SECTION III – I.1 PULVERIZERS

RELIANCE ELECTRIC

REVISED

DATA TRANSMITTA AND CERTIFICATIC

REFER TO THIS NUMBE IN ALL CORRESPONDEN

CUSTOMER ORDER NO.	DATE	REQ. NO.	S.O. NO.
008742016HL	08/25/87		01MAF33492

SOLD TO:
WILLIS & PAUL GROUP
W P CONVEYOR SYSTEMS DIV
66 FORD RD
DENVILLE N J 07834

SHIP TO:
SAME AS "SOLD TO" UNLESS SHOWN
ROY B. PAUL CONSTRUCTION CO.
STONE CONTAINER CORP. PLANT
125 DEPOT ROAD
UNCASVILLE CT. 06382

DATA PROVIDED WITH THIS TRANSMITTAL AND CERTIFICATION IS:

- ☐ FOR CUSTOMER APPROVAL BY DATE: _____
  Return of approval prints by the above date is required to assure scheduled shipment, delay in return and/or revision of approval prints may require shipment reschedule. Return approved D/S to data source.
- ☒ FINAL, APPROVED FOR CONSTRUCTION OR INSTALLATION.
- ☐ PRELIMINARY, ENGINEERING IS COMPLETED.
- ☒ REVISED, SUPERSEDES DATA PREVIOUSLY ISSUED.
- ☐ SEE REMARKS.

DATA SOURCE
TRANSMITTAL AND CERTIFICATION ISSUED BY: ACK DATE 11 15 88 CK BY _____ DATE _____
RELIANCE ELECTRIC CO.
COLLINS IND. DRIVE
ATHENS, GA 30613

DATE PRINTED: 11/14/88

MOTOR OR GEN. DATA

ITEM	USED FOR	USERS PLANT	MOTOR OR GEN. D/S:
1-1			604961-12

QTY.	FRAME		SERV. FA	TYPE	R.P.M.	C BOX D/S
2	00EC 445T	150 HP	1.15	PB	1200	

PH/HZ/VOLTS-WINDING	DUTY	ENCLOSURE	AMB./INSL.	PWR. CODE	MOTOR OR GEN. C/D:
3/60 /460	CONT	TEFC-XEX	40 /F /FB		1575-BA (25)

BEARINGS	MOUNTING & METHOD OF DRIVE	RAILS OR BASE	MODEL NUMBER	REDUCER OR AUX D/S:
BALL	FT CPLD	BASE		

ROTAT FROM OPP. DR. END	D-C FIELD EXCITATION	DOUBLE SHAFT EXTEN.	BRAKE OR AUX. D/S
CCW			

REDUCER DATA

REDUCER STYLE	CLASS	FRAME	RATIO	OUTPUT RPM	ASSEMBLY	BLOWER MOTOR PH/HZ/VOLTS/HP

BRAKE DATA

BRAKE TYPE	SIZE	RATING FT/LB	DUTY	P.O.

DATA FOR CONTROL

D-C MOTOR ARMATURE CURRENT: _____ AMPS
FIELD CHARACTERISTICS PER CURVE: _____
F_1-F_2 _____ MAX. AMPS _____ _____ RPM
$F_{11}-F_{22}$ _____ MAX. AMPS _____ _____ RPM
F_3-F_4 _____ MAX. AMPS _____ _____ RPM

A-C MOTOR INFORMATION FOR SELECTION OF STARTER HEATERS:
CODE: G LOCKED AMPS: 1085
F.L. CURRENT: 173. AMPS.

ADDITIONAL MOTOR OR GEN DATA:

SPCL. INSTALLATION FEAT. AND MISC. DATA

LD LOC - STD
FR CONST RGD
SPCL MAIN C/B REQUIRED

SPECIAL FEATURES:
LIMESTONE PULVERIZER 1A(TAG1) LIMISTONE PULVERIZER 1B(TAG 1)
SHAFT SEALS (LIP TYPE) BOTH ENDS, CROUSE-HINDS TYPE ECD DRAI
OVERSIZE CONDUIT BOX, BURNDY LEAD LUGS, GREASI FITTINGS; 120
VOLT SPACE HEATERS, ROTATION ARROW, ROUTINE TEST AND REPORT,
CLASS FE INSULATION WITH "B" RISE AT BOTH 1.0 & 1.15 S.F.
EXTENDED WARRANTY

CERTIFIED DRAWINGS AND DATA:
APPR DWG 2 REP 8 PRNTS 11-6 OR
B4 & FIN DWG, 2 REP 8 PRNT 2
WKS AFTER RETURN APPR DWG &
MANL-2 COPIES FOR APPR 11-6 OR
B4 24 COPIES 2 WKS AFTER APPR
8 SETS P/L B6 11-6 OR B4

AES THAMES, INC.
THAMES CO-GENERATION PLANT
MONTVILLE, CONN.

