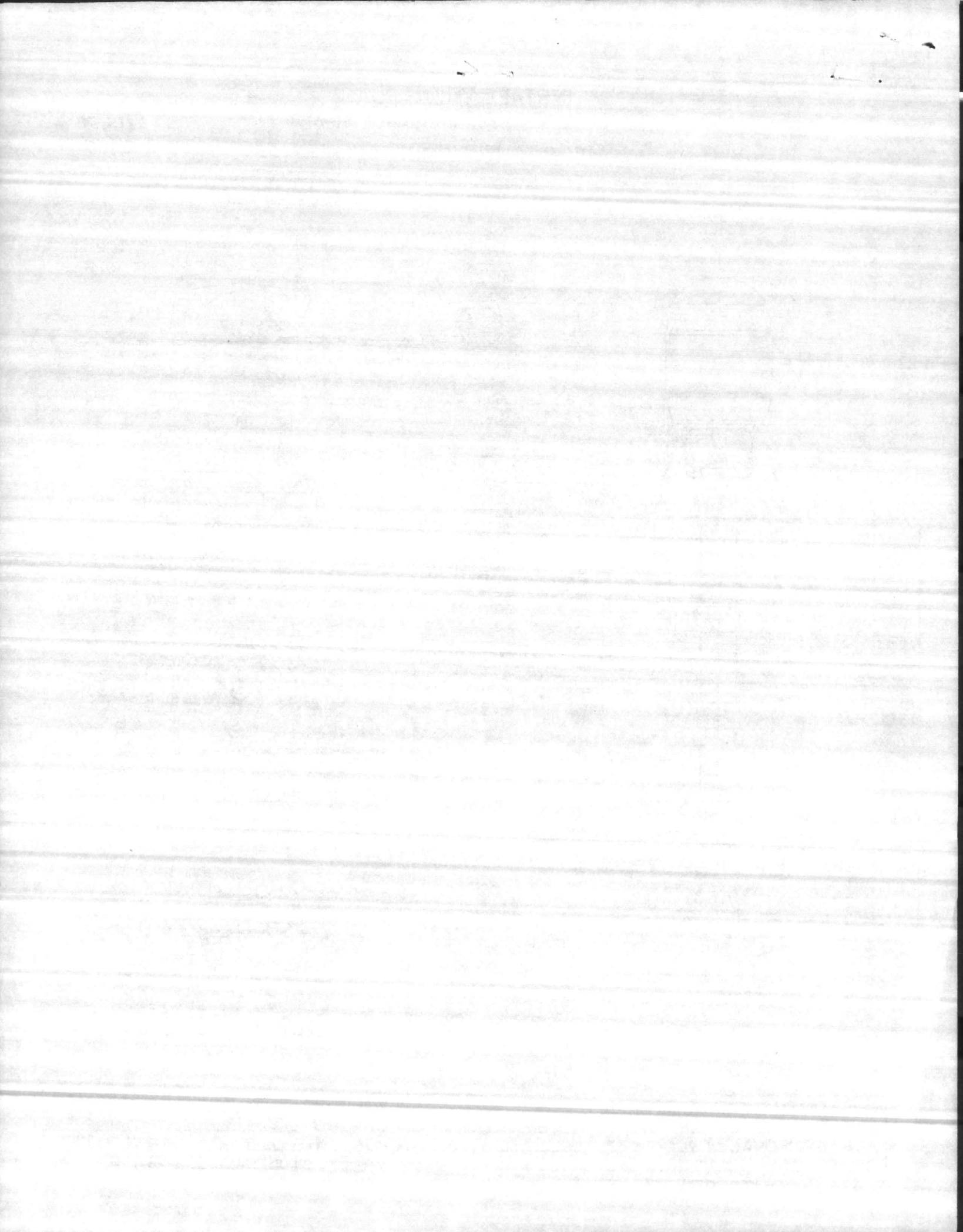


SECTION THRU ELL

Corbin Construction Company

CUSTOMER: _____	YOUR NO: <u>N-196-7-</u>	G. P. M.: <u>1500</u>
LOCATION: <u>Camp LeJeune, North Carolina</u>	OUR NO: <u>71H-113</u>	T. D. H.: <u>165</u>
FOR APPROVAL: <u>Tom Morrow</u>	PUMP NO: <u>65092</u>	R. P. M.: <u>1770</u>
CERTIFIED: <u>T</u>	DATE: <u>1/13/71</u>	B. H. P.: _____

\* INCLUDES 3" HIGH MOTOR ADAPTOR WHEN USED





THESE CURVES SHOW THE GENERAL SHAPE OF THE PUMP BOWL CHARACTERISTICS UNDER SHOP TESTS AT THE CONSTANT SPEED INDICATED. A TOLERANCE OF PLUS OR MINUS 2% MUST BE ALLOWED IN THE GUARANTEED CAPACITY, HEAD, AND EFFICIENCY AT THE RATED POINT WHEN PUMPING NON-GASEOUS WATER, FREE FROM DETRITUS, AT A TEMPERATURE NOT OVER 85° FAHR., AND WITH THE LOWEST IMPELLER SUBMERGED.

FROM TEST NO. 2248

FOR

ADDRESS

TYPE OF PUMP FIG. DRHC R.P.M. 1760

SIZE OF PUMP 15 INS. 2 STAGES 7DR17 IMPELLER 7/8

FIELD PERFORMANCE

THE FIELD PERFORMANCE AS SHOWN BELOW, MAKES ALLOWANCE FOR ALL THE HYDRAULIC AND MECHANICAL LOSSES IN THE COLUMN AND SHAFT OF THE INSTALLATION ACCORDING TO THE STANDARDS OF THE HYDRAULIC INSTITUTE. THE FIELD PUMPING HEAD IS THE LIFT FROM THE WELL PLUS THE DISCHARGE HEAD MEASURED AT THE DISCHARGE CONNECTION AT THE SURFACE.

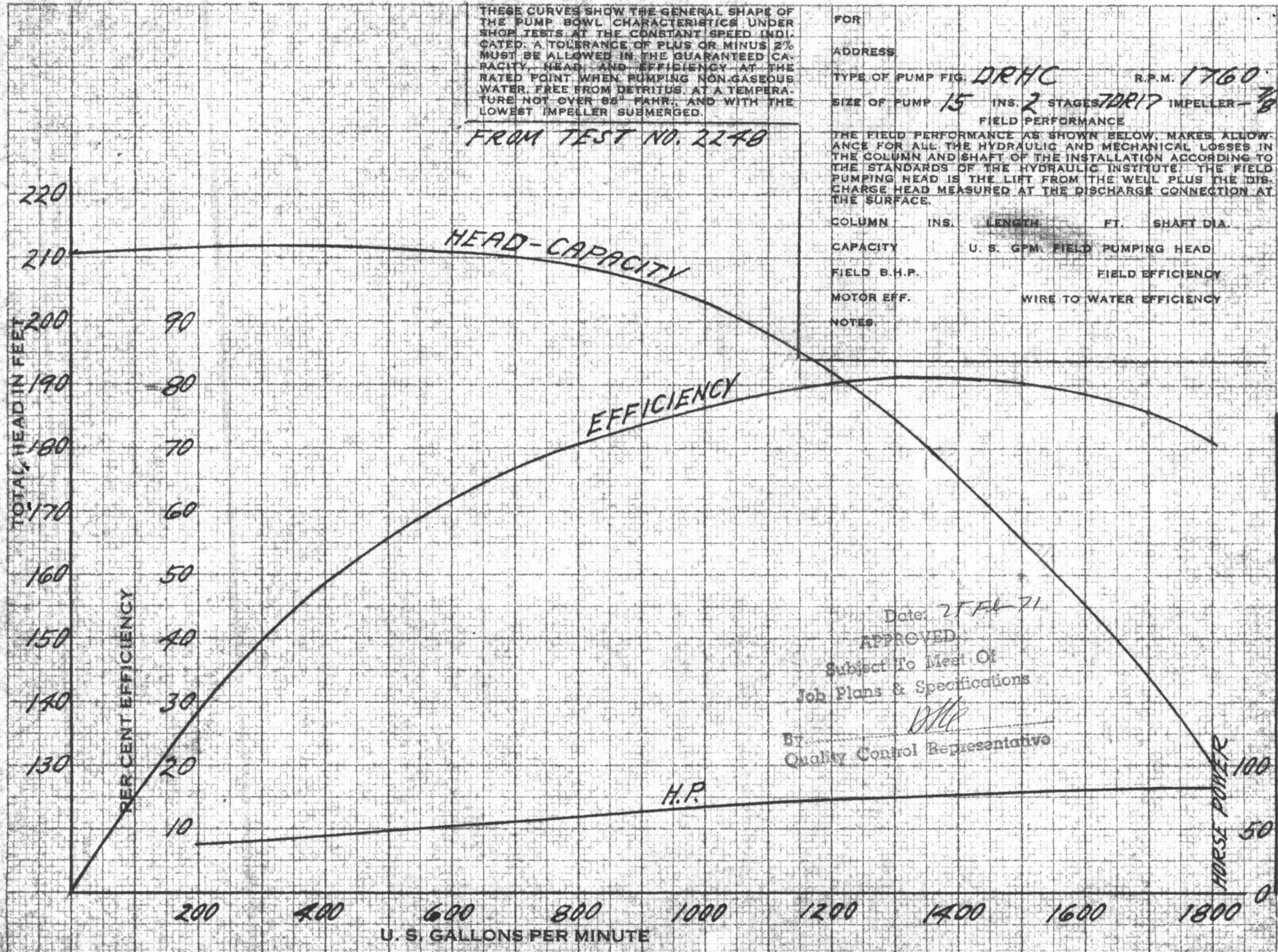
COLUMN INS. LENGTH FT. SHAFT DIA.

CAPACITY U. S. GPM. FIELD PUMPING HEAD

FIELD B.H.P. FIELD EFFICIENCY

MOTOR EFF. WIRE TO WATER EFFICIENCY

NOTES

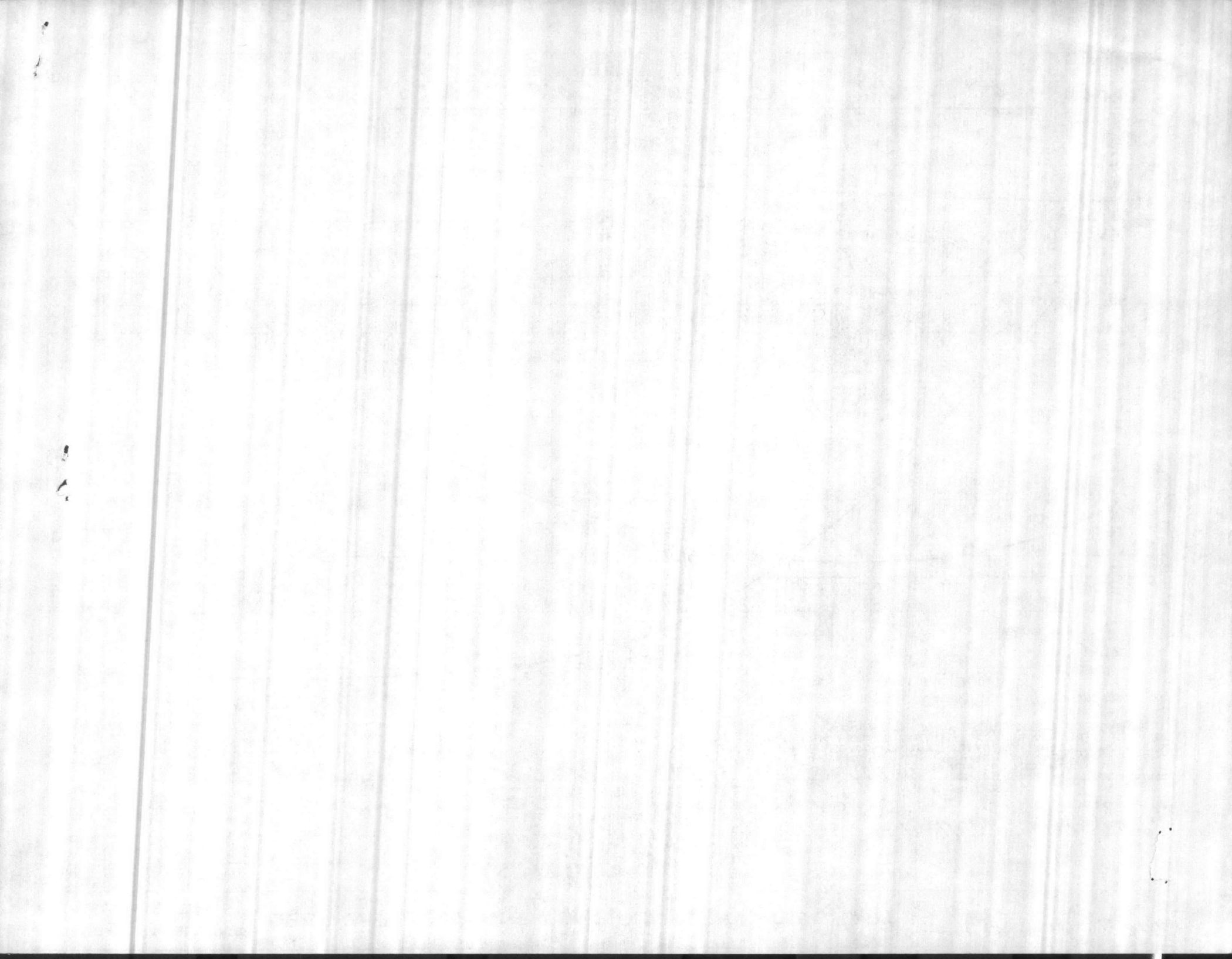


Date: 25 Feb 71

APPROVED

Subject To Meet Of  
Job Plans & Specifications

By: *[Signature]*  
Quality Control Representative





# INSTALLATION PLAN

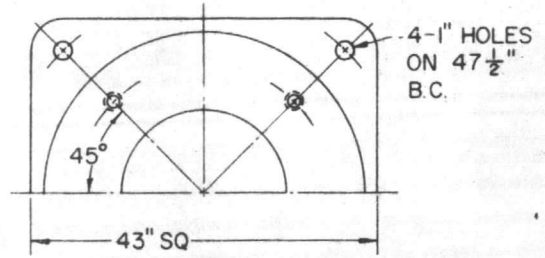
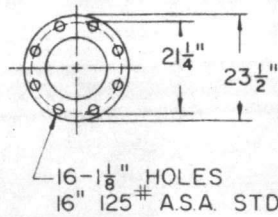
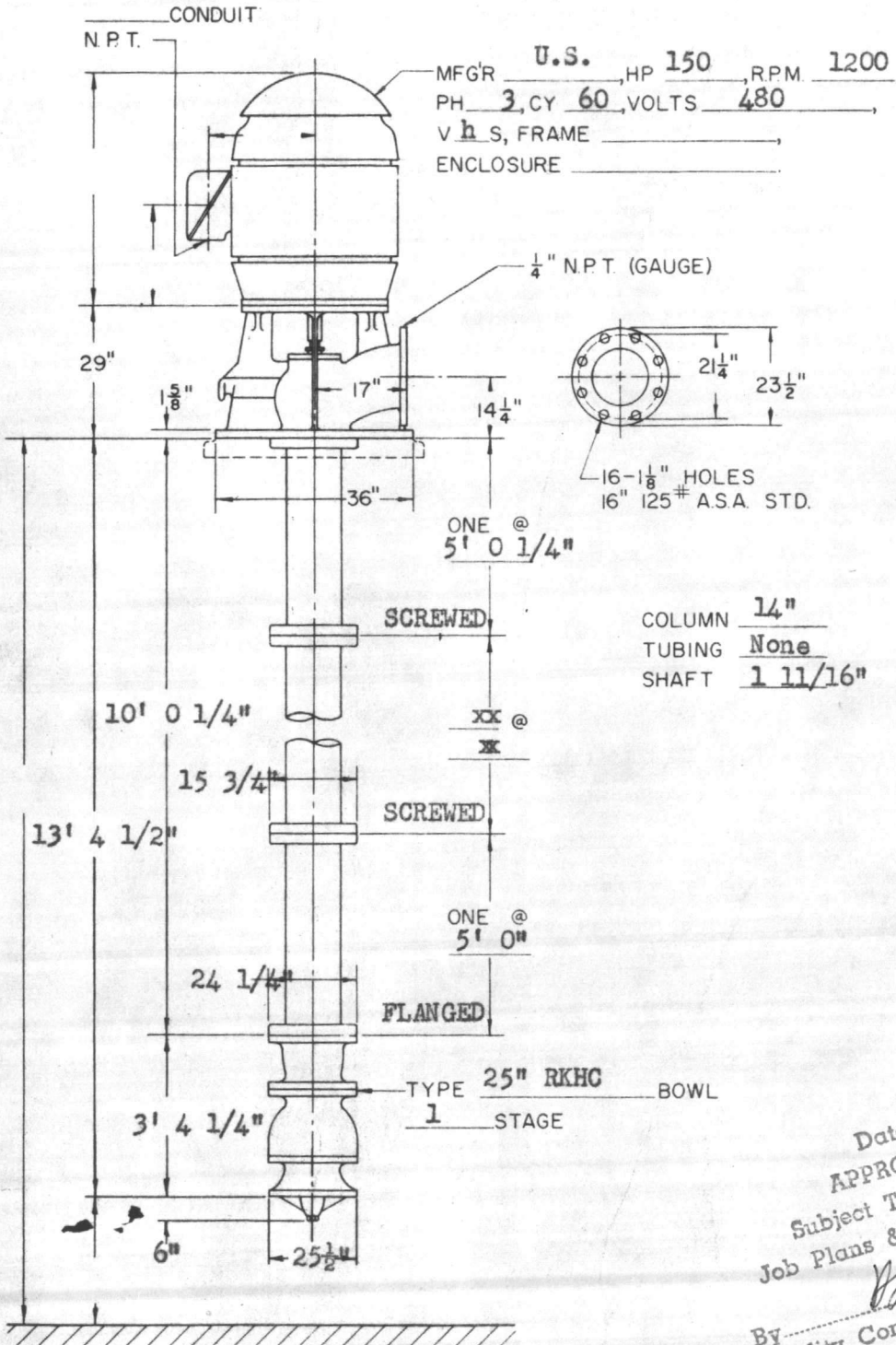
## TYPE TL1625R DISCHARGE HEAD

LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE

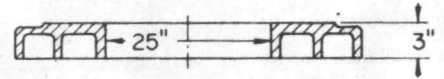


Backwash

USE THESE DIMENSIONS ONLY  
WHEN CERTIFIED BY FACTORY

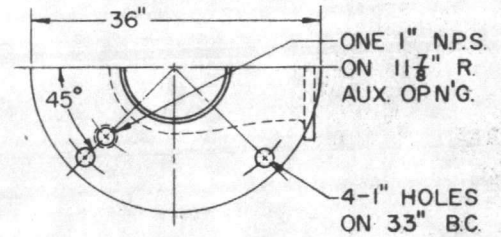


HOLE IN BASE PLATE

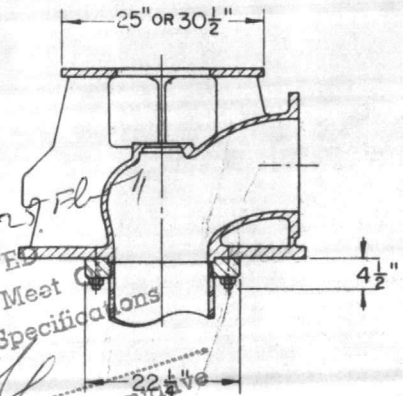


BASE PLATE

COLUMN 1 1/4"  
TUBING None  
SHAFT 1 11/16"



BASE OF HEAD



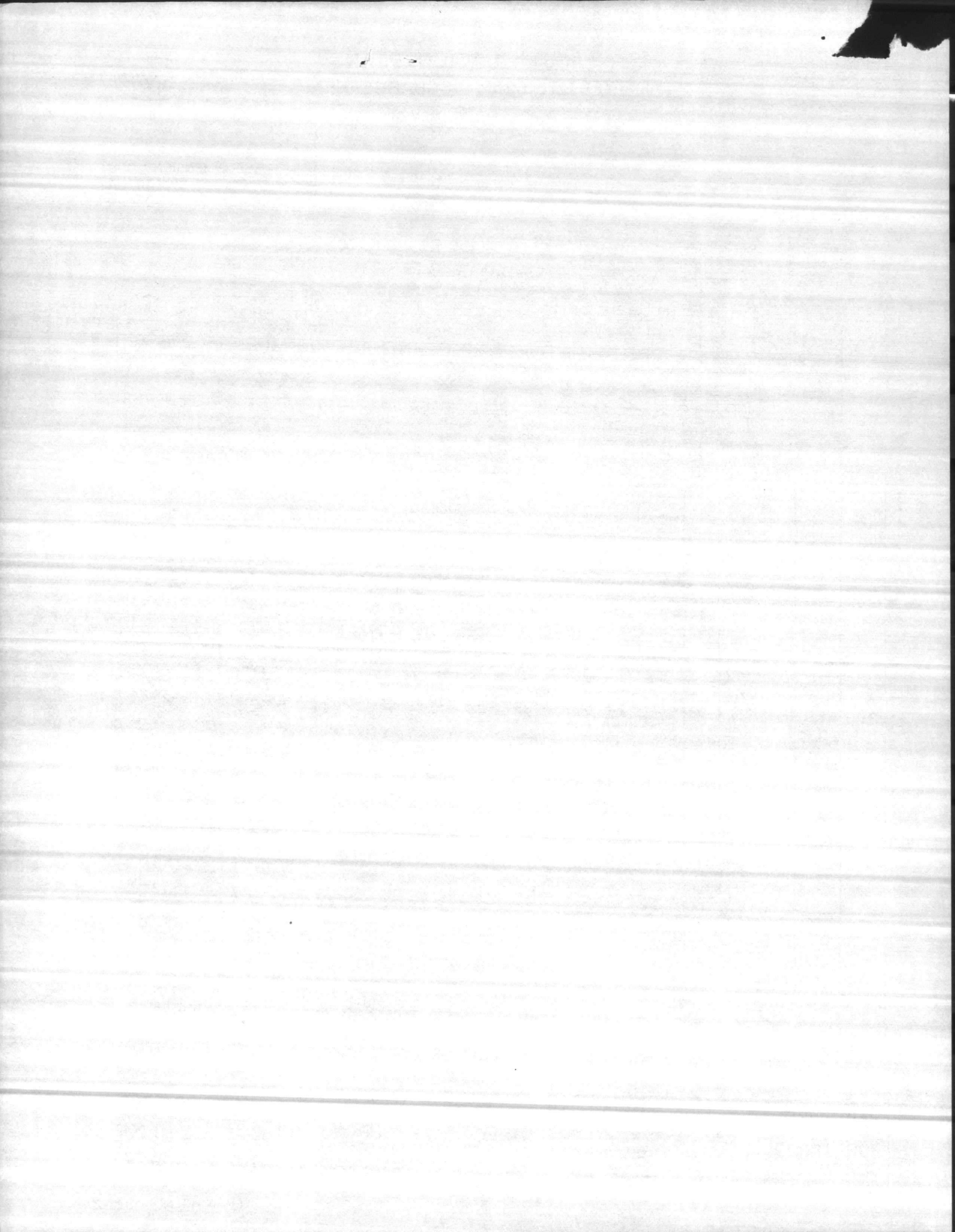
SECTION THRU HEAD

Date: 2/7/71  
APPROVED \_\_\_\_\_  
Subject To Meet \_\_\_\_\_  
Job Plans & Specifications  
By: \_\_\_\_\_  
Quality Control Representative

**Corbin Construction Co.**

CUSTOMER: _____	YOUR NO: <u>N-197-70</u>	G.P.M: <u>7500</u>
LOCATION: <u>Camp LeJeune, North Carolina</u>	OUR NO: <u>78H-114</u>	T.D.H: <u>50</u>
FOR APPROVAL: <u>Tom Morrow</u>	PUMP NO: <u>65093</u>	R.P.M: <u>1170</u>
CERTIFIED: _____	DATE: <u>1/7/71</u>	B.H.P: _____





THESE CURVES SHOW THE GENERAL SHAPE OF THE PUMP BOWL CHARACTERISTICS UNDER SHOP TESTS AT THE CONSTANT SPEED INDICATED A TOLERANCE OF PLUS OR MINUS 2% MUST BE ALLOWED IN THE GUARANTEED CAPACITY HEAD AND EFFICIENCY AT THE RATED POINT WHEN PUMPING NON-GASEOUS WATER FREE FROM DETRITUS, AT A TEMPERATURE NOT OVER 86° FAHR., AND WITH THE LOWEST IMPELLER SUBMERGED.

FOR

ADDRESS

TYPE OF PUMP FIG. **RXHC**

R.P.M. **1200**

SIZE OF PUMP **25**

INS. **2** STAGES **2RK27** IMPELLER

FIELD PERFORMANCE

THE FIELD PERFORMANCE AS SHOWN BELOW, MAKES ALLOWANCE FOR ALL THE HYDRAULIC AND MECHANICAL LOSSES IN THE COLUMN AND SHAFT OF THE INSTALLATION ACCORDING TO THE STANDARDS OF THE HYDRAULIC INSTITUTE. THE FIELD PUMPING HEAD IS THE LIFT FROM THE WELL PLUS THE DISCHARGE HEAD MEASURED AT THE DISCHARGE CONNECTION AT THE SURFACE.

$\rho = 0.93$

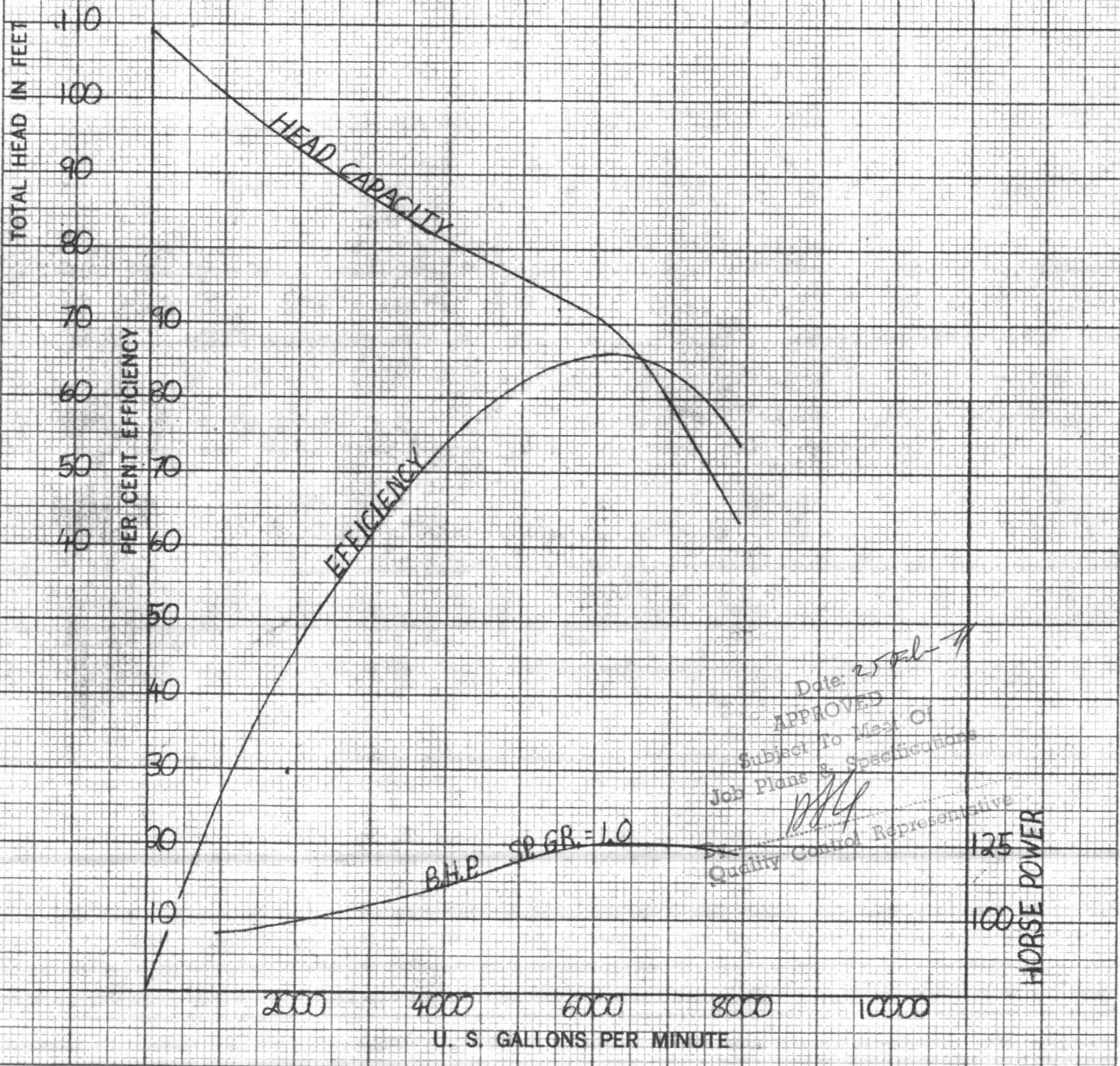
COLUMN INS. LENGTH FT. SHAFT DIA.

CAPACITY U. S. GPM. FIELD PUMPING HEAD

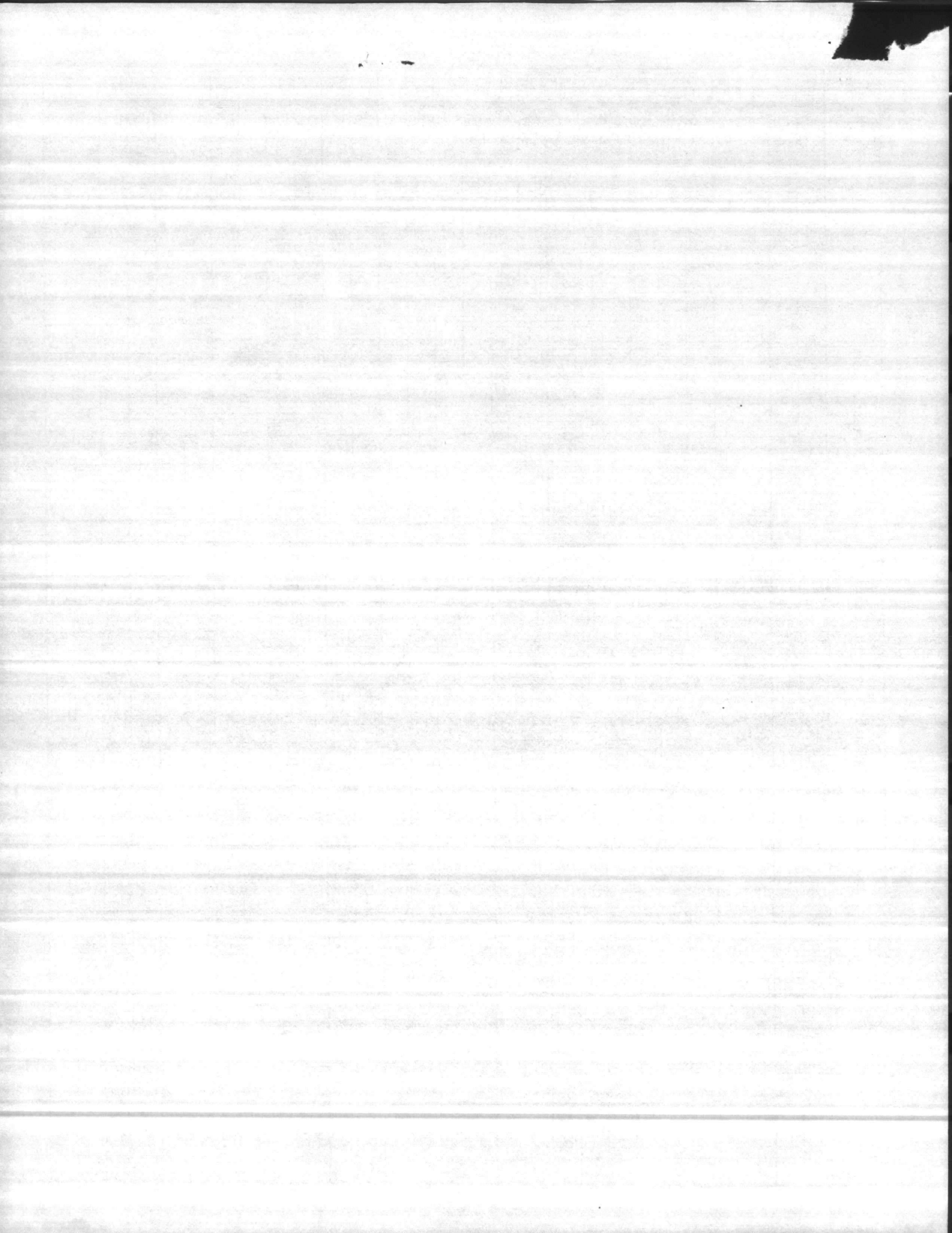
FIELD B.H.P. FIELD EFFICIENCY

MOTOR EFF. WIRE TO WATER EFFICIENCY

NOTES.



Date: 2/5/64  
APPROVED  
Subject To Meet Of  
Job Plans & Specifications  
Quality Control Representative





CUSTOMER: LAYNE-ATLANTIC CO.

**AMARILLO RIGHT ANGLE GEAR DRIVE**

CUSTOMER ORDER NO.: N-199-70 (ITEM 12)

**COMBINATION DRIVE - VERTICAL HOLLOW SHAFT**

CUSTOMER JOB: \_\_\_\_\_

MODEL C40B RATIO 1:1 SERIAL NO. \_\_\_\_\_

ROTATION: STANDARD

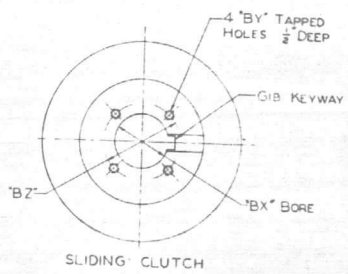
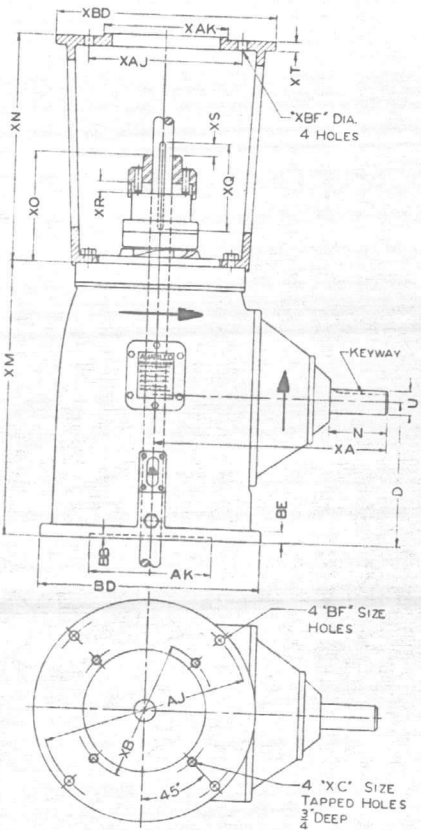
MARKS: \_\_\_\_\_

DRIVE SHAFT NO. WL 27 LENGTH 36"

DRIVE FLANGE BORE 1 1/2" K. W. 3/8 x 7/16

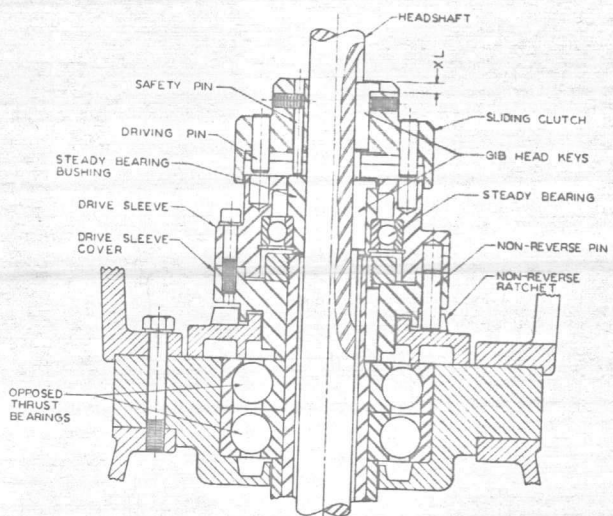
SPECIAL FEATURES: \_\_\_\_\_

ENGINE FLANGE BORE ROUGH BORED K. W. \_\_\_\_\_



**COUPLING DIMENSIONS**

BX BORE	GIB KEYWAY	BY	BZ
3/4	3/16 x 3/32	10-32	1 3/8
7/8	1/2 x 1/8	10-32	1 3/8
1	1/2 x 1/8	10-32	1 3/8
1 1/8	3/8 x 3/16	1/4 - 20	1 3/4
1 1/4	3/8 x 3/16	1/4 - 20	1 3/4
1 1/2	3/8 x 3/16	1/4 - 20	1 3/4
1 5/8	3/8 x 3/16	1/4 - 20	1 3/4
1 3/4	1/2 x 1/4	1/4 - 20	2 1/2
1 7/8	1/2 x 1/4	1/4 - 20	2 1/2
2	1/2 x 1/4	3/8 - 16	3 1/4
2 1/8	5/8 x 1/8	3/8 - 16	3 1/4
2 1/4	5/8 x 1/8	3/8 - 16	3 1/4



**TOLERANCES**

'AK' DIMENSION:  
 8.250 DIA. +.003, -.000  
 13.500 DIA. +.005, -.000  
 22.000 DIA. +.005, -.000  
 'BX' DIMENSION:  
 1/2 DIA. AND SMALLER +.001, -.000  
 LARGER THAN 1/2 DIA. +.0015, -.000  
 'U' DIMENSION:  
 1/2 DIA. AND SMALLER ±.0003  
 LARGER THAN 1/2 DIA. ±.0005

MODEL	D	N	HORIZONTAL SHAFT U			AJ	AK	BB	BD	BE	BF	XA	XB	XC	XL	XM	XN	XO	XQ	XR	XS	XT	XAJ	XAK	XBD	XBF	
			NOM-INAL	ACTUAL	KEYWAY																						
C 20	6 3/4	2 5/8	1 1/4	1.249	5/16 X 5/32	9 1/8	8.250	3/16	10	5/8	7/16	10 7/8			9/32	12 1/4	12 1/2	5 1/2	5 1/4	1 1/2	1 1/2	7/16					
C 40A	8 1/2	4 9/16	1 1/2	1.499	3/8 X 3/16	9 1/8	8.250	1/4	12	7/8	7/16	15 5/8			9/32	16 3/16	16	6 1/2	7	5/8	2	5/8					
C 40B	8 1/2	4 9/16	1 1/2	1.499	3/8 X 3/16	14 3/4	13.500	1/4	16 1/2	7/8	7/16	16 3/4			9/32	16 3/16	16	6 1/2	7	5/8	2	5/8	14 3/4	13 1/2	16 1/2	1 1/8	
C 60	11 1/2	4 1/2	1 1/2	1.499	3/8 X 3/16	14 3/4	13.500	1/4	16 1/2	7/8	7/16	16 3/4			9/32	20 1/4	18	7 13/16	7 3/4	3/4	2 1/4	3/4					
C 80	11 1/2	4 1/4	1 7/8	1.874	3/8 X 3/16	14 3/4	13.500	1/4	16 1/2	7/8	7/16	16 3/4			9/32	20 1/4	18	7 13/16	7 3/4	3/4	2 1/4	3/4					
C 100	11 1/2	4 1/4	1 7/8	1.874	3/8 X 3/16	14 3/4	13.500	1/4	16 1/2	7/8	7/16	16 3/4			9/32	20 1/4	18	7 13/16	7 3/4	3/4	2 1/4	3/4					
C 150	13 3/4	5 1/4	2 7/16	2.436	5/8 X 5/16	18 1/4	13.500	1/4	20	1 1/8	1 1/16	20 3/4	14	1 1/8	9/32	25	20	9	10	7/8	2 3/4	7/8					
C 200	13 3/4	5 1/4	2 7/16	2.436	5/8 X 5/16	18 1/4	13.500	1/4	20	1 1/8	1 1/16	20 3/4	14	1 1/8	9/32	25	20	9	10	7/8	2 3/4	7/8					
C 275	16	6	2 15/16	2.936	3/4 X 3/8	23	13.500	1/4	24 1/2	1 1/8	1 3/16	24 1/2	14 3/4	1 1/8	9/32	30 3/4	27	12 1/2	11 1/2	1 1/8	3 1/2	1					
C 375	16	6	2 15/16	2.936	3/4 X 3/8	23	13.500	1/4	24 1/2	1 1/8	1 3/16	24 1/2	14 3/4	1 1/8	9/32	30 3/4	27	12 1/2	11 1/2	1 1/8	3 1/2	1					
C 450	16	6	2 15/16	2.936	3/4 X 3/8	23	13.500	1/4	24 1/2	1 1/8	1 3/16	24 1/2	14 3/4	1 1/8	9/32	30 3/4	27	12 1/2	11 1/2	1 1/8	3 1/2	1					
C 600	18	6	3 3/4	3.749	7/8 X 7/16	23	13.500	1/4	24 1/2	1 1/8	1 3/16	24 1/2	14 3/4	1 1/8	9/32	30 3/4	27	12 3/8	11 1/2	1 1/8	3 1/2	1					
C 750	21	8	4	3.998	1 X 1/2	28 3/4	22.000	1/4	30 1/2	1 1/4	1 3/16	36 7/8	26	1 1/8	9/32	42	30	16 1/4	15	1 3/8	4	1 1/4					

Date: 2/18/71

BY: Phillip L. Lunde

DATE: 1-14-71

**AMARILLO GEAR COMPANY** Subject To Meet Of  
 P. O. BOX 1789, TELEPHONE 808-373-7491 Job Plans & Specifications  
 AMARILLO, TEXAS 79105  
 By: [Signature]  
 Quality Control Representative



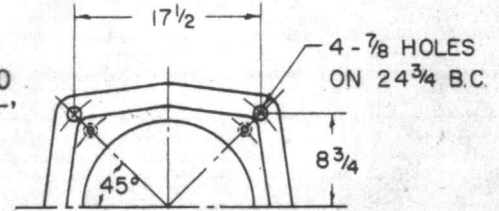
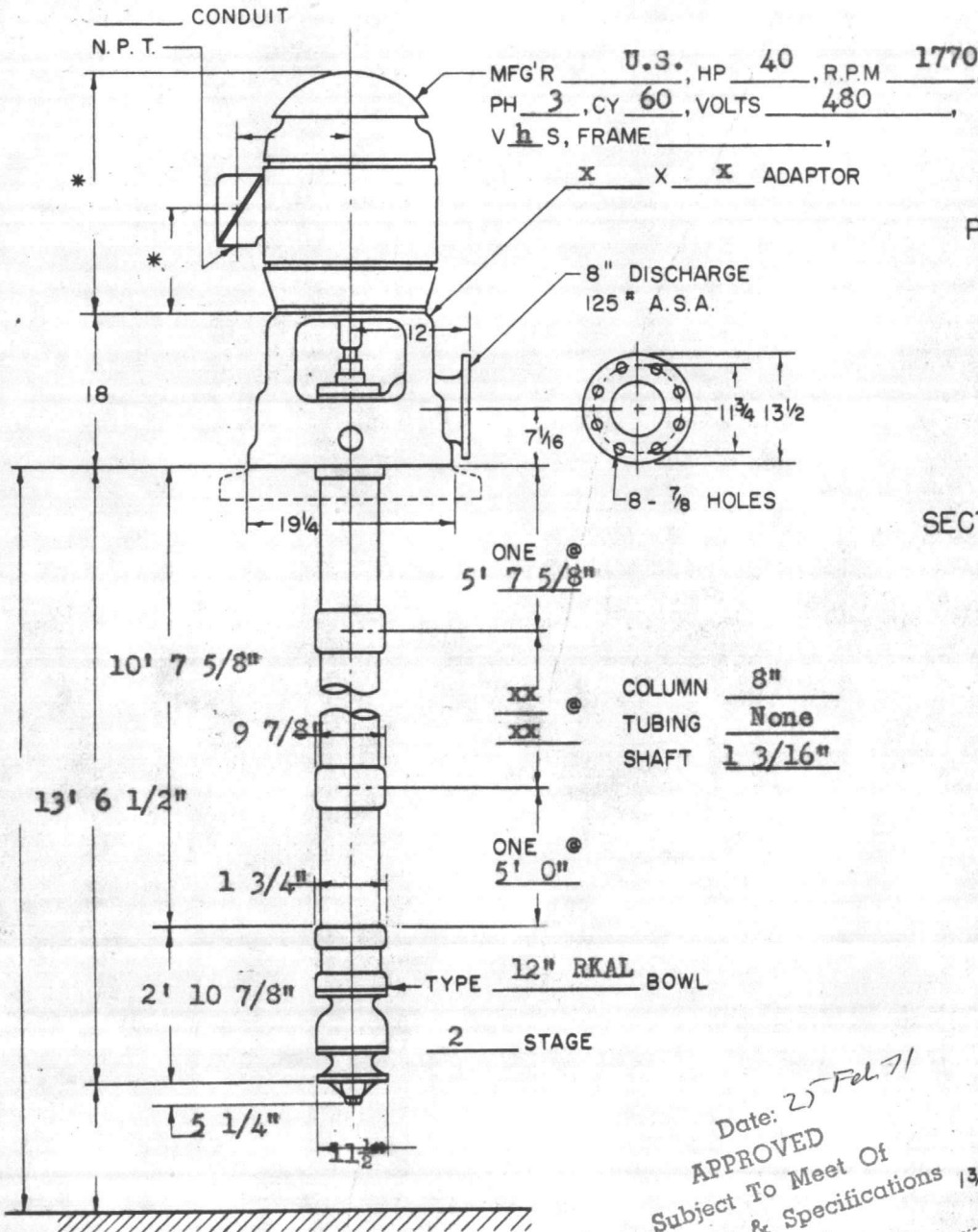
# INSTALLATION PLAN

## TYPE RF 816 DISCHARGE HEAD

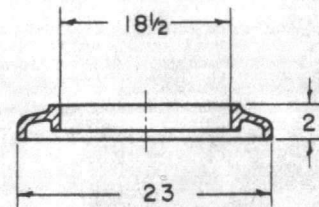
LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE



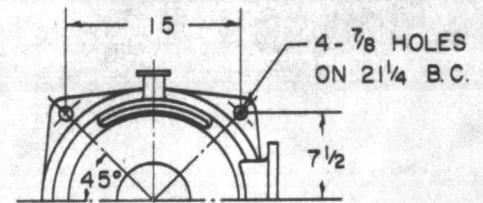
USE THESE DIMENSIONS ONLY  
WHEN CERTIFIED BY FACTORY



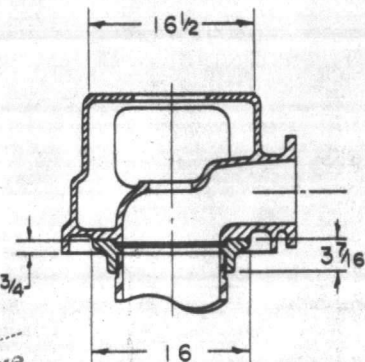
PLAN OF BASE PLATE



SECTION THRU BASE PLATE



PLAN OF HEAD



SECTION THRU ELL

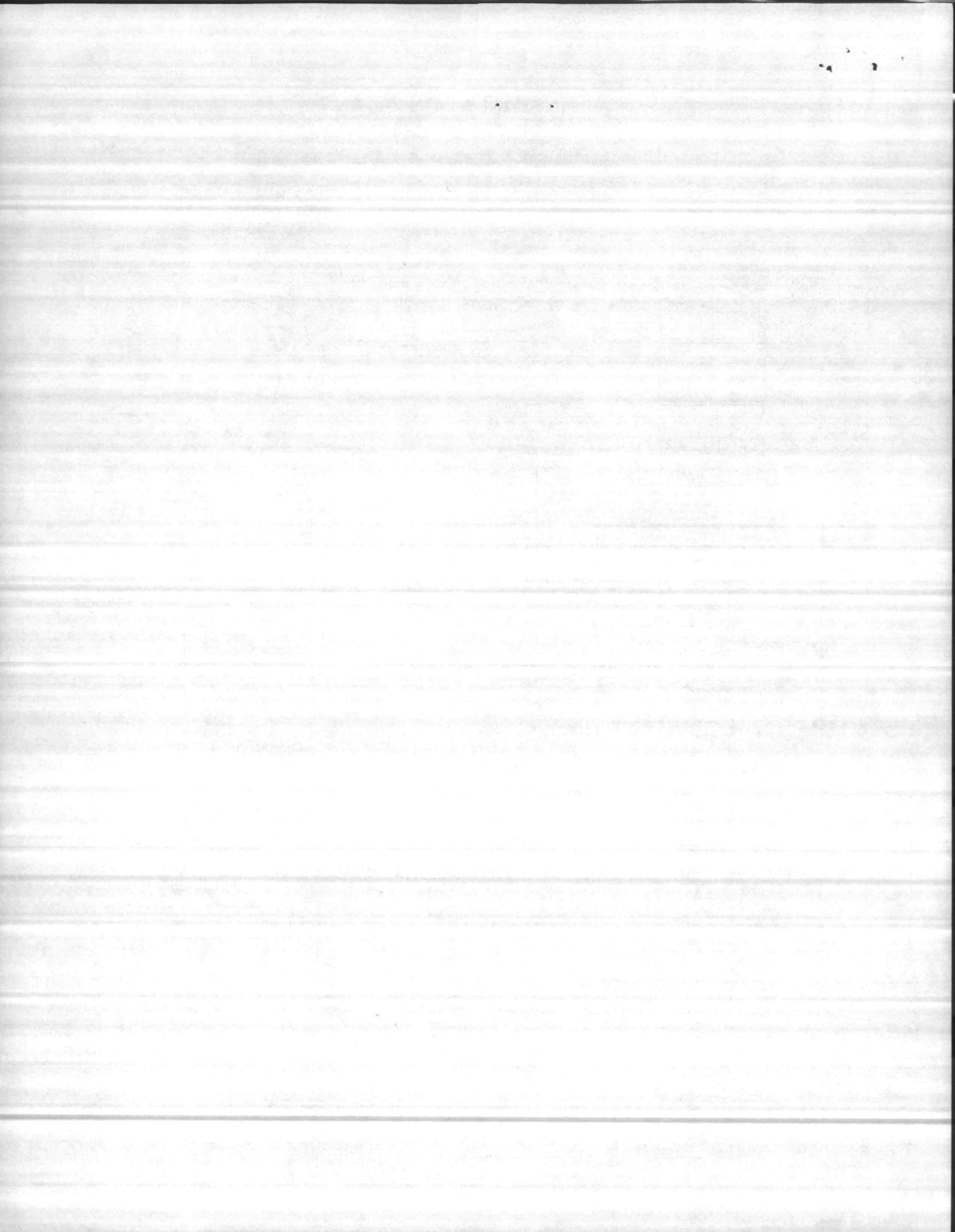
Date: 25 Feb 71  
**APPROVED**  
 Subject To Meet Of  
 Job Plans & Specifications  
 By: *[Signature]*  
 Quality Control Representative

Corbin Construction Company

CUSTOMER: _____	YOUR NO: N-195-70	G. P. M: 750
LOCATION: Camp LeJeune, North Carolina	OUR NO: 71H-112	T. D. H: 130
FOR APPROVAL: Tom Morrow	PUMP NO: 65089-90	R. P. M: 1770
CERTIFIED: _____	DATE: 1/6/71	B. H. P: _____

\* INCLUDES 3" HIGH MOTOR ADAPTOR WHEN USED





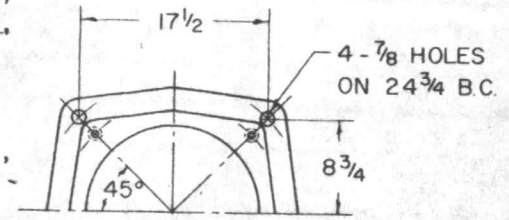
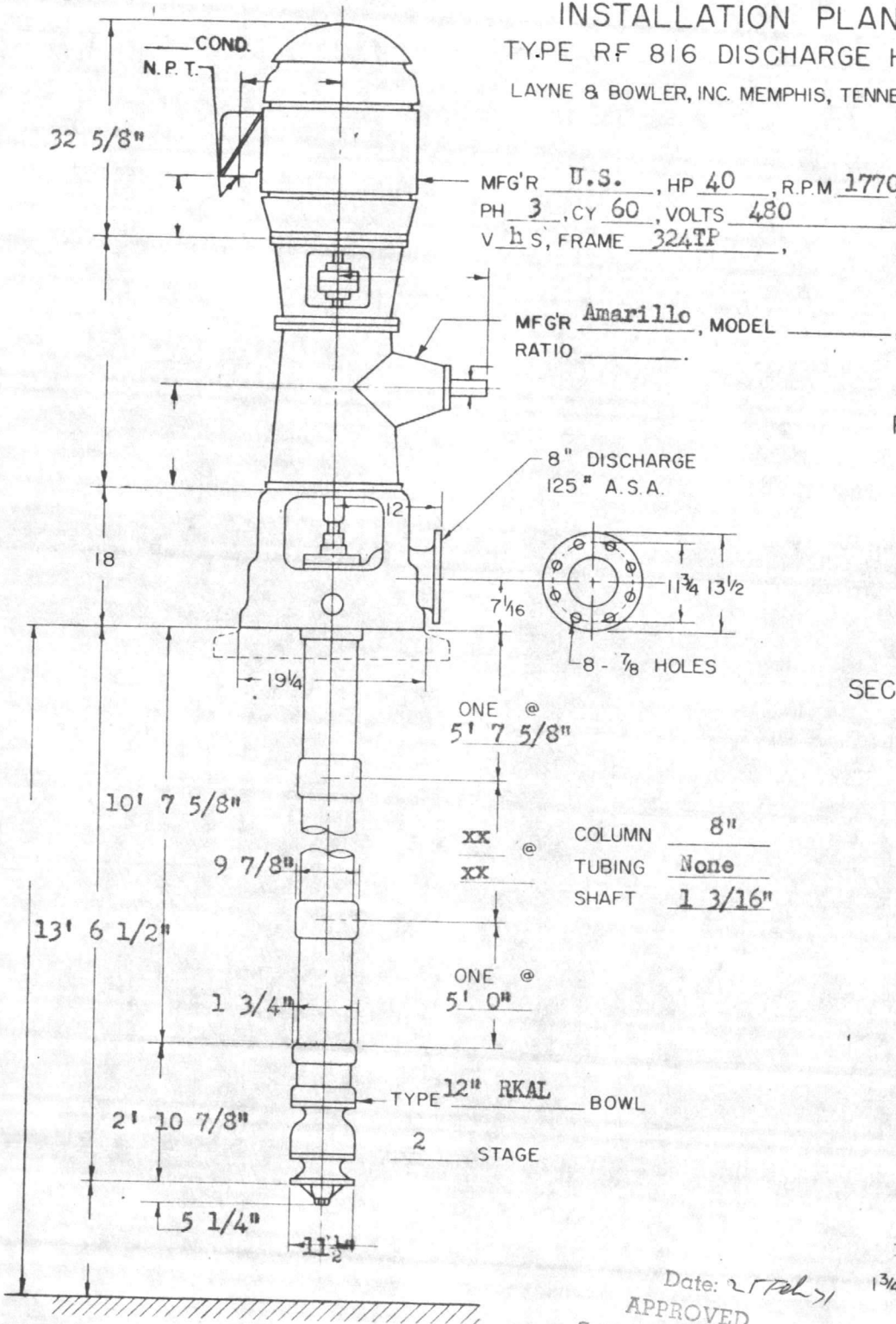


# INSTALLATION PLAN

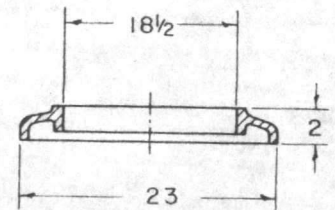
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LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE

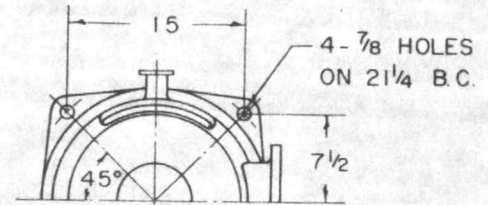
USE THESE DIMENSIONS ONLY  
WHEN CERTIFIED BY FACTORY



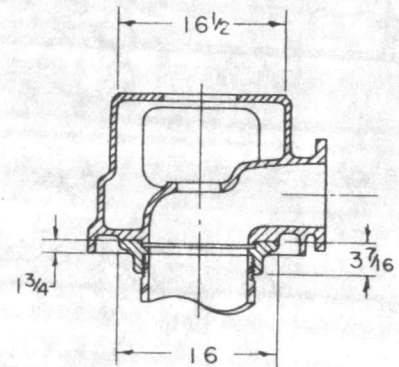
PLAN OF BASE PLATE



SECTION THRU BASE PLATE



PLAN OF HEAD



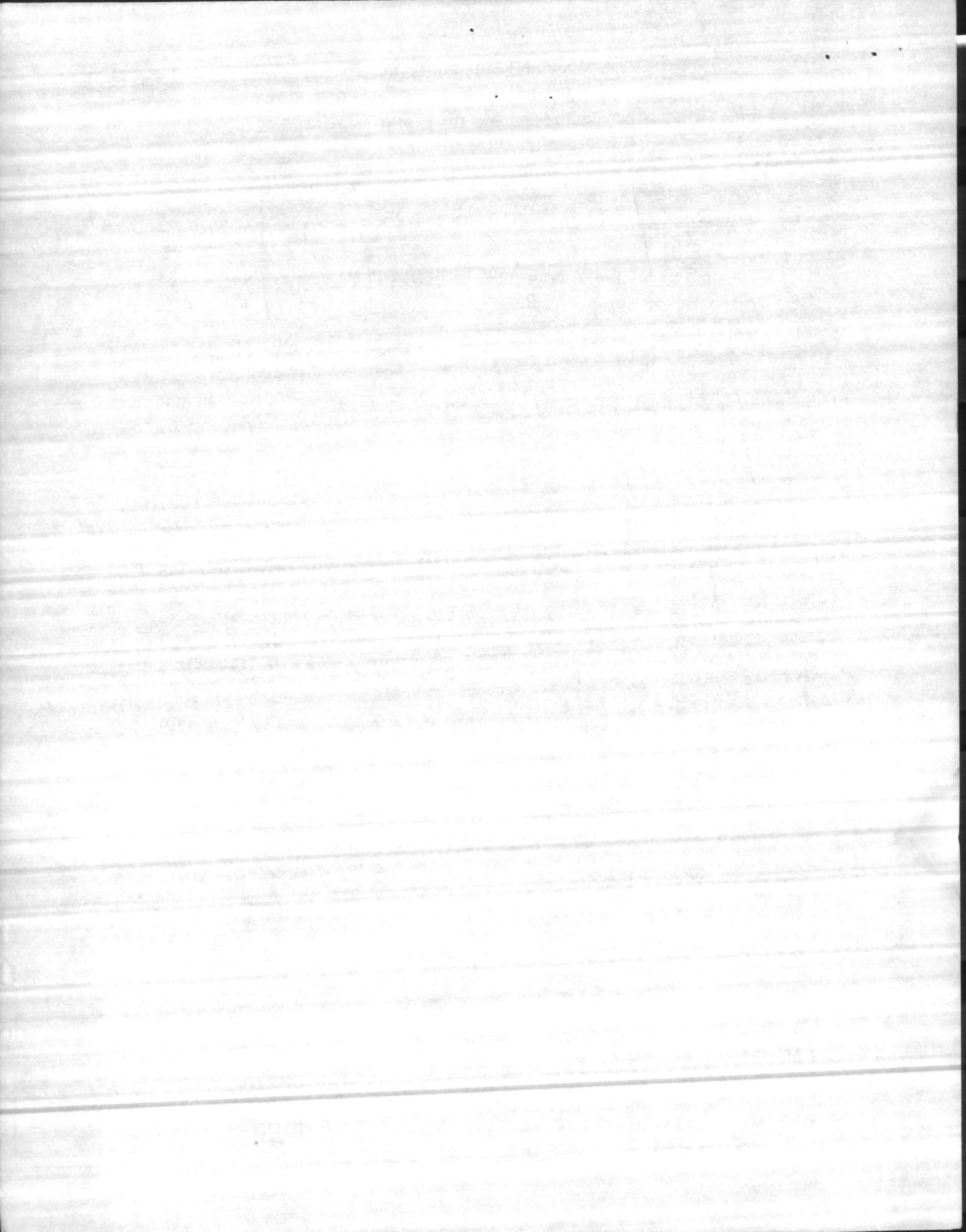
SECTION THRU ELL

Date: 2/17/71  
APPROVED  
Subject To Meet Of  
Job Plans & Specifications

By: [Signature]  
Quality Control Representative

Corbin Construction Company

CUSTOMER: _____	YOUR NO: <u>N-195-70</u>	G. P. M. <u>750</u>
LOCATION: <u>Camp LeJeune, North Carolina</u>	OUR NO: <u>71H-112</u>	T. D. H. <u>130</u>
FOR APPROVAL: <u>Tom Morrow</u>	PUMP NO: <u>65090</u>	R. P. M. <u>1770</u>
CERTIFIED: _____	DATE: <u>1/13/71</u>	B. H. P. _____





THESE CURVES SHOW THE GENERAL SHAPE OF THE PUMP BOWL CHARACTERISTICS UNDER SHOP TESTS AT THE CONSTANT SPEED INDICATED. A TOLERANCE OF PLUS OR MINUS 2% MUST BE ALLOWED IN THE GUARANTEED CAPACITY, HEAD, AND EFFICIENCY AT THE RATED POINT WHEN PUMPING NON-GASEOUS WATER, FREE FROM DETRITUS, AT A TEMPERATURE NOT OVER 86° FAHR., AND WITH THE LOWEST IMPELLER SUBMERGED.

FOR

ADDRESS

TYPE OF PUMP FIG. *RKAL* R.F.M. *1770*

SIZE OF PUMP *12* INS. *2* STAGES *6A13* IMPELLER *STD*

FIELD PERFORMANCE

THE FIELD PERFORMANCE AS SHOWN BELOW, MAKES ALLOWANCE FOR ALL THE HYDRAULIC AND MECHANICAL LOSSES IN THE COLUMN AND SHAFT OF THE INSTALLATION ACCORDING TO THE STANDARDS OF THE HYDRAULIC INSTITUTE. THE FIELD PUMPING HEAD IS THE LIFT FROM THE WELL PLUS THE DISCHARGE HEAD MEASURED AT THE DISCHARGE CONNECTION AT THE SURFACE.

COLUMN INS. LENGTH FT. SHAFT DIA.

CAPACITY U.S. GPM. FIELD PUMPING HEAD

FIELD B.H.P. FIELD EFFICIENCY

MOTOR EFF. WIRE TO WATER EFFICIENCY

NOTES

*PT1818A*  
*97.9057*

220  
200  
180  
160  
140  
120  
100  
80  
60  
40  
20

PERCENT EFFICIENCY  
90  
80  
70  
60  
50  
40  
30  
20  
10

HEAD - CAPACITY

% EFFICIENCY

*B.H.P. SP. GR. = 1.0*

40  
20  
HORSE POWER

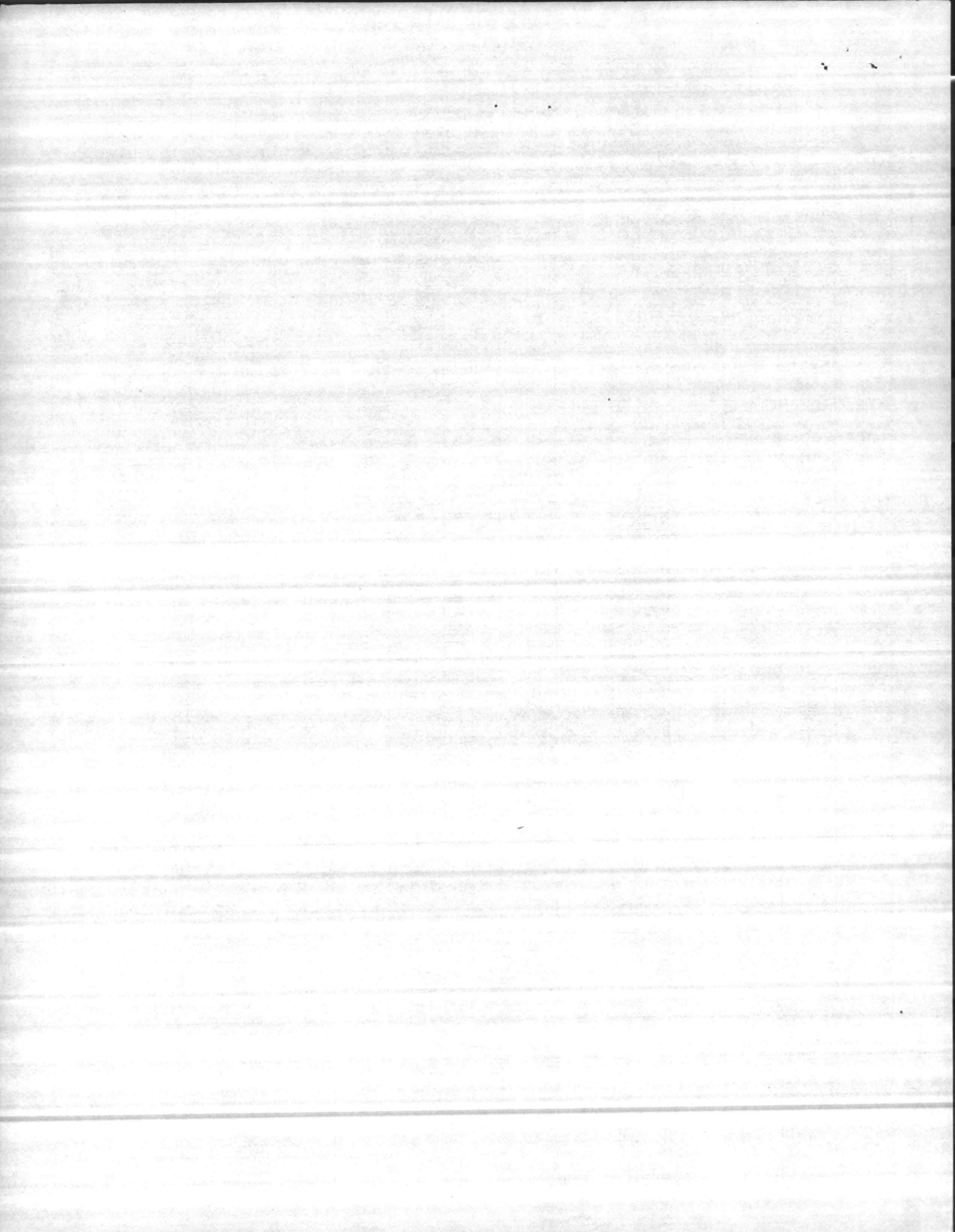
200 400 600 800 1000 1200

U. S. GALLONS PER MINUTE

Date: *25 Feb 7*  
APPROVED

Subject To Meet Of  
Job Plans & Specifications

BY *[Signature]*  
Quality Control Representative

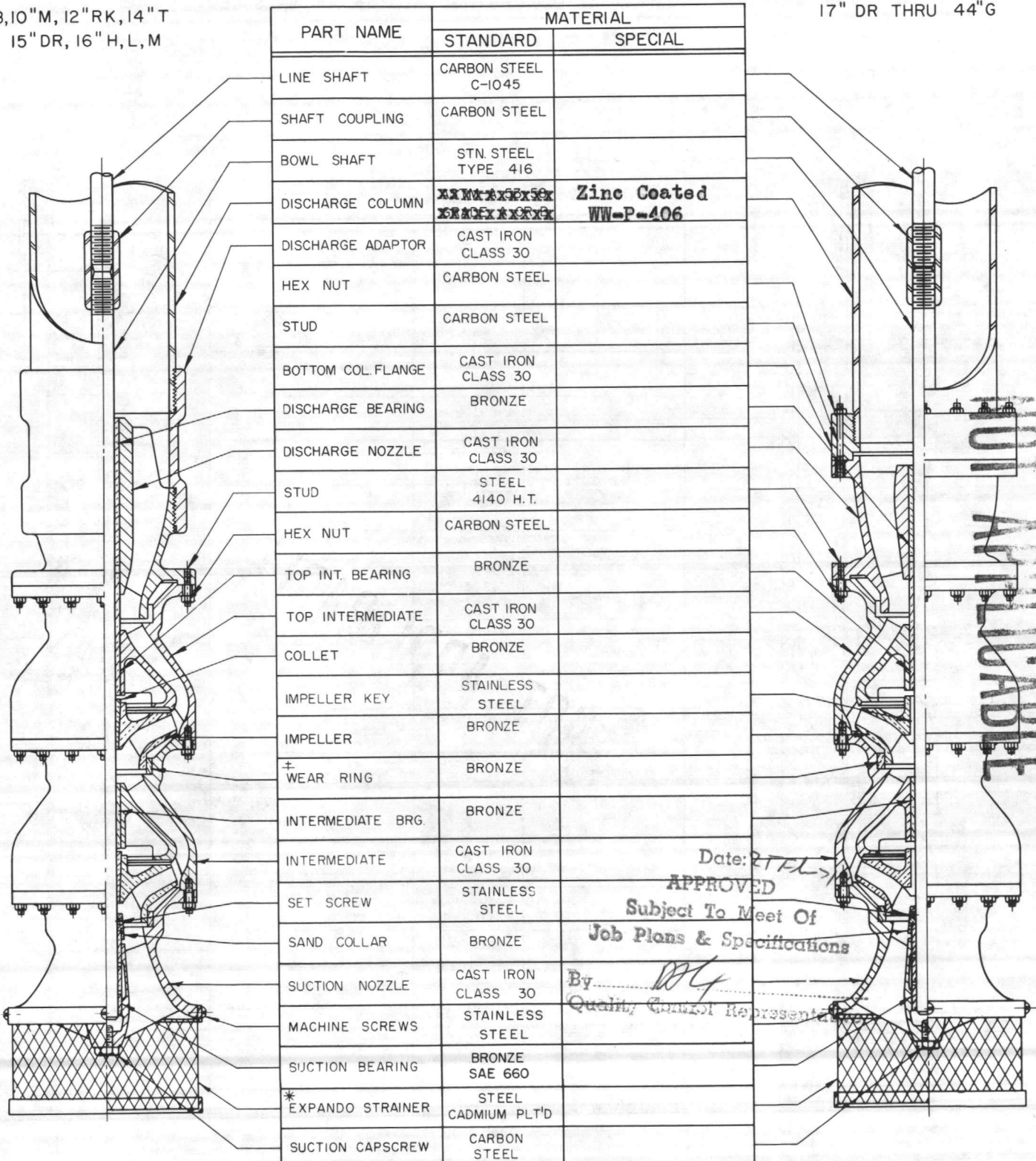


# VERTICAL TURBINE PUMP SHORT COUPLED

OPEN LINE SHAFT WITH DISCHARGE NOZZLE  
LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE

7" B, 10" M, 12" RK, 14" T  
15" DR, 16" H, L, M

17" DR THRU 44"G



PART NAME	MATERIAL	
	STANDARD	SPECIAL
LINE SHAFT	CARBON STEEL C-1045	
SHAFT COUPLING	CARBON STEEL	
BOWL SHAFT	STN. STEEL TYPE 416	
DISCHARGE COLUMN	<del>CAST IRON CLASS 30</del>	<b>Zinc Coated WW-P-406</b>
DISCHARGE ADAPTOR	CAST IRON CLASS 30	
HEX NUT	CARBON STEEL	
STUD	CARBON STEEL	
BOTTOM COL. FLANGE	CAST IRON CLASS 30	
DISCHARGE BEARING	BRONZE	
DISCHARGE NOZZLE	CAST IRON CLASS 30	
STUD	STEEL 4140 H.T.	
HEX NUT	CARBON STEEL	
TOP INT. BEARING	BRONZE	
TOP INTERMEDIATE	CAST IRON CLASS 30	
COLLET	BRONZE	
IMPELLER KEY	STAINLESS STEEL	
IMPELLER	BRONZE	
± WEAR RING	BRONZE	
INTERMEDIATE BRG.	BRONZE	
INTERMEDIATE	CAST IRON CLASS 30	
SET SCREW	STAINLESS STEEL	
SAND COLLAR	BRONZE	
SUCTION NOZZLE	CAST IRON CLASS 30	
MACHINE SCREWS	STAINLESS STEEL	
SUCTION BEARING	BRONZE SAE 660	
* EXPANDO STRAINER	STEEL CADMIUM PLT'D	
SUCTION CAPSCREW	CARBON STEEL	

NOT APPLICABLE

Date: 2/21/68  
APPROVED  
Subject To Meet Of  
Job Plans & Specifications  
By: [Signature]  
Quality Control Representative

\* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER  
± NOT FURNISHED ON 7" B



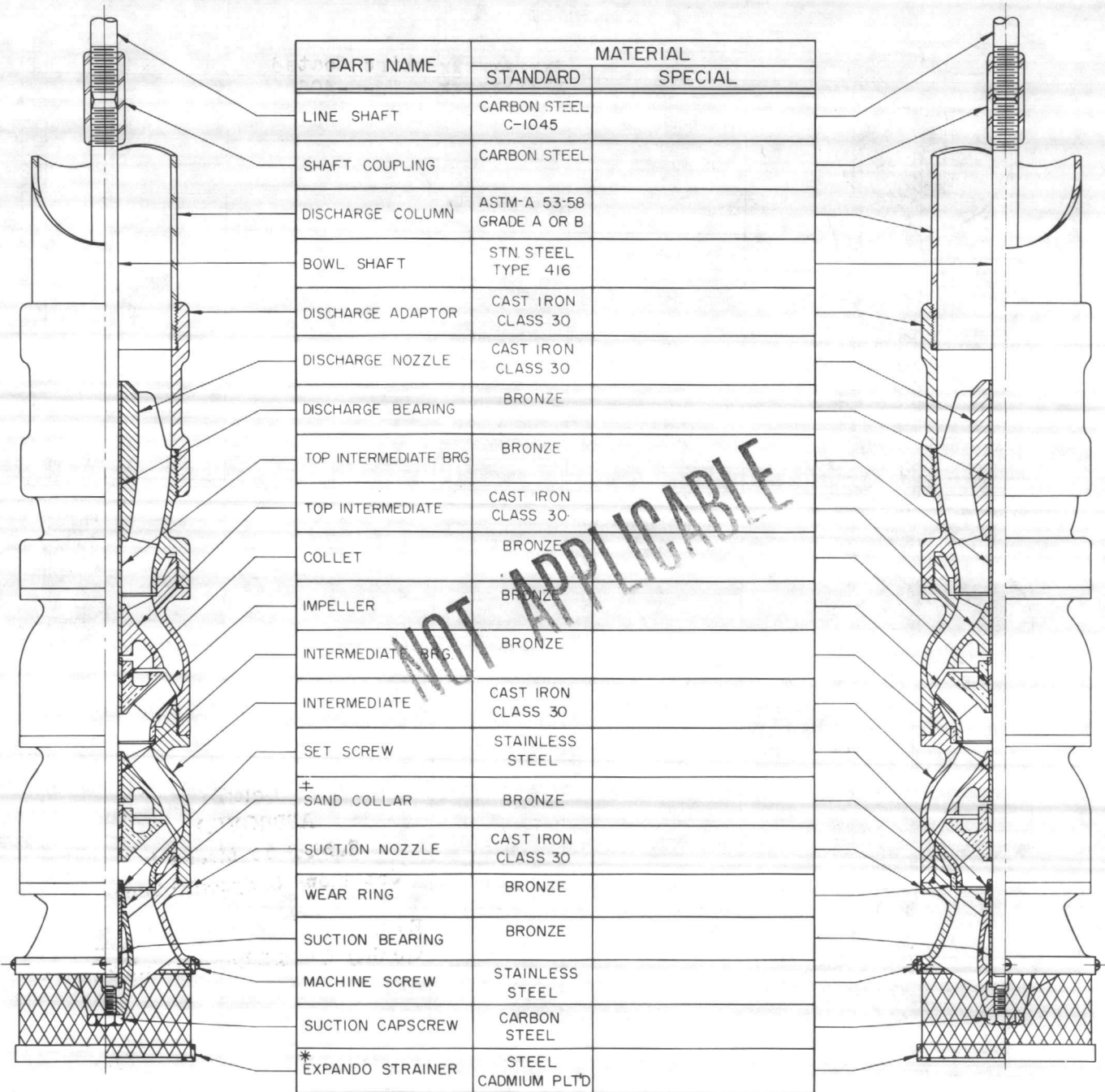


# VERTICAL TURBINE PUMP SHORT COUPLED

OPEN LINE SHAFT WITH DISCHARGE NOZZLE  
LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE

6" DR, RK, M

8" B, DR, PR, RK, T, UR  
10" RK, T, U-12" T, UR

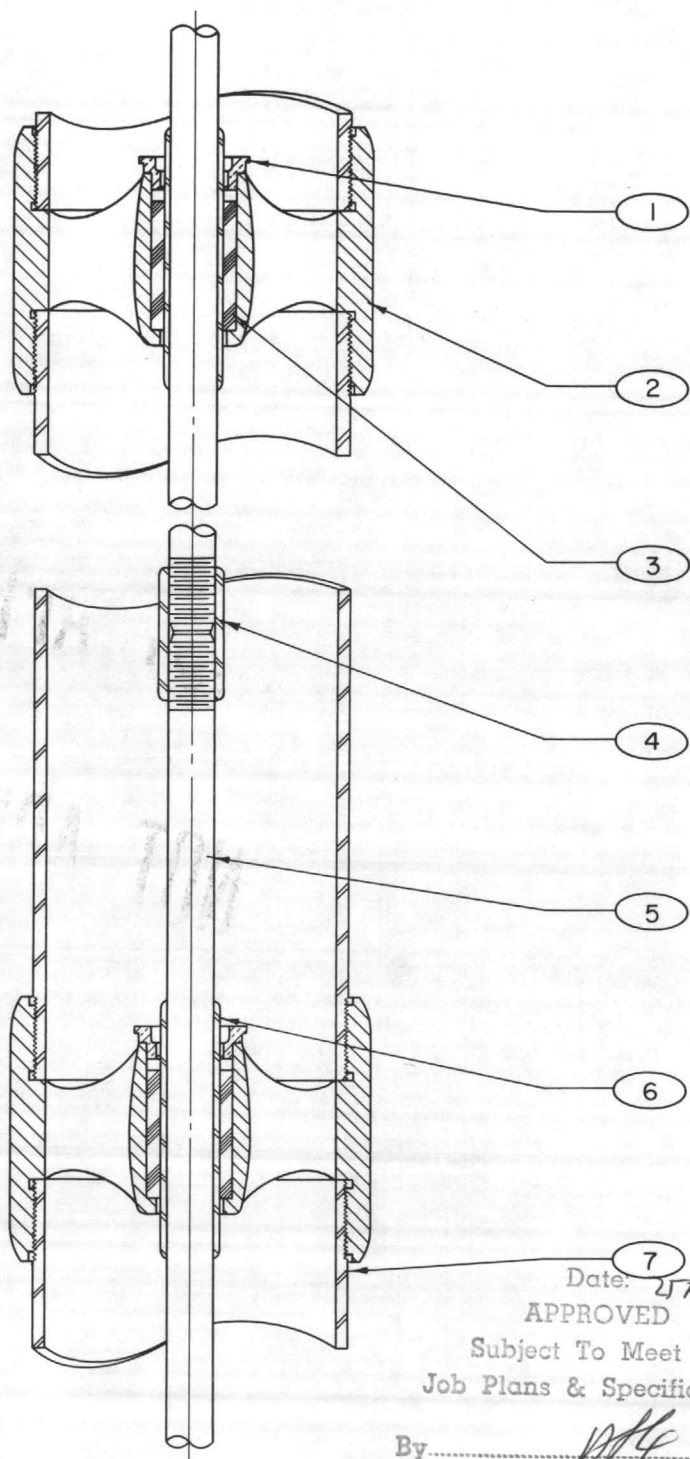


PART NAME	MATERIAL	
	STANDARD	SPECIAL
LINE SHAFT	CARBON STEEL C-1045	
SHAFT COUPLING	CARBON STEEL	
DISCHARGE COLUMN	ASTM-A 53-58 GRADE A OR B	
BOWL SHAFT	STN STEEL TYPE 416	
DISCHARGE ADAPTOR	CAST IRON CLASS 30	
DISCHARGE NOZZLE	CAST IRON CLASS 30	
DISCHARGE BEARING	BRONZE	
TOP INTERMEDIATE BRG	BRONZE	
TOP INTERMEDIATE	CAST IRON CLASS 30	
COLLET	BRONZE	
IMPELLER	BRONZE	
INTERMEDIATE BRG	BRONZE	
INTERMEDIATE	CAST IRON CLASS 30	
SET SCREW	STAINLESS STEEL	
± SAND COLLAR	BRONZE	
SUCTION NOZZLE	CAST IRON CLASS 30	
WEAR RING	BRONZE	
SUCTION BEARING	BRONZE	
MACHINE SCREW	STAINLESS STEEL	
SUCTION CAPSCREW	CARBON STEEL	
* EXPANDO STRAINER	STEEL CADMIUM PLTD	

\* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER  
± HARD RUBBER USED ON 8" BOWLS



DISCHARGE COLUMN ASSEMBLY  
SCREWED COUPLED - OPEN LINE SHAFT



Date: 25 Feb 71

APPROVED

Subject To Meet Of  
Job Plans & Specifications

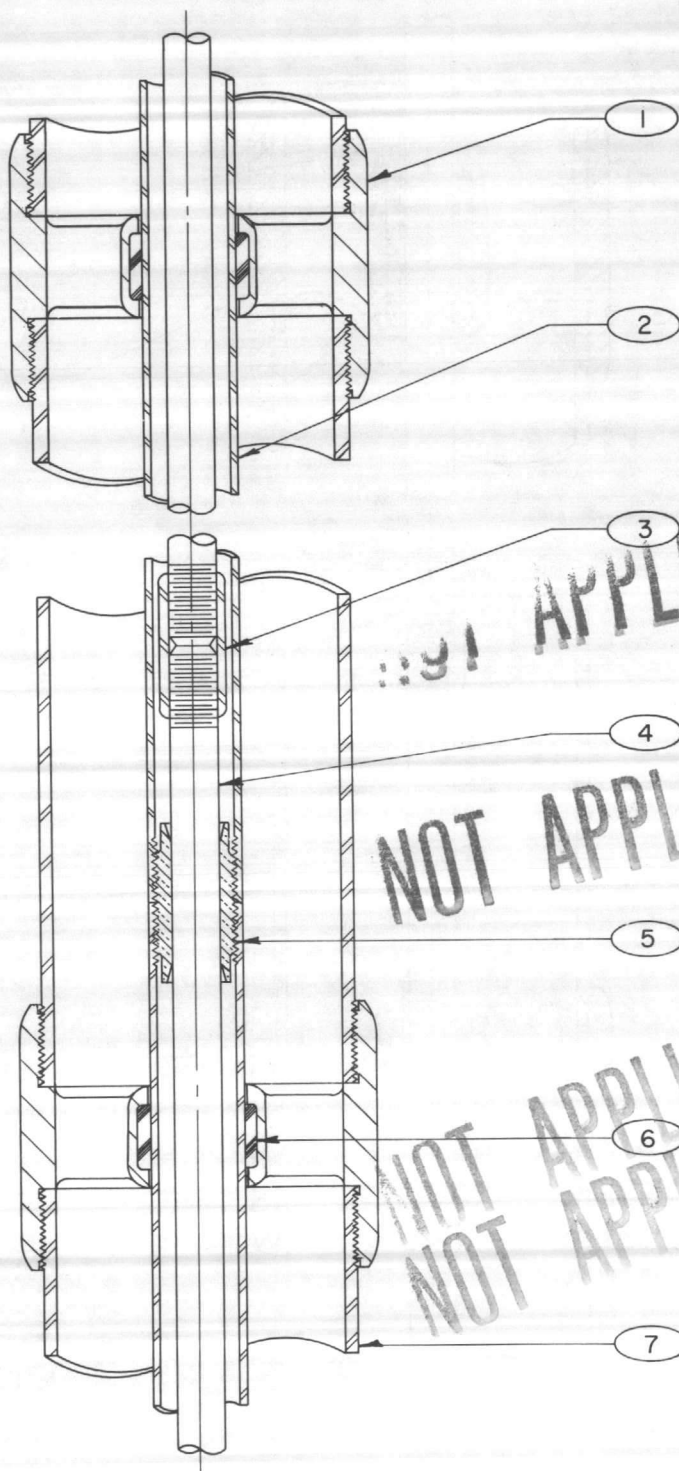
By: *[Signature]*  
Quality Control Representative

ITEM NO.	DESCRIPTION
1	LOCK RING
2	COMBINATION COUPLING
3	RUBBER BEARING
4	SHAFT COUPLING

ITEM NO.	DESCRIPTION
5	LINE SHAFT
6	MONEL SLEEVE
7	COLUMN PIPE

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.

DISCHARGE COLUMN ASSEMBLY  
SCREWED TYPE - ENCLOSED LINE SHAFT



ITEM NO.	DESCRIPTION
1	COMBINATION COUPLING
2	SHAFT TUBING
3	SHAFT COUPLING
4	LINE SHAFT

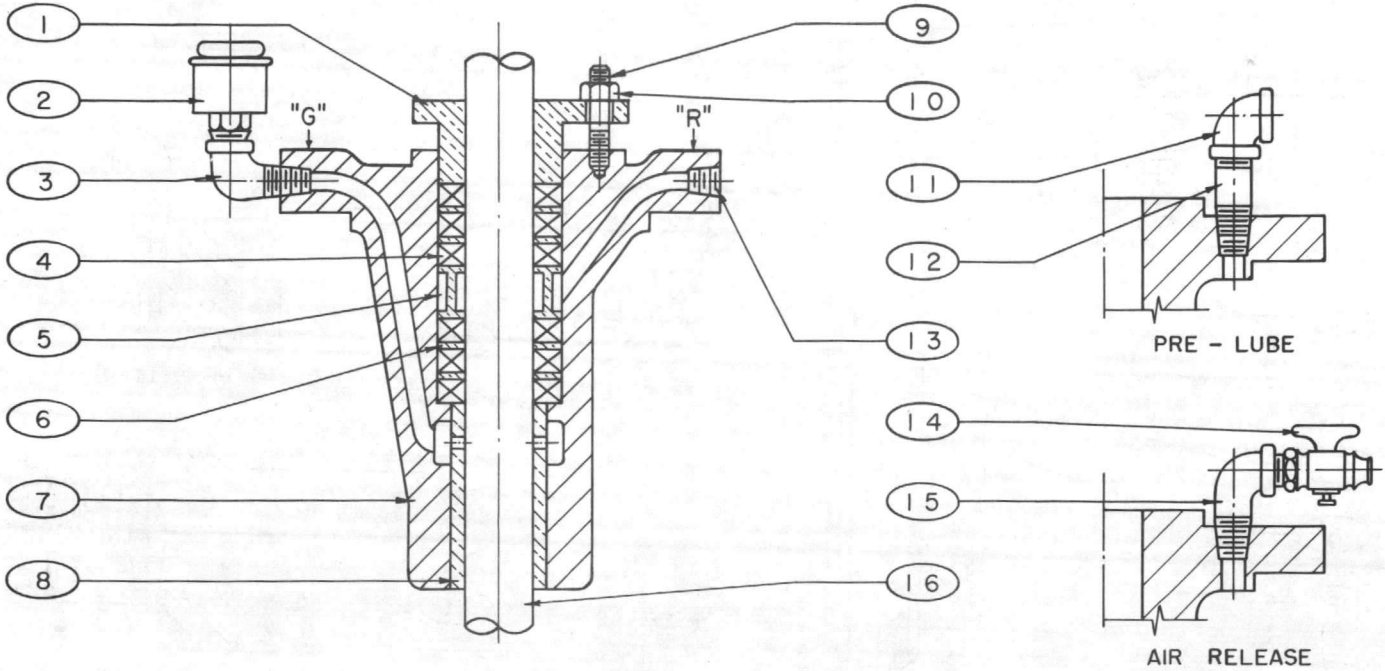
ITEM NO.	DESCRIPTION
5	SHAFT BOX
6	RUBBER BEARING
7	COLUMN PIPE

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.



# STUFFING BOX ASSEMBLY

## WATER LUBRICATED "RNL" TYPE



AIR RELEASE AND PRE-LUBE USED WHEN APPLICABLE

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	PACKING GLAND	9	STUD
2	GREASE CUP	10	NUT (HEX)
3	STREET ELBOW 90°	11	ELBOW 90°
4	PACKING	12	PIPE NIPPLE
5	LANTERN RING	13	RELIEF PIPE TO WASTE
6	SEPARATOR RING	14	PET COCK
7	STUFFING BOX	15	STREET ELBOW 90°
8	STUFFING BOX BEARING	16	LINE SHAFT

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.

Date:

APPROVED *25 FL 71*

ASSEMBLY INSTRUCTIONS Subject To Meet Of  
Job Plans & Specifications

By *PLC*  
Quality Control Representative

FOR SATISFACTORY OPERATION, PACK AS SHOWN ABOVE WITH SEPARATOR RINGS BETWEEN PACKING RINGS. AFTER INSTALLING LOWER THREE PACKING RINGS AND LANTERN RING, IT WOULD BE ADVISABLE TO TAMP THIS LOWER SET TO RELIEVE THE FORCE REQUIRED TO TAMP IT WITH PACKING GLAND AND TOP THREE RINGS.

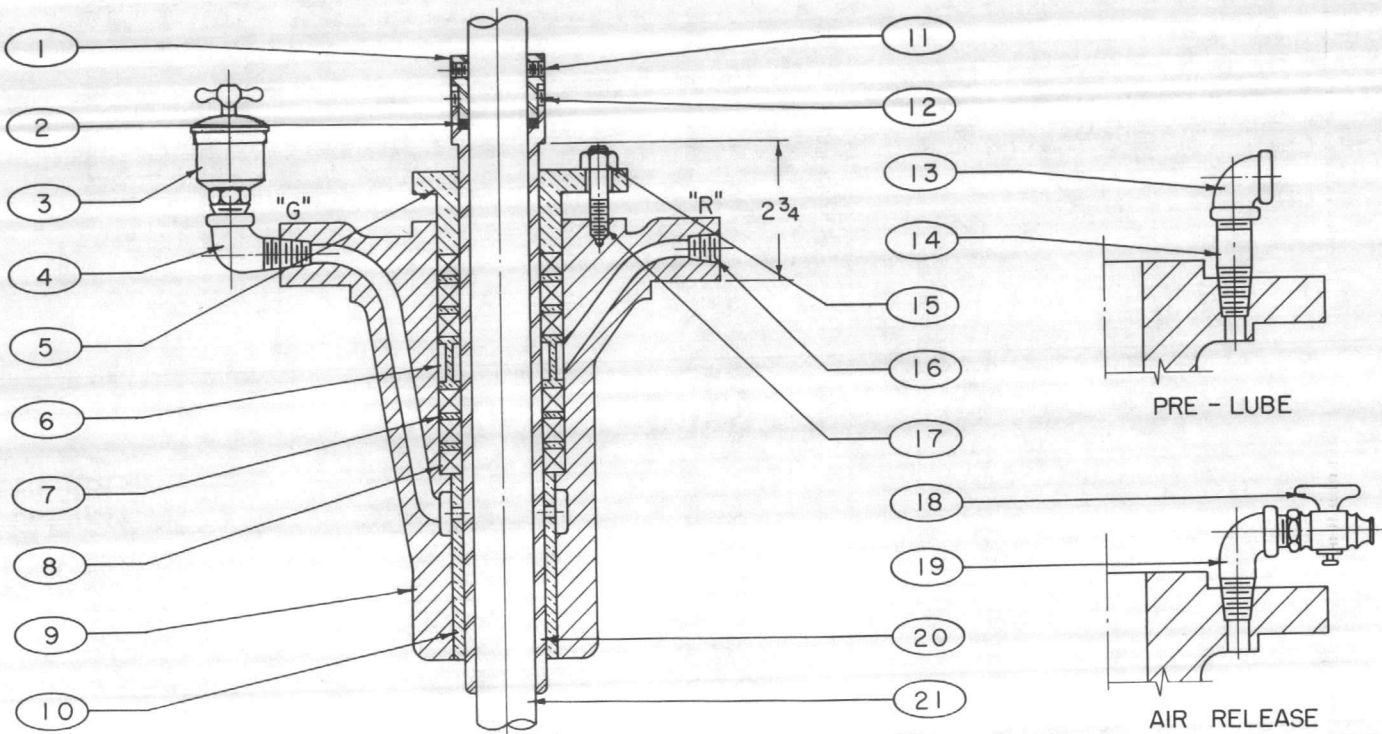
FOR ORIGINAL INSTALLATION, FILL GREASE CUP ONCE AND DISCHARGE CONTENTS INTO BOX. REFILL AND APPLY GREASE DURING OPERATION AT RATE OF ONE TURN EVERY 24 HOURS.

ON ORIGINAL INSTALLATION, THE PACKING GLAND SHOULD BE TIGHTENED WELL TO SET PACKING AND THEN LOOSENEED FOR INITIAL OPERATION. AFTER SEVERAL HOURS' OPERATION AND WITH UNIT RUNNING, THE PACKING GLAND SHOULD BE GRADUALLY TIGHTENED TO REDUCE LEAKAGE TO A MINIMUM. "DO NOT TIGHTEN TO STOP ALL LEAKAGE - PACKING IS TO THROTTLE LEAKAGE - NOT STOP IT."

IF, AFTER PACKING ADJUSTMENT, THE TOP THREE RINGS TEND TO RUN DRY OR HOT A VALVE SHOULD BE INSTALLED IN THE RELIEF LINE TO MAINTAIN ENOUGH BACK PRESSURE TO FORCE LEAKAGE THROUGH THIS PACKING SET. THE LEAKAGE MAY BE SO ADJUSTED THROUGHOUT THE LIFE OF THE PACKING.



# STUFFING BOX ASSEMBLY WATER LUBRICATED "RNL" TYPE WITH SLEEVE



ITEM 3 & 4 NOT FURNISHED ON CONDENSATE SERVICE. THIS CONNECTION USED FOR RELIEF, AND ITEM 16 USED FOR WATER SEAL INLET.

AIR RELEASE AND PRE-LUBE USED WHEN APPLICABLE.