B&V DRAWING NO.12713.61.0403.05-10085

REL. S.O.	FRAME	HP	TYPE	PHASE/ HERTZ	RPM	VOLTS
1MAF33492	445T	150	P	3/60	1189	460

AMPS	DUTY	AMB°C/ INSUL.	S.F.	NEMA DESIGN	CODE LETTER	ENCL.
173	CONT	40/F/FE	1.15	B	G	TEFC-XEX

E/S	ROTOR	TEST S.O.	TEST DATE	STATOR RES.@25°C OHMS (BETWEEN LINES)
599528	418143-71JE	---	---	.0323

PERFORMANCE

LOAD	HP	AMPERES	RPM	% POWER FACTOR	% EFFICIENCY
NO LOAD	0	60.8	1200	4.09	0
1/4	37.5	73.4	1197	51.7	92.8
2/4	75.0	101	1195	73.3	95.2
3/4	112	135	1192	81.8	95.6
4/4	150	173	1189	85.2	95.4
5/4	187	214	1186	86.3	94.9

SPEED TORQUE

	RPM	TORQUE % FULL LOAD	TORQUE LB.-FT.	AMPERES
LOCKED ROTOR	0	144	955	1085
PULL UP	350	132	875	1000
BREAKDOWN	1146	236	1565	606
FULL LOAD	1189	100	662	173

AMPERES SHOWN FOR 460. VOLT CONNECTION. IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE

REMARKS: TYPICAL DATA
XE MOTOR-NEMA NOM. EFF. 95.4%

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

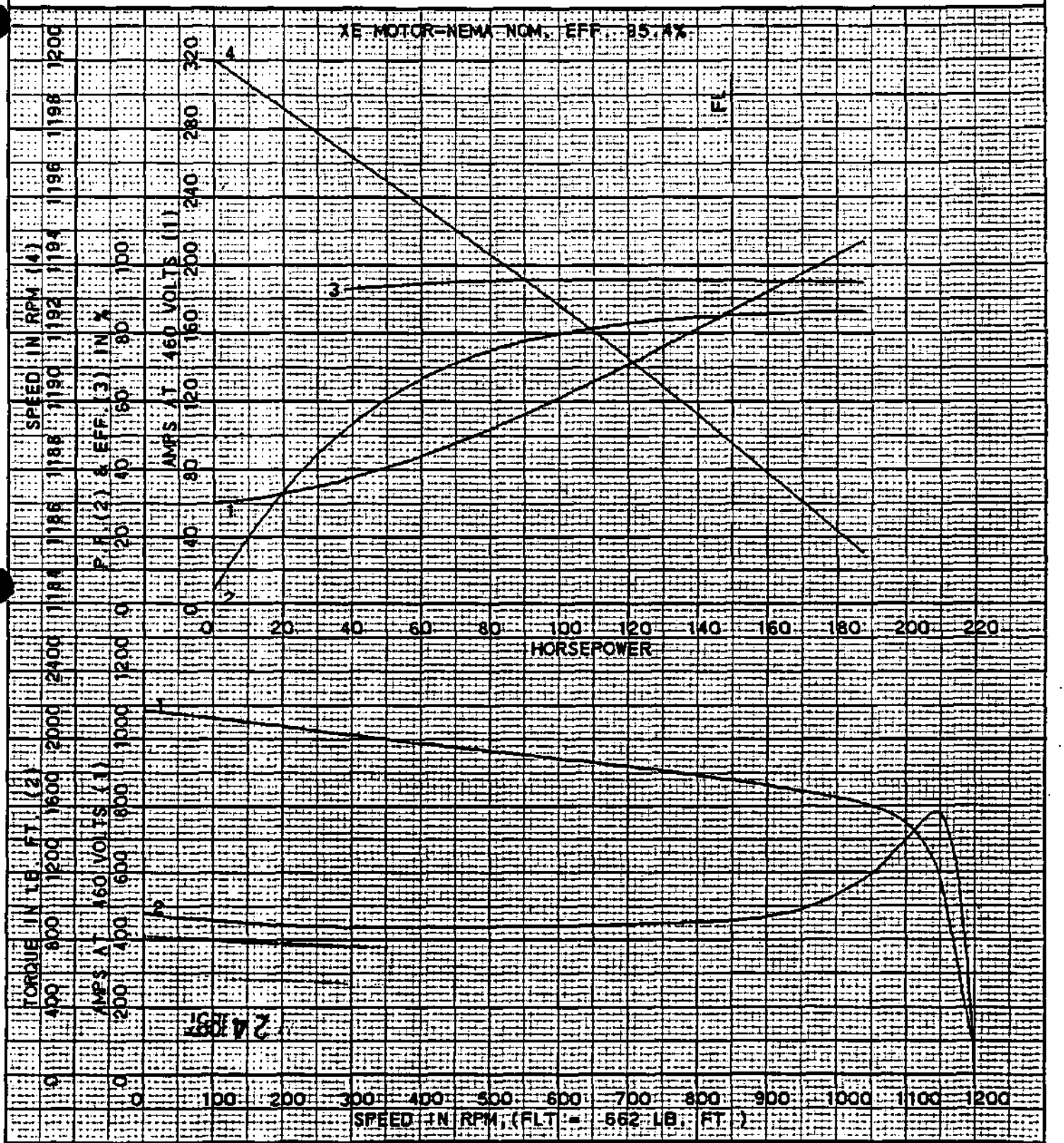
DR. BY D.M. BYRD
CK. BY D.M. BYRD
APP. BY J.P. TSAO
DATE 02/15/87