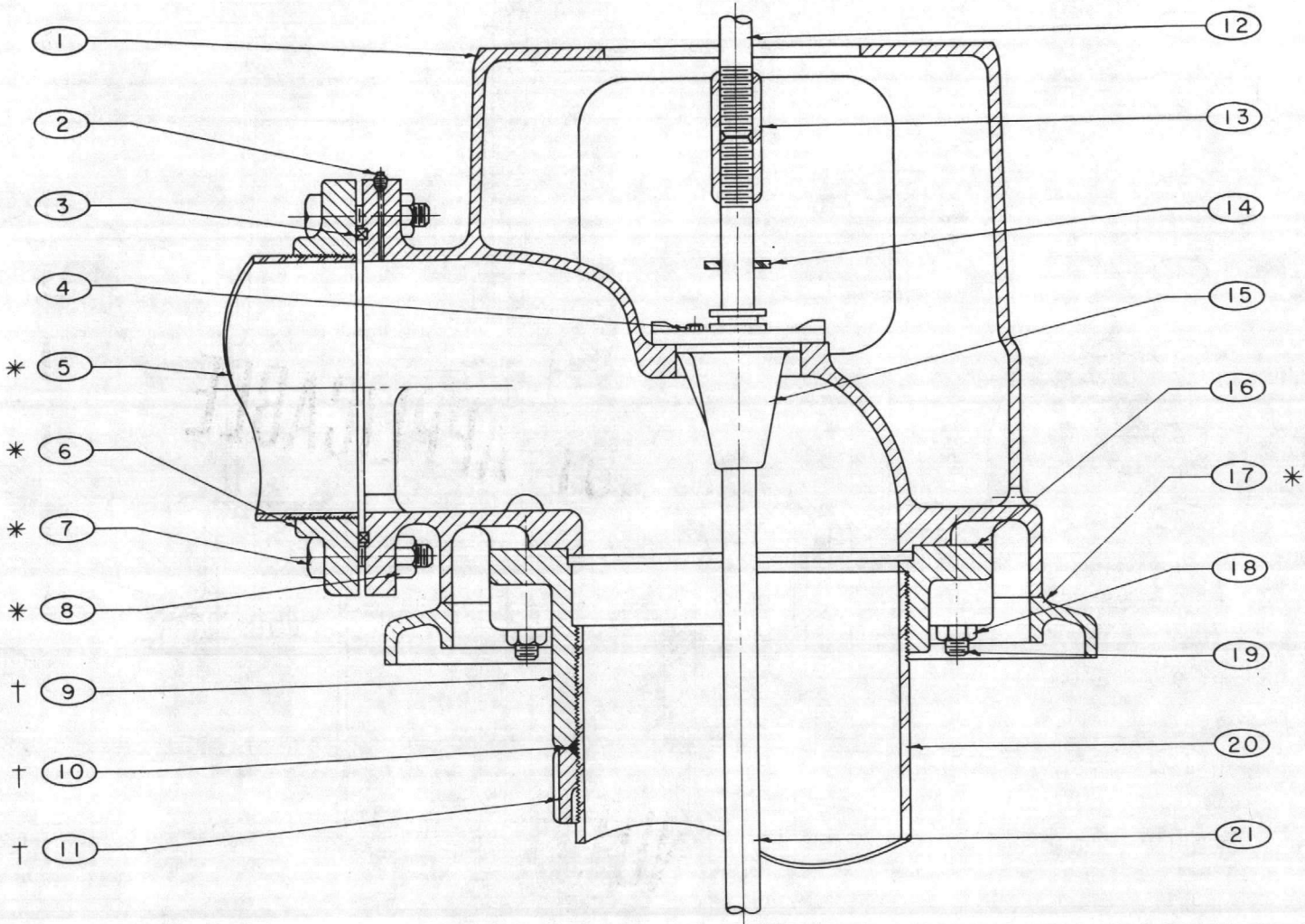
ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	O RING RETAINER	11	SET SCREW, RETAINER
2	O RING	12	SET SCREW, SLEEVE
3	GREASE CUP	13	ELBOW 90°
4	STREET ELBOW 90° 1/4	14	PIPE NIPPLE
5	PACKING GLAND	15	HEX NUT
6	LANTERN RING	16	RELIEF, PIPE TO WASTE 1/4
7	SEPARATOR RING	17	STUD
8	PACKING	18	PET COCK
9	STUFFING BOX	19	STREET ELBOW 90°
10	STUFFING BOX BEARING	20	SLEEVE
		21	LINE SHAFT

IN ORDERING REPLACEMENT PARTS, SPECIFY PARTS DESCRIPTION AND PUMP SERIAL NO.

### ASSEMBLY INSTRUCTIONS

- STEP 1. SLIDE TWO SEPARATOR RINGS, ONE LANTERN RING, TWO SEPARATOR RINGS IN THAT ORDER ON SHAFT SLEEVE. SLIDE SLEEVE OVER SHAFT UNTIL BOTTOM END ENGAGES STUFFING BOX BEARING.
- STEP 2. ALTERNATELY INSERT PACKING, SEPARATOR RINGS AND LANTERN RING INTO STUFFING BOX BORE AS SHOWN ABOVE.
- STEP 3. LOCATE SLEEVE AT 2 3/4" AS SHOWN ABOVE. INSTALL O RING AND O RING RETAINER. NOW SECURE RETAINER TO SHAFT AND SLEEVE TO RETAINER WITH SET SCREWS.
- STEP 4. FOR ORIGINAL INSTALLATION, THE PACKING GLAND SHOULD BE TIGHTENED WELL TO SET PACKING AND THEN LOOSENED FOR INITIAL OPERATION. FILL GREASE CUP ONCE AND DISCHARGE CONTENTS INTO BOX. REFILL AND APPLY GREASE DURING OPERATION AT RATE OF ONE TURN EVERY 24 HOURS. AFTER SEVERAL HOURS OPERATION AND WITH UNIT RUNNING, THE PACKING GLAND SHOULD BE GRADUALLY TIGHTENED TO REDUCE LEAKAGE TO A MINIMUM. "DO NOT TIGHTEN TO STOP ALL LEAKAGE - PACKING IS TO THROTTLE LEAKAGE - NOT STOP IT".
- STEP 5. IF, AFTER PACKING ADJUSTMENT, THE TOP THREE RINGS TEND TO RUN DRY OR HOT, A VALVE SHOULD BE INSTALLED IN THE RELIEF LINE TO MAINTAIN ENOUGH BACK PRESSURE TO FORCE LEAKAGE THROUGH THIS PACKING SET. THE LEAKAGE MAY BE SO ADJUSTED THROUGHOUT THE LIFE OF THE PACKING.

TYPE RF DISCHARGE HEAD  
OPEN LINE SHAFT



\* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER

ITEM NO.	DESCRIPTION
1	DISCHARGE HEAD
2	PIPE PLUG, PRESSURE GAUGE
3	PACKING, COMPANION FLANGE
4	CAPSCREW, STUFFING BOX
5	DISCHARGE PIPE
6	COMPANION FLANGE
7	MACHINE BOLT, COMPANION FLG.
8	HEX NUT, COMPANION FLANGE
9	ADJ. TOP COLUMN FLANGE
10	PACKING
11	PACKING RING

Date: 25 Feb 71  
APPROVED  
† USED FOR UNDERGROUND DISCHARGE

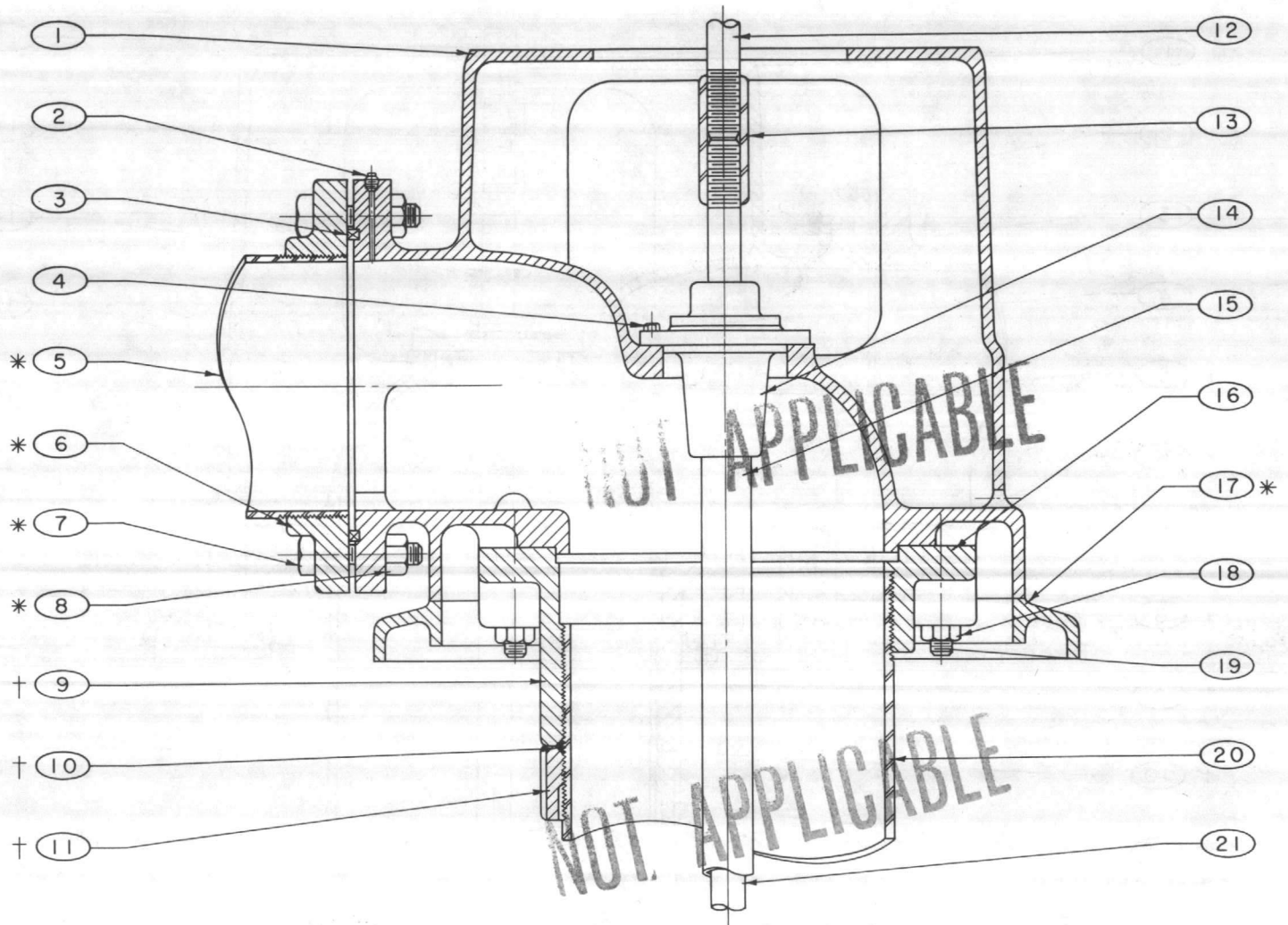
ITEM NO	Job Plans & Specifications	DESCRIPTION
12	By: [Signature]	MOTOR DRIVE SHAFT
13	Quality Control [Signature]	HEAD COUPLING
14		WATER SLINGER
15		STUFFING BOX, ASSEMBLY
16		TOP COLUMN FLANGE
17		BASE PLATE
18		HEX NUT
19		STUD
20		TOP COLUMN PIPE
21		LINE SHAFT, TOP PIECE

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.





# TYPE RF DISCHARGE HEAD ENCLOSED LINE SHAFT



\* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER

ITEM NO.	DESCRIPTION
1	DISCHARGE HEAD
2	PIPE PLUG, PRESSURE GAUGE
3	PACKING, COMPANION FLANGE
4	CAPSCREW, STUFFING BOX
5	DISCHARGE PIPE
6	COMPANION FLANGE
7	MACHINE BOLT, COMPANION FLG.
8	HEX NUT, COMPANION FLANGE
9	ADJ. TOP COLUMN FLANGE
10	PACKING
11	PACKING RING

† USED FOR UNDERGROUND DISCHARGE

ITEM NO.	DESCRIPTION
12	MOTOR DRIVE SHAFT
13	HEAD COUPLING
14	STUFFING BOX (ASSEMBLY)
15	TUBING
16	TOP COLUMN FLANGE
17	BASE PLATE
18	HEX NUT
19	STUD
20	TOP COLUMN PIPE
21	LINE SHAFT, TOP PIECE

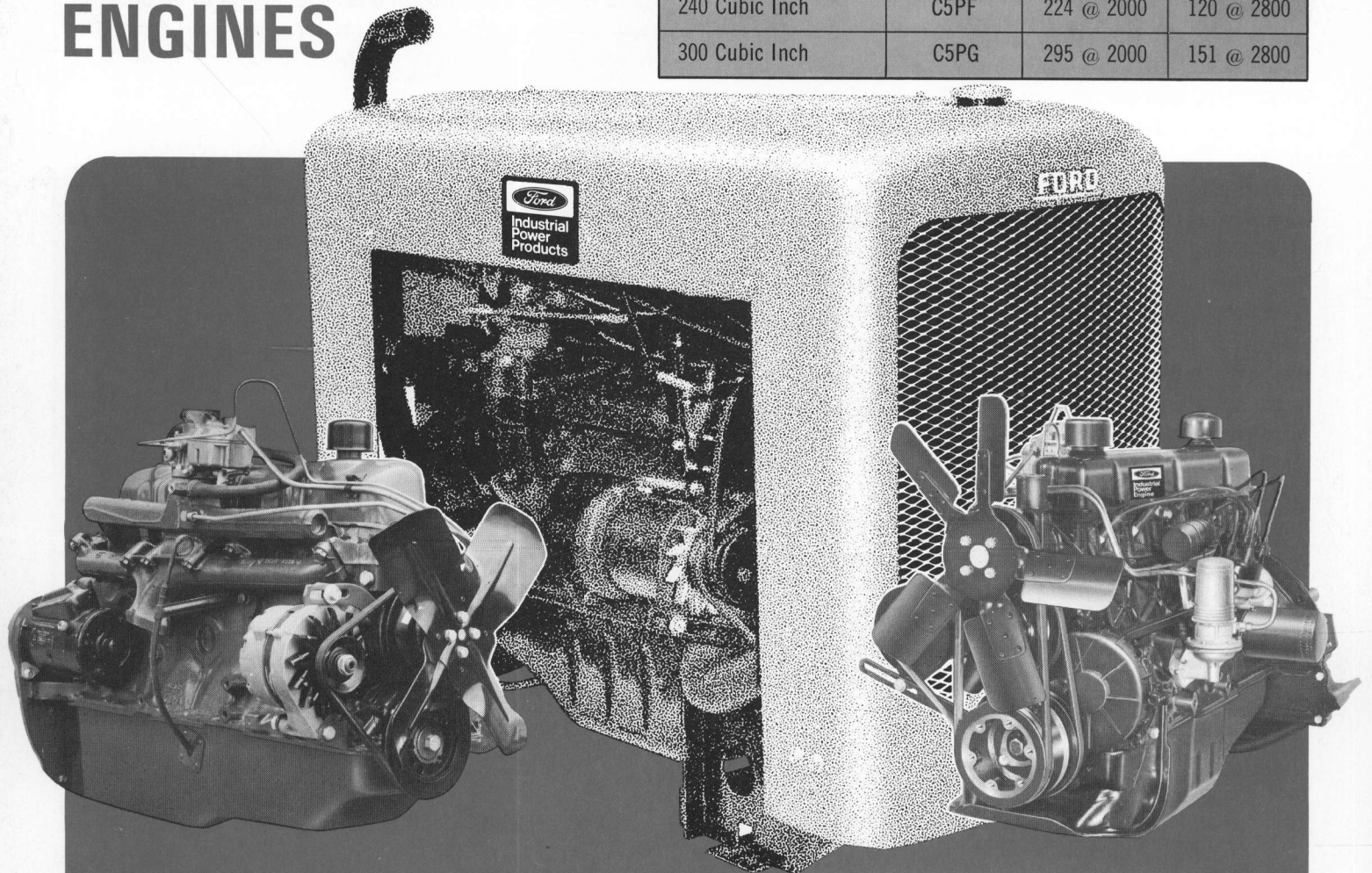
IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.

# FORD

## INDUSTRIAL ENGINES

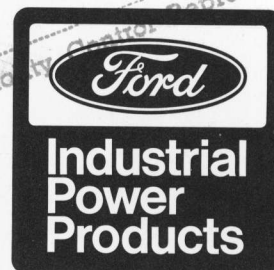
### 6-CYLINDER GASOLINE

DISPLACEMENT	MODEL NUMBER	GROSS TORQUE AT RPM	GROSS HORSEPOWER AT RPM
200 Cubic Inch	200GF	191 @ 2000	99 @ 2800
240 Cubic Inch	C5PF	224 @ 2000	120 @ 2800
300 Cubic Inch	C5PG	295 @ 2000	151 @ 2800



FORD 6-CYLINDER INDUSTRIAL ENGINES ARE DESIGNED TO MEET THE DEMAND FOR COMPACT, HIGH OUTPUT POWER PLANTS. OUTSTANDING DURABILITY results directly from their ability to handle industrial loads easily at low governed engine speeds. ECONOMICAL OPERATION goes hand in hand with short-stroke, low-friction design . . . high efficiency combustion chamber design . . . full-flow, filtered lubrication system . . . and other service-saving features to help keep operating and maintenance expenses to a minimum. MORE DEPENDABLE PERFORMANCE results from industrial duty design features that provide reserve for handling intermittent peak demands as well as normal loads day after day.

- Date: 25 Feb 71
- OVERHEAD VALVES
  - LARGE BORE, SHORT STROKE
  - DEEP, RIGID BLOCK
  - HIGH COMPRESSION
  - REGULAR FUEL
- By: [Signature] Job Representative





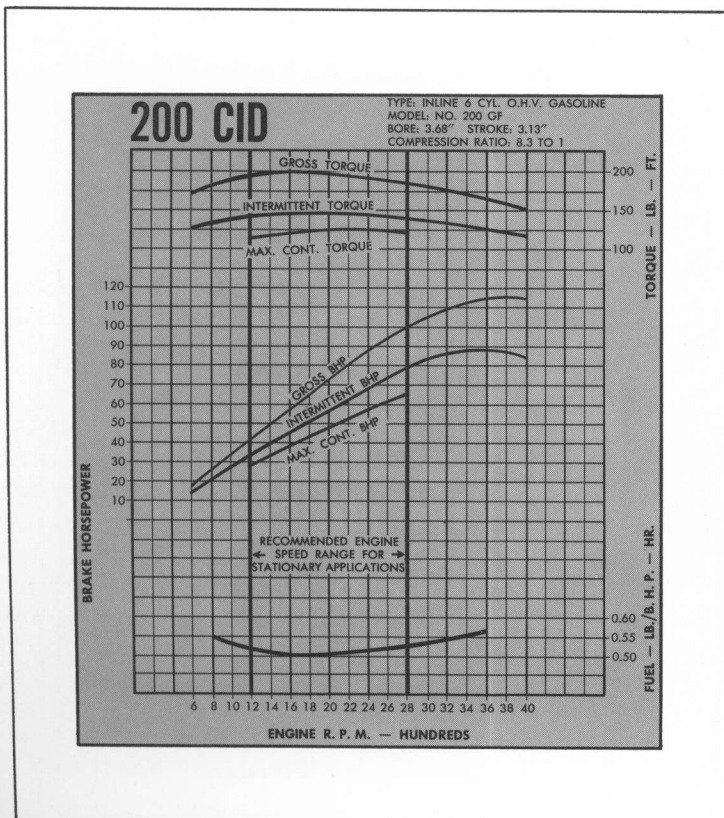
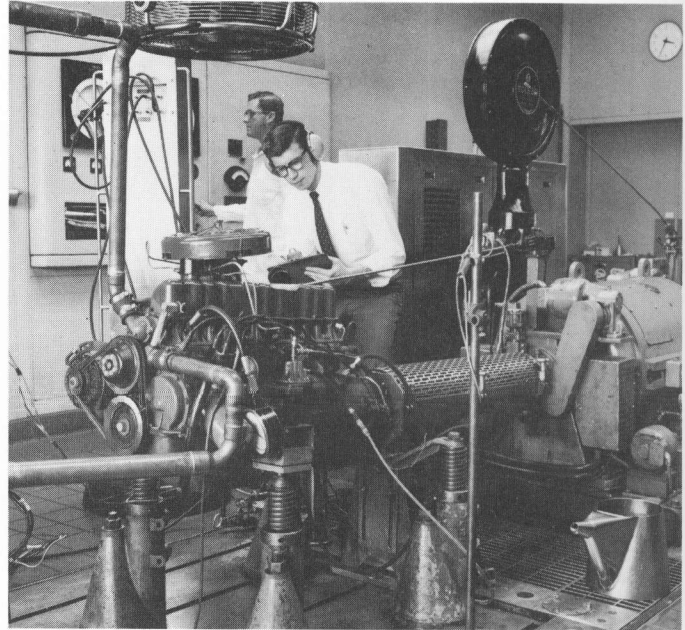
# POWER SPECIFICATIONS . . .

## SOME NOTES ABOUT THE POWER CURVES . . .

**GROSS OUTPUT** — These curves are corrected to 29.92" Hg. and 60° F. dry air. They are for a complete engine assembly less fan, generator and air cleaner. The engine is run with dynamometer exhaust system and optimum spark and fuel settings for best power. **ENGINE INSTALLED OUTPUT (INTERMITTENT)** — These curves are corrected to 29.00" Hg. and 85° F. dry air. They are for a complete engine assembly less fan, but including generator, air cleaner and muffler.\* The engine is run with automatic spark and fuel settings. This is the maximum BHP and torque available for intermittent operation. **MAXIMUM CONTINUOUS OUTPUT** — These curves are corrected to 29.00" Hg. and 85° F. dry air. They represent the maximum BHP and torque recommended for continuous operation of the engines equipped as described for Installed Output. **ACCESSORIES** — The curves should be derated to compensate for any accessories which are added such as hydraulic pumps, air compressors, etc. See tables accompanying power curves for cooling fan power requirements.

**SEVERE OPERATING CONDITIONS**—For each 1,000 feet above sea level that the unit is to be operated, subtract 3% from the horsepower and torque curves. For each 10° F. rise in surrounding air temperature—above that specified in the power curve charts—subtract 1%.

\*Max. of 2" Hg. Back Pressure.



## 200 CID SIX \*

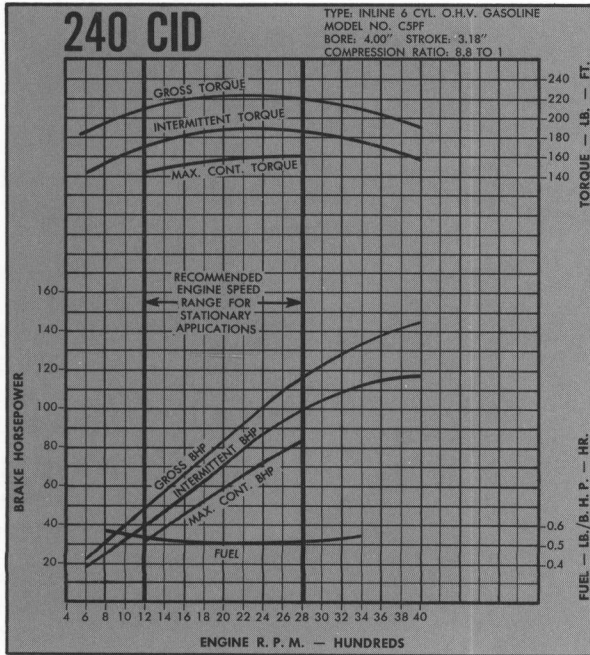
RPM	1200	1600	2000	2400	2800
Gross BHP	42	57	72	86	99
Gross Torque	183	188	191	192	185
Engine Installed BHP (Intermittent)	31	43	56	68	78
Engine Installed Torque (Intermittent)	135	142	146	147	144
Maximum Continuous BHP	27	37	47	58	66
Maximum Continuous Torque	116	122	125	127	122
<b>COOLING FAN POWER REQUIREMENTS (BHP)</b>					
Engine Models	.1	.2	.3	.8	2.0
Power Unit Models	.6	1.4	2.7	4.7	7.4



# Standard Engine Assemblies and Power Units



## 240 CID SIX

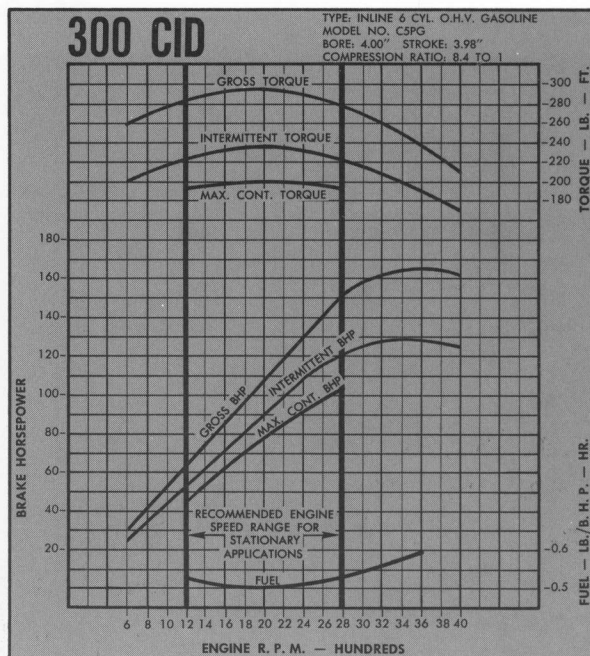


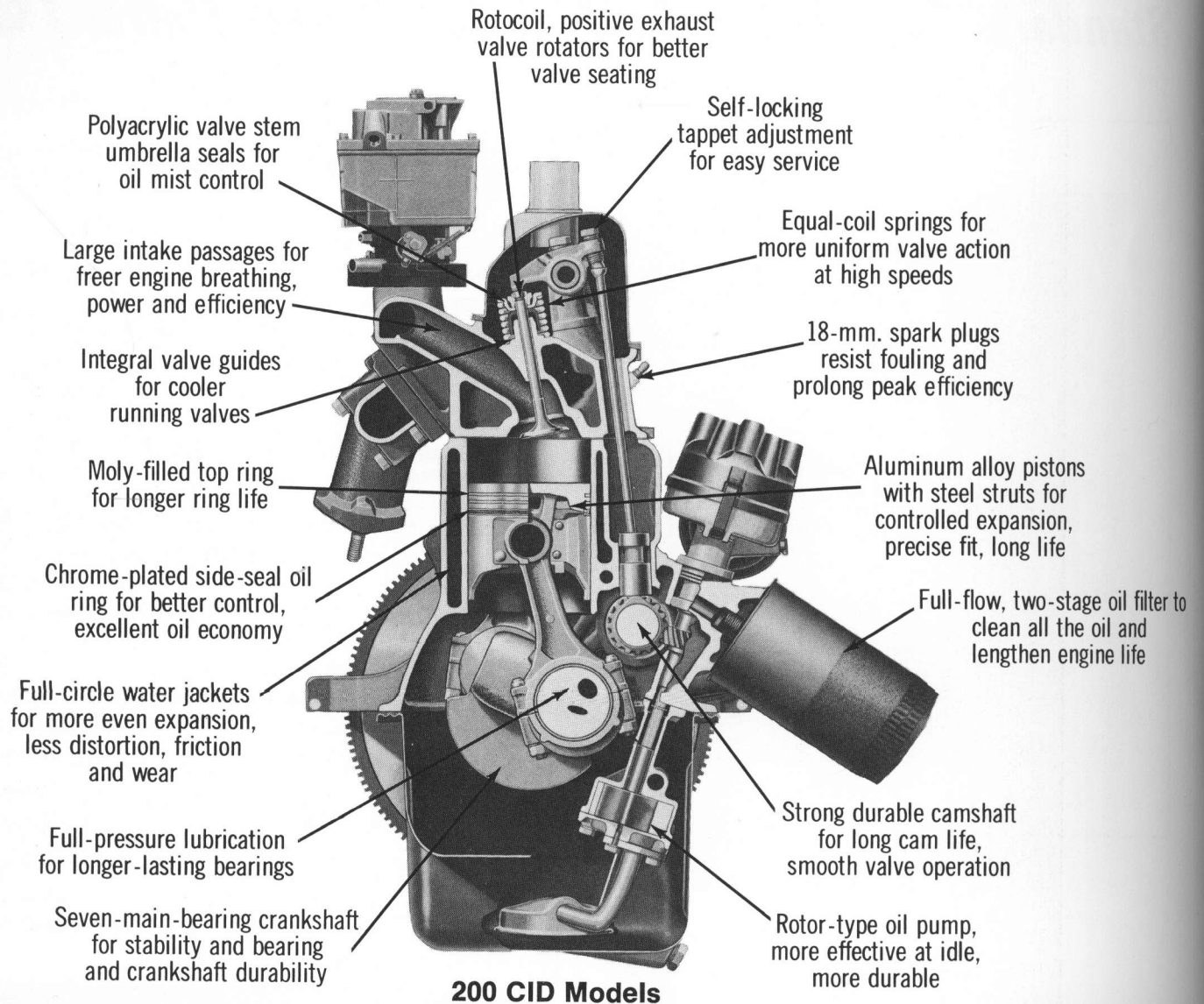
RPM	1200	1600	2000	2400	2800
Gross BHP	48	68	87	104	120
Gross Torque	212	220	224	225	223
Engine Installed BHP (Intermittent)	39	54	71	87	100
Engine Installed Torque (Intermittent)	169	180	187	189	186
Maximum Continuous BHP	33	45	60	73	84
Maximum Continuous Torque	142	151	157	160	159
<b>COOLING FAN POWER REQUIREMENTS (BHP)</b>					
Engine Models	.2	.6	1.2	2.0	3.1
Power Unit Models	.7	1.6	3.1	5.4	8.5

## 300 CID SIX



RPM	1200	1600	2000	2400	2800
Gross BHP	64	86	109	132	151
Gross Torque	281	290	295	294	282
Engine Installed BHP (Intermittent)	53	71	90	108	120
Engine Installed Torque (Intermittent)	225	234	237	232	222
Maximum Continuous BHP	45	62	77	90	101
Maximum Continuous Torque	194	200	200	198	194
<b>COOLING FAN POWER REQUIREMENTS (BHP)</b>					
Engine Models	.2	.6	1.2	2.0	3.1
Power Unit Models	.7	1.6	3.1	5.4	8.5





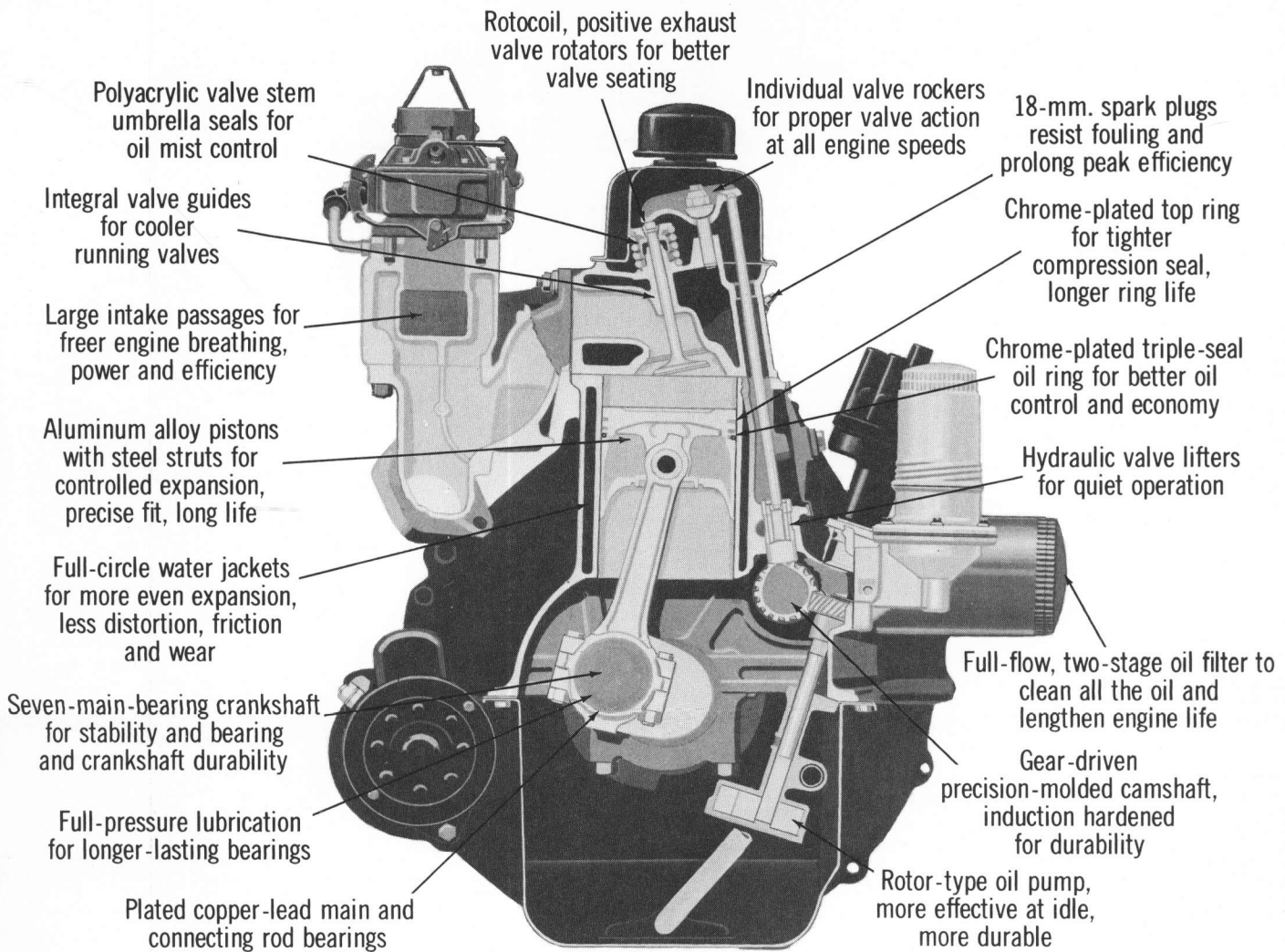
## STANDARD

**STANDARD MODEL  
ENGINE ASSEMBLIES  
INCLUDE:**

- FLYWHEEL AND RING GEAR
- DISTRIBUTOR ASSEMBLY
- IGNITION COIL ASSEMBLY
- SPARK PLUGS AND CABLES
- STARTING MOTOR
- GENERATOR OR ALTERNATOR AND DRIVE BELT
- MANIFOLDS—INTAKE AND EXHAUST
- FAN ASSEMBLY (SUCTION TYPE) AND DRIVE BELT
- CARBURETOR ASSEMBLY
- FUEL PUMP
- CRANKSHAFT DAMPER AND PULLEY
- OIL PUMP
- OIL FILTER ASSEMBLY
- OIL FILLER AND BREATHER CAP
- WATER PUMP ASSEMBLY
- THERMOSTAT
- WATER OUTLET CONNECTION
- ENGINE FRONT SUPPORT\*

\*240/300 CID Models Only

# FEATURES . . . . .



**240/300 CID Models**

# EQUIPMENT

**STANDARD MODEL POWER UNITS INCLUDE THE FOLLOWING ADDITIONAL ITEMS:**



- SHEETMETAL HOUSING
- GENERATOR OR ALTERNATOR REGULATOR
- SKID OR FOOT-TYPE MOUNTING\*\*
- INSTRUMENT PANEL, INCLUDING:
  - IGNITION SWITCH
  - STARTER SWITCH
  - AMMETER OR CHARGING WARNING LIGHT
  - OIL PRESSURE GAUGE OR WARNING LIGHT
  - CARBURETOR CHOKE CONTROL
  - THROTTLE CONTROL
  - WATER TEMPERATURE GAUGE
- WIRING HARNESS
- EXHAUST PIPE ASSEMBLY
- MECHANICAL GOVERNOR
- AIR CLEANER ASSEMBLY
- RADIATOR ASSEMBLY

\*\*200 CID Power Units Available Only as Skid-Mounted.



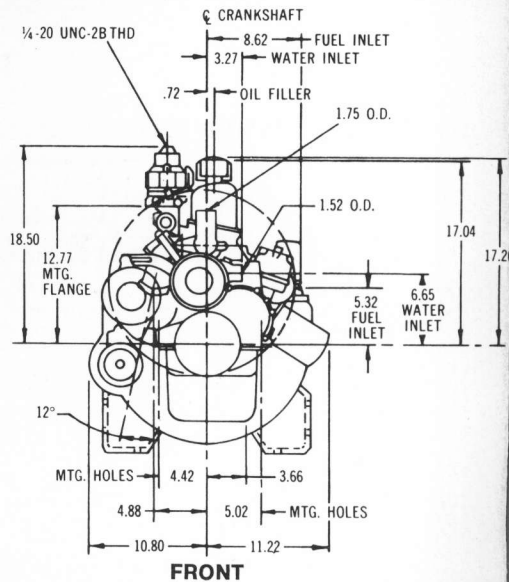
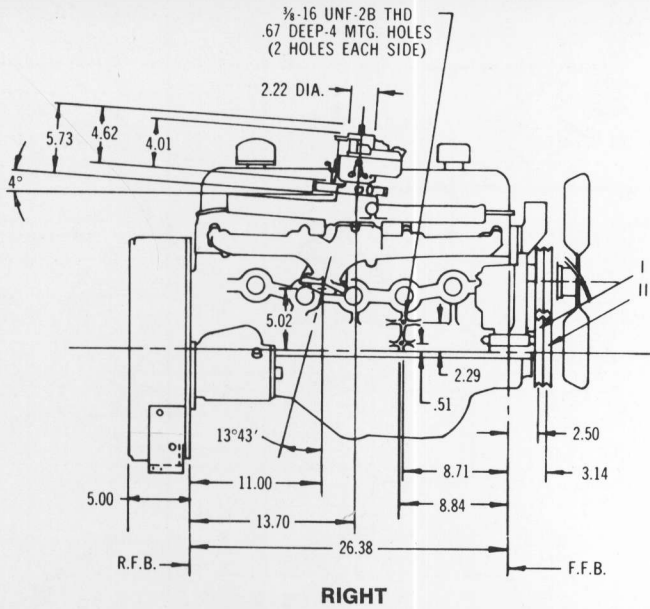
# Standard Engine Assemblies and Power Units

		200 CID	240 CID	300 CID
<b>ENGINE TYPE</b>	In-Line, 6-Cylinder, Overhead Valve	X	X	X
<b>FUEL</b>	Gasoline, Regular Grade	X	X	X
<b>BORE AND STROKE</b>	3.68" x 3.12"	X		
	4.00" x 3.18"		X	
	4.00" x 3.98"			X
<b>DISPLACEMENT</b>	200 Cubic Inches	X		
	240 Cubic Inches		X	
	300 Cubic Inches			X
<b>MEAN COMPRESSION RATIO</b>	8.3:1	X		
	8.8:1		X	
	8.4:1			X
<b>CYLINDER HEADS</b>	High-Grade Cast Iron	X	X	X
<b>CYLINDERS AND CRANKCASE</b>	Cast Iron—Cast Integral	X	X	X
<b>CYLINDER WALL FINISH</b>	Controlled Quality Finish for Uniform Oil Film	X	X	X
<b>PISTONS</b>	Aluminum Alloy, Autothermic Type, Deep Skirt, Cam Ground, Tin-Plated	X	X	X
<b>PISTON RINGS</b>	<b>Top Compression Ring</b> —Cast Iron Alloy, Molybdenum-Filled Groove	X		
	Chrome-Plated Cast Iron Alloy		X	X
	<b>Second Compression Ring</b> —Cast Iron Alloy, Oxide-Coated with Scraper Groove	X		
	Cast Iron Alloy, Phosphate-Coated, with Scraper Groove		X	X
	<b>Oil Control Ring</b> —Steel, Chrome-Plated Rails, with Steel Expander Spacer	X	X	X
<b>CRANKSHAFT</b>	Precision-Molded Alloy Cast Iron, with 7-Bearing Support	X	X	X
<b>MAIN BEARINGS</b>	Replaceable, Steel-Backed, Tin-Plated Aluminum Alloy, Selective Fit	X		
	Replaceable, Steel-Backed, Copper-Lead Alloy, Selective Fit		X	X
<b>CONNECTING ROD BEARINGS</b>	Replaceable, Steel-Backed, Copper-Lead Alloy, Selective Fit	X	X	X
<b>CAMSHAFT</b>	4-Bearing, Precision-Molded Special Alloy Iron, Induction-Hardened	X	X	X
<b>VALVES—INTAKE</b>	S.A.E. #1047 Aluminized Steel	X	X	X
<b>VALVES—EXHAUST</b>	S.A.E. #21-4N Aluminized Steel	X		
	S.A.E. #21-4N Aluminized Steel, Stellite-Faced		X	X
<b>VALVE ROTATION—INTAKE</b>	Ford Free-Turn	X	X	X
<b>VALVE ROTATION—EXHAUST</b>	Positive Roto-Coil Type	X	X	X
<b>VALVE LIFTERS</b>	Hydraulic	X	X	X
<b>LUBRICATION SYSTEM</b>	Full Pressure to All Bearings, Full-Flow Filter, Rotor-Type Internal Oil Pump	X	X	X
<b>OIL CAPACITY</b>	4.5 Quarts Dry—3.5 Quarts Refill	X		
	7 Quarts Dry—6 Quarts Refill		X	X
<b>SPARK PLUGS</b>	18 mm.	X	X	X
<b>ELECTRICAL SYSTEM</b>	12 Volt	X	X	X
<b>IGNITION SYSTEM</b>	Battery	X	X	X
<b>STARTER</b>	Positive-Engagement Type	X	X	X
<b>DISTRIBUTOR</b>	Centrifugal-Vacuum Advance	X	X	X
<b>FIRING ORDER</b>	1-5-3-6-2-4	X	X	X
<b>CHARGING SYSTEM</b>	Alternator: 38 Ampere, 570 Watt	X		
	Generator: 30 Ampere, 450 Watt		X	X
<b>CARBURETOR</b>	1-Venturi, Downdraft	X	X	X
<b>FUEL PUMP</b>	Mechanical Diaphragm Type	X	X	X
<b>COOLING SYSTEM</b>	Series Type	X	X	X
<b>TEMPERATURE CONTROL</b>	Thermostat in Coolant Outlet Connection	X	X	X
<b>WATER PUMP</b>	Prelubricated Centrifugal Type	X	X	X
<b>ENGINE WEIGHT—DRY</b>	337 lb. (Fan to Flywheel, Less Clutch Housing)	X		
	460 lb. (Fan to Flywheel, Less Clutch Housing)		X	
	473 lb. (Fan to Flywheel, Less Clutch Housing)			X

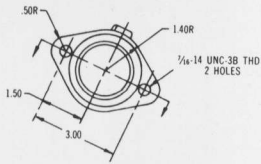
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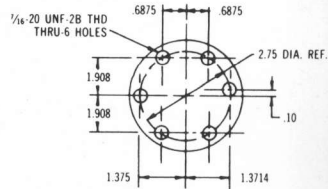
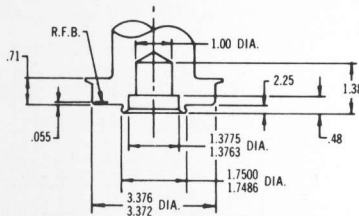
# INSTALL



**200 CUBIC I**

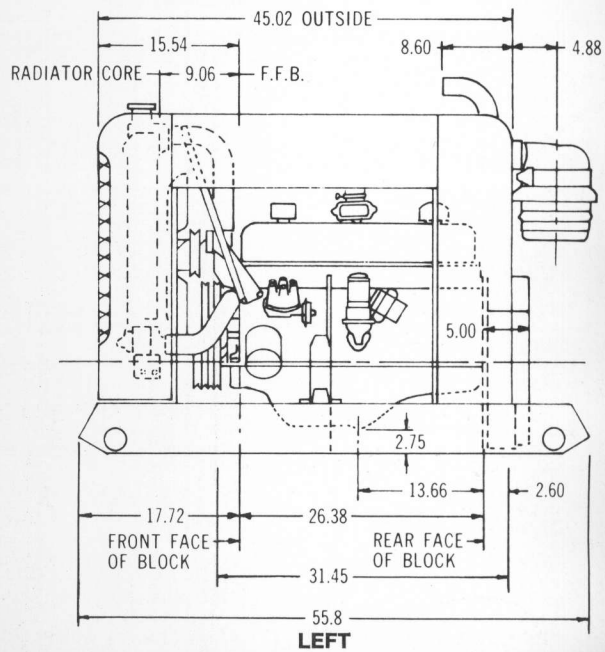
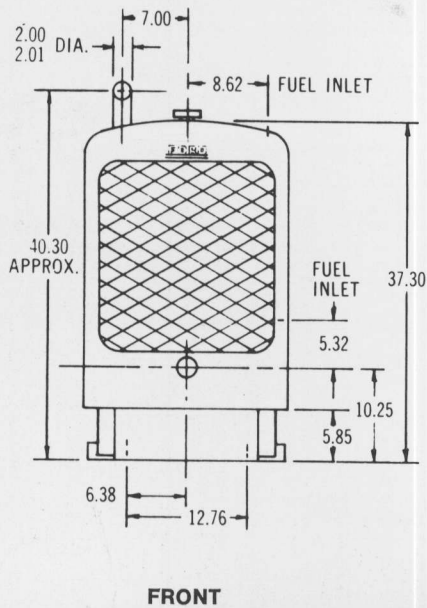


**EXHAUST FLANGE**



**CRANKSHAFT MOUNTING FLANGE**

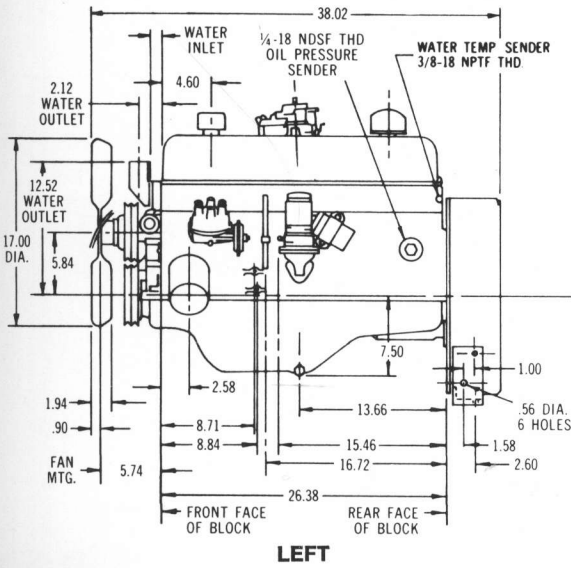
**200 CUBIC INCH ENGINE**



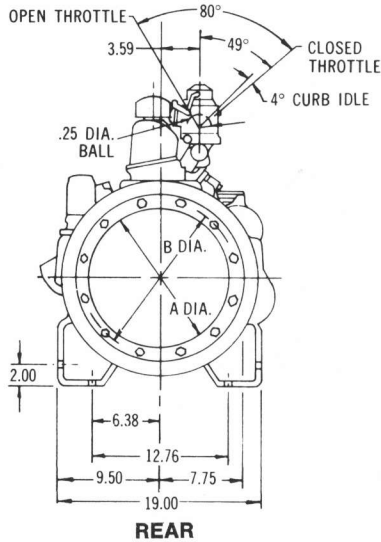
**200 CUBIC INCH ENGINE**

# ATION DIMENSIONS... Standard Engine

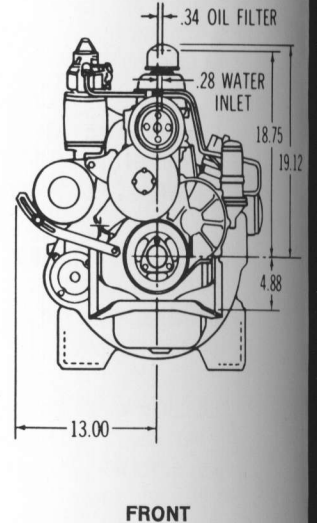
## ENGINE ASSEMBLIES



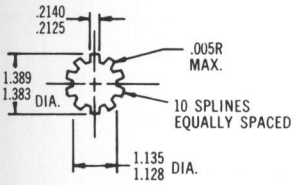
LEFT



REAR



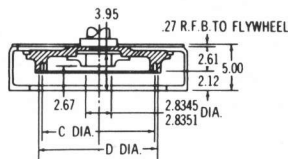
### CH ENGINE



CLUTCH SPLINE

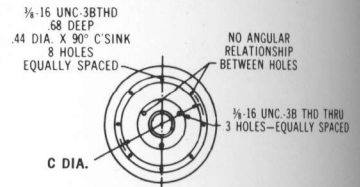
FLYWHEEL HSG	B.C. B DIA.	BORE A DIA.
SAE NO. 3	16.870 16.880	16.125 16.128
SAE NO. 4	14.995 15.005	14.250 14.253

INDUSTRIAL FLYWHEEL W/SAE HSG.