A-C MOTOR PERFORMANCE DATA

E07705-A-B001
ISSUE DATE 02/15/87

File Y82899

REL S.O. 1MAF33492	RPM 1189	S.F. 1.15	ROTOR 418143-71JE
FRAME 445T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 150	AMPS 173	CODE LETTER G	TEST DATE ----
TYPE P	DUTY CONT	ENCLOSURE TEFC-XE	STATOR RES.@ 25°C .0323
PHASE/HERTZ 3/60	AMB°C/INSUL	E/S 599528	OHMS (BETWEEN LINES)



AMPERES SHOWN FOR 460 VOLT CONNECTION. IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY D.M. BYRD
CK. BY D.M. BYRD
APP. BY J.P. TSAO
DATE 02/15/87

A-C MOTOR PERFORMANCE CURVES

E07705-A-B001
ISSUE DATE 02/15/87

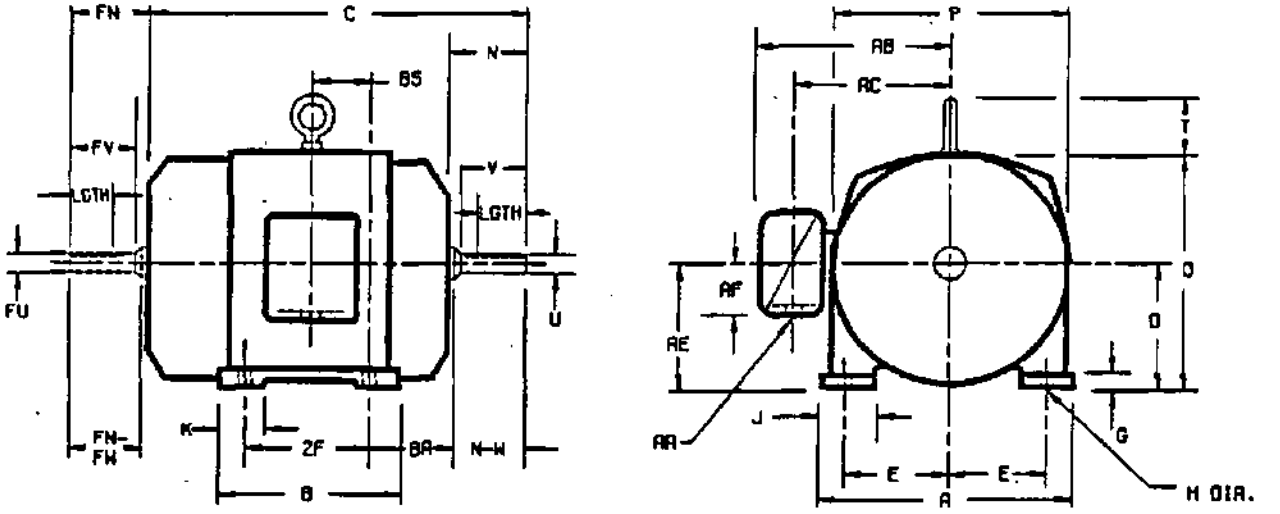
File Y82899

DUTY MASTER ALTERNATING CURRENT MOTORS

SQUIRREL-CAGE INDUCTION

ENCLOSURE: TOTALLY ENCLOSED **COOLING: FAN-COOLED**
MOUNTING: FOOT

OVERSIZE CONDUIT BOX STEEL
FRAMES 404T THRU 445TS



DIMENSIONS ARE IN INCHES

FRAME	A	D(2)	E	O	H	J	K	O	P	T	BA	AA	AB	AC	AF	AE
404T-405TS	19.00	10.00	8.00	1.12	.81	3.25	4.62	21.31	22.50	2.94	6.62	4	19.31	15.25	4.12	10.00
444T-447TS	21.00	11.00	9.00	1.12	.81	3.25	5.25	23.62	25.25	3.06	7.12	4	23.37	18.12	7.00	11.00
(1)																

FRAME	C	BS	B	2F	BACKEND SHAFT AND KEYWAY N	N-W	U(3)	V	LGTH	SQ. KEY	FRONT END SHAFT AND KEYWAY FN	FN-FW	FU(3)	FV	LGTH	SQ. KEY	WEIGHT
404T	38.31	6.88	16.00	12.25	7.62	7.25	2.875	7.00	5.62	.75	8.00	5.25	2.125	5.00	3.88	.50	975
404TS	35.31	6.88	16.00	12.25	4.62	4.25	2.125	4.00	2.75	.50	7.00	4.25	2.125	4.00	2.75	.50	975
405T	38.31	6.88	16.00	13.75	7.62	7.25	2.875	7.00	5.62	.75	8.00	5.25	2.125	5.00	3.88	.50	1100
405TS	35.31	6.88	16.00	13.75	4.62	4.25	2.125	4.00	2.75	.50	7.00	4.25	2.125	4.00	2.75	.50	1100
444T	40.62	8.25	19.00	14.50	8.94	8.50	3.375	8.25	6.88	.88	8.88	5.88	2.375	5.62	4.25	.62	1350
444TS	40.88	8.25	19.00	14.50	5.19	4.75	2.375	4.50	3.00	.62	7.75	4.75	2.375	4.50	3.00	.62	1350
445T	44.62	8.25	19.00	16.50	8.94	8.50	3.375	8.25	6.88	.88	8.88	5.88	2.375	5.62	4.25	.62	1500
445TS	40.88	8.25	19.00	16.50	5.19	4.75	2.375	4.50	3.00	.62	7.75	4.75	2.375	4.50	3.00	.62	1500
(1)																	

(1) SPECIAL DIMENSIONS ON THIS LINE.

(2) "D" VARIES +.00, -.06

(3) "U" & "FU" VARY 1.625 AND LARGER +.000,-.001

CONDUIT BOX LOCATED ON OPPOSITE SIDE WHEN F-2, W-1, W-4, W-5, W-7, OR C-1 MOUNTING IS SPECIFIED.

STANDARD DOUBLE SHAFT SUPPLIED ONLY WHEN SPECIFIED. IF MOUNTING CLEARANCE DETAILS ARE REQUIRED CONSULT FACTORY.

MAXIMUM PERMISSIBLE SHAFT RUNOUT WHEN MEASURED AT END OF STD. SHAFT EXTENSION IS .002 T.I.R. UP TO AND INCLUDING 1.625 DIA. AND .003 T.I.R. 1.625 TO 5 INCH DIA.

FRAME- _____ TYPE- _____ CERTIFIED FOR- _____ PLANT/UNIT- _____ QUANTITY- _____

ORDER- _____ ITEM- _____ HP- _____ RPM- _____ PH- _____ HZ _____ VOLTS _____

RELIANCE SALES ORDER- _____ APPROVED BY- _____ DATE _____

RELIANCE ELECTRIC
CLEVELAND, OHIO U.S.A.

DR. BY CMH
CK. BY LTF
APP. BY TF
DATE 5-25-78

DIMENSION SHEET **604961-12**

ISSUE DATE: NOVEMBER 12, 1985

MOTOR 1MAF33492 SPEC 61.0403
B&V DRAWING NO.12713.61.0403. 05-10101 PROJECT 12713

MOTOR DATA TO BE SUBMITTED

MANUFACTURER RELIANCE ELECTRIC CO. MODEL -

HP 150 . VOLTS 460 . PHASE 3 . HERTZ 60

SERVICE FACTOR 1.15 . NEMA DESIGN LETTER B . FULL LOAD SPEED 1189 RPM

ENCLOSURE: TYPE TEFC EXEX FRAME SIZE 445T

INSULATION SYSTEM: CLASS F STANDARD X SEALED ____, AMB TEMP 40° C

TEMP. RISE 90° C BY RESISTANCE AT SERVICE FACTOR OF 1.0 ____, 1.15 X .

FULL LOAD CURRENT 173 AMPS, LOCKED-ROTOR CURRENT 1085 AMPS

SPACE HEATER (IF FURNISHED): NUMBER OF UNITS 1 , UNIT RATING, WATTS 245

VOLTS 120 , PHASE 1

BEARINGS: TYPE BALL AFBMA L-10 RATING LIFE, NOT LESS THAN N/A HRS

LUBRICATION: TYPE GREASE SYSTEM SLUSHED

SOUND LEVELS:

SOUND POWER LEVEL
RE 10^{-12} WATTS 86 dBA
FREE FIELD

OVERALL MEAN NO-LOAD SOUND PRESSURE LEVEL
RE 20 MICROPASCALS (0.0002 MICROBAR) REFERENCE DISTANCE
OF 1 METER X 3 METERS ____ : 76 dBA FREE FIELD

TOTAL MOTOR WT 1810 LBS

FOR MULTI-SPEED MOTORS:
VARIABLE TORQUE N/A , CONSTANT TORQUE ____ . CONSTANT HORSEPOWER ____
MOTOR TERMINAL CONNECTION DIAGRAM NO. ____ (ATTACH COPY OF DIAGRAM)

FOR WOUND ROTOR MOTORS:
SEC. VOLTS N/A , SEC. AMPS ____ . SEC. RES., OHMS M-M AT 25 C ____

FOR MOTORS IN HAZARDOUS LOCATIONS:
MOTOR ENCLOSURE SURFACE TEMPERATURE, N/A C AT SERVICE FACTOR OF 1.0 ____ 1.15 ____ .
WILL MOTOR CONTAIN A SURFACE TEMPERATURE CONTROL THERMOSTAT REQUIRING CONNECTION INTO THE MOTOR STARTER CONTROL CIRCUIT: YES ____ , NO ____