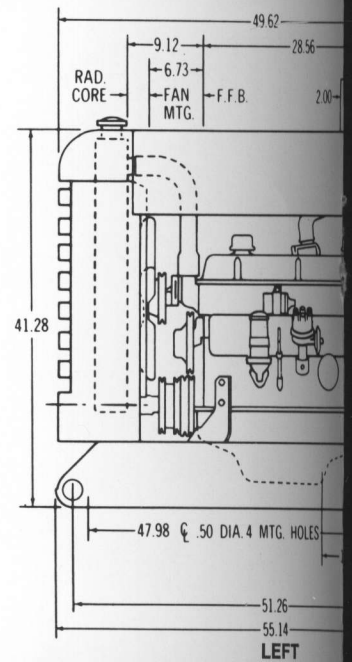
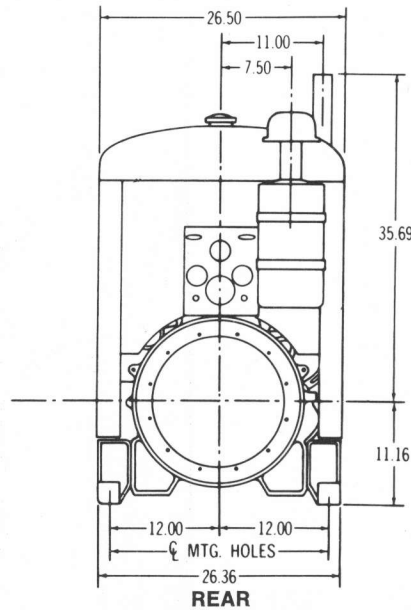
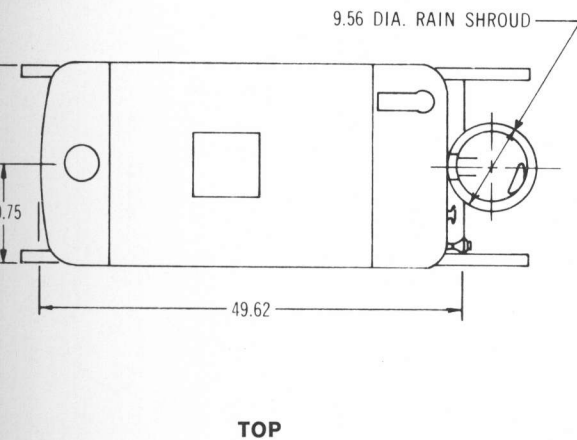
ALL ENGINES

ENGINE DISPLACEMENT	CLUTCH SIZE	C DIA.	D DIA.
200	10"	11.625	12.375 12.380
240	10"	11.625	12.375 12.380
300	11.5"	13.125	13.875 13.880



INDUSTRIAL FLYWHEEL

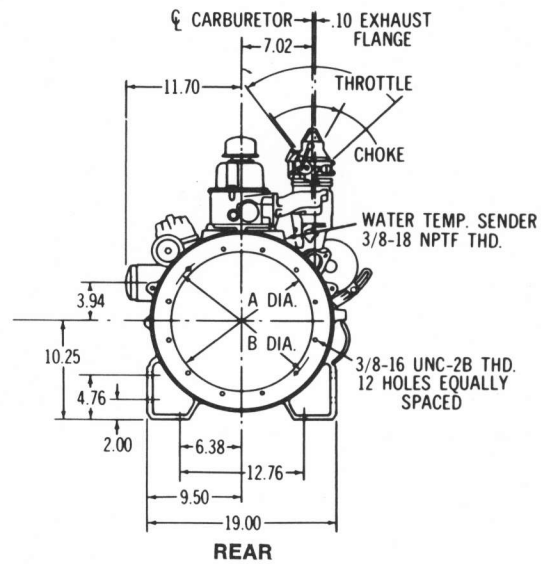
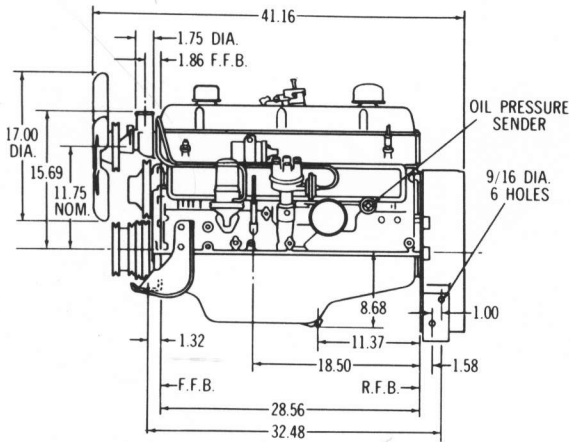
## POWER UNITS



240/300 CID (SKID-MOUNTED)

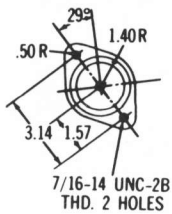


# Assemblies and Power Units

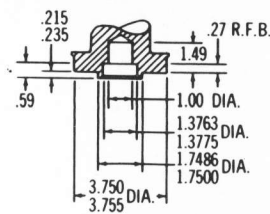


**LEFT**  
**240/300 CUBIC INCH ENGINE**

**REAR**

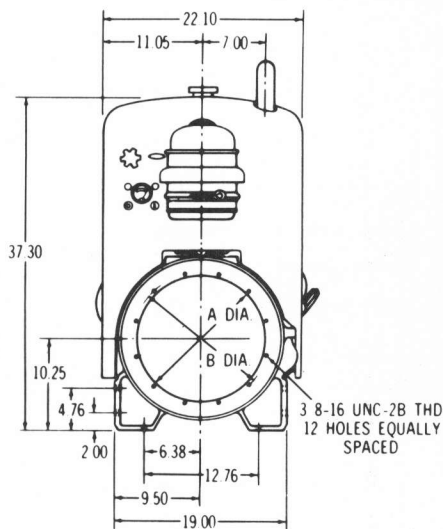
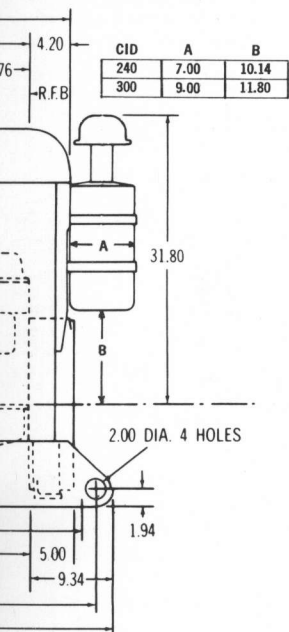
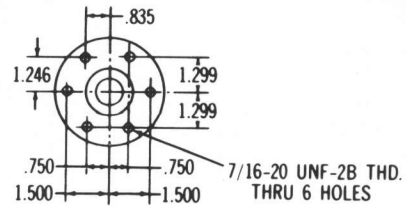


**EXHAUST FLANGE**

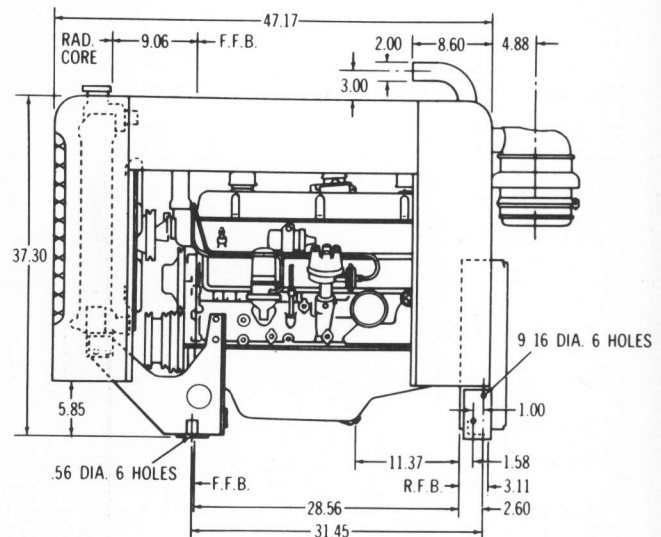


**CRANKSHAFT MOUNTING FLANGE**

**240/300 CUBIC INCH ENGINE**



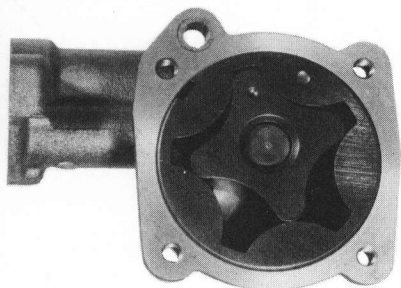
**REAR**



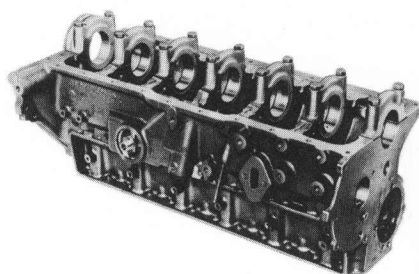
**LEFT**

**240/300 CID (FOOT-MOUNTED)**

# STANDARD ENGINE FEATURES



**ROTOR-TYPE OIL PUMP . . .** High volume oil circulation with quiet, rotor-type pump produces more positive supply at all pressure points in lubrication system over the entire operating range from idle to high speeds.



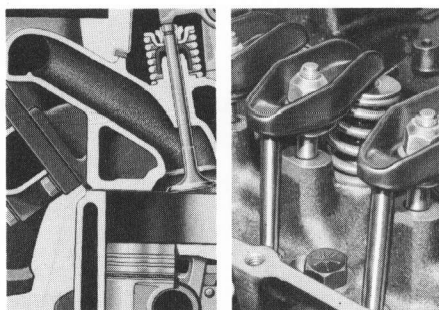
**PRECISION-CAST CYLINDER BLOCK . . .** Ford-pioneered foundry techniques save 50 to 70 pounds over previous six-cylinder blocks. Seven-main-bearing design provides more rigidity for smoother, quieter operation at all speeds.



**SEVEN BEARING CRANKSHAFT—** Specially cast shaft has additional bearing surface for smoother power, longer bearing and crankshaft life. Ford cast alloy crankshaft provides rigidity and improved lubrication characteristics.



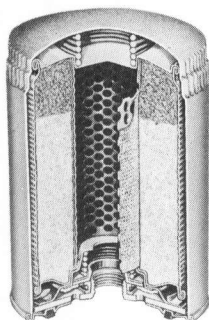
**DEEP-SKIRTED PISTONS . . .** More stable in cylinder bore, reduce wear on bore, piston and rings. Top compression ring on 240/300 CID models has thick chrome plating instead of ordinary flash plate. 200 CID models have a molybdenum-filled groove in the top ring. Oil control rings are chrome faced for long life.



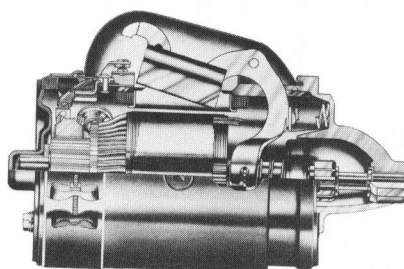
**INTEGRAL INTAKE MANIFOLD — (200 CID SIX) . . .** Provides faster warmup of fuel mixture. Eliminates possibility of manifold gasket leaks. **PEDESTAL-MOUNTED VALVE ROCKER ARMS—(240/300 CID SIXES) . . .** Pedestal rocker arms are self-aligning to minimize wear. Precision castings provide better bearing surfaces and retain lubricant longer than stampings.



**HIGH-LIFT CAMSHAFT . . .** Heavy-duty camshaft is induction hardened, precision-molded alloy iron for long life. High-lift lobes provide wide valve opening for better engine efficiency. Four replaceable bearings, located to minimize deflection, provide accurate valve action and greater durability. Drive is by silent chain on 200 CID models; gears on 240/300 CID models.



**FULL-FLOW OIL FILTER . . .** Has two-section, depth-type filtering element, designed to provide top filtering efficiency, especially with today's multiple-viscosity, high-detergent oils. Easily removed for periodic replacement.



**POSITIVE-ENGAGEMENT STARTER . . .** Drive pinion totally engages before starter torque begins. Pinion remains engaged until engine is started and running. Cuts starter wear and promotes faster, more positive starts.



**HYDRAULIC VALVE LIFTERS . . .** Automatically compensate for wear on valve train parts, maintain correct valve lash clearances for maximum engine efficiency, eliminate need for periodic adjustments. Case-hardened plungers are chrome plated to minimize wear and oil leakdown.

# OPTIONS AND ACCESSORIES

## STANDARD MODEL POWER TRAIN AVAILABILITY

	200 CID		240 CID		300 CID	
	Eng.	Pwr. Unit	Eng.	Pwr. Unit	Eng.	Pwr. Unit
Bell-Type Flywheel and Clutch Housing	X	X	X	X	X	X
SAE #3 Flywheel Housing			X	X	X	X
SAE #4 Flywheel Housing	X	X	X	X	X	X
3-Speed Manual Transmission	X	X	X	X		
4-Speed Manual Transmission	X	X	X	X	X	X
Clutch 11"	X	X	X	X		
Clutch 12"					X	X
Torque Convertor and PTO			X	X	X	X
PTO—Spring-Loaded Clutch	X	X	X	X	X	X
Heavy Duty PTO—Over Center Clutch	X	X	X	X	X	X

NOTE: Special models can be engineered to suit special requirements.

## OPTION AVAILABILITY

Option No.	Description	200 CID		240/300 CID	
		Eng.	Pwr. Unit	Eng.	Pwr. Unit
1	LPG Fuel System	X	X	X	X
2	Mechanical Governor	X	Std.	X	Std.
3	Velocity Governor	X	X	X	X
5	Parking Brake*	X	X	X	X
8	Side Panels		X		X
9	Natural Gas			X	X
10	Foot Mounting				X
11	Safety Switches		X		X
15	Alternator	Std.	Std.	X	X
16	Hard Faced Valves & Seat Inserts	X	X	X	X
17	Air Cleaner—Hat Type	X	X	X	X
26	Housing & Flywheel for Wet Clutch	X	X	X	X

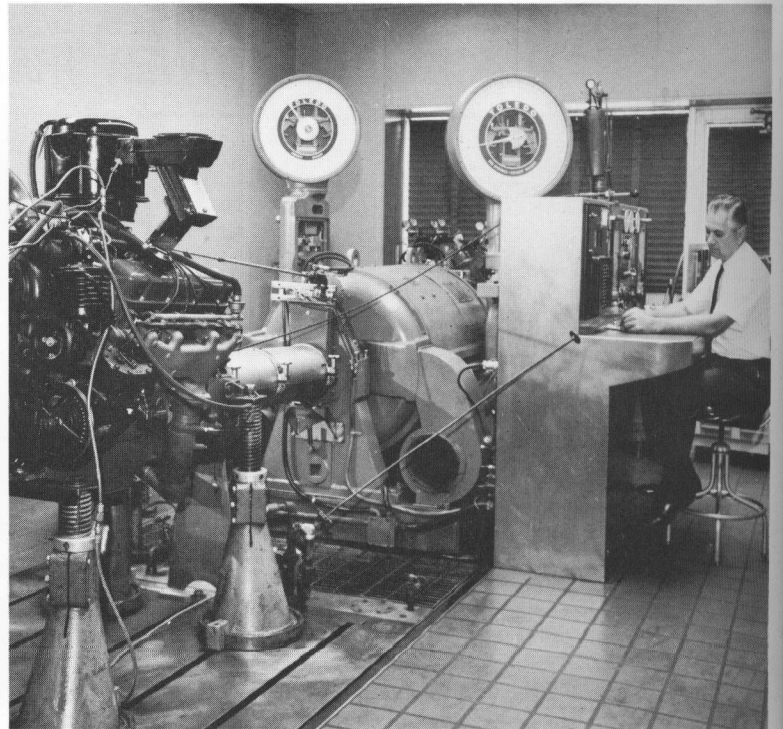
\*Available on models with transmission only.

## ACCESSORIES

- Engine Hour Meter
- Overspeed Safety Switch
- Electric Fuel Pump
- Tachometer
- Power Steering Pump
- Muffler
- Extra Cooling Fan



# THE FORD QUALITY STORY...



Nowhere along the line, from drawing board to delivery, is more infinite care devoted to the production of engines for industrial use than at Ford Motor Company. Ford's concept of total quality begins with ideas—in research and design, continues with exhaustive testing of prototypes, advances to establishment of manufacturing controls and extends to the provision of expert servicing for the finished product.

## RESEARCH AND ENGINEERING

Ford Motor Company maintains a 720-acre Research and Engineering Center at Dearborn, Michigan staffed by some 12,000 engineers, scientists and designers.

Engine design begins with specific objectives and a few basic guide-lines such as size, weight and power output. The rest comes out of the development and

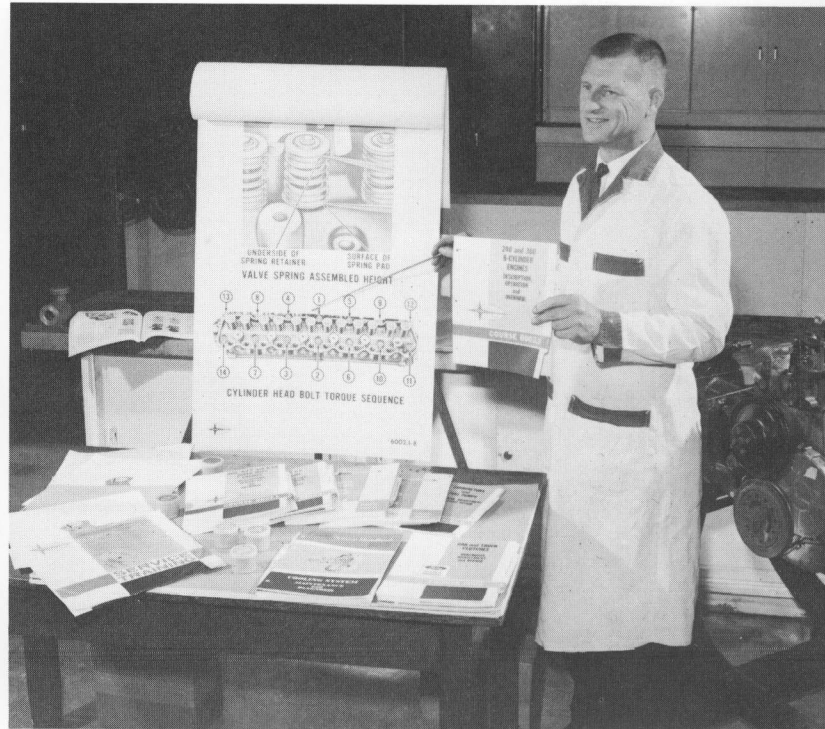
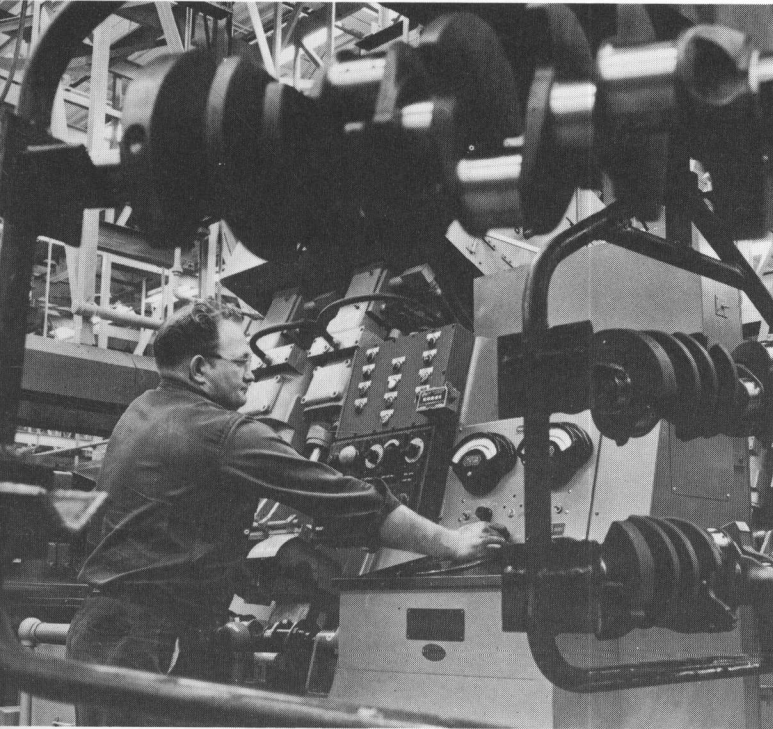
evaluation of promising ideas. It is Ford's unique talent for practical exploration and testing of new ideas that keeps better ideas on the move . . .

. . . to measure wall thicknesses in cylinder blocks, for example, Ford uses an electronic "sonar scanner" that quickly reveals dimensions within thousandths of an inch at any point. This check is used to ensure that the designed wall thickness is faithfully reproduced in the manufacturing process.

. . . a load simulator provides the inertial forces of a set of pistons and connecting rods while precision instruments check for amount and angle of crankshaft imbalance, if any.

. . . a distortion analyzer is used to measure effects on cylinder wall and bearing bore axes and shape as heads, manifolds and oil pan are bolted in place.

# From Drawing Board to Delivery



... a Ford first is the use of photo-elastic plastic in "photographing"—via polarized light—the location, pattern and severity of strains which are introduced into components during assembly and operation of the engine.

... a special honing machine can copy any production-engine cylinder honing technique so that experimental data is extremely precise, and so that no variance in performance characteristics is experienced from lab to assembly-line.

## PRODUCTION AND SERVICE

It is especially significant that Ford engineering-and-design experimental development work is correlated to actual in-use conditions . . . and that experimental data gathered with infinite patience and care is accurately translated into production specifications and techniques. This "realistic" de-

sign philosophy assures production of engines that will perform with the characteristics established in the laboratory. In production, as in engineering, only the finest of precision equipment is used to assure strict adherence to highest production standards.

And then, with so many precautions already taken, Ford makes certain that its engines may be properly maintained and serviced wherever they may be in use. A nationwide network of parts depots and Industrial Power Products Distributors stock and distribute replacement parts, all made to the extreme close tolerances of original equipment components. In addition, Ford continuously strives to maintain a high level of service competence through service training programs for its distributors and dealers. From drawing board to delivery, you can put your faith in Ford.

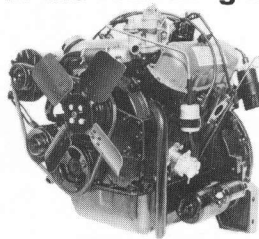
# FORD POWER SELECTOR

DISP	TYPE	FUEL	HORSEPOWER RANGE AT VARIOUS RPMs																					
			20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230
91	V-4	G	-----*																					
104	V-4	G	-----*																					
134	4	G	-----																					
172	4	D	-----																					
172	4	G	-----																					
242	4	D	-----																					
200	6	G	-----																					
240	6	G	-----																					
330	6	D	-----																					
363	6	D	-----																					
300	6	G	-----																					
330	V-8	G	-----																					
361	V-8	G	-----																					
391	V-8	G	-----																					
477	V-8	G	-----																					
534	V-8	G	-----																					

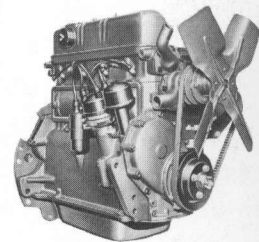
Intermittent H.P. ---  
 Continuous H.P. ———  
 \*Not recommended for continuous full-load applications

## The Engines shown above are grouped in the following brochures

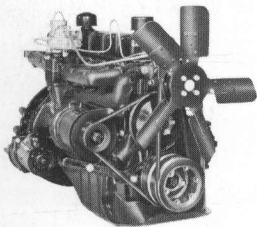
- 91/104 Cubic Inch V-4 Gasoline
- 134/172 Cubic Inch 4-Cylinder Gasoline  
172 Cubic Inch 4-Cylinder Diesel
- 200/240/300 Cubic Inch 6-Cylinder Gasoline
- 242 Cubic Inch 4-Cylinder Diesel  
330/363 Cubic Inch 6-Cylinder Diesel
- 330/361/391 Cubic Inch V-8 Gasoline
- 477/534 Cubic Inch V-8 Gasoline



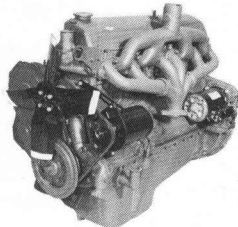
91/104 Cubic Inch V-4 (Gasoline)



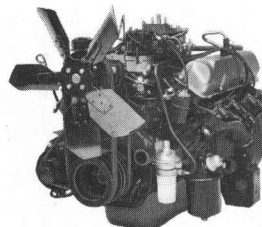
134 Cubic Inch 4 Cyl. (Gasoline)  
172 Cubic Inch 4 Cyl. (Gasoline/Diesel)



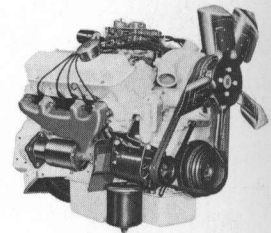
200 / 240/300 Cubic Inch 6 Cyl. (Gasoline)



242 Cubic Inch 4 Cyl. (Diesel)  
330/363 Cubic Inch 6 Cyl. (Diesel)



330/361/391 Cubic Inch V-8 (Gasoline)



477/534 Cubic Inch V-8 (Gasoline)

**SOLD AND SERVICED BY**

FORD INDUSTRIAL  
POWER PRODUCTS





# U.S. HOLLOSHAFT PUMP MOTORS

for outdoor service



Quality Control Representative

TOP COVER  
is lightweight,  
easily removed

UNIQUE LOCK BAR  
holds shaft during  
adjustment

LUBRISCOPE  
combined gauge and  
rapid oil fill

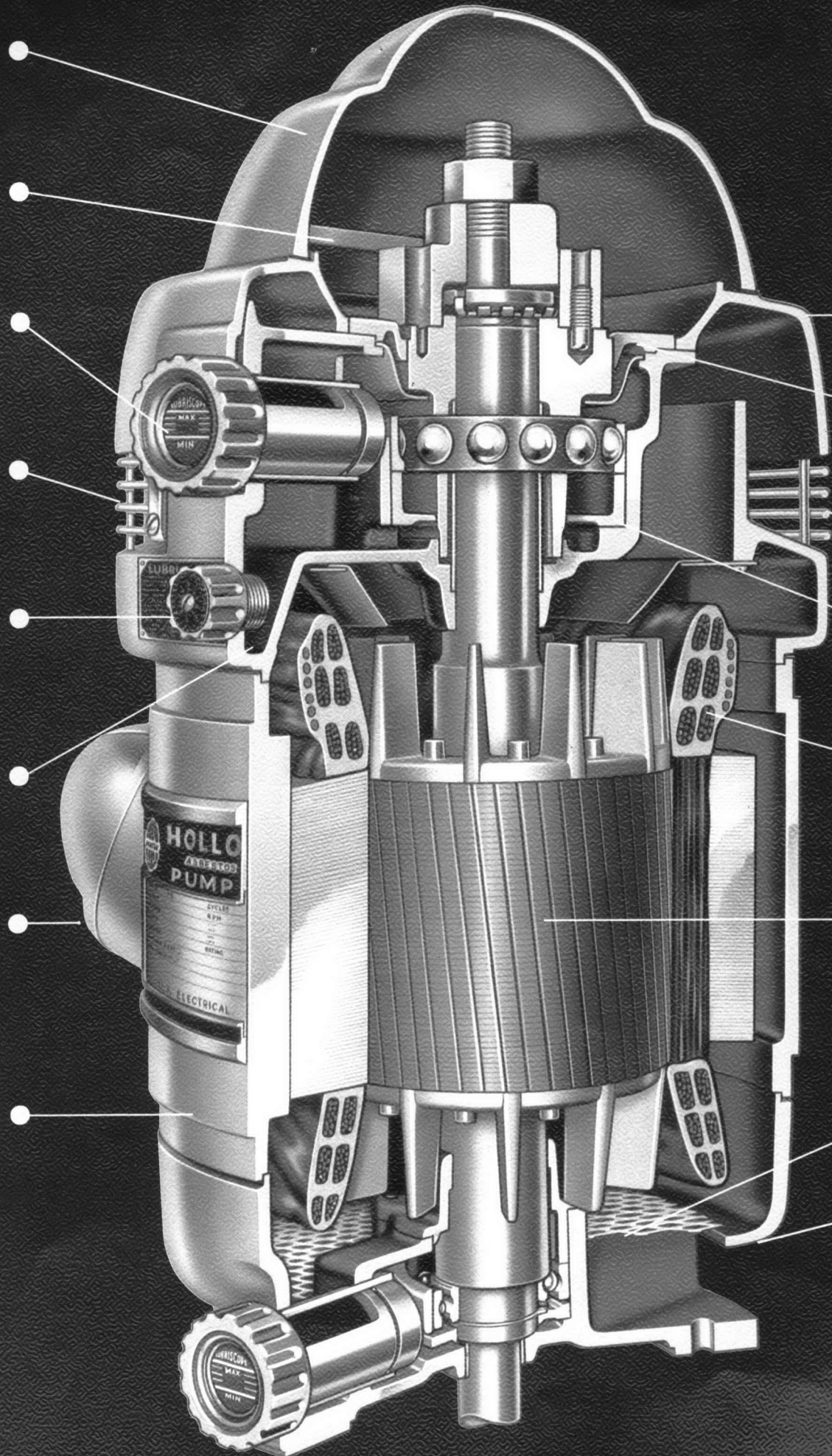
PROTECTIVE GRILLE  
prevents entrance of  
leaves, papers, etc.

OIL CHANGE RECORD  
dial indicates date of  
last oil change

SEDIMENT SUMP  
collects grit particles  
for easy drain

SPLIT TYPE OUTLET  
BOX  
provides easy motor  
connection

NORMALIZED CASTINGS  
maintain accuracy  
of machining





# The story behind the new U.S. Holloshaft Motor

## for Industry

## Agriculture

## Municipalities

TOP COWL  
motor remains  
protected during  
adjustment

BEARING COVER  
protects bearing  
during pump  
adjustment

LARGE AIR OPENING  
reduces intake  
velocity

PROVISION FOR  
STACKED BEARINGS  
extra heavy thrust  
easily obtained

ASBESTOS-PROTECTED  
WINDINGS  
non-carbonizing  
asbestos extends life

SOLID CAST  
ALUMINUM ROTOR  
with integral fan,  
provides indestructible  
structure

RODENT GUARD  
prevents damage due  
to entry of  
small animals

IMPROVED WINDING  
PROTECTION  
meets NEMA  
Weather-Protected  
Type I requirements

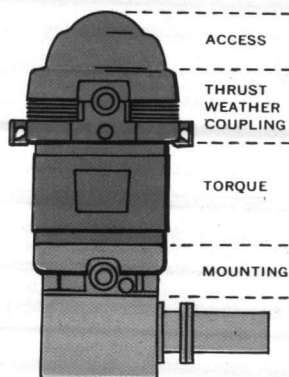
TYPE HU  
OIL LUBRICATED  
7½ to 125 H.P.

This new motor has a combination of features that will appeal to pump users as a practical solution to their past problems. Our concept for this new motor began with the wishes and suggestions of pump users and recognition of the increasing importance and wider use of turbine pumps. To this was added the NEMA rerate program which acknowledged electrical progress by obtaining more HP in a given frame. All of these pointed to the need for a new motor which would combine the best of the past with the possibilities for the future.

As we talked to pump users about their motor needs, we discovered what was important to them—"keep your heavy duty thrust bearing"—"make oil filling easier"—"protect against entry of rodents"—"provide even better weather protection"—"make installation more foolproof" and many others. Our task was to translate these desires into a practical motor construction, completely functional and yet with an enduring, distinctive styling which would harmonize with modern pump designs.

As the new design evolved, it began to show the influence of these objectives. From drawings to mock-up to prototype to production, each step refined the original concepts and brought forth the motor you see here.

**PRINCIPLES OF DESIGN OF THIS NEW MOTOR...** A new relationship between function and form is introduced in Holloshaft design.



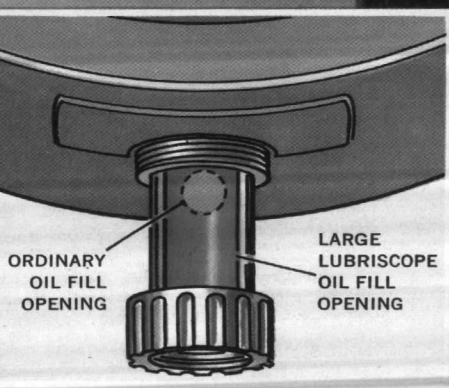
Each zone is proportioned according to purpose: The top is small for easy access, below this are the essential elements of thrust bearing, coupling, air intake and weather protection which call for large space. The center section develops the driving torque and by using the latest re-rated designs can be made smaller than former models. The base is made small to permit use of compact pump head designs. These principles enable the new Type HU motor to take advantage of modern electrical design progress with improved mechanical ruggedness and protection.



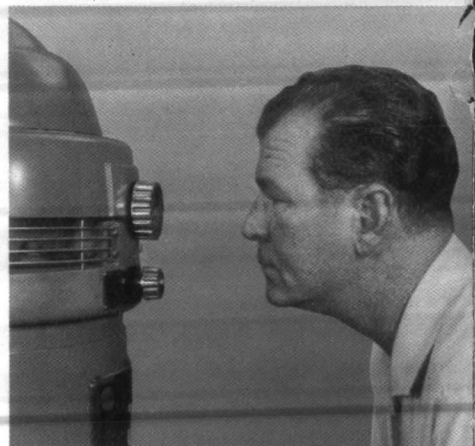
# U.S. MOTORS INTRODUCES... LUBRISCOPE



SEE THE OIL LEVEL AND OIL CONDITION AT A GLANCE



NEW  
LUBRISCOPE  
MAKES  
OIL FILLING  
FAST AND  
EASY



OIL LEVEL EASILY CHECKED... Observe oil level and condition through glass window gauge. Maximum and minimum levels are both clearly marked to indicate safe operating range.

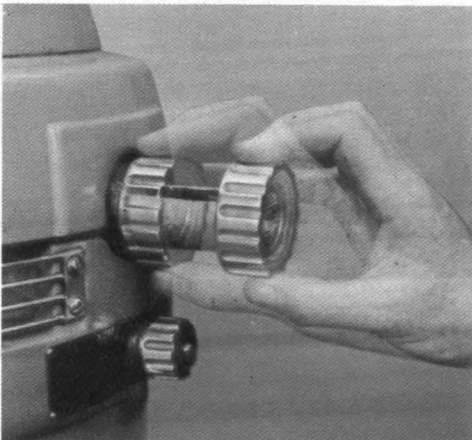
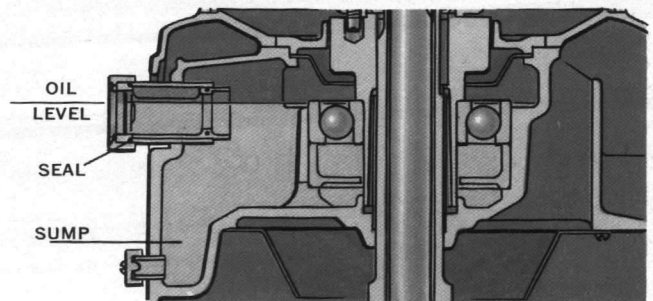
## faster oil fill...visible level...anti-spill!

Here is the answer to the spillage problem . . . and to the demand for faster oil-fill. U.S. Holloshaft introduces Lubriscope—a new kind of oil-fill, and a new standard of lubrication performance. Both the top thrust bearing and the lower guide bearing have the new Lubriscope system. The Lubriscope oil-fill pulls out to provide a large opening extending throughout its length, instead of the usual small fill-hole. This reduces spillage and gives you faster pouring and faster fill, with no need for funnels, spout cans, etc. Lubriscope, in its extended position, provides ample clearance so that any oil spillage or overflow will drop

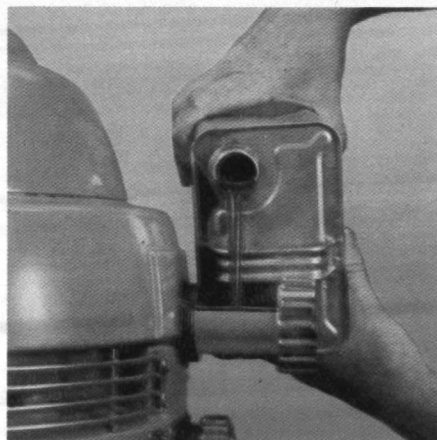
clear of motor. The large Lubriscope fill opening permits wiping the glass window from inside, so that even after years of service, you can still have clear view of oil level. No tools are necessary to open or close oil fills and drains, as they are designed to be hand-tightened. Use of silicone rubber seals permanently prevents oil leakage. Oil is metered to bearings from a large oil reservoir. A convenient dial date record permits ready check of lubrication period. Lubriscope is another U.S. first—the answer to pump operators' requests for a better oil-fill system, brought to reality by U.S. engineering.

### LARGE OIL RESERVOIR PROVIDES AMPLE LUBRICANT — COOLER, CLEANER RUNNING

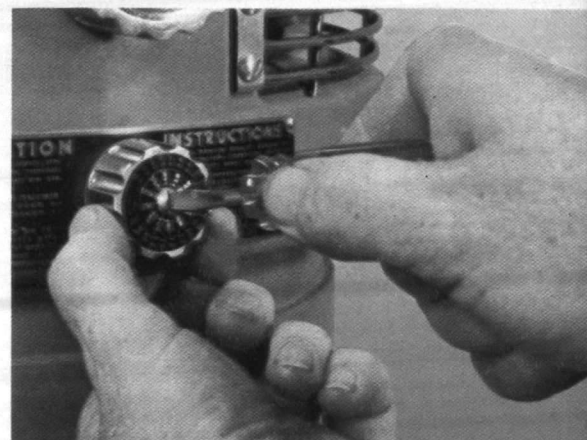
U.S. Holloshaft's large oil reservoir, with ample gravity sump, provides extra volume of lubricant in circulation through the bearing, resulting in less frequent oil turn and cooler operation. Sump collects contaminants and keeps oil cleaner, requiring less frequent oil change. Oil is metered to thrust bearing. Lubriscope's silicone rubber seals prevent leakage.



**NO NEED FOR WRENCHES . . .** When oil filling is desired, turn and pull out Lubriscope. Drawer-like action exposes large fill opening. No tools needed. Whether Lubriscope is retracted or extended, silicone rubber seals prevent leakage.



**FAST POURING — NO MESS . . .** Pour oil into large Lubriscope opening. Fast fill. Ample clearance, so that any spill drops clear of motor and pump. After filling, push Lubriscope in and lock by turning.



**OIL CHANGE RECORD ON MOTOR . . .** Change date record on the convenient stainless steel dial below Lubriscope. No more guesswork or doubt as to oil change date —no searching for records.



# WEATHER PROTECTION

## New U.S. Holloshaft Motors are WEATHER-PROTECTED... BETTER-PROTECTED

COLD AIR ENTERS HERE

**NEW U.S. HOLLOSHAFT EXCEEDS NEMA SPECIFICATIONS FOR WEATHER-PROTECTED TYPE I...** By definition, NEMA Weather-Protected Type I is an open motor with its ventilating passages so constructed as to minimize the entrance of rain, snow, and airborne particles to the electric parts. Its ventilated openings must be so constructed as to prevent the passage of a cylindrical rod  $\frac{3}{4}$  inch in diameter. The new U.S. Holloshaft *more than fulfills* these requirements. A new baffle design gives unusual protection to windings at both top and bottom of the motor. Besides the overlapped baffle at the inlet, low air velocity intake—made possible by the motor's larger diameter at top—protects against dripping water or foreign matter being sucked into motor. The exhaust is completely screened and baffles curve under windings to protect against wind driven rain.

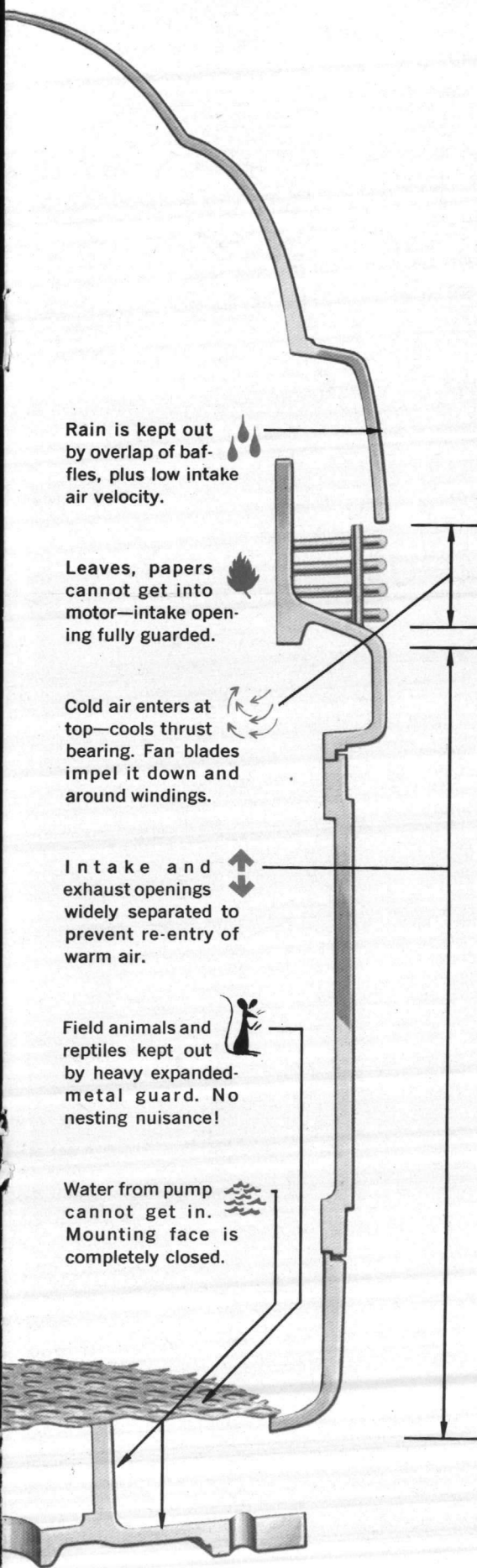
### DOWNDRAFT VENTILATION

Cold air enters the motor above the thrust bearing, and is directed down and around the bearing for maximum cooling effect upon this vital element. The integral fan blades on the rotor whirl the air rapidly down over the windings, cooling the rotor and providing a cool air current for the motor interior.

The air intake is widely separated from the exhaust, located at the bottom of the motor, so that warm exhaust air cannot mingle with intake air and thus be recirculated. Exhaust air is expelled downward and outward, further insuring against re-entry.

WARM AIR EXPELLED HERE





Rain is kept out by overlap of baffles, plus low intake air velocity.

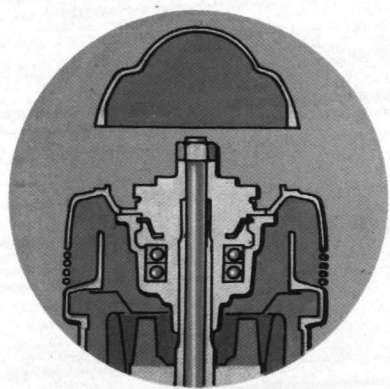
Leaves, papers cannot get into motor—intake opening fully guarded.

Cold air enters at top—cools thrust bearing. Fan blades impel it down and around windings.

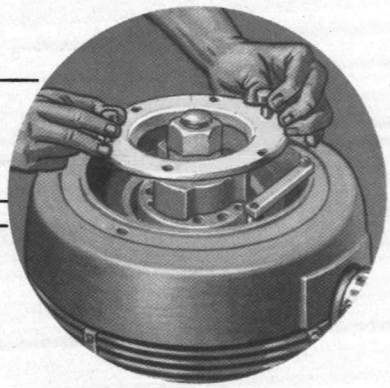
Intake and exhaust openings widely separated to prevent re-entry of warm air.

Field animals and reptiles kept out by heavy expanded-metal guard. No nesting nuisance!

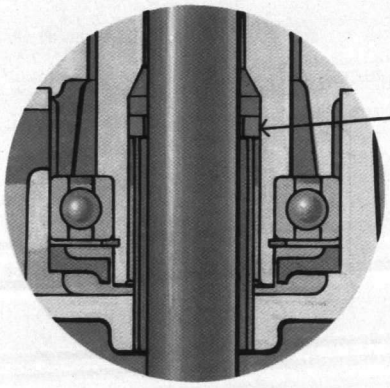
Water from pump cannot get in. Mounting face is completely closed.



**INTERIOR OF MOTOR REMAINS PROTECTED WHEN COVER IS REMOVED...** Tools, nuts, bolts, and other small objects are prevented from falling into motor during installation or adjustment. No fishing or disassembly to recover lost articles...no damage from undetected objects when motor is started!



**BEARING COVER...** Thrust Bearing is protected during shaft adjustment from chips, dirt, grit, or other particles that could get into the bearing, causing premature failure.



**NEW ROTATING SEAL...** Protects lower guide-bearing against entrance of sand through opening of hollowshaft due to sandstorms or conditions encountered during handling and transportation.



**COMPLETELY CLOSED MOUNTING FACE KEEPS WATER OUT...** In the event of leakage of the pump shaft seal, water cannot spray up onto the motor windings. Mounting registers are machined for perfect setting and concentric alignment with pump head.

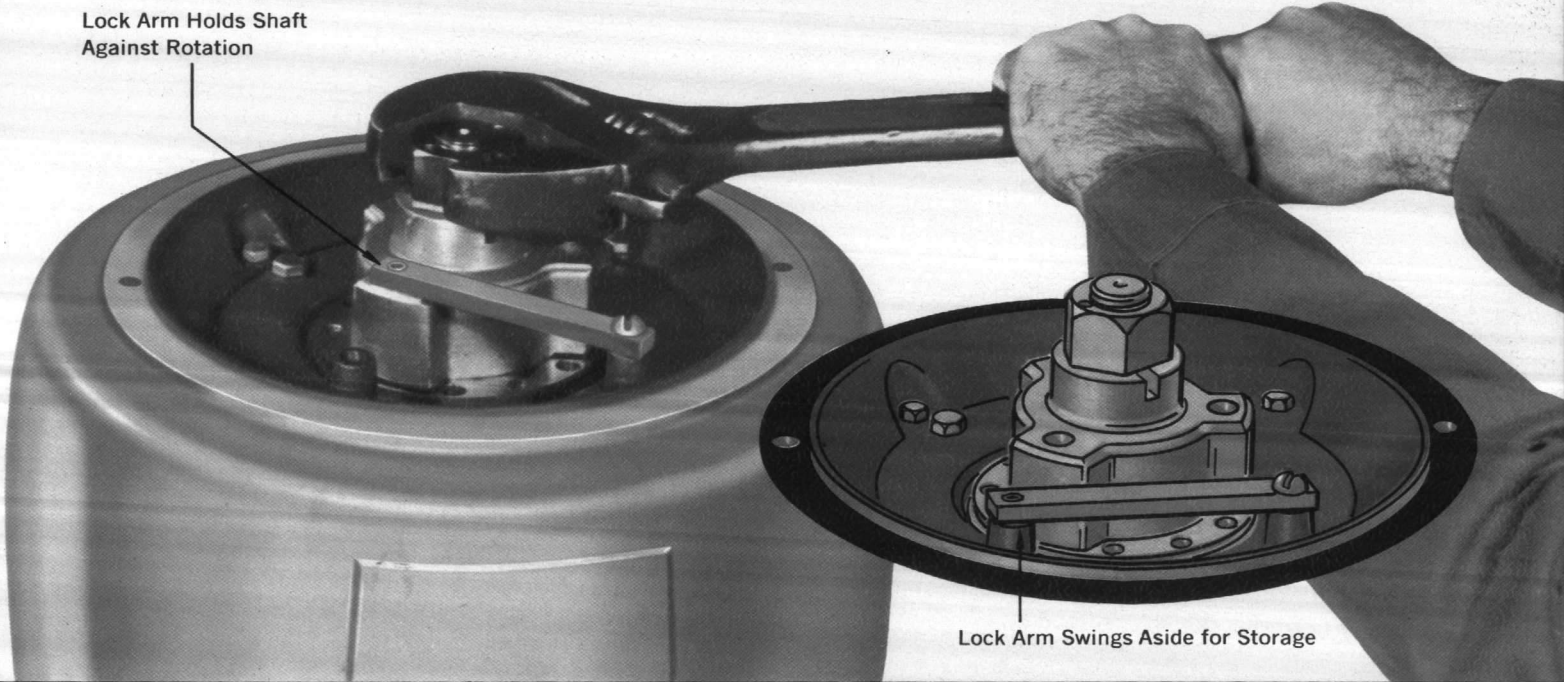
# CONVENIENCE

# features make U.S. Holloshaft

**EXCLUSIVE U. S. PIVOTED LOCK ARM . . . HOLDS SHAFT DURING ADJUSTMENT . . . TAKES PLACE OF EXTRA HELPER . . .** To prevent rotation during adjustment it is no longer necessary to have a helper hold the motor shaft with a wrench.

You merely release one end of the new *exclusive* U.S. Lock Arm from its convenient storage position on the motor, swing it over to engage with the coupling—then make the shaft adjustment quickly and *easily* by yourself!

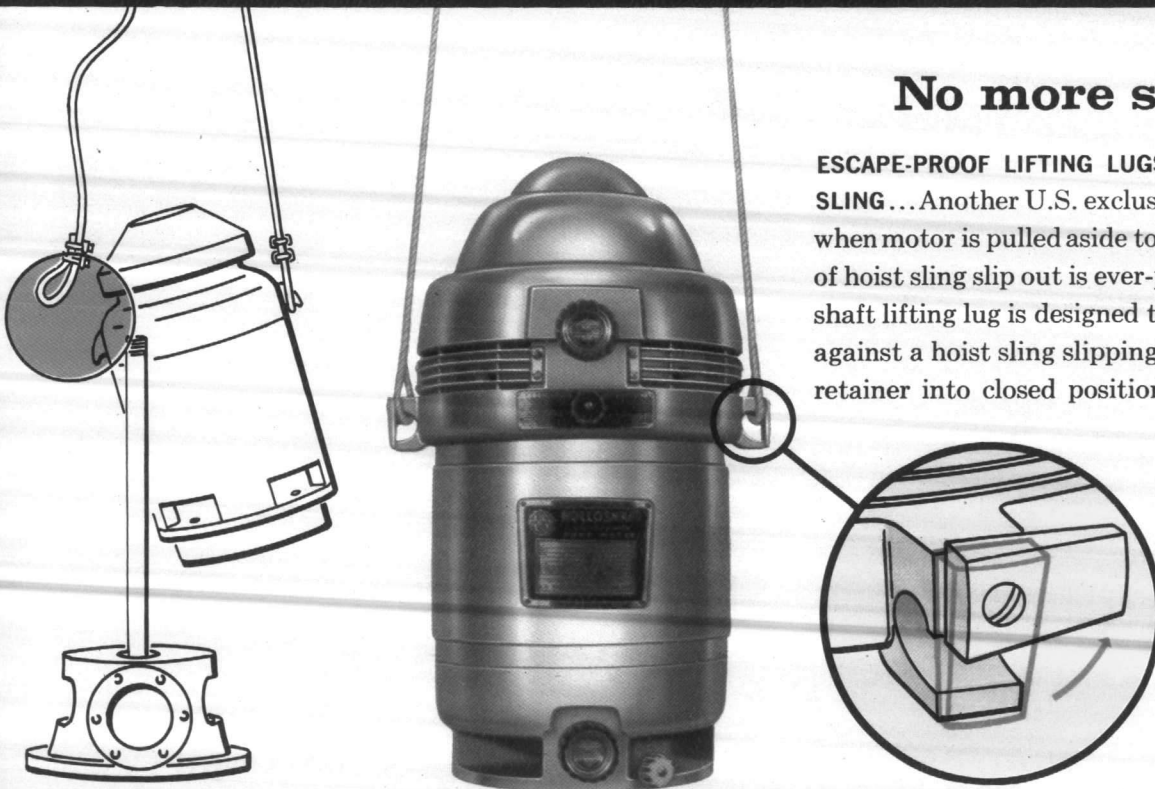
Lock Arm Holds Shaft Against Rotation



Lock Arm Swings Aside for Storage

## No more slip outs!

**ESCAPE-PROOF LIFTING LUGS SWING ASIDE TO TAKE SLING . . .** Another U.S. exclusive! On ordinary motors, when motor is pulled aside to clear pump head, hazard of hoist sling slip out is ever-present. This U.S. Holloshaft lifting lug is designed to give positive assurance against a hoist sling slipping out. Gravity swings the retainer into closed position after sling is inserted.

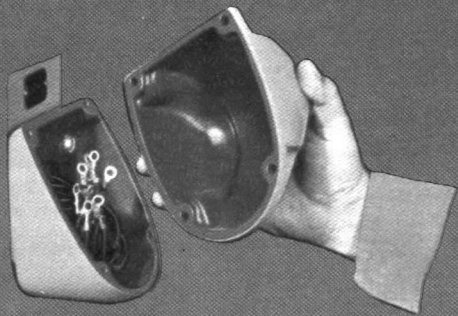




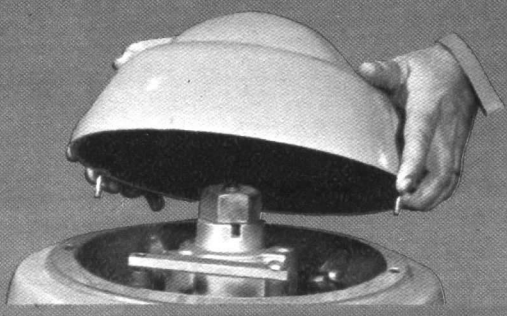
easy to install, maintain



**THRUST BEARING SLEEVE MOUNTED FOR EASY REMOVAL . . .** Sleeve mounted thrust bearing easily lifted free of motor. It is located at the *top* of the motor to make it possible to remove bearing without motor disassembly.

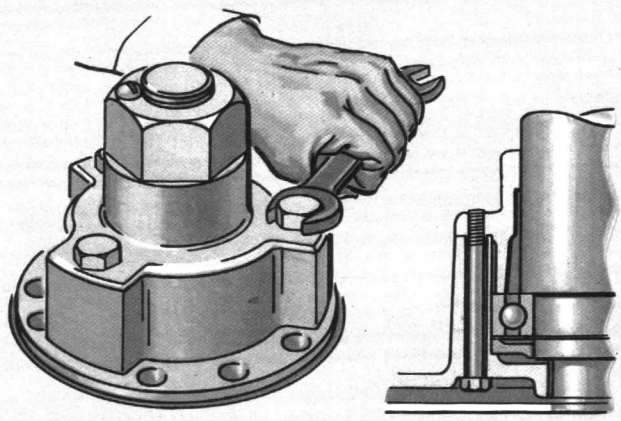


**LARGE CAST-IRON CONDUIT BOX . . .** The heavy-duty split dome conduit box gives convenient access to leads and terminals. Ample room makes connections easy. A special gasket seals and positions leads for easy identification. Box can be rotated in 90° steps to facilitate conduit connection.



**SMALL LIGHT-WEIGHT COVER EASY TO LIFT . . .** Only the motor cover need be removed to provide access to the adjusting nut, backstop, and thrust bearing. This small, light-weight motor cover is gasket-sealed and releases easily after bolts are loosened. Captive bolts cannot get loose.

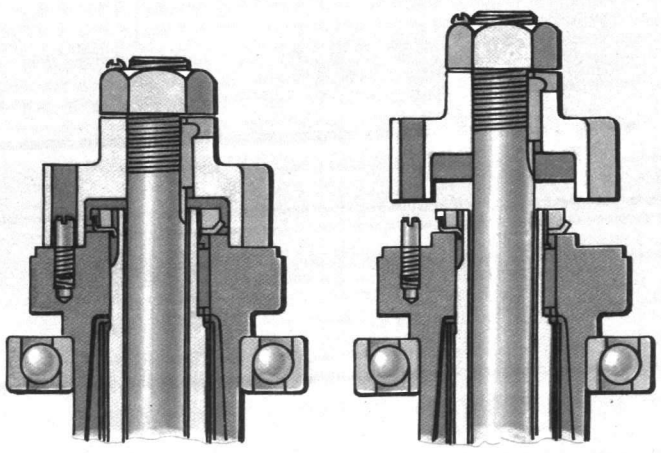
**PROTECTIVE DEVICES  
against starting upthrust  
and reversal damage**



UPPER ASSEMBLY

LOWER ASSEMBLY

**HOLD-DOWN BOLTS PROTECT AGAINST MOMENTARY UPTHURST . . .** In some shallow settings, the pump may develop a momentary upthrust during starting. The Holloshaft motor is designed so that its lower bearing cannot lift. To prevent upward movement of the pump shaft, it is only necessary to install hold-down bolts in the coupling.



ENGAGED

DISENGAGED

**REVERSE PROTECTION COUPLING DISENGAGES PUMP IF MOTOR IS REVERSED . . .** Pump couplings may unscrew and cause damage if motor is reversed. The U. S. Reverse Protection Coupling is designed so that unscrewing of the pump shaft causes the drive coupling to rise and disengage from motor.

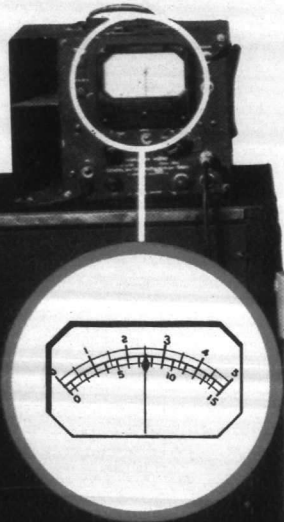


# BALANCE

## U. S. refines balance of motor after assembly

U. S. Holloshaft is the only motor designed with *provision* for final balancing to split-hair precision *after assembly*. Sensitive vibrometer detects slightest vibration, enabling operator to make the correction

needed. Holloshaft motors are balanced on a three-point support to over-all vibration amplitude of less than .00084" — to assure smooth running, trouble-free performance, and long life.



Maximum allowable vibration .00084"

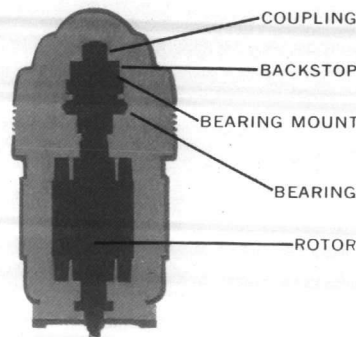


### AT U. S. ALL ROTATING COMPONENTS ARE ELECTRICALLY BALANCED

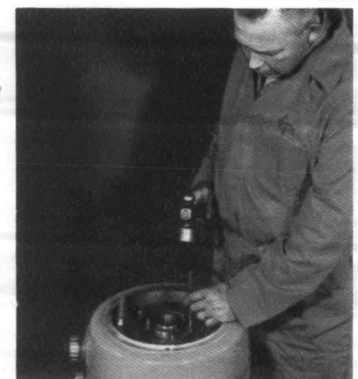
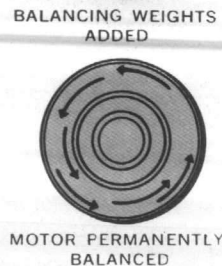
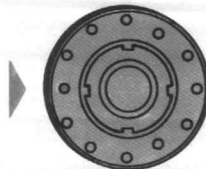


All rotating components are subjected to individual balancing tests and corrections. Rotor, thrust bearing mount, coupling, and backstop are dynamically balanced and corrected. Above, dynamic balance of rotor assembly is being perfected on an electronically controlled machine which measures correction required.

### ONLY U. S. HOLLOSHAFT MOTORS RECEIVE THESE EXTRA BALANCING REFINEMENTS



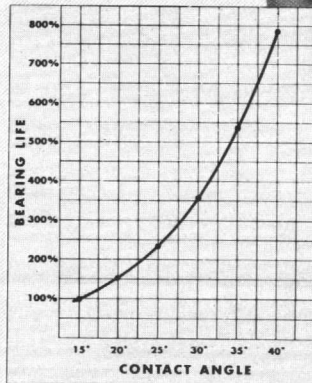
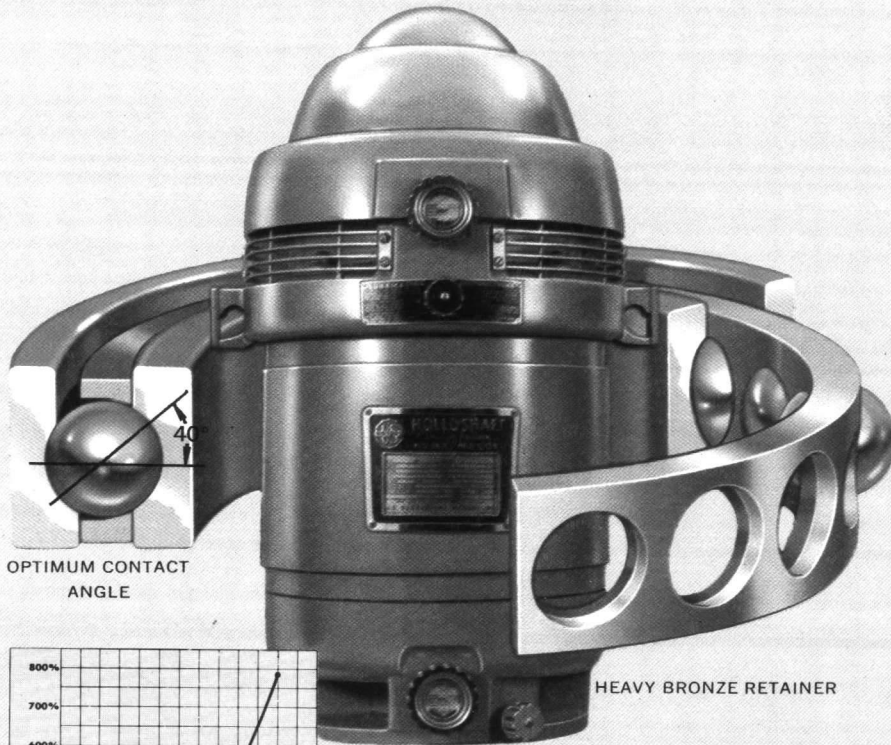
Normal tolerances of component parts may result in cumulative error leading to imbalance of the over-all assembly. Only U. S. Holloshaft design provides recesses to allow this imbalance to be corrected in assembled motor.



Balance of assembled motor is corrected by tamping micrometric lead weights permanently into recesses in the bearing mount.

# RUGGED THRUST BEARING

## 5 REASONS why U. S. Thrust Bearings Last Longer



OPTIMUM THRUST ANGLE OF CONTACT MEANS LONGER BEARING LIFE... Thrust bearings are made in a range of contact angles of 15° to 40°. U.S. provides bearings at the top of this range, for longest thrust bearing life.

THRUST BEARING LIFE VS. CONTACT ANGLE  
Source: Capacity Formula, Anti-Friction Bearing Manufacturers Association

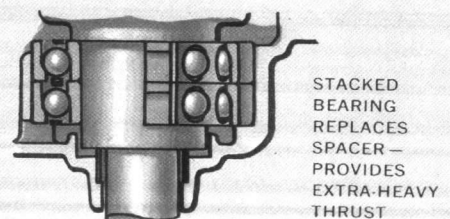
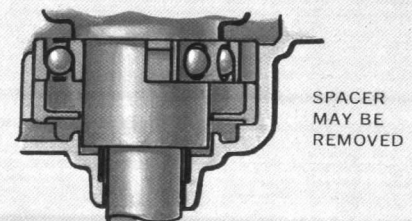
HEAVY BRONZE RETAINER

... Thrust bearing life is influenced by many factors. It is dependent upon bearing selection, internal motor design and external conditions. U. S. has designed the Holloshaft motor *around* the load-carrying thrust bearing. The following five reasons show why thrust bearings last longer in U.S. motors:

1. U. S. starts with the *right bearing construction* having the optimum contact angle of 40°, and with a heavy bronze ball retainer. Maximum ball diameter reduces stress and prolongs life;
2. U. S. designs the motor *ventilation* so that cool air flows in above and is directed over the bearing, thus insuring cool operation;
3. U. S. *normalizes* the motor castings so that internal stresses cannot develop and cause warpage. Alignment of bearings is maintained;
4. U. S. provides a *large oil reservoir* with sump for ample bearing lubricant supply. This results in cooler running, cleaner oil, less frequent oil-change requirement; and
5. U. S. balances all rotating components, then *refines the over-all balance* of the assembled motor to eliminate harmful vibration and lateral stresses, thus increasing bearing life.

### THRUST BEARINGS MAY BE STACKED FOR EXTRA-HEAVY DUTY

For all normal service, the Holloshaft motor's standard thrust bearing is ample. Should it ever become necessary to change the pump bowl setting to a lower or receded water level, or if the pump originally requires more bearing capacity than for normal service, Holloshaft design has provision for using stacked bearings. Space for stacking is obtained simply by removing spacer ring. Angular contact bearings for stacking are specially made to work in tandem. They are accurately ground so that they will share the load between them. Stacked bearings may be used for increased load capacity and increased operating life.

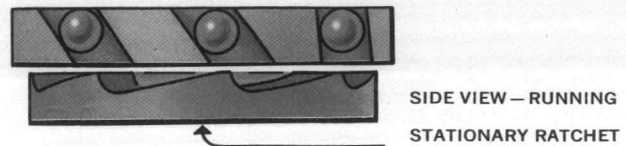
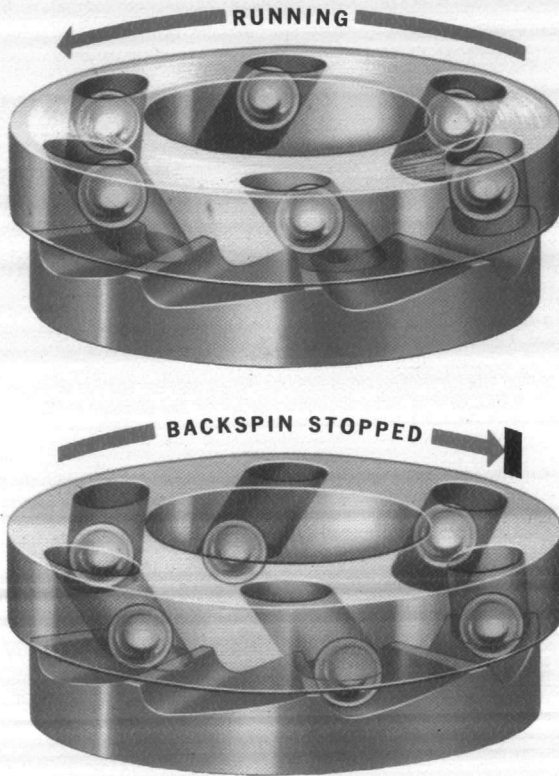




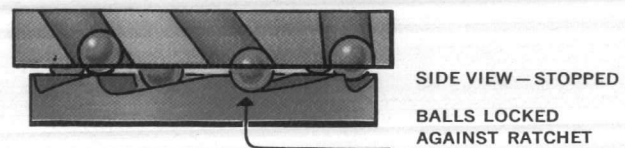
# BALLOMATIC BACKSTOP

## locks shaft quickly and positively against backspin

The ball type backstop, pioneered by U. S. Motors, is now accepted as the most dependable device for preventing turbine pump backspin, caused by water column receding when motor current ceases. When motor starts, the balls are disengaged — being thrown outward and upward at a compound angle, and held there by centrifugal force.



Just before rotation ceases, gravity pulls balls downward to ratchet, and motor reversal is prevented.



(BALLOMATIC BACKSTOP IS OPTIONAL EQUIPMENT)

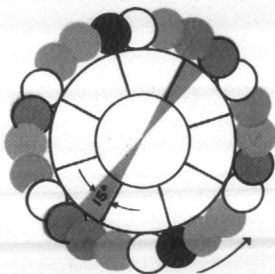


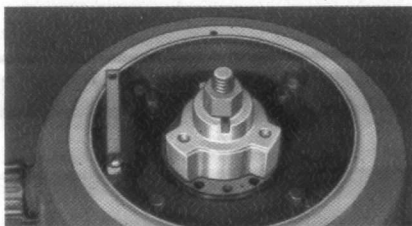
DIAGRAM OF VERNIER DESIGN

### THE BALLOMATIC VERNIER PRINCIPLE—minimum reverse movement... minimum reverse momentum!

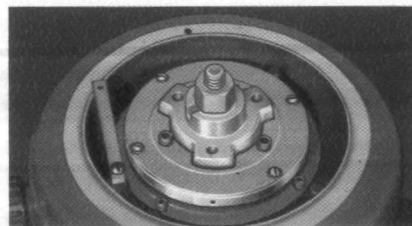
Utilizing a non-matching number of ball-channels and ratchet teeth, the Ballomatic backstop works on the vernier principle. In the 1½ to 5 h.p. range, 6 balls and 8 ratchet teeth (see diagram) provide 24 lock-positions, limiting maximum reversal

to 15°. Two opposite balls engage teeth. On higher horsepower motors, as many as 12 balls and 14 teeth provide 84 lock-positions, limiting maximum reversal to approximately 4½°. Minimizing reversal minimizes momentum and shock on engaging.

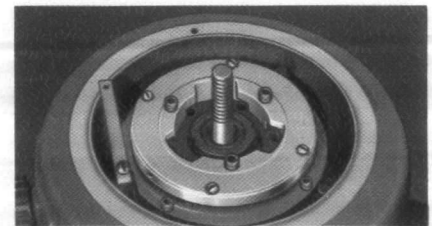
### BALLOMATIC IS INDEPENDENT OF COUPLING—either can be removed without disturbing the other!



**MOTOR WITH COUPLING ONLY... NO BALLOMATIC.** Photo shows standard motor with coupling before Ballomatic backstop is installed.



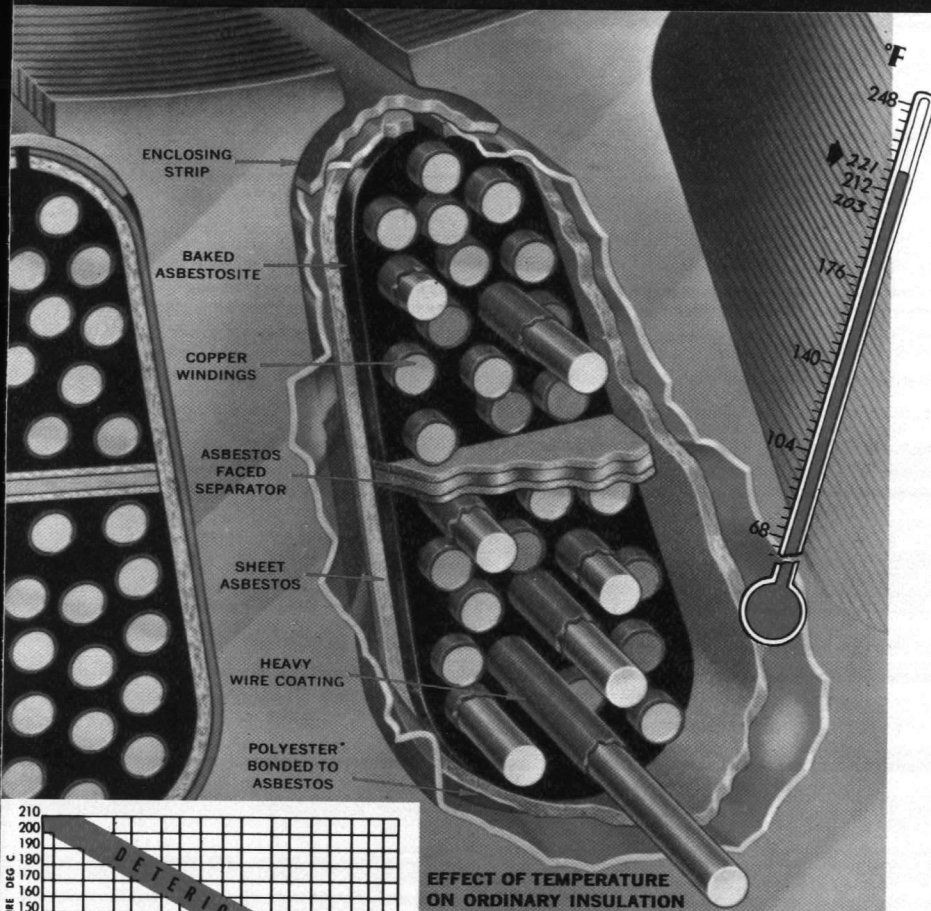
**MOTOR WITH BOTH COUPLING AND BALLOMATIC.** Here the Ballomatic backstop has been installed without disturbing the coupling or pump setting.



**MOTOR WITH BALLOMATIC ONLY... NO COUPLING.** Similarly, the above photo shows how coupling may be removed without disturbing Ballomatic backstop.



# ASBESTOS PROTECTED WINDINGS

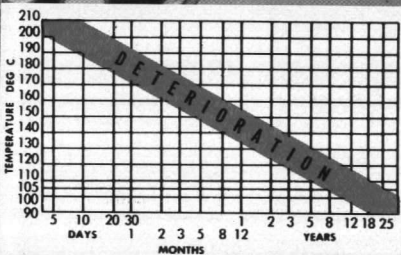


## LONGER MOTOR LIFE WITH NATURE'S NON-CARBONIZING INSULATION

... Motors are rated 40°C. rise according to NEMA standards. This is the temperature rise by thermometer on the outside of coils or core at rated load. But there is a 15% service factor which increases the temperature rise to 50°C. To find the actual maximum *internal* temperature, 15°C. is allowed, also the surrounding temperature of 40°C. maximum, thus giving 105°C. total or 221°F. Several conditions may cause even this temperature to be exceeded, such as low voltage, overload, unbalanced line voltage, recirculation of air due to restricted space, clogging of air passage, deposits of oil, dirt, etc. Records of insurance companies, rewind shops and maintenance departments indicate burnouts as a most common cause of motor failure.

## EACH WIRE ISOLATED WITH INORGANIC ASBESTOS

... Being inorganic, asbestos will not deteriorate, regardless of time and temperatures. ONLY U. S. protects all windings with asbestos! In the U. S. patented process, electric vibration of windings assures that *each wire* is completely covered with non-carbonizing non-organic asbestos.



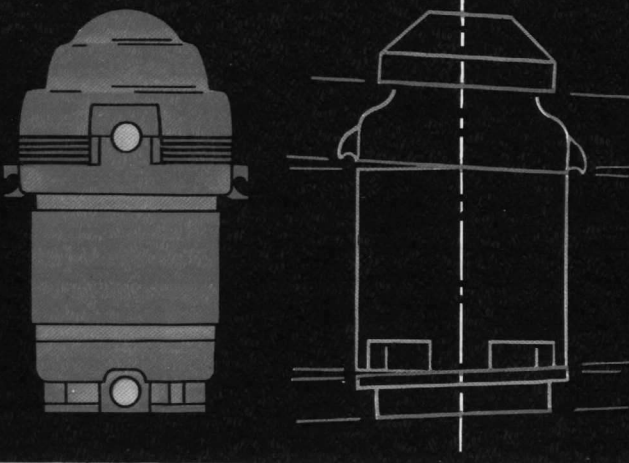
### EFFECT OF TEMPERATURE ON ORDINARY INSULATION

Life of ordinary organic material such as paper and cloth at 105°C. (221°F) is 7 years. The rate of deterioration increases with temperature. Insulation carbonizes, reducing its physical strength and changing it from insulator to conductor. RESULT: MOTOR BURN-OUT!

## NORMALIZING

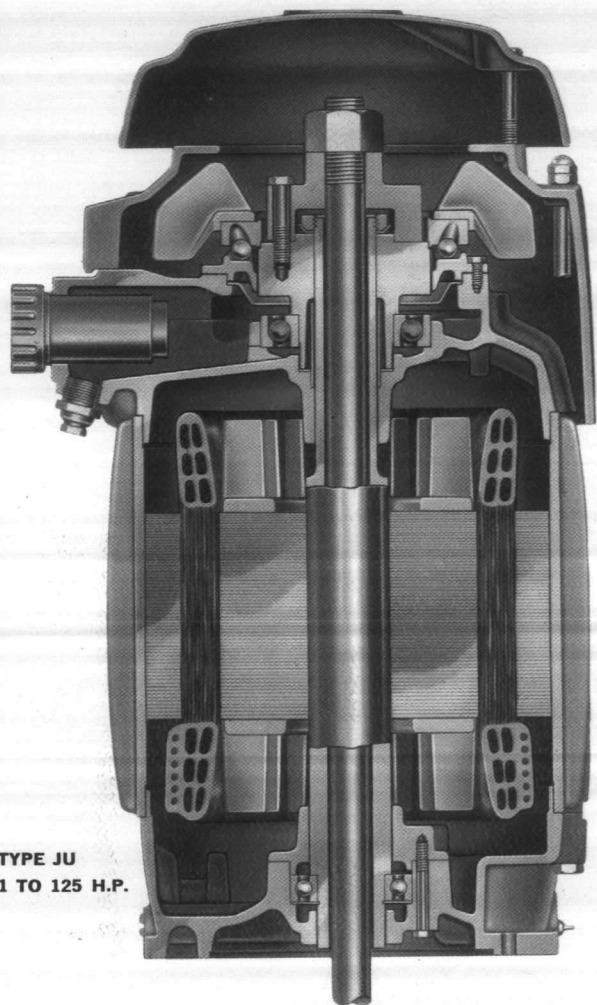
of castings assures precision and permanent alignment

HEAT SEASONING REMOVES STRESSES... Like fine precision parts in giant telescopes, artillery, machine tools—U. S. motor castings are normalized. Heat seasoning insures precision and permanent alignment. Internal stresses that would otherwise distort the casting are removed before machining, so that every part retains its accuracy for life... and motor longevity is accordingly increased.



## TOTALLY-ENCLOSED TYPE

for severe conditions



TYPE JU  
1 TO 125 H.P.

In many industrial applications, it has been found that enclosed motors provide the solution to difficult environmental conditions. Designed to cope with adverse, but non-explosive atmospheres, the new JU Totally-Enclosed Holloshaft provides, in addition to the HU Holloshaft features, a rugged enclosure which completely excludes harmful contaminants. If you have an application in which dirt, moisture, acid or alkali is present in such quantities that passage of outside air through the motor must be prevented, the Totally-Enclosed Holloshaft is for you.

### SPECIAL FEATURES OF THE TOTALLY-ENCLOSED HOLLOSHAFT:

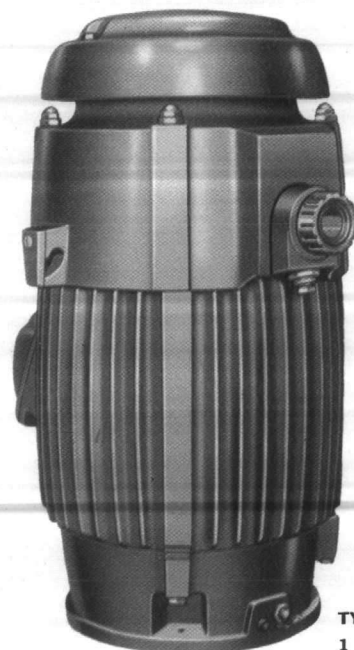
- **COOLING FAN**  
provides forced draft
- **LUBRISCOPE**  
clear view, fast oil-fill
- **THRUST BEARING AT TOP OF MOTOR**  
oil lubricated above 5 h.p.
- **COOLING RIBS**  
for rapid heat dissipation
- **ALL CAST-IRON EXTERIOR**  
corrosion resistant, rigid
- **NORMALIZED CASTINGS**  
heat-treated to prevent warping
- **REDUCED MOTOR**  
compact, space-saving
- **BALLOMATIC BACKSTOP**  
(optional) locks shaft quickly, positively against backspin
- **LUBRIFLUSH SYSTEM AT LOWER BEARING**  
transverse lubrication flushes out old grease
- **MOMENTARY UPTHRUST PROTECTION**  
hold-down bolt prevents shaft upward motion at starting
- **CONDENSATION DRAIN**  
collects and drains internal moisture
- **SAFETY-LOCK LIFTING LUGS**  
prevent escape of hoist sling
- **NON-REVERSE COUPLING**  
disengages pump if motor is reversed
- **ASBESTOS PROTECTED WINDINGS**  
non-organic asbestos cannot carbonize — protects against motor burn-out

## EXPLOSION-PROOF TYPE

for Hazardous Fume or Dust Conditions

Where explosive atmospheres prevail, safety precautions or required compliance with national and local codes necessitates the use of explosion-proof motors. The Explosion-Proof Holloshaft Motor is designed for locations in which hazards are present due to the use, handling, or storage of volatile liquids... highly inflammable gases... explosive dusts and other dangerous substances. It

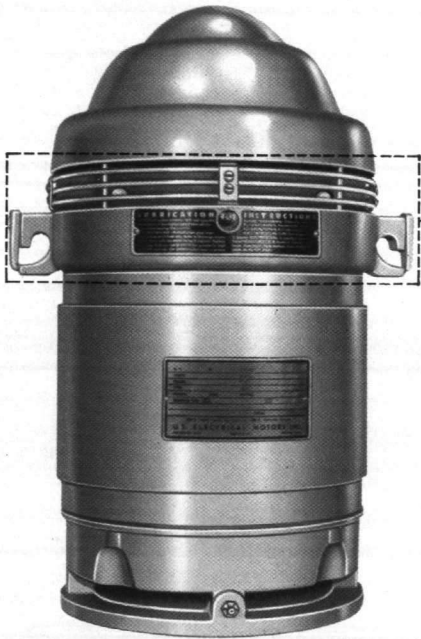
complies with Underwriters' specifications and carries the approved label of the National Board of Fire Underwriters. Exceeds Class I, Group D, specifications for explosive, inflammable gas conditions, and Class II, Groups F and G, for combustible dust. Besides the Totally-Enclosed features listed above, the Explosion-Proof Type EU has optional Spark-Resistant Backstop.



TYPE EU  
1 TO 125 H.P.



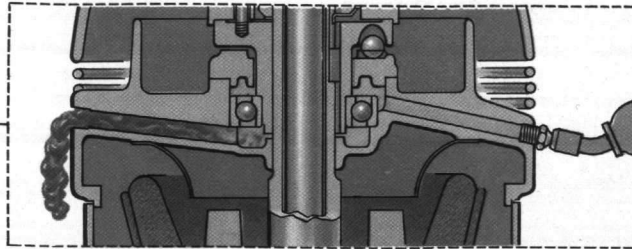
## GREASE-LUBRICATED MODEL 1½ TO 5 H.P.



The smaller, grease-lubricated models of U. S. Holloshaft Pump Motors retain most of the features of the larger horsepower type—such as the Rerated Frame for compactness, the Grille Screen, the Thrust Bearing located at the top of the motor, the pivoted Shaft Lock Arm, Weather Protection, the optional Ballomatic Backstop, and others. Grease lubrication, at both top and lower bearings, is the famous U. S. Lubriflush system.

### U. S. EXCLUSIVE LUBRIFLUSH TRANSVERSE LUBRICATION SYSTEM

Lubriflush provides up to *12 times* the volume of grease that can be accommodated in ordinary bearing lubrication system. With Lubriflush *transverse* lubrication, old worn-out grease is completely flushed out by new grease. With the advent of new varieties of modern greases having different chemical bases—many of which will not mix without becoming unsafe for bearing lubrication—the *complete* flush provided by Lubriflush becomes an important safety feature. Old and new greases never mix!



Cross section of portion in dotted rectangle

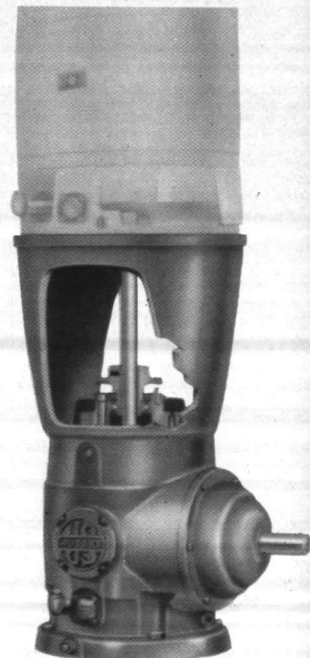
Lubriflush provides complete flush—old grease forced out

## OTHER U.S. PRODUCTS SERVE THE PUMP INDUSTRY

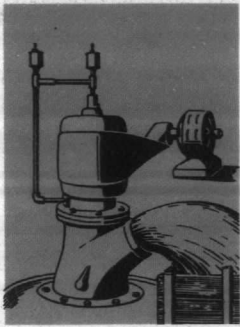


**FOR NON-ELECTRICAL SERVICE, U. S. HOLLOSHAFT RIGHT-ANGLE GEAR DRIVES . . .** Where electricity is unavailable or uneconomical, engine-driven pumping power is made readily applicable by U. S. Holloshaft Right-Angle Gear Drives. It is compact and weatherproof. U. S. makes its own gears, for top efficiency and long life. Other features: Visolube observable lubrication with constantly cycling oil, Normalized Castings, Accessible Thrust Bearing at top of drive, Backstop, and Momentary Upthrust Protection.

**FOR 24-HOUR STANDBY SERVICE . . . U. S. HOLLOSHAFT COMBINATION GEAR DRIVES . . .** For municipal water supply stations, sewage plants, fire-fighting, and other installations where continuous service is essential—this combination gear drive provides rapid shift from motor drive to auxiliary engine drive in the event of power failure. The combination gear drive has all the features of the right-angle gear drive (above).





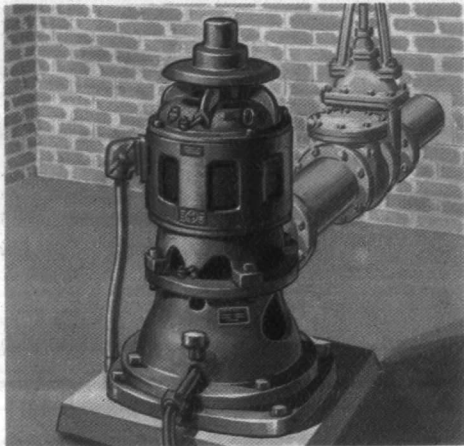


1908

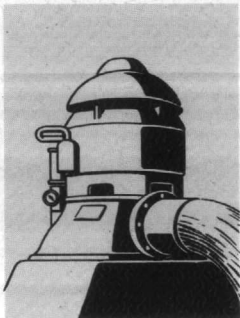


1918

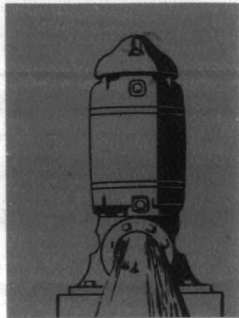
for half a century  
**U.S. MOTORS**  
have led the way in  
pump motor progress



1922 INTRODUCED WORLD'S FIRST VERTICAL  
HOLLOWSHAFT TYPE PUMP MOTOR



1930



1947



## NEW U.S. HOLLOSHAFT MOTORS

YEARS AHEAD FOR YEARS TO COME

Years ahead in design, U. S. Hollowshaft Motors are the result of the accumulated know-how of a half-century of leadership in the pump motor field. Here is a truly different and completely functional design,

from top to bottom. U. S. Motors' long experience in sensing and fulfilling the needs of the turbine pump industry has made possible this revolutionary motor that will be years ahead for years to come.



**U.S. ELECTRICAL MOTORS Inc.**

PACIFIC PLANT: Los Angeles 54, California (Box 2058) ATLANTIC PLANT: Milford, Connecticut

ALBANY 3, N. Y.  
ATLANTA, Ga.  
BAKERSFIELD, Calif.  
BALTIMORE 4, Md.  
BOSTON 16, Mass.  
BUFFALO 14, N. Y.  
CHARLOTTE, N. C.

CHICAGO 34, Ill.  
CINCINNATI 37, Ohio  
CLEVELAND 14, Ohio  
COLUMBUS, Ohio  
DALLAS, Texas  
DAVENPORT, Iowa  
DENVER 16, Colo.

DETROIT 4, Mich.  
FRESNO 1, Calif.  
HASTINGS, Neb.  
HOUSTON, Texas  
INDIANAPOLIS, Ind.  
KALAMAZOO, Mich.  
KANSAS CITY, Kan.

LUBBOCK, Texas  
MEMPHIS, Tenn.  
MILWAUKEE 3, Wis.  
NEWARK 4, N. J.  
NEW ORLEANS 24, La.  
NEW YORK 6, N. Y.  
PHILADELPHIA 2, Pa.

PHOENIX, Ariz.  
PITTSBURGH 22, Pa.  
RICHMOND 26, Va.  
SACRAMENTO 8, Calif.  
ST. PAUL 4, Minn.  
SALT LAKE CITY 11, Utah

SAN FRANCISCO 7, Calif.  
SAN JOSE 10, Calif.  
SEATTLE 4, Wash.  
STOCKTON, Calif.  
SYRACUSE 4, N. Y.  
TAMPA 11, Fla.  
MOTORS U. S. DE MEXICO, S. A. — MONTERREY, MEXICO

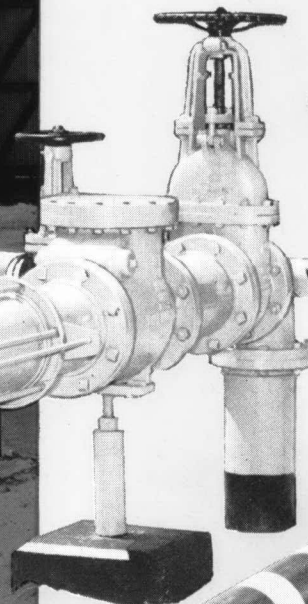
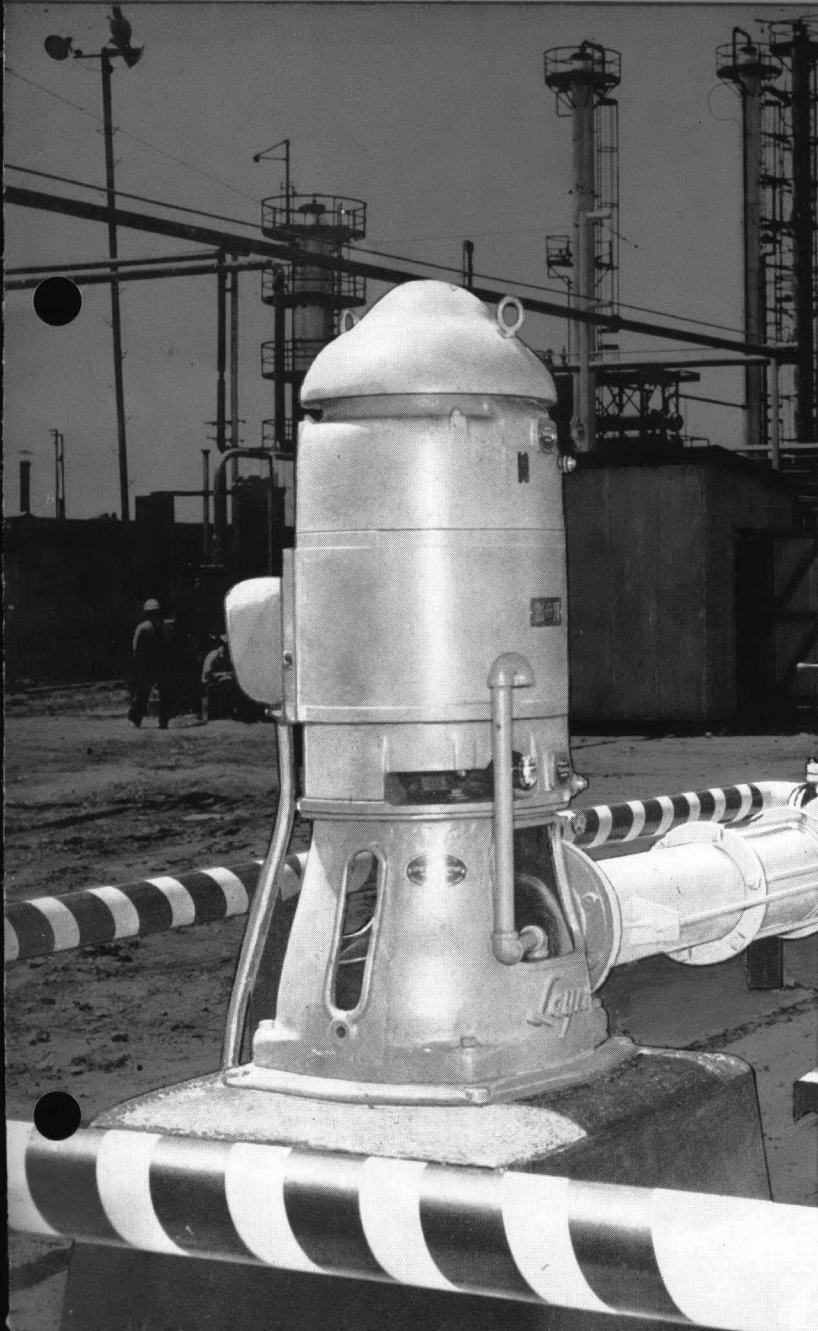


**WATER LUBRICATED**

# **VERTICAL TURBINE PUMPS**

**FOR WATER WELLS**

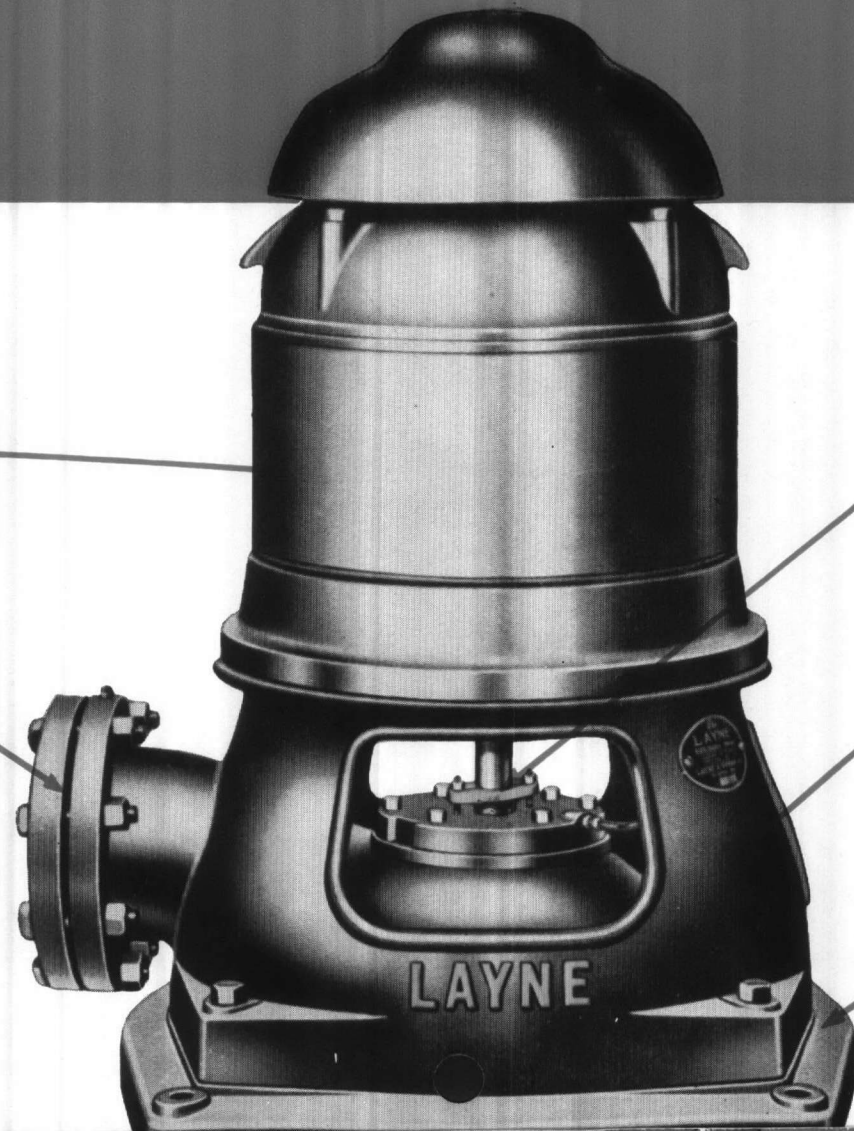
**Serving Cities, Factories,  
and all kinds of Industries**



Date: *25 Feb 71*  
**APPROVED**  
Subject To Meet Of  
Job Plans & Specifications  
*BJK*  
Quality Control

# LAYNE

## VERTICAL TURBINE PUMP



● **ELECTRIC MOTOR**, vertical hollow shaft type of any standard make.