FOR DUST IGNITION-PROOF MOTORS: MOTOR ENCLOSURE SURFACE TEMPERATURE RISE UNDER ANY ABNORMAL OPERATING CONDITION INCLUDING OVERLOAD, SINGLE-PHASING, ETC., ASSUMING ENCLOSURE SURFACE TEMPERATURE OF 120 C WHEN ABNORMAL CONDITION DEVELOPS:

MINIMUM TIME TO REACH 145 C N/A SECS

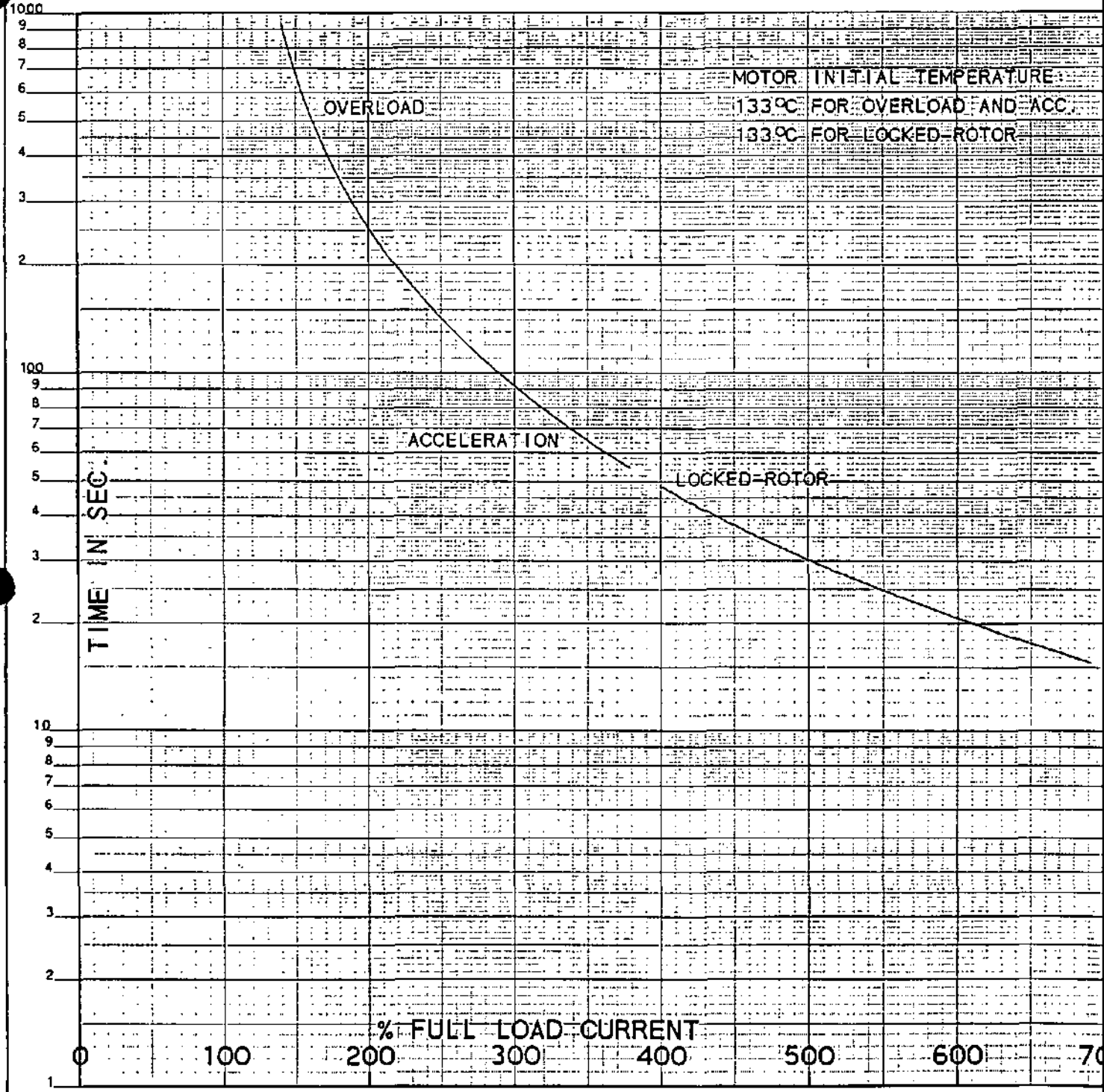
MAXIMUM RATE OF RISE ____ C IN 3 SECS

NOV 17 1987

ADDITIONAL MOTOR DATA FOR MOTORS LARGER THAN 200 HP AND FOR ALL MOTORS RATED ABOVE 600 VOLTS SHALL BE SUBMITTED ON SHEETS 2 AND 3.