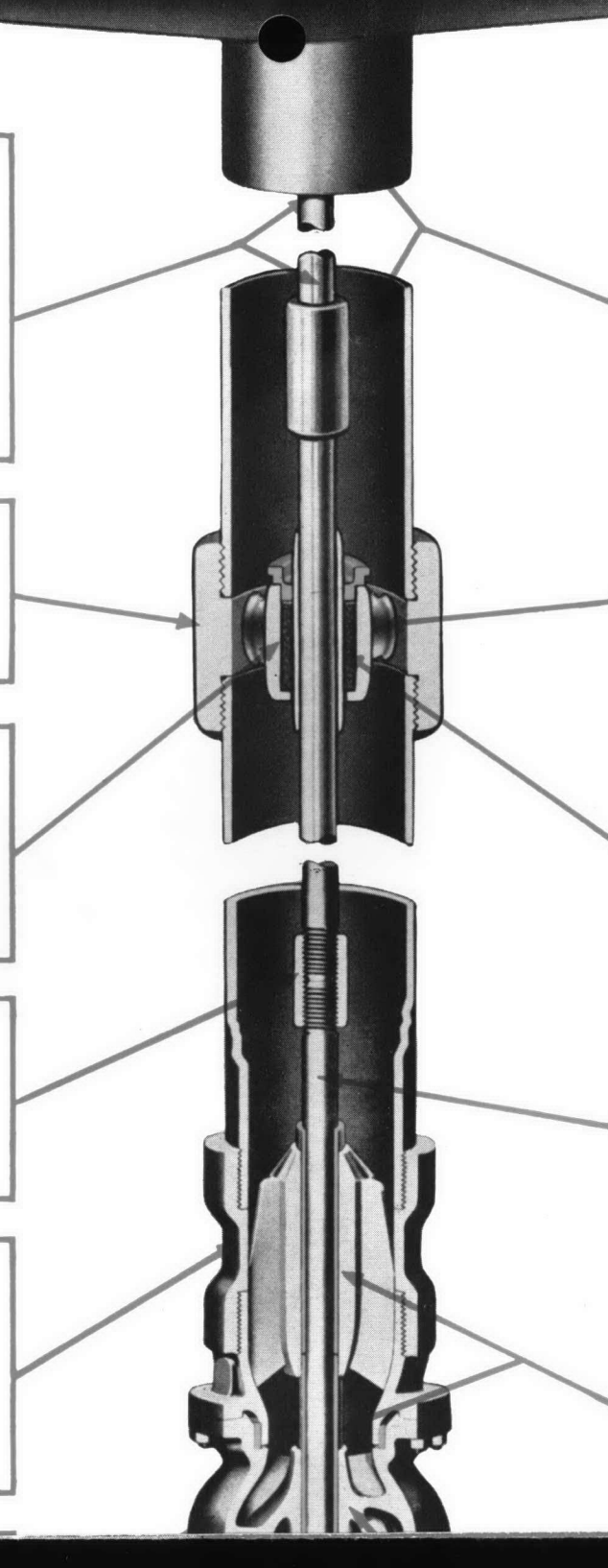
● **DISCHARGE OUTLET**, above-ground type, fitted with standard companion flange. Underground discharge outlet can be furnished if required.

● **STUFFING BOX** or **PACKING GLAND** designed for vertical shaft operating at relatively high speed.

● **PUMP DRIVE HEAD** of heavy cast iron, rugged design with low center of gravity. Drive heads are available for any kind of power application.

● **BASE PLATE**, separate from pump drive head, made of heavy cast iron. Separate base plates are not standard equipment but are furnished on special order.





● **LINE SHAFT** is highest grade carbon steel stock, turned, ground and polished. Standard lengths are 10-feet, and both ends are faced and threaded in lathes. Size of shaft is determined by the horsepower and pump speed. Shaft made of special alloys for severe or unusual conditions furnished at extra cost.

● **COLUMN or DISCHARGE PIPE** supports the pump bowls and conducts the water to the surface of the ground. It also centers and supports the line shaft. It is **STANDARD WEIGHT STEEL PIPE**, fabricated in 10-foot lengths with ends threaded and faced. Column pipe is furnished in sizes giving proper velocity of water without excess friction loss.

● **DISCHARGE PIPE COUPLINGS** are extra heavy semi-steel, with aligning spider cast integrally. All pipe connections are butt joint insuring proper alignment.

● **ALIGNING SPIDERS** are cast in the combination column and coupling, are full streamlined and are spaced at 10-foot intervals. The rubber shaft bearing is mounted in the spider hub.

● **RUBBER BEARINGS** are extra length, made of highest grade cutless rubber, with inside bearing surface fluted to insure maximum lubrication by the water. They are retained in the spider hub by a positive screw lock.

● **SHAFT SLEEVES** are **MONEL METAL** affixed to the line shaft opposite the rubber bearings.

● **SHAFT COUPLINGS** are made from solid steel shafting stock, bored, threaded and finished all over on special lathes. Each is carefully balanced. No set screws, bolts or pins are used.

● **IMPELLER SHAFT** is over-size, made of selected stainless steel shaft stock. It connects with the line shaft and extends through the pump bowl. The impellers are affixed with collets. No keyways or keys are necessary.

● **ADAPTER CASTING** connects the top stage of the pump bowl with the discharge pipe. It is designed with vanes which straighten the flow of water from the pump bowl, delivering it to the discharge column with minimum turbulence.

● **SLEEVE BEARINGS** in adapter and throughout the entire pump bowl are made of plastic bronze, extra long for added wearing life.

● **BOWL STAGES or SECTIONS** make up the complete bowl. The size and number of stages required depend upon the amount of water, the pumping head and pump speed.

● **IMPELLERS** are fully enclosed, bottom suction, non-overloading type. They are made of phosphor bronze, hand finished, and accurately balanced.

● **WEAR RINGS** are fitted in each stage. They are made of phosphor bronze and are removable so new rings may be installed when required.

● **SUCTION NOZZLE BUSHING** is plastic bronze, sleeve type and extra long and rugged.

● **SUCTION STRAINER** is steel and designed for use with vertical turbine pumps. The cone type is standard but flat or basket type is available for special conditions.

● **DIFFUSER VANES** are designed in conformance with the most modern practices in hydro-dynamics. The proportions are accurately calculated for minimum loss of applied energy.

● **SUCTION NOZZLE** is venturi type with streamline vanes. It conducts the water from the suction pipe to the eye or suction of the lowest impeller and delivers it without swirls or eddies.

● **SUCTION PIPE** for standard pumps consists of 10-feet of standard weight steel pipe.

The manufacturer reserves the right to change, alter or in any way improve the product with equal or better materials other than those stated, or, if for some reason, the materials are not available.

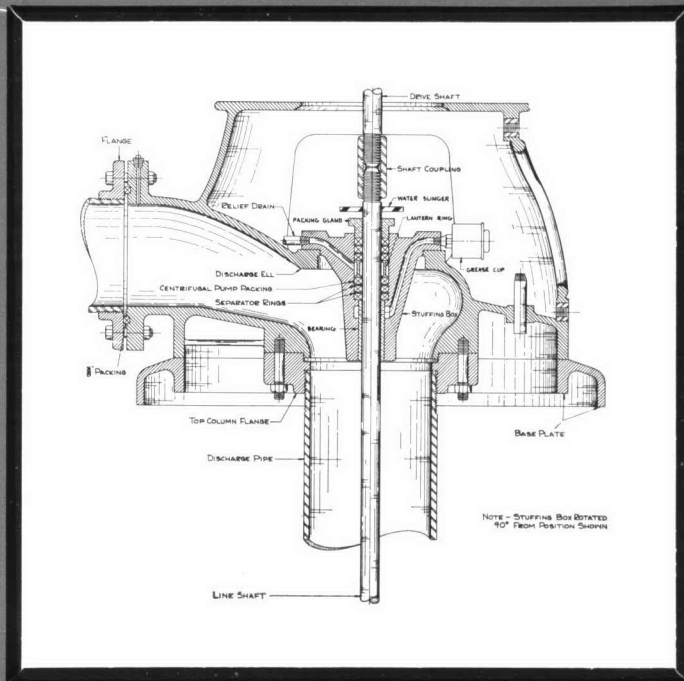


● WATER LUBRICATED

# PUMP DRIVE HEADS

## A TYPE FOR EVERY REQUIREMENT

The most commonly used pump drive heads are those shown on this page and the head shown on the large illustration on the inside of this folder. All Layne Pump Drive Heads have low center of gravity and plenty of iron for rugged strength. The design is simple and all adjustments are made easily and quickly. Only minimum care and attention is required after the pump is installed.



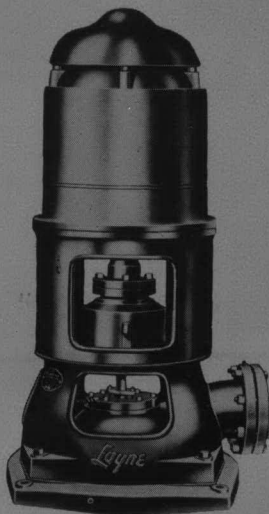
Construction details of Type TF drive head. This is the head shown on the full length illustration inside this folder. It is the basic part of all standard drive heads.



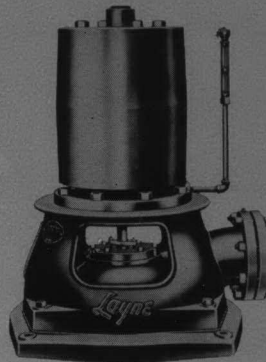
Type TF-GD combination drive head for electric motor and standby engine drive through right angle gear.

## SPECIAL DRIVE HEADS

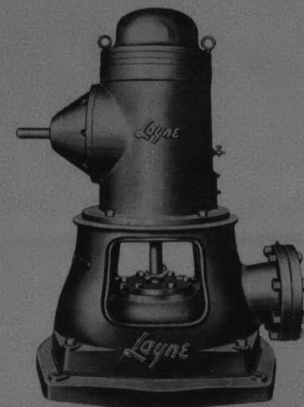
Supplementing the complete line of standard pump drive heads is a line of special heads. These are for unusual conditions or power applications. Available are heads for Underwriters' Fire Pumps, combination electric motor and direct connected engine drive, vertical steam turbine drive, combination electric motor and belt drive, heads for exceedingly heavy duty and others. Usually it is possible to design and furnish heads for any condition.



Type MA head with thrust bearing assembly, motor support and flexible coupling for mounting solid shaft motor.



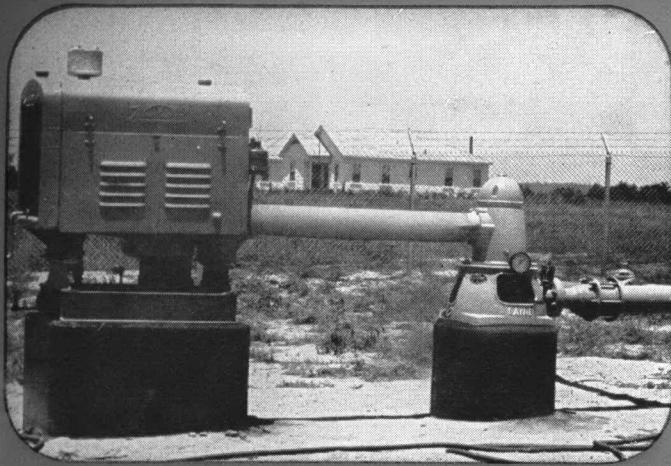
Type BF drive head has pulley and thrust bearing assembly for belt drive. Either flat or grooved pulleys furnished.



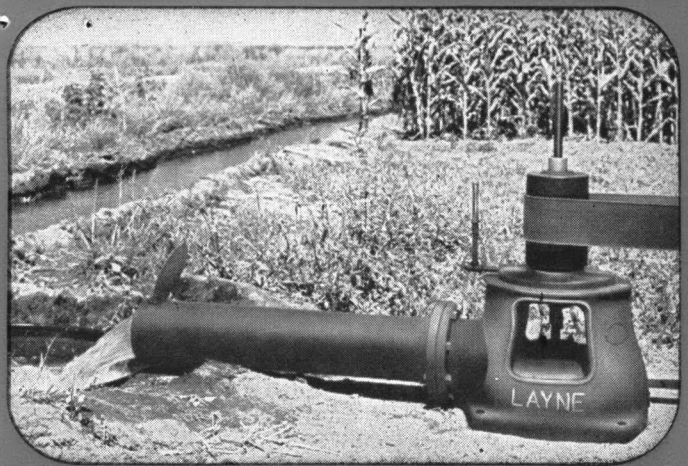
Type TF-GD head for direct engine drive through right angle gears.

*"Better Built  
for Better Service"*





This direct connected engine drive through right angle gears is used extensively where there is no electric power.



Engine driven pump using one-quarter turn belt drive. A popular drive in agricultural irrigation work.

# LAYNE VERTICAL TURBINE PUMPS

**A Dependable and Efficient Line of Pumps  
Used Throughout the Entire World**

**APPLICATIONS**—For over 75 years Layne Pumps have been used for pumping water for cities, towns and villages; by industries of all sizes and kinds; by railroad systems; by farmers, agriculturalists and planters for irrigating crops—in fact, by all who use water for any purpose in quantity, large or small.

Layne Short Coupled Pumps also are used for

pumping water from lakes, reservoirs or streams. They are particularly desirable for this kind of pumping duty because fluctuations of water level do not interfere with operation of the pump. They also are used for mine drainage and sub-surface drainage. Since the driver is installed at the surface above high water level, the pumping units cannot drown out.

**SIZES AND CAPACITIES**—The sizes of Layne Pumps depend upon quantity of water, speed of pump and the pumping head. Required inside well diameters range from 4-inches for the smallest pump up to 42-inches for the largest pump. There are many intermediate sizes. Capacities range from 50 U. S. gallons a minute up to 30,000 U. S. gallons a minute. Total pumping heads vary from the lift in the well or shaft only up to seven or eight hundred feet. The amount of setting (discharge column) depends upon the distance to the pumping water level.

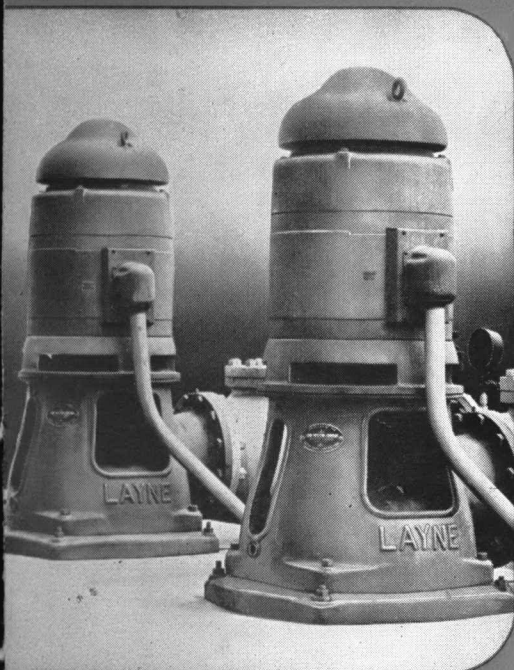
Beginning at the surface or the top of the pump, the following component parts make up a complete pump:

(a) The pump drive head which consists of the discharge ell and outlet, the stuffing box or packing gland and the thrust bearing assembly, when one is necessary. The drive head supports the entire pump which is suspended in the well or shaft.

(b) The discharge column consisting of suction pipe and connections, the line shafting with couplings, bearings and supporting members. The length of discharge column is governed by the distance from the pump drive head to the pumping water level.

(c) The pump bowl, made up of discharge and suction nozzles, intermediate bowls or stages, including impellers, bowl bushings, wearing rings and impeller shaft. The number of stages (bowls) depends upon the pump bowl size (diameter), speed of rotation, amount of water pumped and the total pumping head. The bowl usually is equipped with 10 feet of suction pipe.

If you have a pumping problem, write the factory giving operating conditions. Recommendations and estimates will be sent. No obligation whatever.



Typical installation with hollow shaft vertical motor. The standard unit where electric power is available.

**LAYNE & BOWLER, INC.**

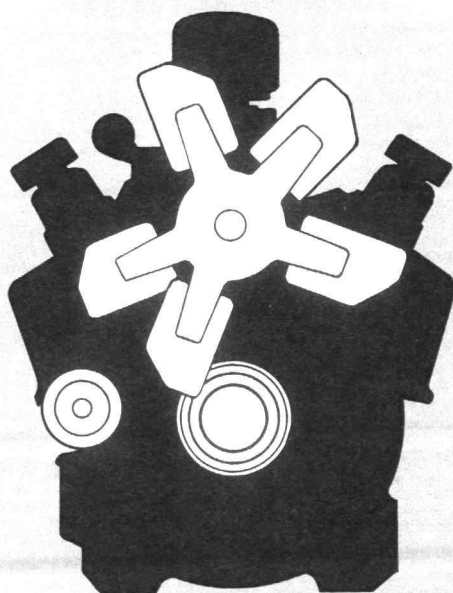
**GENERAL OFFICES, MEMPHIS, TENN. 38108**

**Offices and Representatives Throughout the World**





**SUPERDUTY**  
—→ \* **477** \* ←—  
**534**





## FORD V-8 CYLINDER 477 AND 534 SERIES ENGINES

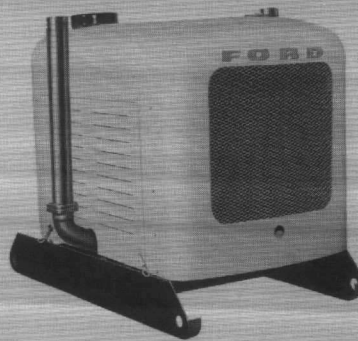
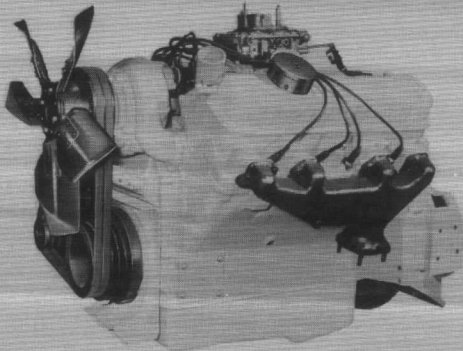
Ford Superduty engines are built to handle big jobs more dependably, efficiently and economically! They feature direct-flow induction, large main bearings, autothermic four-ring pistons, extra capacity oil reservoir with plate-type internal oil cooler and

- **Modern large bore, short stroke engine design**
- **Dynamically balanced crankshaft** has increased rigidity for less vibration . . . greater engine smoothness
- **Large replaceable main bearings** (steel-backed copper-lead alloy) keep unit-loading pressure low for sustained bearing life and durability
- **Autothermic four-ring turbulence-top pistons** with integral steel strut for strength and durability
- **Durable high-lift camshaft** contoured to reduce valve seating velocities for extended valve life
- **Cast iron piston top ring groove insert** for long life
- **Chrome-plated piston rings** for tighter compression seal and resistance to wear
- **Large dished-type intake valves** with positive rotators are self-cleaning, seat tighter, last longer
- **Integral valve guides** for cooler valve operation and valve stem durability
- **Special alloy intake and exhaust valve seat inserts** for maximum wear resistance

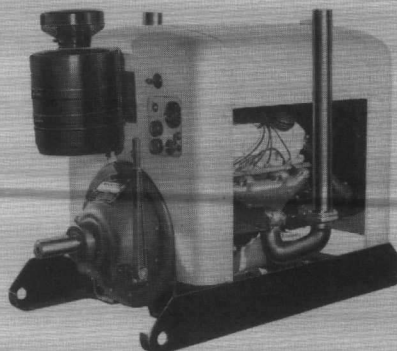
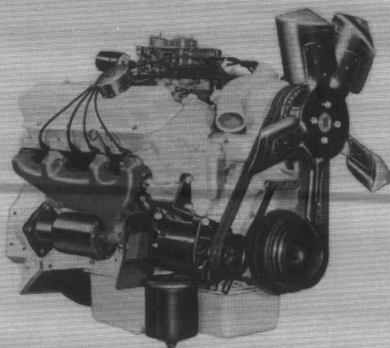
three-stage cooling with two thermostats . . . and other plus features that make these engines Superduty power plants. Exceptionally high torque over the low and medium-speed range is a performance characteristic. Others are:

- **Sodium cooled exhaust valves**
- **Tungsten-cobalt alloy valve facings** for long valve and seat life
- **Full pressure lubrication** for longer-lasting moving engine components
- **Dependable rotor-type oil pump** for increased oil pressure at all engine speeds
- **Gear-driven camshaft** for durability and timing accuracy
- **Wide-contact timing gears** for reduced tooth loading, greater durability
- **Oil pan with deep reservoir, baffle and rear sump** provides oil supply to block-mounted internal pump at all times
- **Plate-type internal oil cooler** to reduce oil temperatures, minimize carbon formation, maintain oil film strength, extend oil change interval and increase engine life
- **Special full flow two stage oil filtration system**
- **Gear-driven mechanical overspeed governor** for engine protection.

### FORD 477 GASOLINE ENGINE AND POWER UNIT

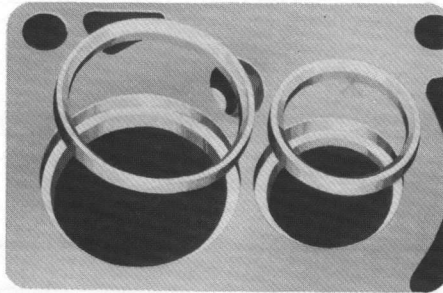


### FORD 534 GASOLINE ENGINE AND POWER UNIT





**Big power to handle big jobs with Ford efficiency, dependability, economy! Here are some reasons why:**



Durable valve seat inserts. Intake and exhaust inserts are hard-faced with long-wearing metal alloys to give maximum wear resistance. Integral valve guides with water jacketed guides and seats.

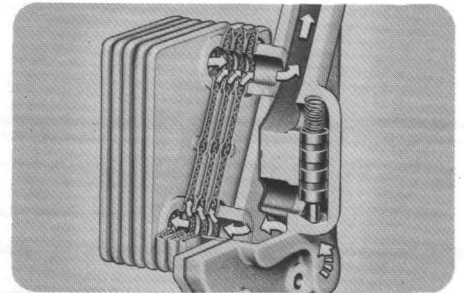
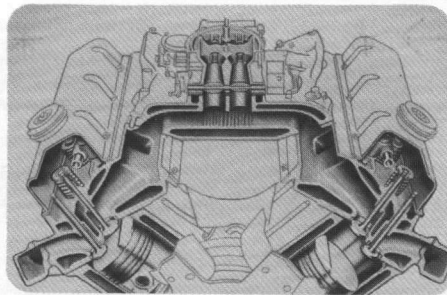
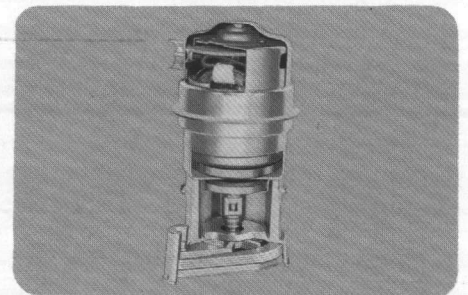


Plate-type internal oil cooler. Reduces oil temperatures to minimize carbonization, keep greater oil film strength, prolong life of moving parts, extend time between oil changes. Easily accessible.



Short stroke design. Delivers more power with less piston travel, reduces internal friction for long engine life and greater fuel and oil economy. Turbulence-Top pistons are super-fitted aluminum-alloy 4-ring type, designed for high-turbulence power.

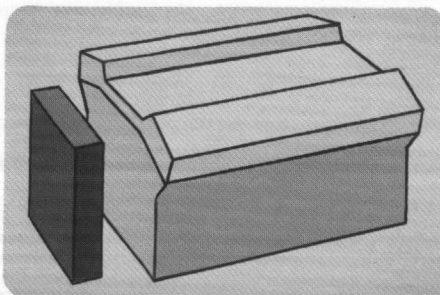


Submerged type fuel pump. Big capacity electric fuel pump mounted in fuel tank delivers a constant supply of fuel. It minimizes vapor lock, as only liquid fuel under pressure is delivered to the carburetor. Not dependent on engine rpm for output.

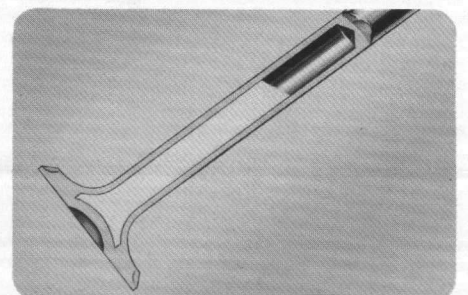
### Advanced 3-stage parallel flow cooling.

1. Head—for cold starts, thermostats are closed, coolant is pumped through the cylinder heads and manifold jacket, returning to the pump. This preheats the fuel-air mixture for efficient burning and greater power. Fast block warm-up provides better lubrication.

2. Head and block—at 140 deg. back thermostat opens allowing coolant to circulate more rapidly through the block. The coolant flows through head, block and intake manifold jacket but the closed front thermostat prevents it from flowing through the radiator.



3. Complete cooling—at 160 deg. the front thermostat opens allowing the coolant (12,600 gal./hr) to flow through the radiator and the entire cooling system. Approximately half of the coolant is directed to the heads and half to the block.

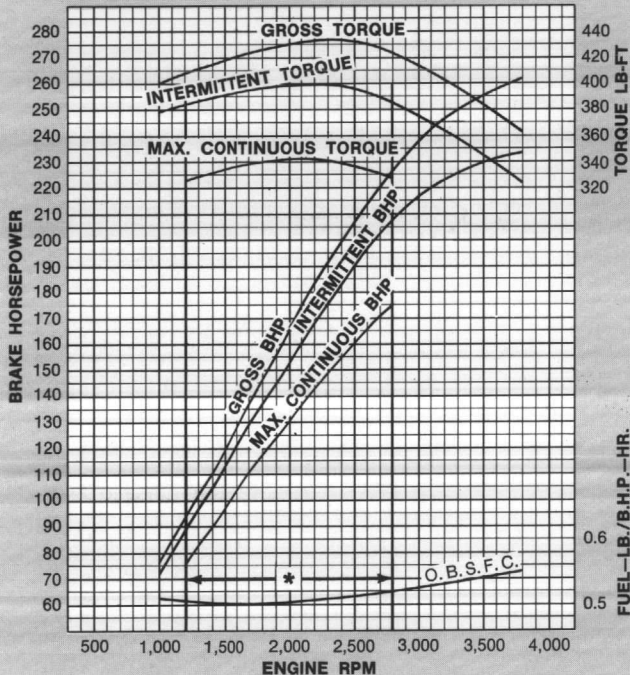


Sodium-cooled exhaust valves. Hollow and partially-filled with powdered sodium. This feature, combined with integral valve guides, allows valve heads to operate up to 225 deg. cooler. Results in cleaner-running longer-lasting valves and seats.

## \* 477 CU. IN. V-8 \*

### 477 CU. IN. V-8

BORE 4.50 IN. STROKE 3.75 IN.  
COMPRESSION RATIO 7.5 : 1

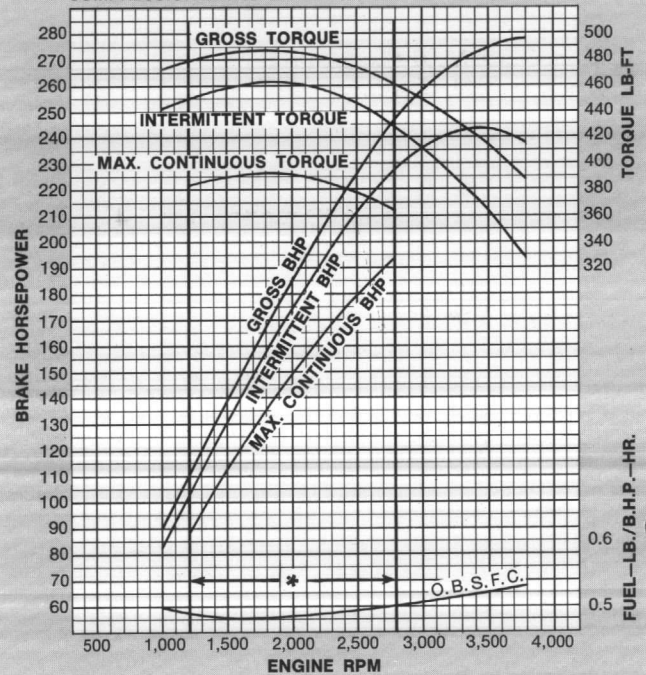


\* RECOMMENDED ENGINE SPEED RANGE FOR STATIONARY APPLICATIONS

## 534 CU. IN. V-8

### 534 CU. IN. V-8

BORE 4.50 IN. STROKE 4.20 IN.  
COMPRESSION RATIO 7.5 : 1



\* RECOMMENDED ENGINE SPEED RANGE FOR STATIONARY APPLICATIONS

**Special note**—gross output curves are corrected to 29.92 in. Hg and 60 deg. F. dry air. They are for a complete engine assembly less fan, generator and air cleaner. The engine is run with dynamometer exhaust system and the optimum spark and fuel settings for best power. Engine-installed output (intermittent) and maximum continuous output curves are corrected to 29 in. Hg and 85 deg. F. dry air. Engine is equipped with exhaust system, generator, less fan, with automatic spark and fuel settings.

**Accessories**—the curves should be derated to compensate for any accessories which are added such as hydraulic pumps, air compressors, etc. See tables below for cooling fan power requirements. **Severe operating conditions**—for each 1,000 ft above sea level that the unit is to be operated, subtract 3 per cent from the horsepower and torque curves. For each 10 deg. F. rise in surrounding air temperature above that specified in the power curve charts, subtract one per cent (1%) from the horsepower and torque curves.

#### BHP losses due to fan

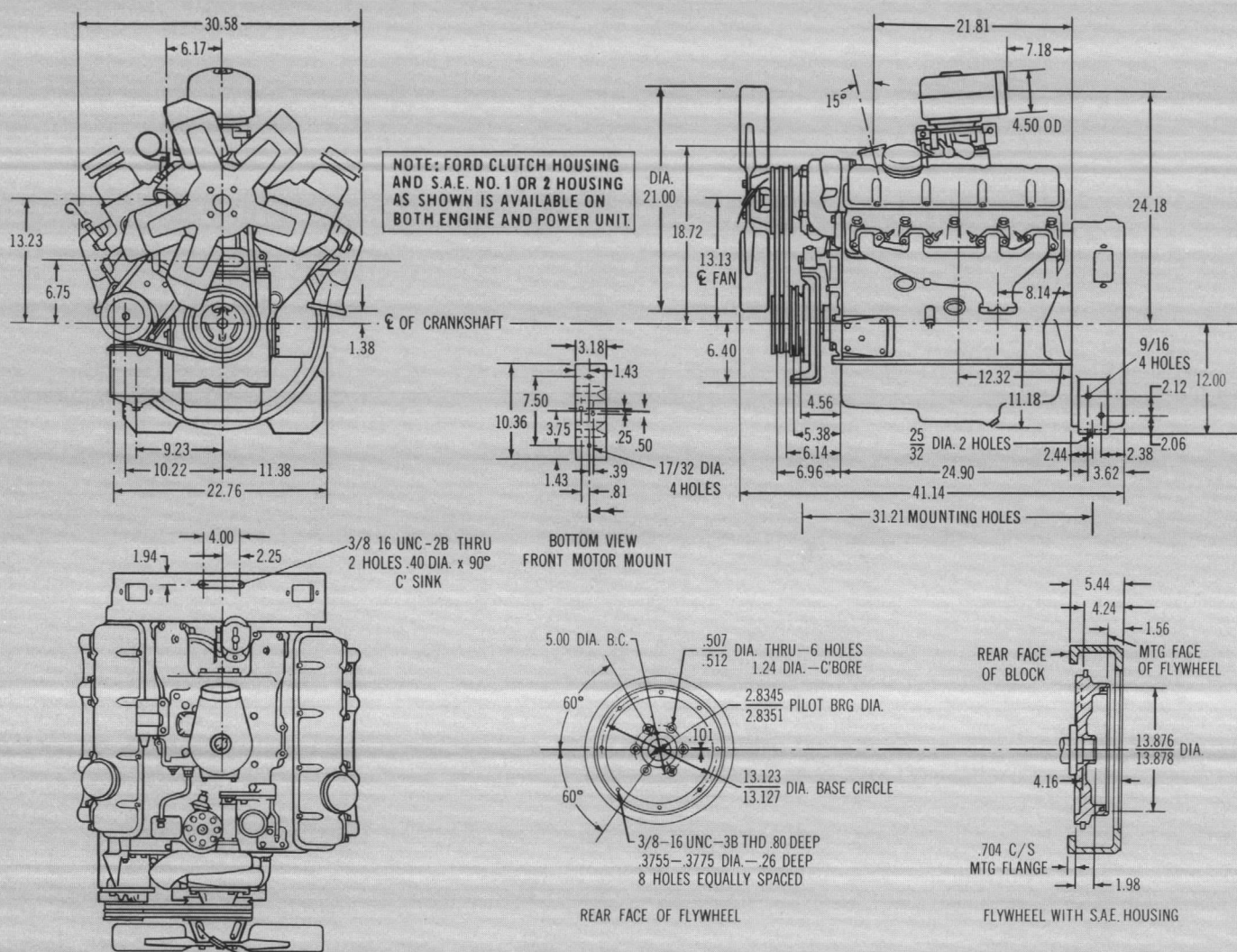
Engine rpm .....	1,200	1,600	2,000	2,400	2,800
Engine .....	0.8	1.9	3.6	8.8	12.0
Power unit .....	1.8	3.4	6.5	11.5	15.5



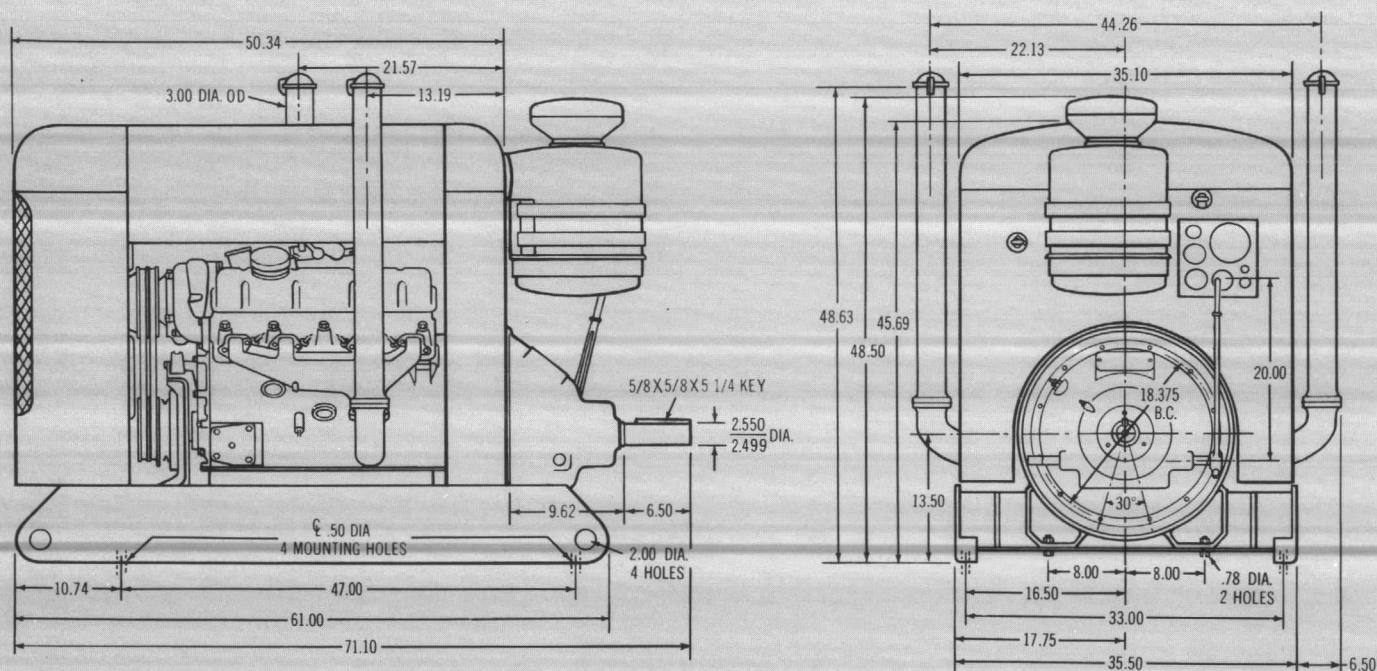




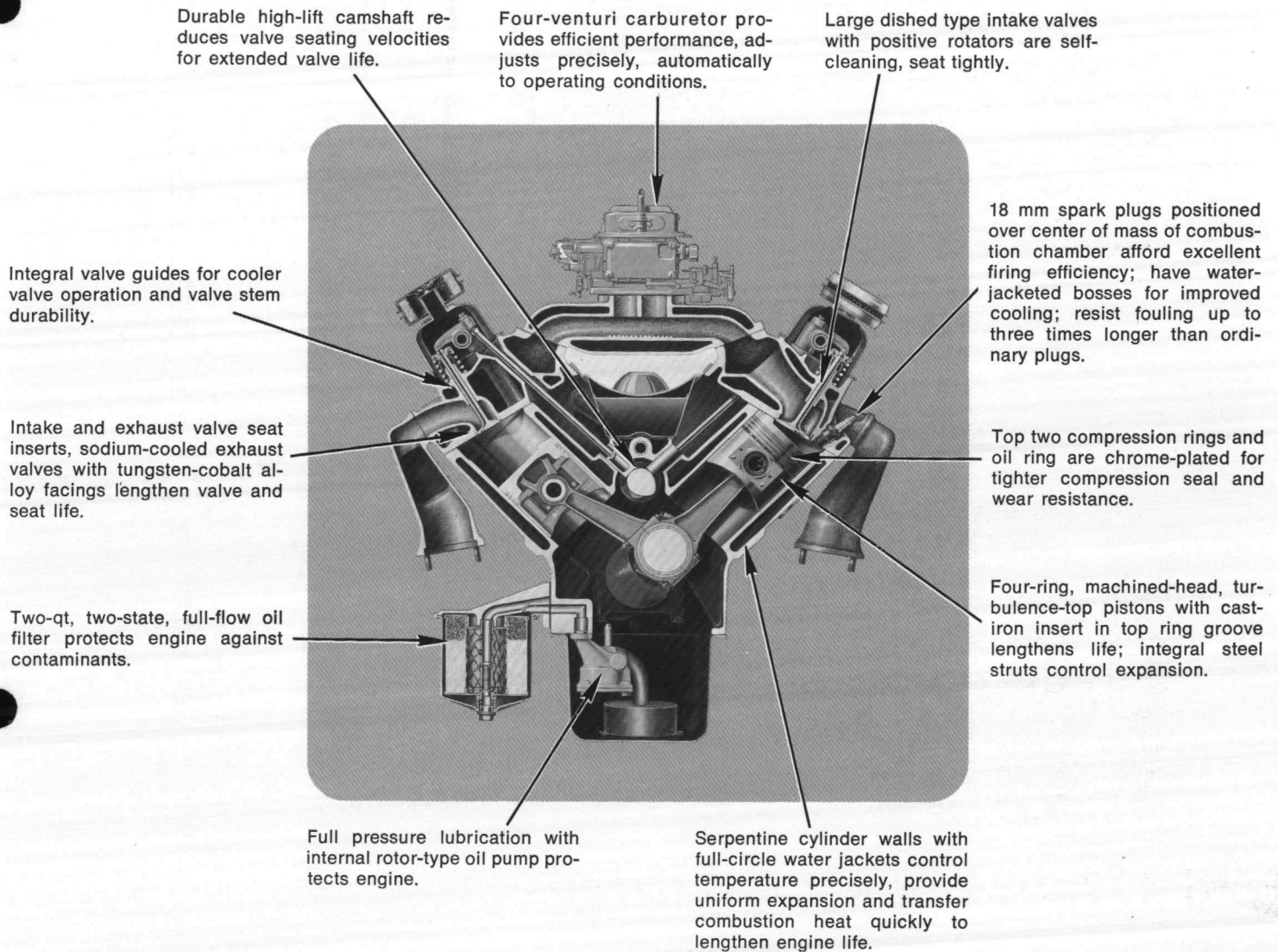
# Ford 477, 534 engine dimensions



# Ford 477, 534 power unit dimensions



# An inside look at the famed Ford V-8 engine design



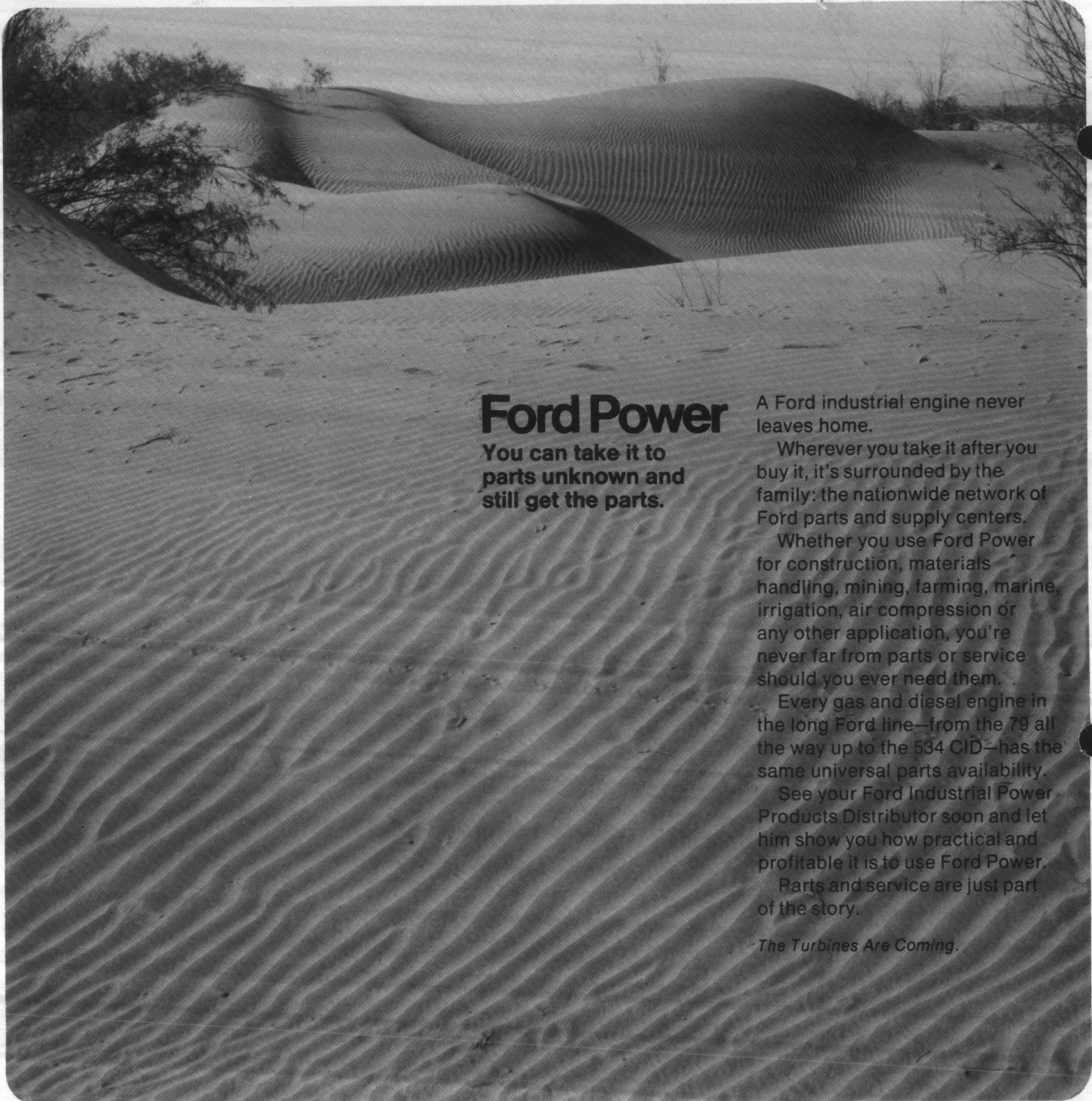
## Accessories available for 477, 534 engines

Engine hour-meter • tachometer • 11½-in. clutch  
• 13-in. clutch • heavy-duty 5-speed transmission  
• Triple Drive Range Transmatic with a 6-speed automatic torque converter • power-steering pump  
• high-capacity air cleaner • heavy-duty alternator

• high-capacity radiator • 23-in. diameter, 5-bladed fan where extra cooling effort is required • fuel tank with submerged electric fuel pump • instrument panel with standard switches and gauges • air brake compressor.

*The specifications in this folder were in effect at the time it was approved for printing. Ford Industrial Engine and Turbine Operations, Village Plaza, 23400 Michigan Avenue, Dearborn, Michigan 48124, whose policy is one of continuous improvement, reserves the right, however, to discontinue models or change specifications, design or prices at any time without notice and without incurring any obligation. EFD 8787 IET*





## Ford Power

**You can take it to parts unknown and still get the parts.**

A Ford industrial engine never leaves home.

Wherever you take it after you buy it, it's surrounded by the family: the nationwide network of Ford parts and supply centers.

Whether you use Ford Power for construction, materials handling, mining, farming, marine, irrigation, air compression or any other application, you're never far from parts or service should you ever need them.

Every gas and diesel engine in the long Ford line—from the 79 all the way up to the 534 CID—has the same universal parts availability.

See your Ford Industrial Power Products Distributor soon and let him show you how practical and profitable it is to use Ford Power.

Parts and service are just part of the story.

*The Turbines Are Coming.*

**See your nearby Industrial Power Products Distributor.  
He is listed in the Yellow Pages.**





CORBIN CONSTRUCTION COMPANY, INC.

General Contractors

P. O. BOX 471

DUNN, NORTH CAROLINA 28334

2  
filed under 11A  
# 15F

Date 7 January 1971 Job No. \_\_\_\_\_

TO  
Captain W. F. Russell, Jr., CEC, USN  
Resident Officer in Charge of Construction  
Marine Corps Base, Camp Lejeune, North Carolina

CONTRACT: N62470-70-C-0939  
Water Treatment Plant, Wells  
and Distribution System

Gentlemen:

We are sending you { herewith } five Federal Pump Corp. prints of ~~Sheet No.~~ Bulletin 185-C, Surface Wash  
{ under separate cover } prints of Sheet No. Pump  
five ~~samples~~ Prints of Bulletin 228-C, Duplex Sewage Ejection Unit

These are: (As checked below).

1.  For \_\_\_\_\_ approval. Please return corrected prints.
2.  Revised and for \_\_\_\_\_ final approval. Please return correct prints.
3.  For your Files and use on job \_\_\_\_\_
4.  Approved for fabrication—Please forward correct prints.
5.  \_\_\_\_\_

Remarks: In conformance with Section 11A.5, 11A.7 and 15F.8

*filed under 11A*  
*copy to 1/13/71*  
*3 copies to 1/13/71*

ROUTING ORDE. INT

1	60	W
2	510	
3		
4		
5		
	ORIG	INT

C. C. \_\_\_\_\_

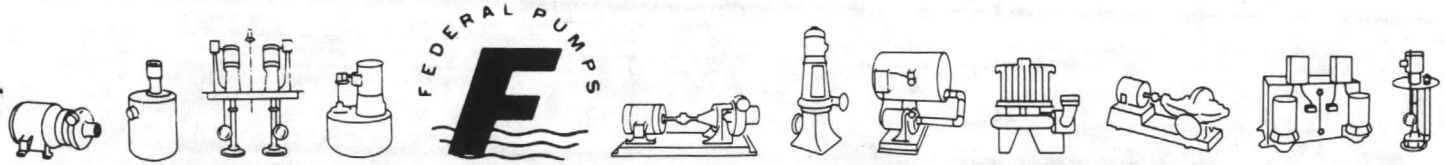
Yours Truly,  
CORBIN CONSTRUCTION CO., INC.  
APPROVAL SECTION

Drwgs. Enclosed Ten Bulletins

By: DJK  
Quality Control Representative

PLEASE ACKNOWLEDGE RECEIPT OF THE ABOVE PROMPTLY





ESTABLISHED 1927 • CENTRIFUGAL PUMPS • TURBINE PUMPS • ROTARY PUMPS • SEWAGE & SUMP PUMPS • BOILER FEED PUMPS • CONDENSATE PUMPS • CELLAR DRAINERS • HOT WATER CIRCULATORS

**FEDERAL PUMP CORPORATION • 1144 UTICA AVE. BROOKLYN 3, N. Y. • GL 1-2000**

PROJECT: WATER TREATMENT PLANT  
 CAMP LEJEUNE, N. C.  
 CONTRACT No. N62470-70-C-0939

October 7, 1970

Refer To:  
 RECORD No. B-29283

CONTRACTOR: CORBIN CONSTRUCTION CO.

Representative:  
 J. C. Holland Sales Co.

ARCHITECT:

REVISED: 12-22-70

ENGINEER:

ITEM NO. 1: SURFACE WASH PUMPS. In Accordance with paragraphs 11A.5 & 11A.7  
QUANTITY DESCRIPTION

1	INSTALLATION: HORIZONTALLY SPLIT CASE PUMP & MOTOR UNIT			
1	PUMP 3SC-15-4 Brz. Ftd.	BASIN/PIT DEPTH	single stage, double suction, Mech.seal, s/s shaft, C.I. Base	
	EDR SQ.FT. 200	GPM 116	<del>###</del> /TDH	
	MOTOR drip prf ball brg. H.P. 15	R.P.M. 1750		
	VOLTS 480	PHASE 3	CYCLE 60	
	BASIN/RECEIVER			
	MODIFICATIONS, CONTROLS, AND ACCESSORIES			
	Curve included			
	The suction and discharge connections are in the lower half of the casing allowing the removal of the rotating element without disturbing the pipe connections.			
	Motor starters shall be furnished by others.			

APPROVED OR APPROVED AS NOTED  
 BY: D. Hof  
 Quality Control Representative  
 Corbin Construction Company  
 Date: 7 Jan 71



FEDERAL BUREAU OF INVESTIGATION, U.S. DEPARTMENT OF JUSTICE

October 15, 1950

Mr. J. Edgar Hoover, Director, FBI

100-100000

Re: [Illegible]

NY 100-100000

1. [Illegible]

NY 100-100000

1

2. [Illegible]

1

3. [Illegible]

4. [Illegible]

[Illegible]

[Illegible]

APPROVED AND FORWARDED:  
Special Agent in Charge  
Gerald W. [Illegible]  
Gerald W. [Illegible]  
Date: \_\_\_\_\_

**FEDERAL PUMP CORPORATION • 1144 UTICA AVE. BROOKLYN 3, N. Y. • GL 1-2000**

ITEM NO. 2 SEWAGE PUMPING UNIT: In accordance with paragraphs 15F.8 and MIL-P-21251 and Dwg. 1338913

QUANTITY	DESCRIPTION
1	INSTALLATION: DUPLEX SEWAGE EJECTOR UNIT.
2	PUMP VSA-4A-1½-4 4" discharge BASIN/PIT DEPTH caple of passing 2½" solids EDR SQ.FT. 100 GPM 22 ###/TDH
2	MOTOR drip prf ball bear. H.P. 1½ R.P.M. 1750 VOLTS 480 PHASE 3 CYCLE 60
1	BASIN/RECEIVER 53" dia. steel coverplate for 48" dia. pit opening.
1	MODIFICATIONS, CONTROLS, AND ACCESSORIES Pedestal mounted, NEMA 1, automatic alternating float switch assembly.  NOTE: MOTOR STARTERS SHALL BE FURNISHED BY OTHERS.

ITEM NO.

QUANTITY	DESCRIPTION
	INSTALLATION:
	PUMP BASIN/PIT DEPTH EDR SQ.FT. GPM PSIG/TDH
	MOTOR H.P. R.P.M. VOLTS PHASE CYCLE
	BASIN/RECEIVER

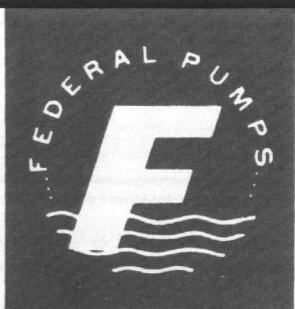
MODIFICATIONS, CONTROLS, AND ACCESSORIES

APPROVED or APPROVED AS NOTED.  
By: D. J. [Signature]  
Quality Control Representative  
Corbin Construction Company  
Date: 7/27/71

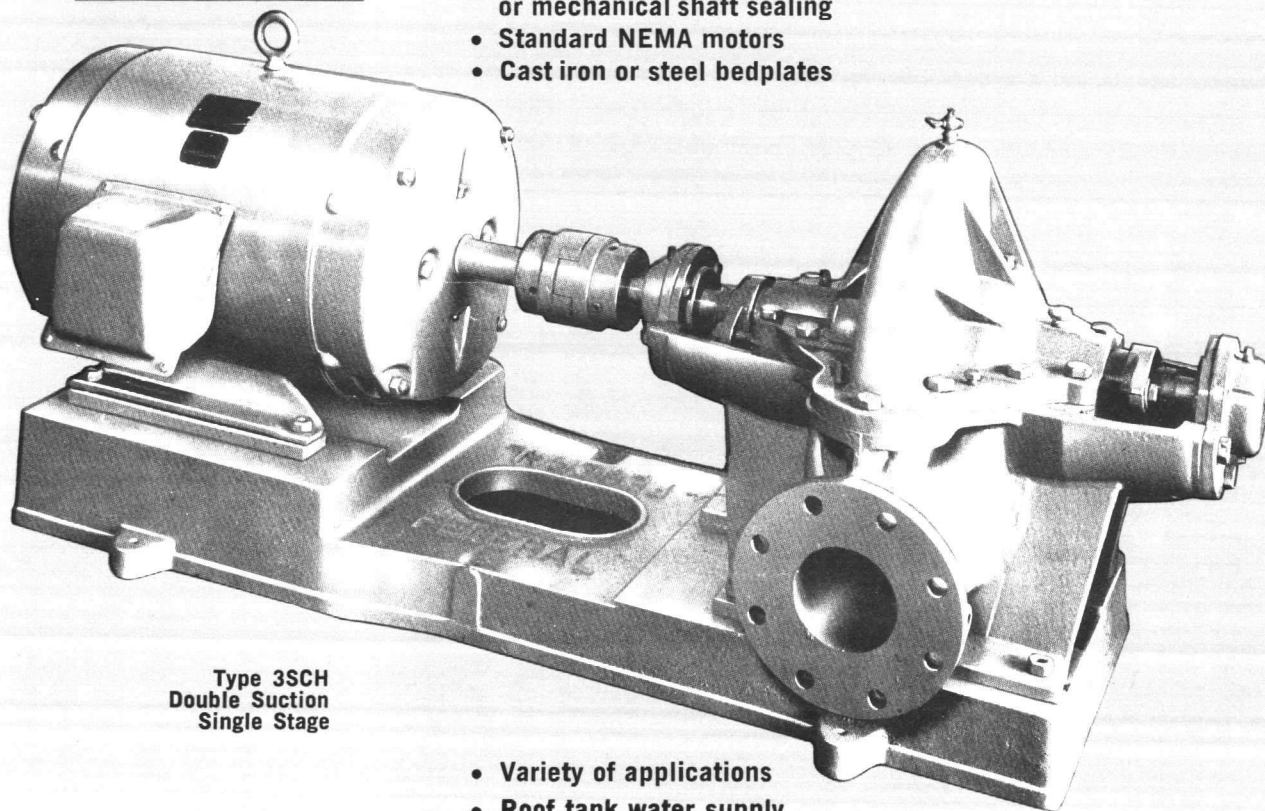




# horizontally split case pumps



- Double suction
- Flexibly coupled
- Horizontally split casing
- Hydraulically balanced impellers
- 1150, 1750, or 3450 R.P.M.
- Packed stuffing box or mechanical shaft sealing
- Standard NEMA motors
- Cast iron or steel bedplates



**Type 3SCH**  
**Double Suction**  
**Single Stage**

- Variety of applications
- Roof tank water supply
- Hydropneumatic water pressure systems
- Hot water circulation
- Condensate return
- Boiler feed water
- Chilled water circulation
- Condenser water service
- Process applications

ESTABLISHED 1927

## FEDERAL PUMP CORPORATION

1144 UTICA AVENUE • BROOKLYN, N. Y. 11203

# ENGINEERING SELECTION TABLE — 1750 R.P.M.

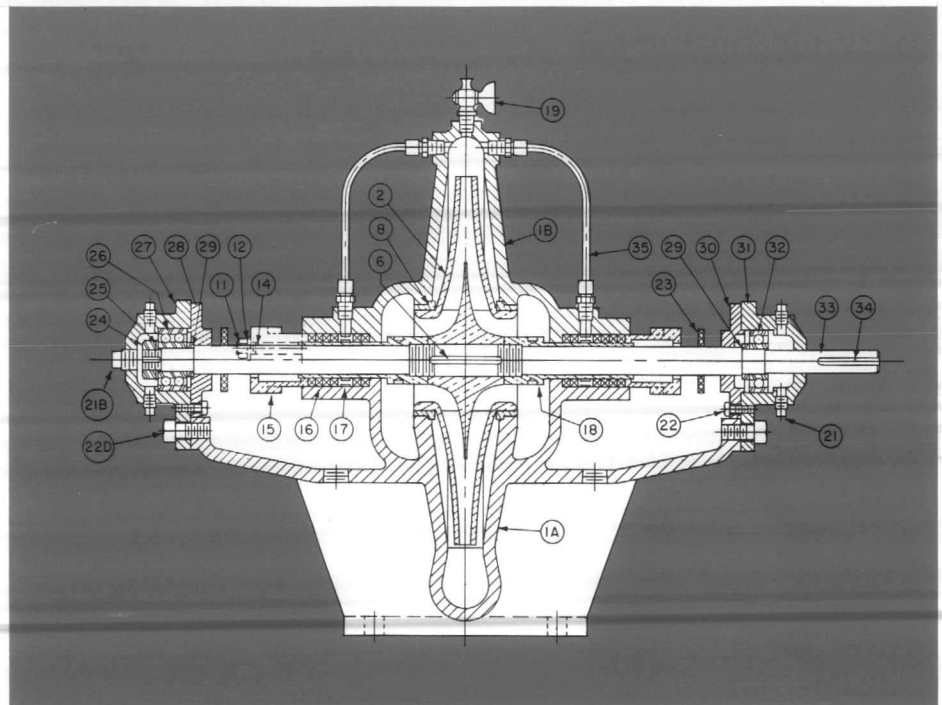
(1150 R.P.M. and 3450 R.P.M. selections available upon request)

## TOTAL DYNAMIC HEAD (FEET)

G.P.M.	40	50	60	70	80	90	100	120
50	2SCL-1½-¼	2SCL-2-¼	2SCL-2-¼	2SCL-3-¼	2SCL-5-¼	2SCL-5-¼	2SCL-5-¼	3SC-7½-¼
100	2SCL-2-¼	2SCL-3-¼	2SCL-3-¼	2SCL-5-¼	2SCL-5-¼	2SCL-5-¼	2SCL-7½-¼	3SC-7½-¼
150	3SC-3-¼	2SCL-5-¼	2SCL-5-¼	2SCL-5-¼	2SCL-5-¼	2SCL-7½-¼	3SC-7½-¼	3SC-10-¼
200	3SC-3-¼	3SC-5-¼	3SC-5-¼	3SC-7½-¼	3SC-7½-¼	3SC-10-¼	3SC-10-¼	3SC-15-¼
250	3SC-5-¼	3SC-5-¼	3SC-7½-¼	3SC-7½-¼	3SC-7½-¼	3SC-10-¼	3SC-10-¼	3SC-15-¼
300	3SC-5-¼	3SC-7½-¼	3SC-7½-¼	3SC-10-¼	3SC-10-¼	3SC-10-¼	3SC-15-¼	3SC-15-¼
350	3SC-7½-¼	3SC-7½-¼	3SC-10-¼	3SC-10-¼	3SC-10-¼	3SC-15-¼	3SC-15-¼	3SC-20-¼
400	3SC-7½-¼	3SC-10-¼	3SC-10-¼	3SC-10-¼	4SCH-15-¼	4SCH-15-¼	3SCH-20-¼	3SCH-20-¼
450	4SCH-10-¼	4SCH-10-¼	4SCH-10-¼	4SCH-15-¼	4SCH-15-¼	4SCH-15-¼	4SCH-20-¼	4SCH-25-¼
500	4SCH-10-¼	4SCH-10-¼	4SCH-10-¼	4SCH-15-¼	4SCH-15-¼	4SCH-20-¼	4SCH-20-¼	4SCH-25-¼
600	4SCH-10-¼	4SCH-15-¼	4SCH-15-¼	4SCH-15-¼	4SCH-20-¼	4SCH-20-¼	4SCH-20-¼	4SCH-25-¼
700	6SC-10-¼	6SC-15-¼	4SCH-15-¼	4SCH-20-¼	4SCH-20-¼	4SCH-20-¼	4SCH-25-¼	4SCH-30-¼
800	6SC-15-¼	6SC-15-¼	4SCH-20-¼	4SCH-20-¼	4SCH-25-¼	4SCH-25-¼	4SCH-25-¼	4SCH-40-¼
900	6SC-15-¼	6SC-15-¼	6SC-20-¼	6SC-25-¼	6SC-25-¼	6SC-25-¼	6SC-30-¼	4SCH-40-¼
1000	6SC-15-¼	6SC-20-¼	6SC-20-¼	6SC-25-¼	6SC-25-¼	6SC-30-¼	6SC-40-¼	4SCH-40-¼
1200	6SC-20-¼	6SC-20-¼	6SC-25-¼	6SC-25-¼	6SC-30-¼	6SC-30-¼	6SC-40-¼	5SCH-50-¼
1400	6SC-20-¼	6SC-25-¼	6SC-30-¼	6SC-30-¼	6SC-40-¼	6SC-40-¼	8SC-50-¼	6SCH-60-¼
1600	8SC-20-¼	8SC-25-¼	8SC-30-¼	8SC-40-¼	8SC-40-¼	8SC-50-¼	8SC-50-¼	8SC-60-¼
1800	8SC-25-¼	8SC-30-¼	8SC-40-¼	8SC-40-¼	8SC-50-¼	8SC-50-¼	8SC-60-¼	6SCH-75-¼
2000	8SC-30-¼	8SC-40-¼	8SC-40-¼	8SC-50-¼	8SC-50-¼	8SC-60-¼	8SC-60-¼	6SCH-75-¼

### PARTS LIST

- 1A\* PUMP CASING (LOWER HALF)
- 1B\* PUMP CASING (UPPER HALF)
- 2 IMPELLER
- 6 IMPELLER KEY
- 8 CASING WEARING RING
- 10 CASING GASKET (NOT SHOWN)
- 10A SHAFT SLEEVE GASKET
- 11 GLAND NUT
- 12 GLAND WASHER
- 14 GLAND STUD
- 15 PACKING GLAND
- 15A PACKING RETAINING BUSHING
- 16 PACKING
- 17 WATER SEAL RING
- 18 SHAFT SLEEVE
- 18A SLEEVE LOCK NUT
- 19 VENT COCK
- 21 PLUG
- 21B PLUG
- 22B CAP SCREW
- 22E CAP SCREW (NOT SHOWN)
- 23 FLINGER
- 26 OUTER BALL BEARING
- 27 OUTER BEARING HOUSING
- 28 OUTER BEARING CAP
- 29 THRUST COLLAR
- 30 INNER BEARING CAP
- 31 INNER BEARING HOUSING
- 32 INNER BALL BEARING
- 33 SHAFT
- 34 SHAFT KEY
- 35 WATER SEAL PIPE
- 67 SET SCREW
- 83 RETAINING RING



Note: Construction varies slightly on different pump sizes.



**NOTE:** Units shown in the selection table are non-overloading with their motors at the stated condition point and for a reasonable drop in head. Not all selections are non-overloading throughout the entire operating range. See performance curves for additional information.

**EXPLANATION OF MODEL NUMBERS:** Example: 3SCH-25-4; 3 indicates 3" discharge; SCH indicates type of pump (SCL, SC, SCH and SCU are single-stage pumps of various head ranges, SSC are two-stage pumps); -25 indicates motor horsepower; -4 indicates motor speed (-4=1750 RPM, -2=3450 RPM, -6=1150 RPM).

**TOTAL DYNAMIC HEAD (FEET)**

140	160	180	200	220	240	260	280	G.P.M.
3SC -10-4	2SSC -10-4	2SSC -10-4						50
3SC -10-4	2SSC -10-4	2SSC -15-4	2SSC -15-4	2SSC -15-4	2SSC -20-4	2SSC -20-4	2SSC -20-4	100
3SC -15-4	2SSC -15-4	2SSC -15-4	2SSC -15-4	2SSC -20-4	2SSC -20-4	2SSC -20-4	2SSC -25-4	150
3SC -15-4	3SCH -20-4	3SCH -20-4	2SSC -20-4	2SSC -20-4	2SSC -25-4	2SSC -25-4	2½SSC-30-4	200
3SC -20-4	3SCH -20-4	3SCH -25-4	2½SSC-25-4	2½SSC-25-4	2½SSC-30-4	2½SSC-30-4	3SSC -40-4	250
3SC -20-4	3SCH -25-4	3SCH -25-4	2½SSC-25-4	2½SSC-30-4	2½SSC-30-4	3SSC -40-4	3SSC -40-4	300
3SCH -25-4	3SCH -25-4	3SCH -30-4	3SSC -30-4	3SSC -40-4	3SSC -40-4	3SSC -40-4	3SSC -50-4	350
3SCH -25-4	3SCH -25-4	3SCH -30-4	3SSC -40-4	3SSC -40-4	3SSC -40-4	3SSC -50-4	3SSC -50-4	400
3SCH -25-4	3SCH -30-4	4SCH -40-4	3SSC -40-4	3SSC -40-4	3SSC -40-4	3SSC -50-4	3SSC -50-4	450
4SCH -30-4	4SCH -40-4	4SCH -40-4	3SSC -40-4	3SSC -50-4	3SSC -50-4	3SSC -50-4	3SSC -60-4	500
4SCH -30-4	4SCH -40-4	4SCH -50-4	5SSC -60-4	5SSC -60-4	4SSC -60-4	4SSC -75-4	4SSC -75-4	600
4SCH -40-4	4SCH -40-4	4SCH -50-4	5SSC -60-4	5SSC -60-4	5SSC -75-4	5SSC -75-4	5SSC-100-4	700
4SCH -40-4	4SCH -50-4	4SCH -50-4	5SSC -75-4	5SSC -75-4	5SSC -75-4	5SSC-100-4	5SSC-100-4	800
4SCH -50-4	4SCH -50-4	5SCH -60-4	5SCH -75-4	5SCU -75-4	5SCU-100-4	5SCU-100-4	5SSC-100-4	900
4SCH -50-4	5SCH -60-4	5SCH -75-4	5SCH -75-4	5SCU -75-4	5SCU-100-4	5SCU-100-4	5SSC-100-4	1000
5SCH -60-4	5SCH -60-4	5SCH -75-4	5SCH -75-4	5SCU-100-4	5SCU-100-4	5SCU-125-4	5SCU-125-4	1200
5SCH -60-4	5SCH -75-4	5SCU -75-4	5SCU-100-4	5SCU-100-4	5SCU-125-4	5SCU-125-4	6SCU-200-4	1400
5SCU -75-4	5SCU-100-4	5SCU-100-4	5SCU-100-4	5SCU-125-4	5SCU-125-4	6SCU-150-4	6SCU-200-4	1600
6SCH-100-4	6SCH-100-4	6SCH-100-4	6SCH-125-4	6SCU-150-4	6SCU-150-4	6SCU-200-4	6SCU-200-4	1800
6SCH-100-4	6SCH-100-4	6SCH-125-4	6SCH-125-4	6SCU-150-4	6SCU-150-4	6SCU-200-4	6SCU-200-4	2000

**FEATURES**

**CASING:** Close-grained cast iron, horizontally split thru center of shaft for simple removal of entire rotating assembly without disturbing suction and discharge pipe connections. Both sections are bored and faced in one machine setting to insure perfect alignment. Standard pumps, viewed from the drive end, have suction on the right; the reverse can be specified when pump is ordered.

**IMPELLER:** Double suction design insures perfect hydraulic balance. Impeller is machined from single piece bronze casting, balanced and cut to meet exact conditions of service required.

**WEARING RINGS:** Bronze wearing rings are easily replaced; insure minimum slippage and high efficiency.

**SHAFT:** Turned and ground to insure maximum power transmission with minimum vibration or deflection.

**SHAFT SLEEVES:** Cast bronze sleeves extend through

stuffing box; easily replaced; protect the shaft from corrosion and wear.

**BEARINGS:** Nationally recognized manufacture. Heavy duty ball bearings; grease lubricated.

**STUFFING BOXES:** Ample depth for maximum pump working pressures. Lantern ring water-seal available if required. Glands are bronze split type for simple packing adjustment (mechanical shaft seals are available if preferred).

**COUPLING:** Flexible type; sized for maximum power transmission.

**BEDPLATE:** Cast iron drip-rim type with drain tapping and grouting opening. Fabricated steel bedplates are also available.

**DRIVERS:** Electric motor drive is standard. Gasoline or diesel engine and steam turbine drivers are also available for special applications.

**SUGGESTED SPECIFICATIONS FOR ARCHITECTS AND ENGINEERS**

Furnish and install as shown on plans a Type SC (or SSC) horizontally split case, single stage (or two-stage), centrifugal pump, Model \_\_\_\_\_, as manufactured by Federal Pump Corporation. Pump shall have a capacity of \_\_\_\_\_ G.P.M. against a Total Dynamic Head of \_\_\_\_\_ feet, and shall be flexibly-coupled to a \_\_\_\_\_ H.P., \_\_\_\_\_ Phase \_\_\_\_\_ cycles, \_\_\_\_\_ volts, \_\_\_\_\_ R.P.M. drip-proof motor. Casing shall be of extra heavy cast iron, the upper half of which shall be removable without disconnecting suction or discharge piping.

Impeller(s) shall be enclosed, single-piece, cast bronze, of the double suction type, (single suction mounted back-to-back for two-stage pumps).

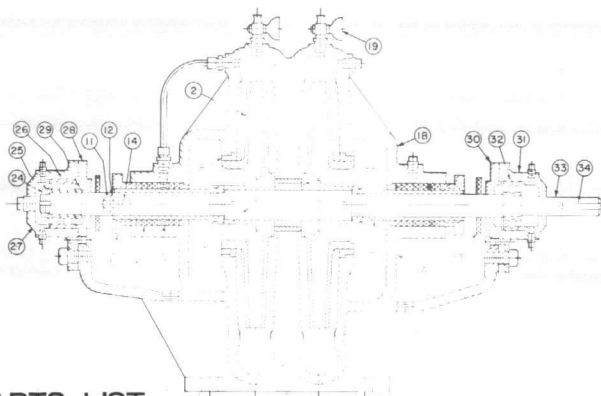
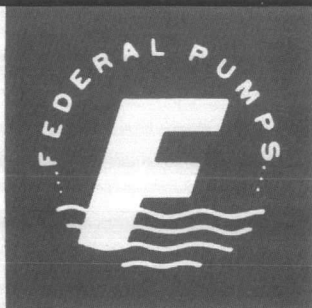
Pump shall have renewable wearing rings. Shaft shall be of high grade alloy steel protected by renewable bronze sleeves. Inboard and outboard bearings shall be mounted in dust and moisture-proof housings.

Pumps shall have deep stuffing boxes with adjustable glands (or mechanical shaft seals, if preferred).

Entire unit shall be mounted on common extra heavy cast iron drip-rim bedplate.



# TWO STAGE horizontally split case pumps



## PARTS LIST

1A*	PUMP CASING (Lower Half)	23	FLINGER
1B*	PUMP CASING (Upper Half)	24	BEARING LOCK NUT
2	IMPELLER	25	BEARING LOCK WASHER
6	IMPELLER KEY	26	OUTER BALL BEARING
8	CASING WEARING RING	27	OUTER BEARING HOUSING
10	CASING GASKET (Not Shown)	28	OUTER BEARING CAP
11	GLAND NUT	29	THRUST COLLAR
12	GLAND WASHER	30	INNER BEARING CAP
14	GLAND STUD	31	INNER BEARING HOUSING
15	PACKING GLAND	32	INNER BALL BEARING
16	PACKING	33	SHAFT
17	WATER SEAL RING	34	SHAFT KEY
18	SHAFT SLEEVE	86	INTER-STAGE SPACER
19	VENT COCK		

\*Furnished Only As A Complete unit

**CASING:** Close-grained cast iron, horizontally split through center of shaft. Both sections are bored and faced in one machine setting to insure perfect alignment.

**IMPELLERS:** Single piece cast bronze, balanced and cut to meet exact conditions of service specified. Keyed and locked to shaft. The two impellers are mounted with opposed suction openings to provide for perfect hydraulic balance, eliminating thrust on the bearings.

**WEARING RINGS:** Bronze wearing rings are easily replaced; insure minimum slippage and high efficiency.

**SHAFT:** Turned and ground to insure maximum power transmission with minimum vibration or deflection.

**SHAFT SLEEVES:** Cast bronze sleeves extend through stuffing box; easily replaced.

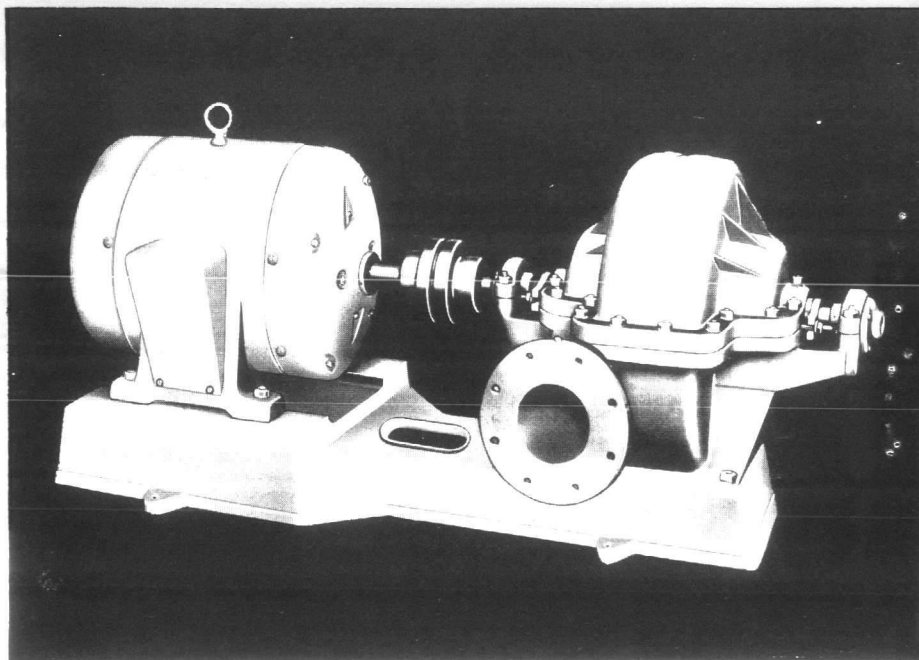
**BEARINGS:** Nationally recognized manufacture. Heavy duty ball bearings; grease lubricated.

**STUFFING BOX:** Ample depth for maximum pump working pressures. Lantern ring water-seal available on first stage stuffing box if required.

**GLANDS:** Bronze glands allow for quick and easy packing adjustment. Drip pockets and drip tappings are provided.

**COUPLING:** Flexible type; sized for maximum power transmission.

**BEDPLATE:** Cast iron drip-rim type, with drain tapping and grouting openings. Fabricated steel bedplates are also available.



ESTABLISHED 1927

## FEDERAL PUMP CORPORATION

1144 UTICA AVENUE • BROOKLYN, N. Y. 11203

CENTRIFUGAL PUMPS • TURBINE PUMPS • SEWAGE EJECTORS • SUMP PUMPS • BOILER FEED UNITS • CONDENSATE UNITS • HEATING & AIR CONDITIONING CIRCULATORS

5M-12-67

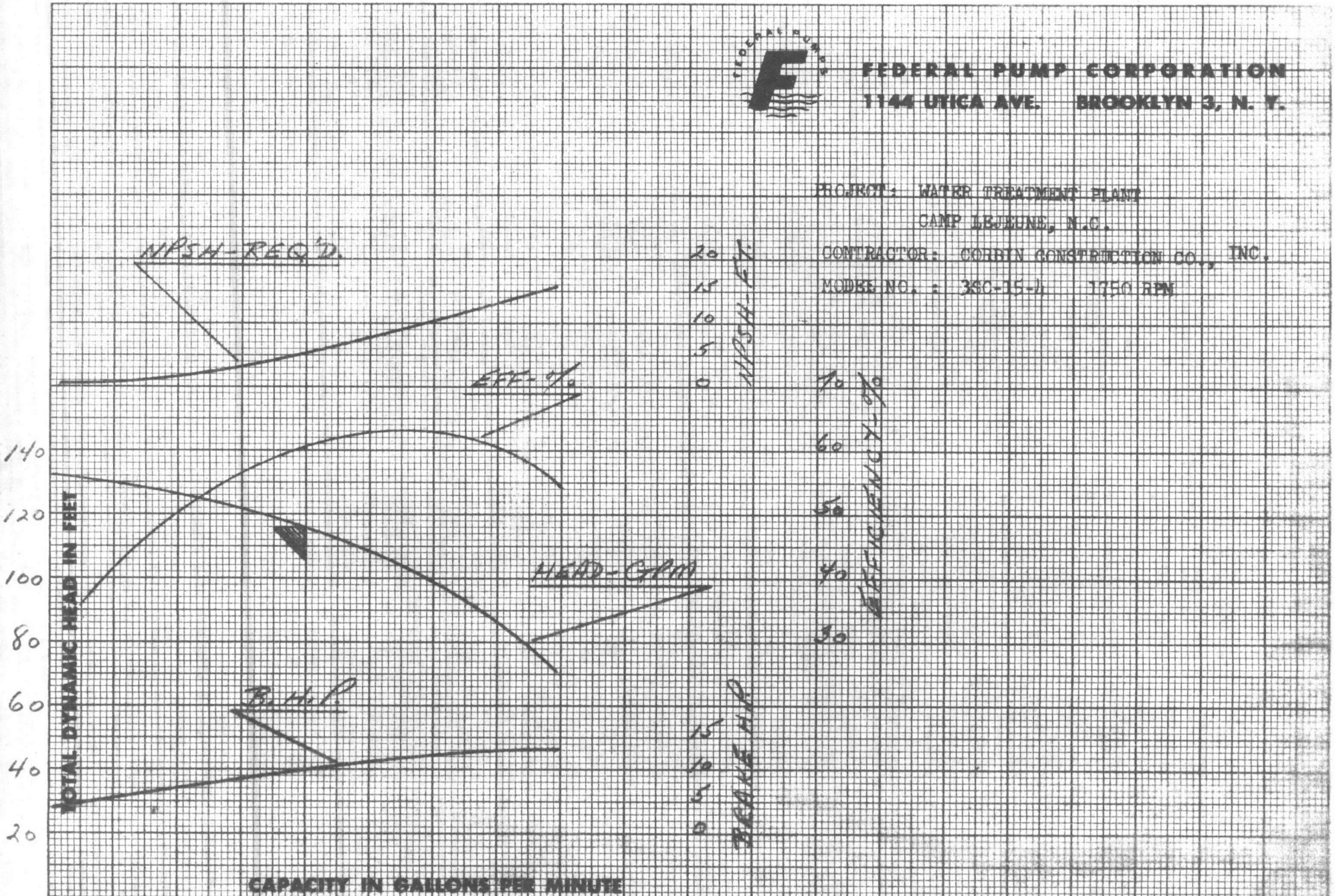


FEDERAL PUMP CORPORATION  
 1144 UTICA AVE. BROOKLYN 3, N. Y.

PROJECT: WATER TREATMENT PLANT  
 CAMP LEJUNE, N.C.

CONTRACTOR: CORBIN CONSTRUCTION CO., INC.

MODEL NO.: 380-15-1 1750 RPM

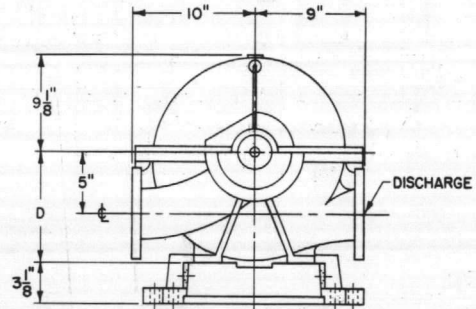
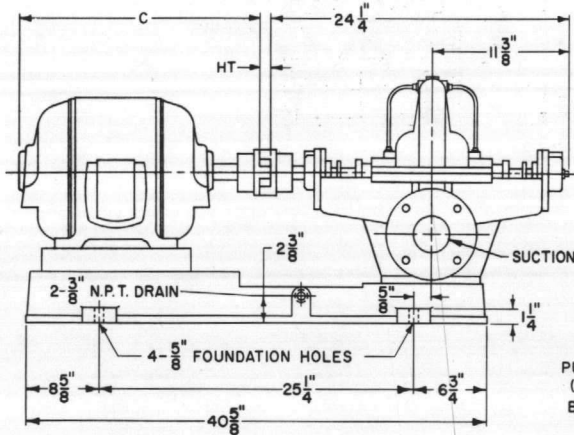
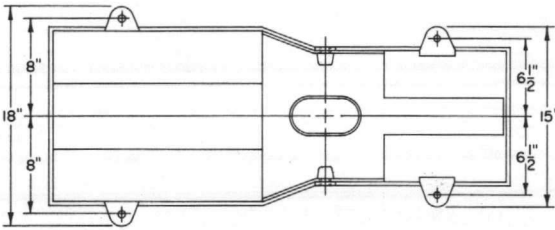


0 50 100 150 200 250 300 350 400





TYPE SC horizontally split case pump  
OUTLINE & DIMENSIONS  
CAST IRON DRIP TYPE BEDPLATE



PUMP END OF BASE  
(NARROW END)  
BASE NO. BP-III

PUMP			MOTOR					D
PUMP SIZE	DIS-CHARGE	SUC-TION	NEMA FRAME	1750 RPM	1150 RPM	C	HT	
3SC	3	3	145T		1	12 3/4	1/2	12 1/8
			182T	3	1 1/2	12 5/8	1/2	12 1/8
			184T	5	2	13 5/8	3/4	12 1/8
			213T	7 1/2	3	15 3/4	7/8	12 1/8
			215T	10	5	17 1/4	7/8	12 1/8
			254T	15	7 1/2	20 1/2	1	12 1/8
			256T	20		22 1/4	1	12 1/8
			284T	25		23 1/2	1	12 1/8

ALL DIMENSIONS ARE IN INCHES.  
PUMPS ARE FURNISHED AS STANDARD WITH 125# ASA DIS-CHARGE & SUCTION FLANGES. PUMPS WITH 250# ASA DIS-CHARGE & SUCTION FLANGES ARE FURNISHED WHEN RE-QUIRED.

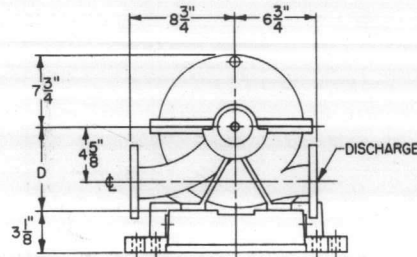
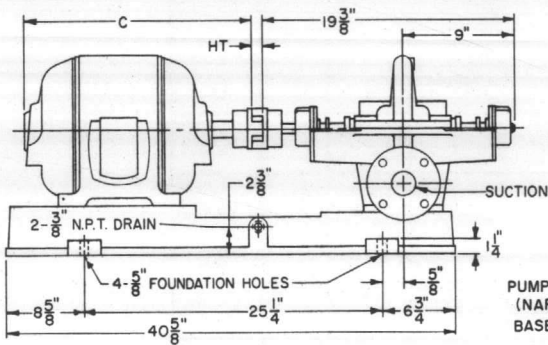
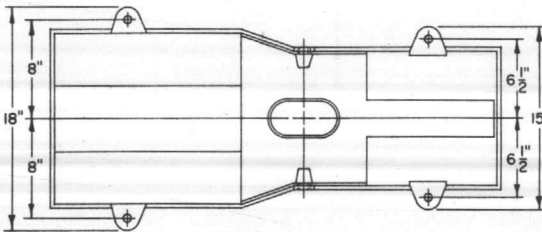
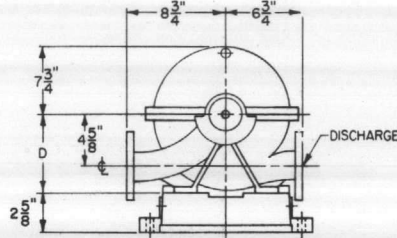
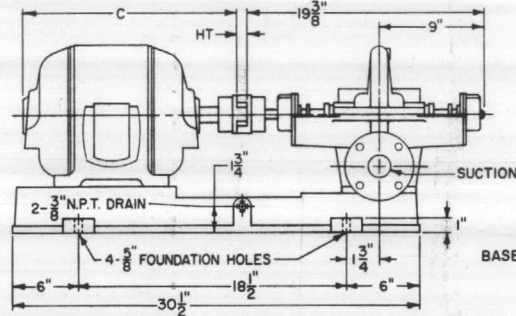
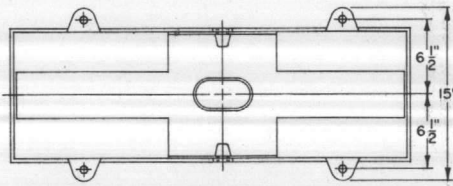


**FEDERAL PUMP CORPORATION**

1144 UTICA AVENUE • BROOKLYN, N. Y. 11203

TYPE SG horizontally split case pump  
 OUTLINE & DIMENSIONS  
 CAST IRON DRIP TYPE BEDPLATE

DRWG. NO.  
 185.11



PUMP END OF BASE  
 (NARROW END)  
 BASE NO. BP-111

PUMP			MOTOR							MOTOR									
PUMP SIZE	DIS-CHARGE	SUC-TION	NEMA FRAME	3450 RPM	1750 RPM	1150 RPM	C	D	HT	BASE NO.	NEMA FRAME	3450 RPM	1750 RPM	1150 RPM	C	D	HT	BASE NO.	
2SCL	2	3	56		3/4		11 5/8		1/2		213T	10	7 1/2		15 3/4	10 1/4	7/8	BP-110	
			56			1/2	12 3/8		1/2		215T	15			17 1/4		7/8		
			143T		1	3/4	11 3/4		1/2	BP-110								BP-111	
			145T		1 1/2=2	1	12 3/4		1/2		254T	20			20 1/2	10 3/4	7/8		
			182T	5	3	1 1/2	12 5/8		1/2										
			184T	7 1/2	5	2	13 5/8		3/4										

ALL DIMENSIONS ARE IN INCHES.  
 PUMPS ARE FURNISHED AS STANDARD WITH 125# ASA SUCTION AND DISCHARGE FLANGES. PUMPS WITH 250# ASA SUCTION AND DISCHARGE FLANGES WILL BE FURNISHED WHEN REQUIRED.

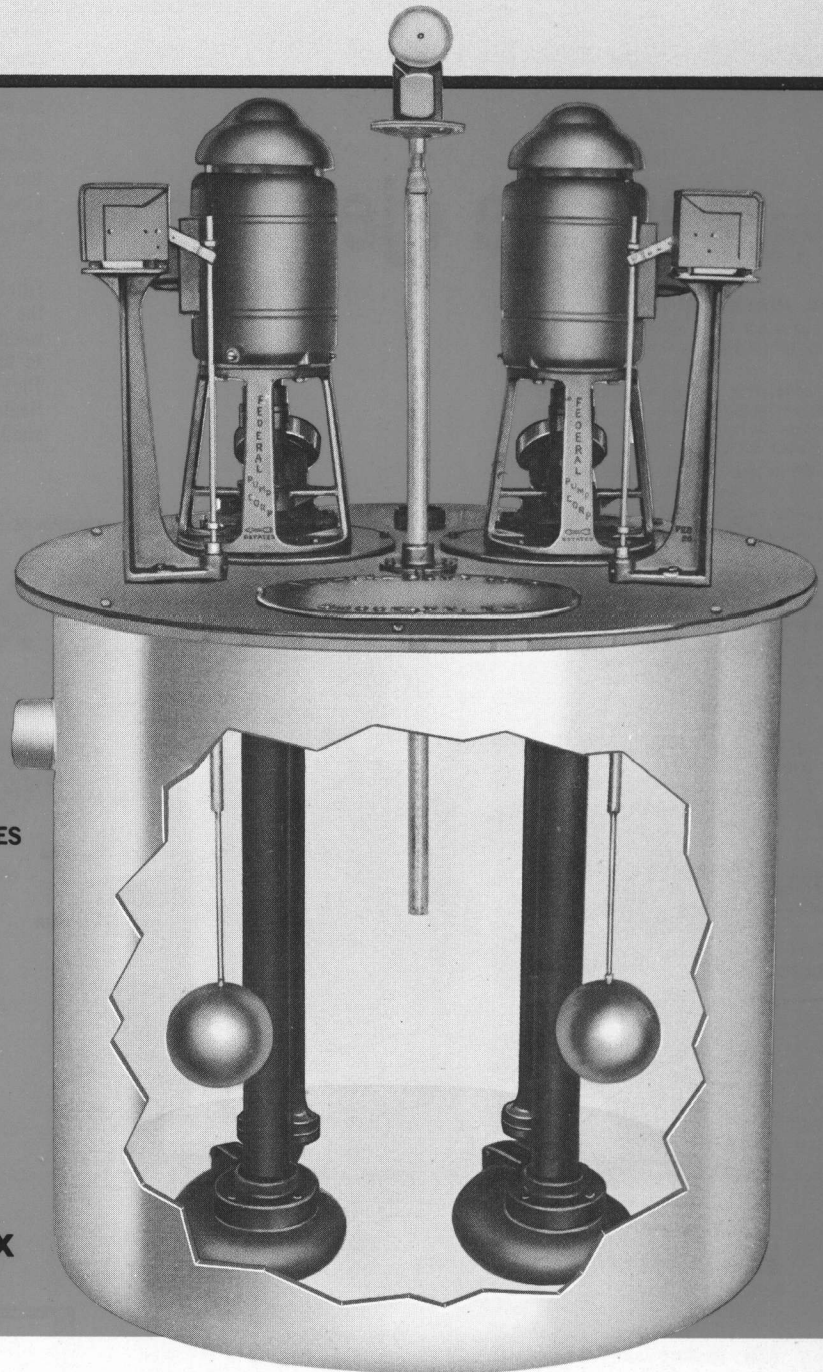
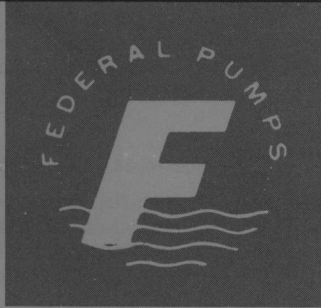


**FEDERAL PUMP CORPORATION**

1144 UTICA AVENUE • BROOKLYN, N. Y. 11203

**TYPE**  
**'VSA'**

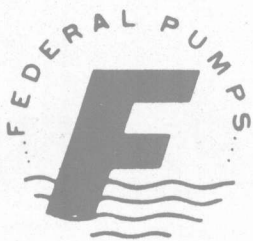
**VERTICAL SUBMERGED**  
**sewage ejectors**



- NON-CLOG
- SCREENLESS
- WET PIT INSTALLATIONS
- CAST IRON AND STEEL BASINS
- PIT COVERS AND GROUTING FRAMES
- 1750 RPM, 1150 RPM, 870 RPM
- COMPLETE CONTROL SYSTEMS
- MODIFICATIONS AVAILABLE

**DUPLEX  
UNIT**

ESTABLISHED 1927



**FEDERAL PUMP CORPORATION**

1144 UTICA AVENUE • BROOKLYN, N. Y. 11203



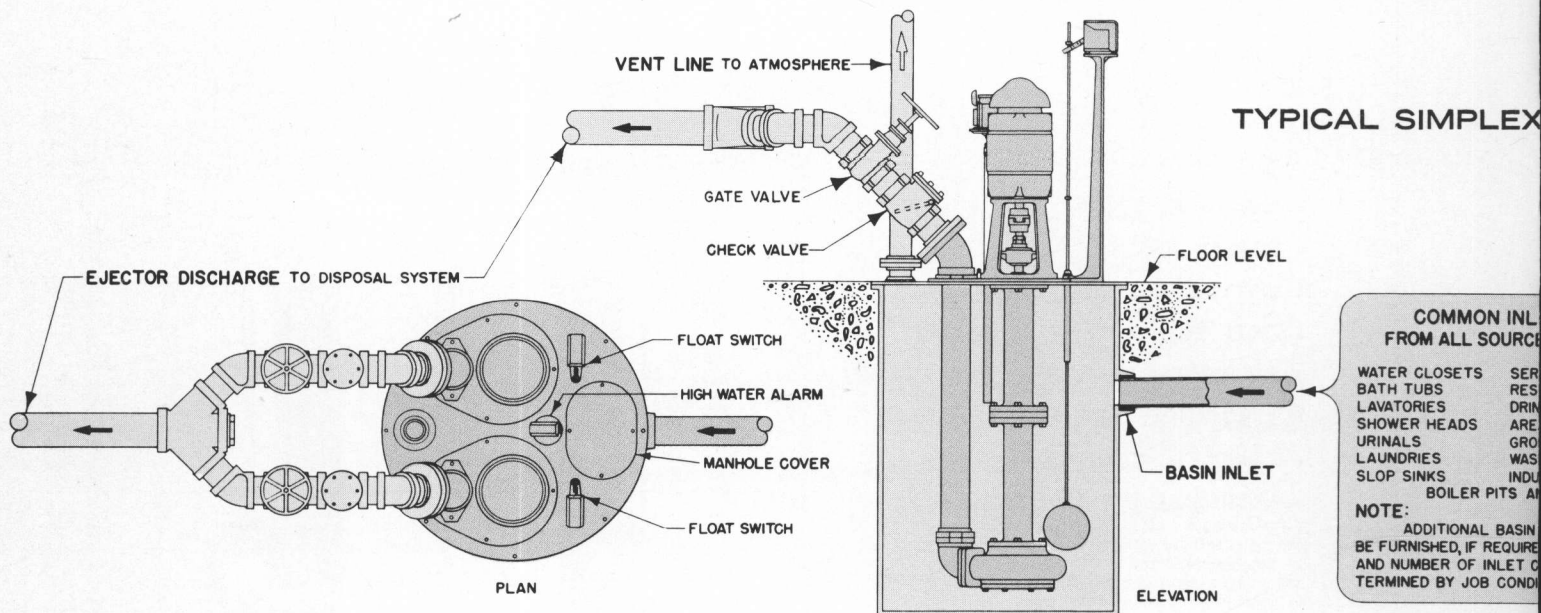
# TYPE VSA sewage ejectors

Furnish and install as shown on plans a duplex VSA..... vertical submerged sewage ejector unit as manufactured by Federal Pump Corp. Each pump shall be rated ..... G.P.M. at ..... feet Total Dynamic Head, shall have a ..... inch discharge and be built for a pit or basin ..... deep.