BLACK & VEATCH CONSULTING ENGINEERS		SHEET 1 OF 3
	MOTOR INFORMATION SHEET	

REL. S.O. 1MAF33492	RPM 1189	S.F. 1.15	ROTOR 418143-71JE
FRAME 445T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 150	AMPS 173	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEFC-XE	STATOR RES.@ 25°C .0323
PHASE/HERTZ 3/60	AMB°C/INSUL	E/S 599528	OHMS (BETWEEN LINES)



THERMAL LIMIT CURVE

REMARKS: XE MOTOR-NEMA NOM. EFF. 95.4%

AMPERES SHOWN FOR 460 VOLT CONNECTION, OF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE. THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY D.M. BYRD
CK. BY D.M. BYRD
APP. BY J.P. TSAO
DATE 02/15/87

A-C MOTOR PERFORMANCE CURVES

E07705-A-B001
ISSUE DATE 02/15/87

File A79299

WILLIAMS
PATENT CRUSHER and PULVERIZER CO.

TELEX NO. 44-7133

OLDEST & LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD

CRUSHERS
GRINDERS
SHREDDERS
CONVEYORS
DRYER MILLS
AIR SEPARATORS

TELEPHONE: 314 - 621-3348
2701 NORTH BROADWAY
ST. LOUIS, MO., U.S.A. 63102

WILLIAMS MODEL 40GA
IMPACT DRYER MILL
FOR
WILLIS & PAUL GROUP
66 FORD ROAD
DENVILLE, NEW JERSEY 07834

AES THAMES, INC.
THAMES COGENERATION PLANT
MONTVILLE, CONNECTICUT
P.O. 008742-018HL

EQUIPMENT LIST

	SERIAL No.	SHOP ORDER
40 GA IMPACT DRYER MILL	18555	871448
40 GA IMPACT DRYER MILL	18560	871448
4 FT. SPINNER SEPARATOR	18556	871449
4 FT. SPINNER SEPARATOR	18561	871449
6MBTU OIL FIRED AIR HEATER	18557	871450
6MBTU OIL FIRED AIR HEATER	18562	871450
MODEL "E" LUBRICATION UNIT	18558	871451
MODEL "E" LUBRICATION UNIT	18563	871451

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
2701 NORTH BROADWAY, ST. LOUIS, MO. 63102

CONTENTS

DRYER MILL INSTRUCTIONS

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
2701 NORTH BROADWAY, ST. LOUIS, MO. 63102

CONTENTS

6MBTU/HR AIR HEATER

WILLIAMS

CRUSHERS CONVEYORS SHREDDERS GRINDERS

Oldest and largest manufacturer of hammer mills in the world

SAFETY PROCEDURES FOR OPERATION OF WILLIAMS EQUIPMENT

WILLIAMS PATENT CRUSHER & PULVERIZER CO., INC.

2701 North Broadway • St. Louis, Missouri 63102-1597, U.S.A.

GENERAL SAFETY PROCEDURES FOR OPERATION OF WILLIAMS EQUIPMENT

Because each installation of Williams Equipment involves different uses and considerations it must be understood that these safety instructions are general in nature and that each specific installation must be reviewed by the owner or plant management to insure maximum safety precautions. It is the responsibility of the owner or plant management to provide complete safety instructions and procedures for the operation of all Williams equipment, which their personnel will be involved with in the performance of their duties, and to see that all the necessary precautions are followed. All personnel who will be involved in the operation or servicing of Williams equipment must be properly trained in the operation and servicing of such equipment and must be fully familiar with these general safety procedures and the safety precautions attached to the Williams equipment.

HAZARDOUS MATERIALS WARNING

OVERSIZE OR THE WRONG TYPE OF MATERIAL FED INTO A MILL CAN CAUSE SERIOUS PERSONAL INJURIES AND PROPERTY DAMAGE, INCLUDING DAMAGE TO THE EQUIPMENT ITSELF.

No explosive, flammable or similar hazardous material is to be fed into any operating Williams equipment under any circumstances.

If there is any possibility that hazardous material could be accidentally overlooked by the personnel feeding the Williams equipment, the owner must provide suitable protection such as listed below or mandated by Federal, State or Local regulations.

A) Inert gas atmosphere in system.

B) Explosion vents for Williams equipment and building housing the equipment.

C) Explosion suppression system.

D) Operators station protected by blast panels and shielding.

E) Water deluge system for fires.

Heat and sparks generated during the operation of some Williams equipment can cause combustible materials to ignite unless precautions are taken by the owners.

1) When personnel are working inside the mill or near the rotor the power to the driver shall be de-energized and locked out with an approved safety tag on the controls or starter.

2) Never enter or service equipment through the conveyor, feed hopper, or discharge opening.

3) Only the specified size and type material which the mill was designed to handle shall be fed into the mill.

4) The inherent ballistic action of the grinding operation can cause pieces of the material being processed to be thrown out the feed or discharge openings and injure personnel in the vicinity. It is the owner's responsibility to provide and maintain proper screens and shrouds at all the mill openings to contain the material being processed inside the hopper or mill.

NEVER ALLOW PERSONNEL TO STAND IN LINE WITH OR IN THE IMMEDIATE VICINITY OF THE FEED OR DISCHARGE OPENING OF A MILL OR SHREDDER WHILE MATERIAL IS BEING PROCESSED.