Impellers shall be cast iron non-clog balanced design; shafts carbon steel sized for maximum load; thrust bearings ball type mounted in moisture-proof housings mounted above the suspension plate; casings smooth-passage cast iron with renewable bronze sleeve bearing; renewable bronze sleeve intermediate bearings provided for each four feet of unsupported shaft length. Flexible copper grease lines shall be provided for each shaft bearing; suspension plate cast iron with strengthening ribs; suspension leg sections cast iron with integral cast flanges on each end; discharge pipe wrought steel with expansion joints at both ends; top discharge connection shall be 45° elbow with integral ASA standard flange.

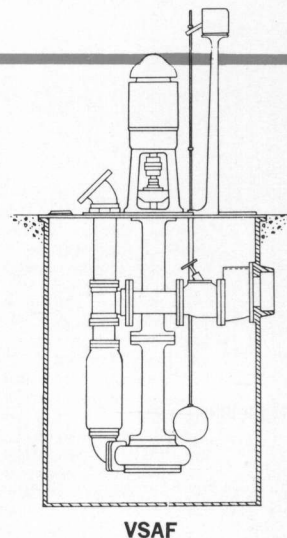
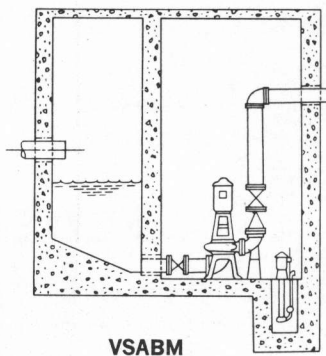
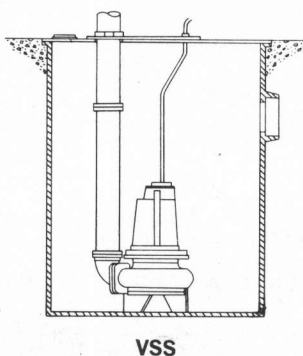
Motors shall be ..... HP, ..... phase, ..... cycles, ..... volts, ..... R.P.M. open, drip-proof ball bearing type.

Furnish a pedestal mounted alternating float switch to alternate the operation of the pumps and provide simultaneous operation when required. Furnish a pedestal mounted auxiliary float switch to turn on both pumps if the alternating float switch is inoperative. The alternating and auxiliary float switches shall have copper floats, brass rods, adjustable stops, galvanized rod guides and shall be equal to Federal Type FS-4.



## OTHER SEWAGE EJECTOR ARRANGEMENTS

VSA ejectors are vertical submerged type. Also available are Type VSS submersible ejectors (Bulletin 229A), Type VSABM dry pit ejectors (Bulletin 230A) and Type VSAF FED-FLUSH ejector systems with strainer baskets to hold solids between pumping cycles (Bulletin 232A).



Furnish a compression tube type high water alarm with integral 110/6v. transformer and 2½" bell equal to Federal Type FS-5.

Furnish for each motor a magnetic line voltage starter in wall mounting general purpose enclosure providing overload and low voltage protection and with a Hand-Off-Automatic selector switch in the cover.

Furnish a cast iron sewage basin ..... diameter x ..... deep with inlet as determined by job conditions. Basin shall have a steel cover with required openings for pumps, controls, manhole and vent connection and shall be treated with a corrosion resistant coating.

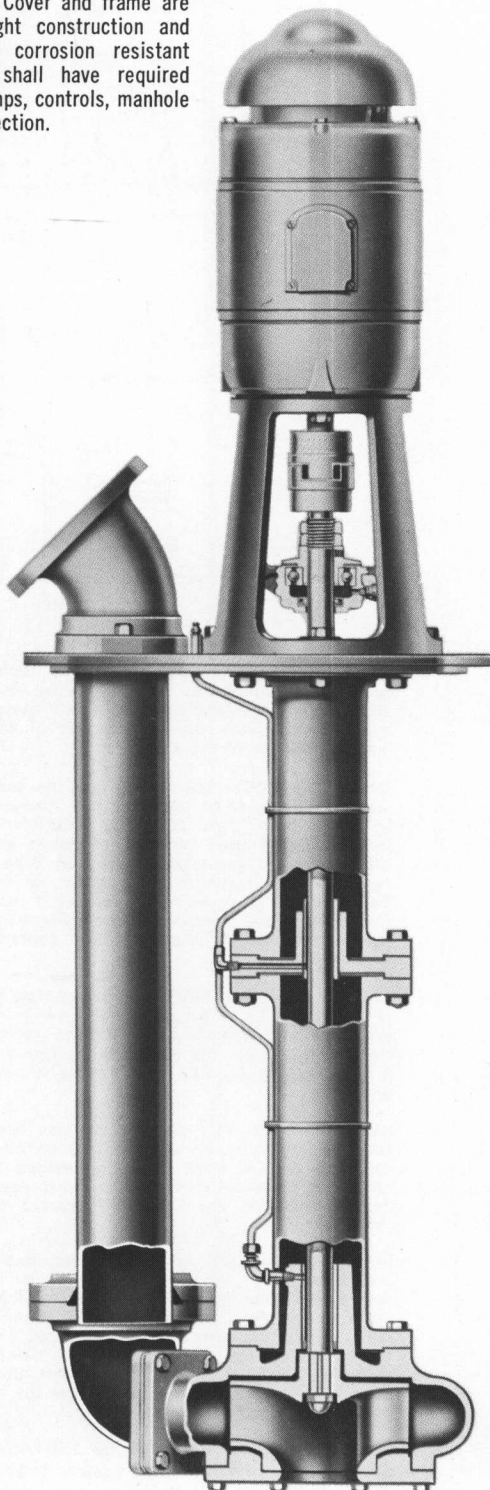
ALTERNATE FOR CONCRETE PIT: Furnish a welded angle iron pit frame and heavy steel cover equal to Federal Type PF-1 for a concrete pit ..... x ..... x ..... deep. Cover and frame are to be of gastight construction and treated with a corrosion resistant coating. Cover shall have required openings for pumps, controls, manhole and vent connection.

INSTALLATION

LINE INCLUDING:-

- SINKS
- WASH SINKS
- FOUNTAINS
- FLOOR DRAINS
- WATER
- TRUCKS (CARS, ETC.)
- INDUSTRIAL WASTE
- AND MANY OTHER USES

ALL CONNECTIONS CAN BE MADE BY ANY TYPE, SIZE, LOCATION AND MATERIAL. CONNECTIONS TO BE DETERMINED BY ARCHITECT.



FEATURES

**MOTOR** Nationally known manufacture. Single phase motors in fractional horsepower frame sizes have built-in overload protection; other motors should be protected by magnetic starters.

**FLEXIBLE COUPLING** Machined and balanced.

**THRUST BEARING** Ball bearing mounted above suspension plate in dust and moisture-proof housing.

**ADJUSTING NUTS** Two bronze lock nuts for accurate vertical adjustment of impeller clearance.

**SUSPENSION PLATE** Cast iron plate has integral strengthening ribs.

**DISCHARGE PIPE** Wrought steel, locked to suspension plate, held in bottom elbow by mating flange, forming bottom expansion joint.

**TOP DISCHARGE ELBOW** Cast iron 45° elbow with integral 125# discharge flange and top expansion joint ring.

**IMPELLER** One-piece, cast iron, non-clog, balanced, keyed and locked to shaft.

**SHAFT** Carbon steel, turned and ground, sized for maximum load.

**SUSPENSION LEG** Cast iron sections with integrally cast end flanges.

**GUIDE BEARINGS** Renewable bronze sleeve type intermediate guide bearing for each four feet of unsupported shaft length plus bottom guide bearing in pump casing.

**CASING** Cast iron with smooth water passages.

**LUBRICATION SYSTEM** Intermediate and bottom guide bearings lubricated through flexible copper grease lines; alemite fitting furnished above the suspension plate for each line.

**BASINS AND PITS** Sewage basins of cast iron or steel construction are available. Also steel covers and grouting frames for concrete pits.

**BOARD OF STANDARDS AND APPEALS LISTING** Federal VSA ejectors are listed and approved by the New York City Board of Standards and Appeals, Calendar No. 741-50-SA.

MODIFICATIONS AVAILABLE

**DISCHARGE CONNECTION** Under-cover tee connections; special top discharge connections.

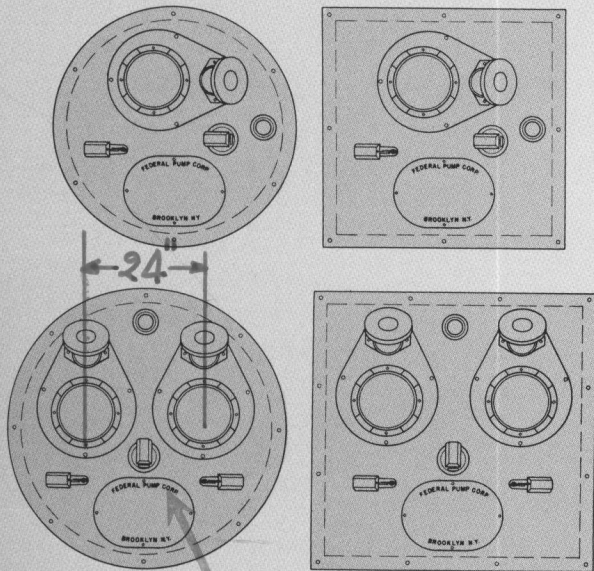
**MATERIALS OF CONSTRUCTION** Bronze or stainless steel impeller; stainless steel shaft; all-bronze or all-iron pump; rubber or teflon guide bearings; galvanized or wrought iron discharge pipe.

**LUBRICATION SYSTEM** Sight-feed oiler; solenoid operated oiler.

**NON-STANDARD MOTORS** Totally enclosed or explosion proof; special voltages and cycles; encapsulated windings; two-phase; wound rotor; turbine drive; dual drive gear.

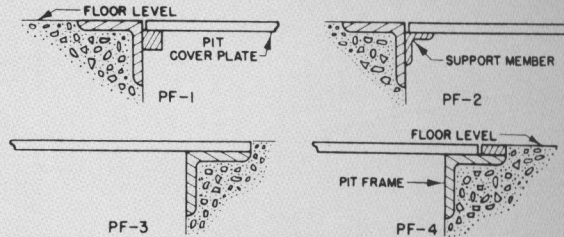


# STANDARD ARRANGEMENTS FOR PIT COVER PLATES AND PIT FRAMES



## PIT AND BASIN COVERS

Drawings show standard arrangement of Simplex and Duplex VSA units. Square covers are for concrete pits and are usually furnished with pit frames. Round covers are furnished for cast iron and steel sewage basins. Steel covers are standard; cast iron covers are also available. Covers are of gastight construction and have a corrosion resistant coating. Non-standard shapes and arrangements of steel covers are available.



## PIT FRAMES

Type PF-1 furnished as standard for square and rectangular pits. Permits frame and cover to be installed flush with finished floor. Has bar support for cover.

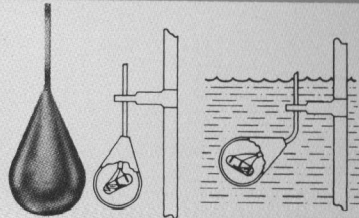
Type PF-2 construction same as PF-1 except with angle iron support for cover.

Type PF-3 furnished as standard for round pits. Frame supports cover and should be recessed into concrete so that cover is flush with finished floor.

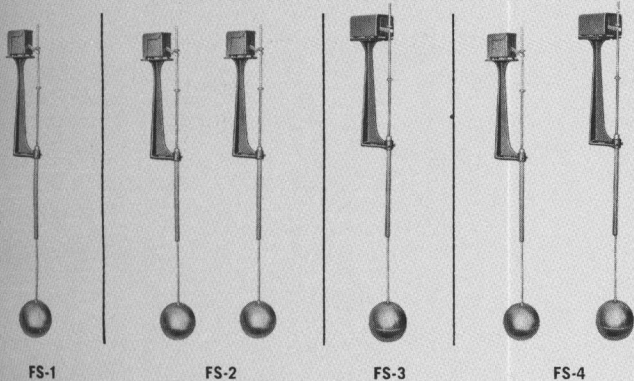
Type PF-4 construction same as PF-3 except with filler strip. Frames and covers are treated with corrosion resistant coating, and are available in non-standard shapes and sizes, sectional construction, and galvanized or checkered steel.

## SUBMERS-A-BULB CONTROLS (SB)

VSA ejectors can be controlled by Federal Submers-a-bulb controls in lieu of standard float switches. See Bulletin 253 for complete details.



## CONTROL EQUIPMENT



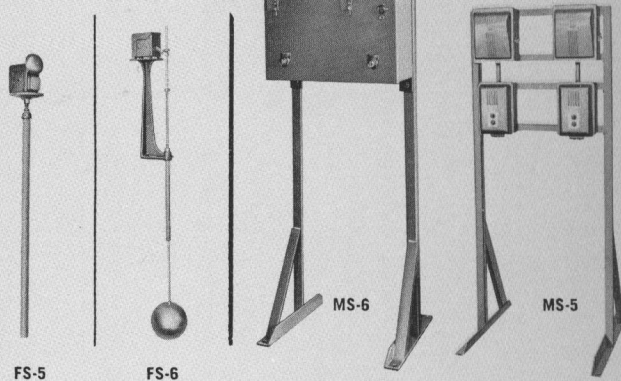
### PUMP CONTROLS

The following control arrangements are available:

- FS-1 (for single unit) — one float switch for start-stop control.
- FS-2 (for duplex unit) — two float switches for start-stop control. The switches can be manually set to change the lead pump. Both pumps will operate if the in-flow rate requires.
- FS-3 (for duplex unit) — one alternating float switch which operates the two pumps on an alternating basis and turns on both pumps simultaneously if the in-flow rate requires.
- FS-4 (for duplex unit) — one alternating float switch (as described immediately above) plus one two-pole emergency auxiliary float switch which will turn on both pumps at a predetermined high water level if the alternating float switch fails to operate for some reason.

FS-5 (for single or duplex unit) — a compression tube type high water alarm assembly. Alarm bell can be integrally mounted on the actuator or can be remotely located; voltage transformers, visual alarms and silencing relays are available.

FS-6 (for single or duplex unit) — one float switch to act as a high water alarm actuator instead of the compression tube type described immediately above.



## STARTER ARRANGEMENTS

- MS-1 (for single or duplex unit) — magnetic starter(s) for mounting on adjacent wall or on the float switch pedestal(s).
- MS-2 (for single or duplex unit) — magnetic starter(s) plus disconnect switch(es) in separate enclosures for mounting on adjacent wall or on the float switch pedestal(s).
- MS-3 (for single or duplex unit) — combination magnetic starter(s) and fusible disconnect switch(es) for mounting on adjacent wall or on float switch pedestal(s). (NOTE: combination starters may also be furnished with unfused disconnect switch or with circuit breaker.)
- MS-4 (for duplex unit) — two magnetic starters in individual enclosures mounted on wall panel (or floor panel).
- MS-5 (for duplex unit) — two magnetic starters and two disconnect switches, all in individual enclosures, mounted on wall panel (or floor panel).
- MS-6 (for duplex unit) — two magnetic starters and two disconnect switches in a single sheet metal enclosure for wall mounting (or for floor mounting).

### Control Modifications:

- "Hand-off-automatic" selector switch in starter cover.
- Pilot light in starter cover.
- Control circuit transformer in starter.
- Dust-tight, water-tight and explosion-proof starter enclosures.
- Manual transfer switch for duplex unit.
- Automatic electric alternator for duplex unit.



# SELECTION TABLE

# PUMP SIZING DATA

## 1750 RPM

## 1150 RPM

## 870 RPM

UNIT NO.	G.P.M.	DISCH. HEAD (FEET)	MOTOR H.P.	DISCH. SIZE (INCHES)
VSA-1A-3/1-4	50	22	3/4	1/2
VSA-1A-1-4		27	1 1/2	1/2
VSA-1A-1 1/2-4		37	1 1/2	1/2
VSA-1A-2-4		44	2	1/2
VSA-1A-3-4		67	3	1/2
VSA-1A-3/1-4	75	16	3/4	1/2
VSA-1A-1-4		21	1 1/2	1/2
VSA-1A-1 1/2-4		32	1 1/2	1/2
VSA-1A-2-4		42	2	1/2
VSA-1A-3-4		57	3	1/2
VSA-1A-5-4	66	5	1/2	
VSA-1A-3/1-4	100	15	3/4	1/2
VSA-1A-1-4		20	1 1/2	1/2
VSA-1A-1 1/2-4		30	1 1/2	1/2
VSA-1A-2-4		37	2	1/2
VSA-1A-3-4		52	3	1/2
VSA-1A-5-4	64	5	1/2	
VSA-1A-1-4	125	17	1 1/2	1/2
VSA-1A-1 1/2-4		21	2	1/2
VSA-1A-2-4		30	2	1/2
VSA-1A-3-4		43	3	1/2
VSA-1A-5-4		63	5	1/2
VSA-1A-1-4	150	13	1 1/2	1/2
VSA-1A-1 1/2-4		21	2	1/2
VSA-1A-2-4		28	2 1/2	1/2
VSA-1A-3-4		41	3 1/2	1/2
VSA-1A-5-4		58	5 1/2	1/2
VSA-1C-7 1/2-4	65	7 1/2	1/2	
VSA-1A-1-4	200	9	1 1/2	1/2
VSA-1A-1 1/2-4		14	2	1/2
VSA-1A-2-4		22	2	1/2
VSA-1A-3-4		34	3	1/2
VSA-1A-5-4		56	5 1/2	1/2
VSA-1C-7 1/2-4	61	7 1/2	1/2	
VSA-1A-1 1/2-4	250	8	1 1/2	1/2
VSA-1A-2-4		16	2	1/2
VSA-1A-3-4		25	3	1/2
VSA-1A-5-4		36	5	1/2
VSA-1C-7 1/2-4		52	7 1/2	1/2
VSA-1C-10-4	71	10	1/2	
VSA-1C-15-4	88	15	1/2	
VSA-1A-2-4	300	11	2	1/2
VSA-1A-3-4		23	3	1/2
VSA-1A-5-4		35	5	1/2
VSA-1C-7 1/2-4		48	7 1/2	1/2
VSA-1C-10-4		68	10	1/2
VSA-1C-15-4	85	15	1/2	
VSA-1A-3-4	350	20	3 1/2	1/2
VSA-1A-5-4		32	5 1/2	1/2
VSA-1C-7 1/2-4		50	7 1/2	1/2
VSA-1C-10-4		65	10	1/2
VSA-1C-15-4		80	15	1/2
VSA-1C-3-4	400	16	3 1/2	1/2
VSA-1C-5-4		30	5 1/2	1/2
VSA-1C-7 1/2-4		42	7 1/2	1/2
VSA-1C-10-4		61	10	1/2
VSA-1C-15-4		75	15	1/2
VSA-1C-5-4	500	23	5 1/2	1/2
VSA-1C-7 1/2-4		36	7 1/2	1/2
VSA-1C-10-4		55	10	1/2
VSA-1C-15-4		71	15	1/2
VSA-1C-20-4		81	20	1/2
VSA-5C-5-4	600	17	5 1/2	5
VSA-5C-7 1/2-4		30	7 1/2	5
VSA-5C-10-4		55	10	5
VSA-5C-15-4		65	15	5
VSA-5C-20-4		75	20	5
VSA-5C-7 1/2-4	750	21	7 1/2	5
VSA-5C-10-4		35	10	5
VSA-5C-15-4		55	15	5
VSA-5C-20-4		66	20	5
VSA-5H-25-4		72	25	5
VSA-6H-15-4	1000	30	15	6
VSA-6H-20-4		40	20	6
VSA-6H-25-4		60	25	6

UNIT NO.	G.P.M.	DISCH. HEAD (FEET)	MOTOR H.P.	DISCH. SIZE (INCHES)
VSA-1A-3/1-6	50	23	3/4	1/2
VSA-1A-1-6		28	1 1/2	1/2
VSA-1A-1 1/2-6		31	1 1/2	1/2
VSA-1C-3-6		37	2 1/2	1/2
VSA-1C-5-6		46	3 1/2	1/2
VSA-1A-3/1-6	75	20	3/4	1/2
VSA-1A-1-6		23	1 1/2	1/2
VSA-1A-1 1/2-6		29	1 1/2	1/2
VSA-1C-3-6		36	2 1/2	1/2
VSA-1C-5-6		45	3 1/2	1/2
VSA-1A-3/1-6	100	16	3/4	1/2
VSA-1A-1-6		20	1 1/2	1/2
VSA-1A-1 1/2-6		27	1 1/2	1/2
VSA-1C-2-6		32	2	1/2
VSA-1C-3-6		35	2 1/2	1/2
VSA-1C-5-6	44	3 1/2	1/2	
VSA-1E-7 1/2-6	56	7 1/2	1/2	
VSA-1A-1-6	125	18	1 1/2	1/2
VSA-1A-1 1/2-6		25	2	1/2
VSA-1C-2-6		29	2	1/2
VSA-1C-3-6		34	3	1/2
VSA-1C-5-6		43	5	1/2
VSA-1E-7 1/2-6	55	7 1/2	1/2	
VSA-1A-1-6	150	13	1 1/2	1/2
VSA-1A-1 1/2-6		21	2	1/2
VSA-1A-2-6		25	2 1/2	1/2
VSA-1C-3-6		33	3 1/2	1/2
VSA-1C-5-6		42	5 1/2	1/2
VSA-1E-7 1/2-6	52	7 1/2	1/2	
VSA-1A-1 1/2-6	200	16	1 1/2	1/2
VSA-1A-2-6		22	2 1/2	1/2
VSA-1C-3-6		31	3 1/2	1/2
VSA-1C-5-6		40	5 1/2	1/2
VSA-1E-7 1/2-6		50	7 1/2	1/2
VSA-1A-1 1/2-6	250	14	1 1/2	1/2
VSA-1C-2-6		19	2	1/2
VSA-1C-3-6		27	3	1/2
VSA-1C-5-6		37	5 1/2	1/2
VSA-1E-7 1/2-6		49	7 1/2	1/2
VSA-1E-10-6	60	10	1/2	
VSA-1C-2-6	300	15	2	1/2
VSA-1C-3-6		25	3	1/2
VSA-1C-5-6		33	5 1/2	1/2
VSA-1E-7 1/2-6		47	7 1/2	1/2
VSA-1E-10-6		57	10	1/2
VSA-1E-15-6	62	15	1/2	
VSA-1C-2-6	350	13	2	1/2
VSA-1C-3-6		21	3	1/2
VSA-1C-5-6		30	5 1/2	1/2
VSA-1E-7 1/2-6		45	7 1/2	1/2
VSA-1E-10-6		54	10	1/2
VSA-1E-15-6	60	15	1/2	
VSA-1C-2-6	400	12	2	1/2
VSA-1C-3-6		20	3	1/2
VSA-1C-5-6		27	5 1/2	1/2
VSA-1E-7 1/2-6		38	7 1/2	1/2
VSA-1E-10-6		49	10	1/2
VSA-1E-15-6	58	15	1/2	
VSA-1C-3-6	500	15	3	1/2
VSA-1C-5-6		23	5 1/2	1/2
VSA-1E-7 1/2-6		33	7 1/2	1/2
VSA-1E-10-6		44	10	1/2
VSA-1E-15-6		56	15	1/2
VSA-5E-5-6	600	15	5 1/2	5
VSA-5E-7 1/2-6		27	7 1/2	5
VSA-5E-10-6		36	10	5
VSA-5E-15-6		50	15	5
VSA-5H-5-6	750	14	5 1/2	5
VSA-5H-7 1/2-6		22	7 1/2	5
VSA-5H-10-6		30	10	5
VSA-5H-15-6		44	15	5
VSA-6H-10-6	1000	17	10	6
VSA-6H-15-6		34	15	6

UNIT NO.	G.P.M.	DISCH. HEAD (FEET)	MOTOR H.P.	DISCH. SIZE (INCHES)
VSA-1A-3/1-8	50	17	3/4	1/2
VSA-1C-1-8		18	1 1/2	1/2
VSA-1C-1 1/2-8		21	1 1/2	1/2
VSA-1C-2-8		25	2	1/2
VSA-1E-3-8		31	3 1/2	1/2
VSA-1E-5-8	42	5 1/2	1/2	
VSA-1A-3/1-8	75	15	3/4	1/2
VSA-1C-1-8		17	1 1/2	1/2
VSA-1C-1 1/2-8		20	1 1/2	1/2
VSA-1C-2-8		24	2 1/2	1/2
VSA-1E-3-8		30	3 1/2	1/2
VSA-1E-5-8	40	5 1/2	1/2	
VSA-1A-3/1-8	100	13	3/4	1/2
VSA-1C-1-8		15	1 1/2	1/2
VSA-1C-1 1/2-8		19	1 1/2	1/2
VSA-1C-2-8		23	2 1/2	1/2
VSA-1E-3-8		29	3 1/2	1/2
VSA-1E-5-8	39	5 1/2	1/2	
VSA-1A-3/1-8	125	11	3/4	1/2
VSA-1C-1-8		13	1 1/2	1/2
VSA-1C-1 1/2-8		18	1 1/2	1/2
VSA-1C-2-8		22	2 1/2	1/2
VSA-1E-3-8		28	3 1/2	1/2
VSA-1E-5-8	38	5 1/2	1/2	
VSA-1A-3/1-8	150	9	3/4	1/2
VSA-1C-1-8		12	1 1/2	1/2
VSA-1C-1 1/2-8		17	1 1/2	1/2
VSA-1C-2-8		21	2 1/2	1/2
VSA-1E-3-8		27	3 1/2	1/2
VSA-1E-5-8	37	5 1/2	1/2	
VSA-1C-3/1-8	200	7	3/4	1/2
VSA-1C-1-8		11	1 1/2	1/2
VSA-1C-1 1/2-8		16	1 1/2	1/2
VSA-1C-2-8		20	2 1/2	1/2
VSA-1E-3-8		26	3 1/2	1/2
VSA-1E-5-8	36	5 1/2	1/2	
VSA-1C-1-8	250	9	1 1/2	1/2
VSA-1C-1 1/2-8		13	1 1/2	1/2
VSA-1E-2-8		17	2	1/2
VSA-1E-3-8		25	3 1/2	1/2
VSA-1E-5-8		35	5 1/2	1/2
VSA-1C-1 1/2-8	300	12	1 1/2	1/2
VSA-1E-2-8		14	2	1/2
VSA-1E-3-8		22	3 1/2	1/2
VSA-1E-5-8		34	5 1/2	1/2
VSA-1E-7 1/2-8		57	7 1/2	1/2
VSA-1E-2-8	350	13	2	1/2
VSA-1E-3-8		21	3 1/2	1/2
VSA-1E-5-8		33	5 1/2	1/2
VSA-1E-7 1/2-8		36	7 1/2	1/2
VSA-1E-2-8		400	11	2
VSA-1E-3-8	18		3 1/2	1/2
VSA-1E-5-8	30		5 1/2	1/2
VSA-1E-7 1/2-8	34		7 1/2	1/2
VSA-1E-2-8	500		15	3 1/2
VSA-1E-3-8		26	5 1/2	1/2
VSA-1E-5-8		33	7 1/2	1/2
VSA-1E-7 1/2-8		33	7 1/2	1/2
VSA-5H-2-8		600	10	2
VSA-5H-3-8	14		3 1/2	5
VSA-5H-5-8	20		5 1/2	5
VSA-5H-7 1/2-8	27		7 1/2	5
VSA-5H-3-8	750	12	3 1/2	5
VSA-5H-5-8		18	5 1/2	5
VSA-5H-7 1/2-8		26	7 1/2	5
VSA-6H-5-8	1000	14	5	6
VSA-6H-7 1/2-8		20	7 1/2	6

### PUMP CAPACITY

Pump capacity can be determined by the number of water closets to be handled. Other fixtures need not be considered. The capacity shown applies to single pumps and to each pump of a duplex set.

No. of Water Closets Handled	Pump Capacity (G.P.M.)
1	50
2 or 3	75
4 or 5	100
6 or 7	125
8 to 10	150
11 to 15	200
16 to 20	250
21 to 25	300
26 to 30	350

If outside drainage is greater than 1/2 the pump capacity as determined above, add the excess amount to the pump capacity.

### PUMP DISCHARGE HEAD

The discharge head for a sewage ejector installation consists of the following elements:

**STATIC HEAD** The difference in elevation between the lowest water level in the sewage basin or pit, and the maximum height of the discharge line.

**FRICITION** Loss of head in the discharge line, including valves and other fittings.

**BACK PRESSURE** Proper allowance must be made for back pressure in sewer line, if existing.

### EXAMPLE

**PROPOSED INSTALLATION:** Sewage basin 5'-0" in depth to be set in ground, with top flush with finished floor. Basement floor 10'-0" below highest point of discharge line. Ejector capacity 100 g.p.m. Size of discharge line 4".

Static Head ..... 14 ft.\*  
 Friction Head: discharge line ... 2 ft. valves & other fittings ..... 3 ft.  
 Back Pressure: ..... 6 ft.  
 Total Dynamic Head ..... 25 ft.

\*Lowest water level estimated to be approximately 1 ft. above bottom of sewage basin.

### DRAINAGE FROM FIXTURES AND OTHER SOURCES

WATER CLOSET	7 G.P.M.
URINAL	3 G.P.M.
LAVATORY	5 G.P.M.
BATH TUB	6 G.P.M.
SHOWER BATH	8 G.P.M.
LAUNDRY TRAY	3 G.P.M.
D K. FOUNTAIN	1 G.P.M.
WASHING MACHINE - Residential	10 G.P.M.
WASHING MACHINE - Commercial Average	20 G.P.M.
WASH SINK or FOUNTAIN - Ind'l. Avge.	9 G.P.M.
AUTOMATIC DISHWASHER - Residential	3 G.P.M.
SERVICE SINK	4 G.P.M.
RESTAURANT SINK	4 G.P.M.
SLOP SINK	15 G.P.M.
1/2" HOSE CONN.	5 G.P.M.
FLOOR DRAIN	5 G.P.M.
AUTO. WASH RACK	18 G.P.M.

### OUTDOOR DRAINAGE

(Based on normal rainfall of 1" per hour)

- PAVED AREA:** 1 G.P.M. per 100 sq. ft.
- SANDY SOIL:** 2 G.P.M. per 100 sq. ft.
- CLAY SOIL:** 1 G.P.M. per 100 sq. ft.

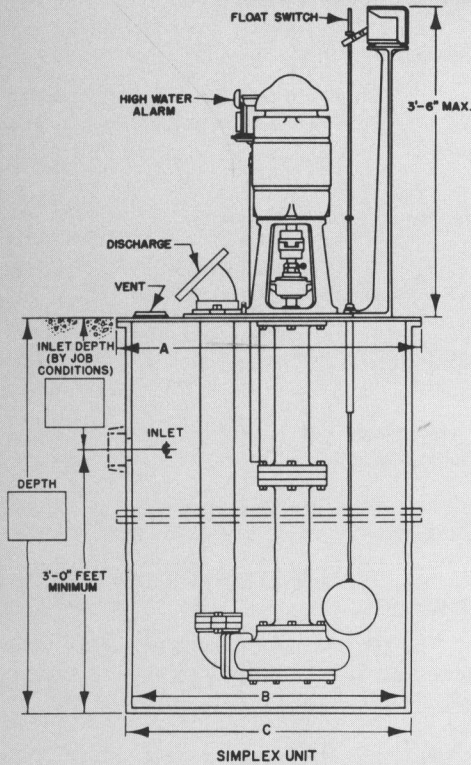
**EXPLANATION OF UNIT NUMBERS:** Example VSA-4A-3-4; VSA is the type of pump (vertical submerged sewage ejector); -4 is the discharge size; A is the pump frame designation (size of volute and impeller); -3 is the motor horsepower; and -4 is the operating speed (-4 = 4-pole 1750 RPM; -6 = 6-pole 1150 RPM; -8 = 8-pole 870 RPM).



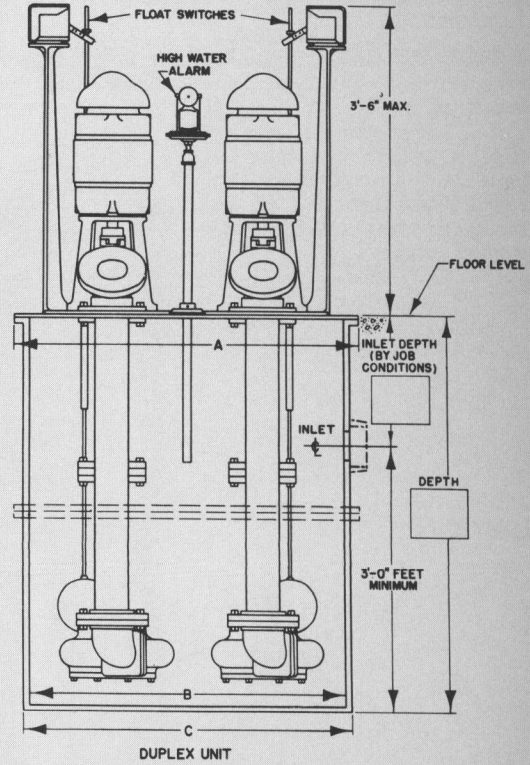
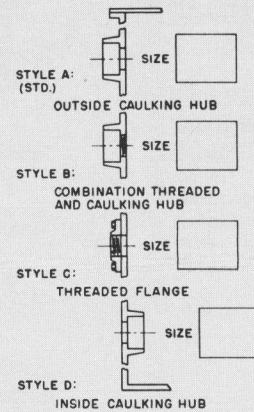
# TYPE 'VSA'

# VERTICAL SUBMERGED sewage ejectors

## DATA



### STYLES OF INLET CONNECTIONS



B BASIN INSIDE DIA.	APPROX. GALS. PER FT. DEPTH	DEPTH IN FEET	NO. OF SECTIONS		A COVER & FLANGES CAST IRON	A COVER STEEL	C APPROX.		TOP FLANGE AND MATING FLANGES CAST IRON BASINS	
			CAST IRON	STEEL			CAST IRON	STEEL	TAPPINGS	BOLT CIRCLE
30	37	3 TO 5 10 1/2 TO 12	1 2	1 1	34	30 1/2	31 1/2	30 1/2	(6) 3/8"	32 1/2
36	55	3 TO 5 10 1/2 TO 12	1 2	1 1	40	36 1/2	37 1/2	36 1/2	(6) 3/8"	38 1/2
42	70	3 TO 5 10 1/2 TO 12	1 2	1 1	46	42 1/2	43 1/2	42 1/2	(8) 1/2"	44 1/2
48	95	3 TO 5 10 1/2 TO 12	1 2	1 1	53	48 1/2	49 1/2	48 1/2	(8) 1/2"	51
54	120	3 TO 5 10 1/2 TO 12	1 2	1 1	60	54 1/2	55 1/2	54 1/2	(12) 1/2"	57
60	150	3 TO 5 10 1/2 TO 12	1 2	1 1	66	60 1/2	61 1/2	60 1/2	(12) 1/2"	63
72	210	3 TO 5 14 1/2 TO 12	1 2	1 1	78	72 1/2	73 1/2	72 1/2	(16) 1/2"	75
84	290	3 TO 6 16 1/2 TO 12	2 3	1 1	90	84 1/2	85 1/2	84 1/2	(16) 1/2"	87

### MINIMUM PIT AND BASIN SIZES

PUMP FRAME	ROUND		SQUARE	
	SIMPLEX	DUPLEX	SIMPLEX	DUPLEX
VSA-4A	30" DIA.	42" DIA.	30" x 30"	42" x 42"
VSA-4C, 5C, 6C	36" DIA.	48" DIA.	36" x 36"	48" x 48"
VSA-4E, 5E, 6E	42" DIA.	48" DIA.	42" x 42"	48" x 48"
VSA-5H, 6H	48" DIA.	54" DIA.	48" x 48"	54" x 54"

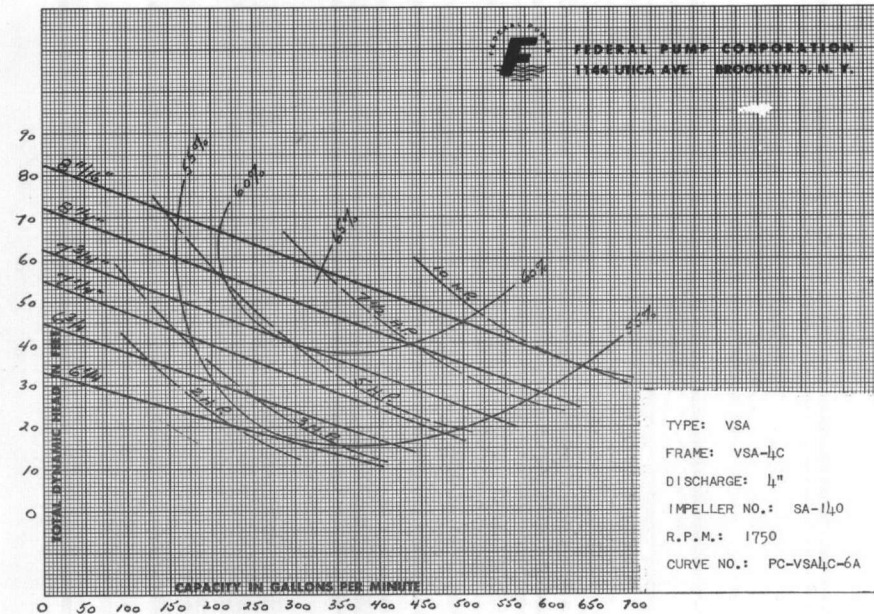
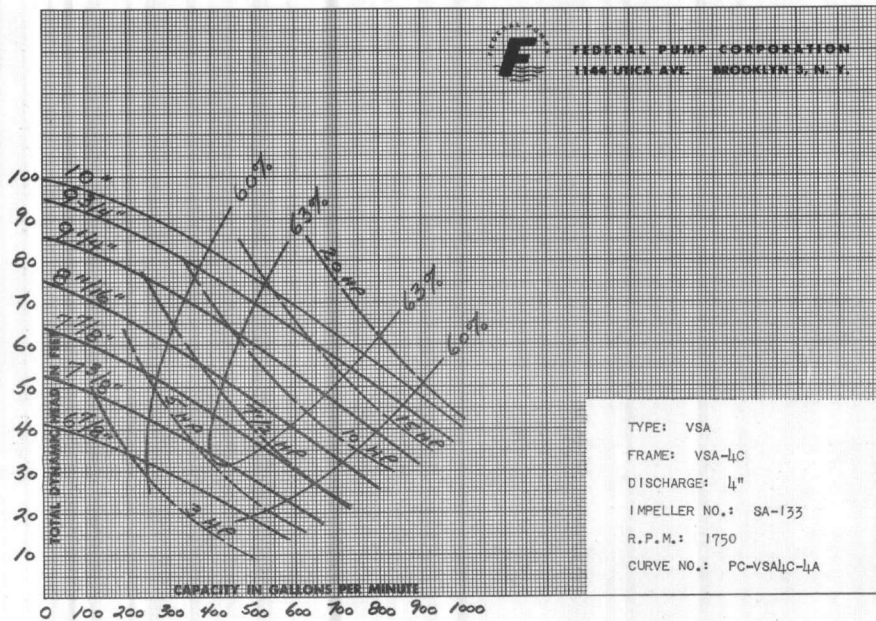
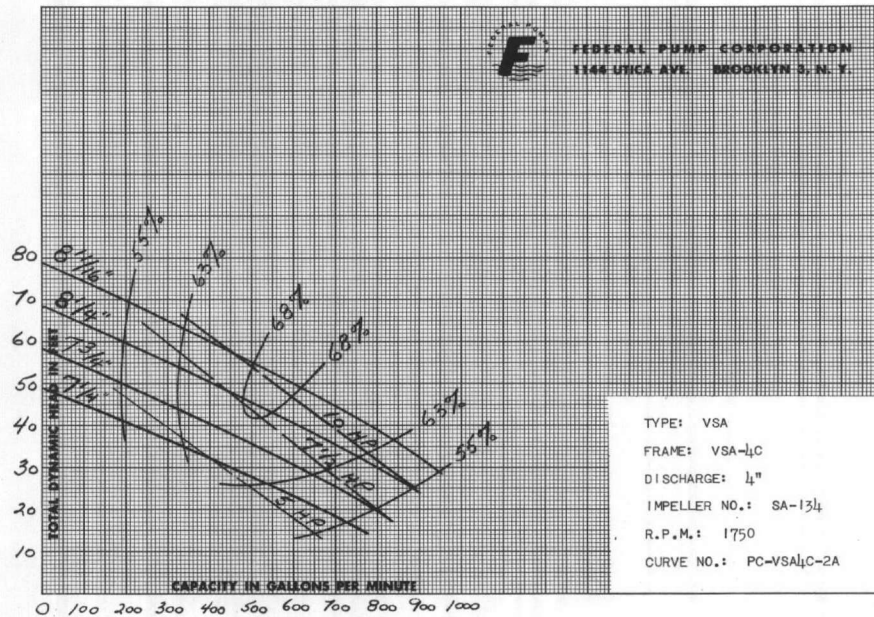
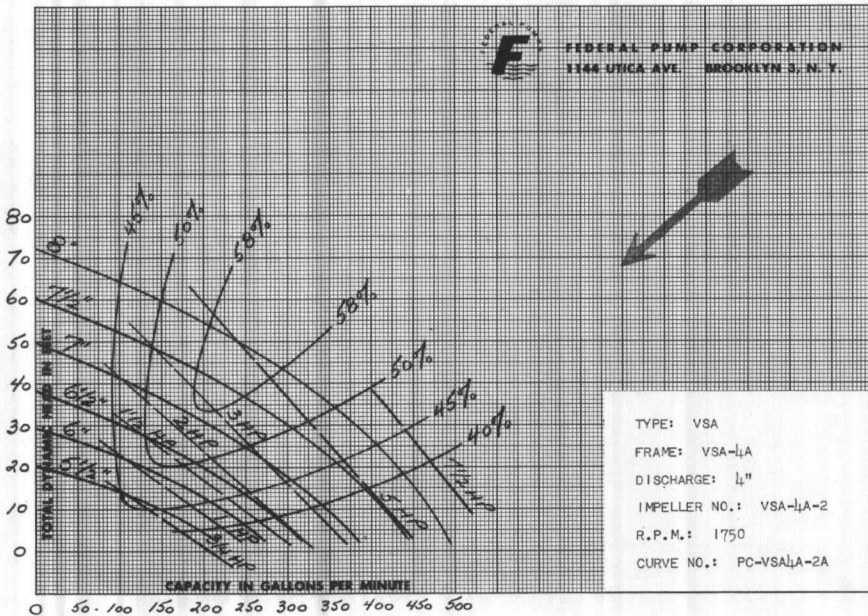
**DIMENSIONS** All dimensions are in inches unless stated otherwise. Do not use for construction purposes unless certified. Basin dimensions may vary slightly due to casting of the iron and fabrication of the steel.

**INLET CONNECTIONS** Basins can be furnished with any number of inlets of the styles shown, in sizes 1 1/4" thru 10". The location of the inlet is determined by job conditions such as distance from farthest fixture and pipe pitch. Indicate size, style and location of inlet in boxes provided above when releasing the basin for fabrication. Unless ordered otherwise, centerline of inlet is directly below centerline of manhole.

**MULTI-SECTION BASINS** The intermediate flanges of multi-section basins have the same outside diameter and bolt hole dimensions as the top flange on which the cover is mounted. Bolts and gasketing material are furnished for field assembly.

**STEEL BASINS** VSA ejectors can be furnished with basins of heavy welded steel construction. The top of the steel basin is welded to the shell and therefore, there is no top flange. Steel basins can also be furnished square or rectangular.

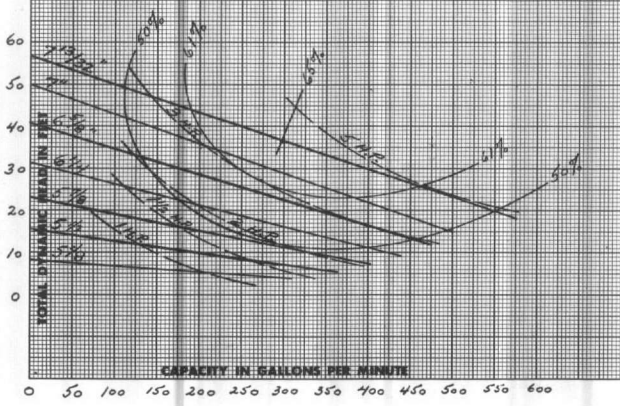
**SIZING THE BASIN** In most cases, basin diameter can be the minimum shown in the table, and the depth should be sufficient to allow three feet below the inlet connection. If job conditions require shallower basin, increase the diameter. The pump cycle can be determined from the volume of water between the inlet connection and a line one foot above the bottom of the basin.







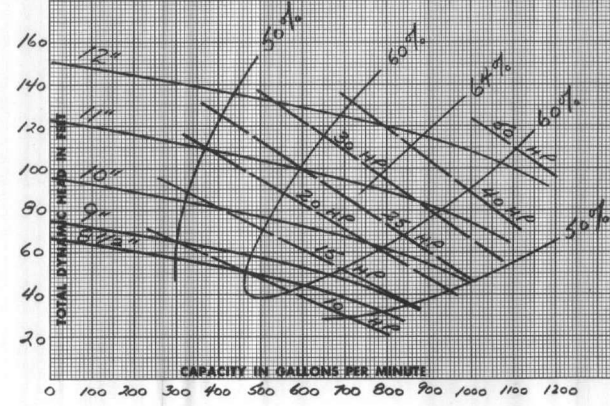
FEDERAL PUMP CORPORATION  
1144 UTICA AVE. BROOKLYN 3, N. Y.



TYPE: VSA  
FRAME: VSA-4C  
DISCHARGE: 4"  
IMPELLER NO.: SA-125  
R.P.M.: 1750  
CURVE NO.: PC-VSA4C-8A



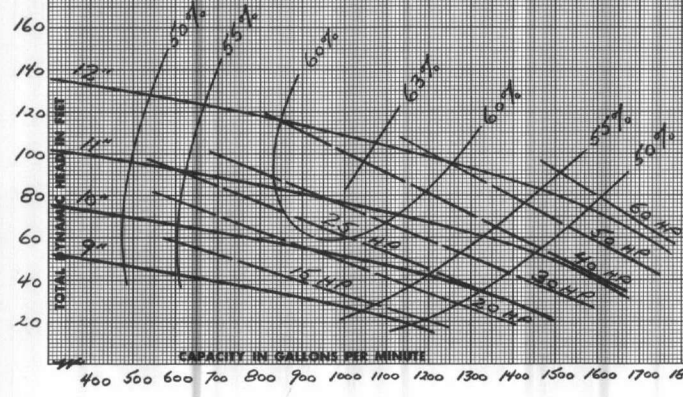
FEDERAL PUMP CORPORATION  
1144 UTICA AVE. BROOKLYN 3, N. Y.



TYPE: VSA  
FRAME: VSA-4E  
DISCHARGE: 4"  
IMPELLER NO.: VSA-4C-2-50  
R.P.M.: 1750  
CURVE NO.: PC-VSA4E-2A



FEDERAL PUMP CORPORATION  
1144 UTICA AVE. BROOKLYN 3, N. Y.



TYPE: VSA  
FRAME: VSA-6H  
DISCHARGE: 6"  
IMPELLER NO.: 3707  
R.P.M.: 1750  
CURVE NO.: PC-VSA6H-2A