5) All personnel in the vicinity of an operating mill must wear a hard hat and safety glasses in addition to any special clothing or protective equipment the particular installation may require.

6) **NEVER OPERATE A MILL FASTER THAN THE DESIGN SPEED.**

7) Before starting the equipment for the first time and for normal daily operation the following precautions should be followed:

   A) Check to see that all alarm signals and emergency devices are functioning properly.

   B) All access doors, covers, or inspections ports are closed and securely fastened in place.

   C) Infeed conveyors or chutes cleared of all materials that could enter grinding chamber until the rotor attains operating speed.

   D) Make a daily inspection of the rotor condition before the start of operations noting any badly worn or broken items that could fail and replace them before using the mill.

   E) All protective covers or guards on the drive connection and flywheel or shaft end are fastened properly in place.

   F) The mill is empty and clear of all debris or product so the rotor is free to turn without interference and the hammers can swing on their pivots.

   G) All personnel are clear of any moving parts and positioned at their assigned operating stations.

8) **NORMAL OPERATING VIBRATION AND WEAR CAN CAUSE BOLTS TO LOOSEN AND ALLOW COMPONENTS TO FALL OFF THE MILL OR INTO THE ROTOR UNLESS A REGULAR REVIEW OF THE MILL IS MADE BY OPERATING PERSONNEL TO TIGHTEN ANY LOOSE BOLTS.**

9) Should the rotor become jammed or the feed chute plugged do not attempt to clear the chute or open the cover while the rotor is turning and the power is connected. Before any service operations on the mill, de-energize the driver and wait until all rotor movement has ceased. If entry to the rotor area is made, after the power is locked off and the rotor movement has ceased, care should be taken to secure the rotor from turning because the rotor could turn if stepped on or physically pushed thereby causing swing hammers to fall and strike the rotor, or anyone in the vicinity.

The above list is not intended to include all precautions that can be taken to insure safe operation of Williams equipment, but to supplement any existing ordinances, applicable regulations and specific safety instructions by the owner or plant management for the particular application of the Williams equipment.

These safety instructions should be framed and posted in all operating locations where personnel are stationed.

WILLIAMS
CRUSHERS CONVEYORS SHREDDERS GRINDERS
Oldest and largest manufacturer of hammer mills in the world
2701 North Broadway • St. Louis, Missouri 63102, U.S.A.

INSTRUCTIONS FOR WILLIAMS HAMMER MILLS

This pamphlet is intended to serve as a guide for installation, operation, and maintenance of your Williams Hammer Mill Equipment. This pamphlet refers to hammer mills, rigid arm hammer breakers and shredders, rotating ring crushers, and all similar rotating Williams grinders, hogs, and shredders. For convenience they will be referred to herein as mills.

Installation, operation and maintenance are each discussed separately so as to give you as much specific information as is possible.

All Williams Mills, regardless of size, are run at the factory before shipment. They are mechanically sound when prepared for shipment and all but the largest sizes are shipped as an assembled unit. Those machines too large to be shipped in one piece can be assembled without difficulty. The proper relation of the several sections will be quite obvious upon visual inspection. When properly installed, lubricated, and maintained, your Williams Mill will give you good service for many years.

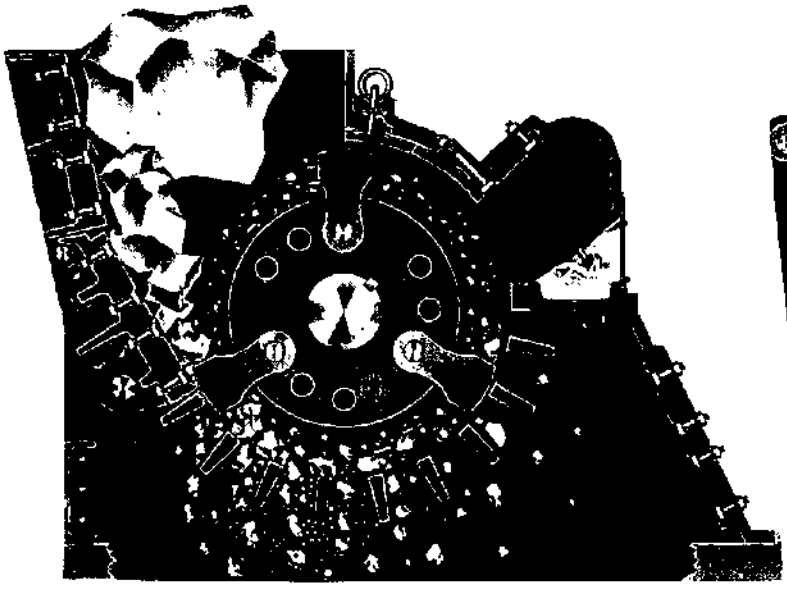


Fig. 1645 – Sectional view illustrating the Williams down-running type Hammer Mill. This design is used in the Slugger and Super-Slugger types.

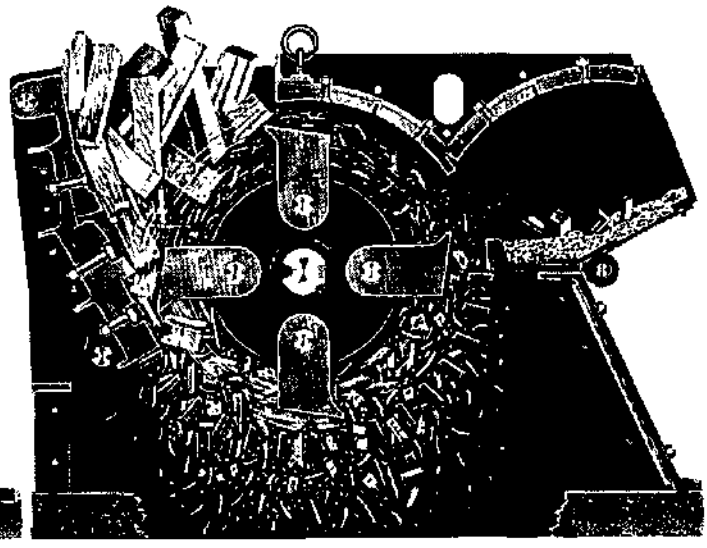


Fig. 1646 – Sectional view illustrating the Williams "No-Nife" Hog type Shredder.

INSTALLATION

Foundation: The machine should be supported on concrete, steel or heavy timbers, the setting to be strong and heavy enough to carry the vibration and weight of the mill and driving motor. This foundation is to be isolated from any building foundation so as not to transmit vibration into the building. The foundation is to be level and uniformly even with anchor bolts located as per specifications on **certified** Williams installation prints. Bolt the mill assembly down solidly, shimming to make certain that it remains level in both directions. Check this level along the shaft and bearing pedestals. Care should be exercised when drawing up the foundation bolts so that the mill frame is not warped out of position due to an uneven or unlevel foundation. When a mill and motor base are used, the entire assembly is set on its foundation in the same manner as described above. Now, flush in grouting material to give a good bearing between the mill and foundation. Although a Williams Mill is a heavily built machine, care must be exercised to prevent damage in handling. Whether a hoist or jack be used to lift the machine, under no circumstances, should a strain be put on the mill shaft. Always lift the machine by the lower frame, placing the strain on the well braced bottom flanges. See Fig. 1876.

The lifting lug provided on the removable cover section of many models is for your convenience in removal of this portion of the mill only and **will not** carry the weight of the entire mill.

Feed Chute: All mills should be equipped with adequate feed chutes. If there is any design question check with the factory.

Accessibility: The interior of your Williams Mill is easily reached for repairs and adjustments by simply opening the removable half of the cover. Therefore, leave sufficient room around your mill to provide comfortable working space and for the removal of the mill cover and hammer bolts. The hammer bolts are usually removed from the side opposite the drive. See Fig. 1814

SAFETY:

It is the customer's responsibility to provide and to keep in operation — shrouds or similar safety devices — necessary to prevent material or tramp iron throw out at the feed opening of the mill or feed hopper — for the safety of all personnel.

Personnel in the vicinity of this equipment when in operation should wear hard hats, goggles, and other similar safety equipment.

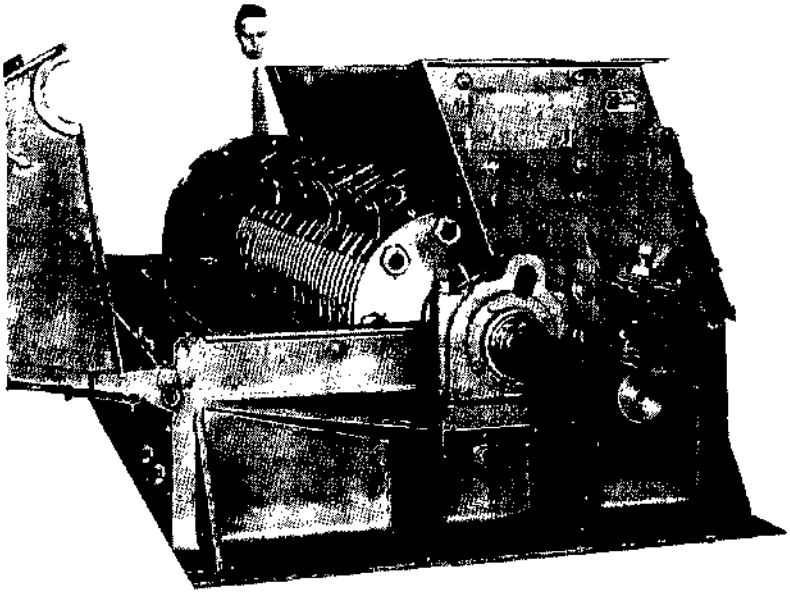


Fig. 1814 — No. 60 type GA Rigid Arm Breaker. Cover has been opened to show interior.

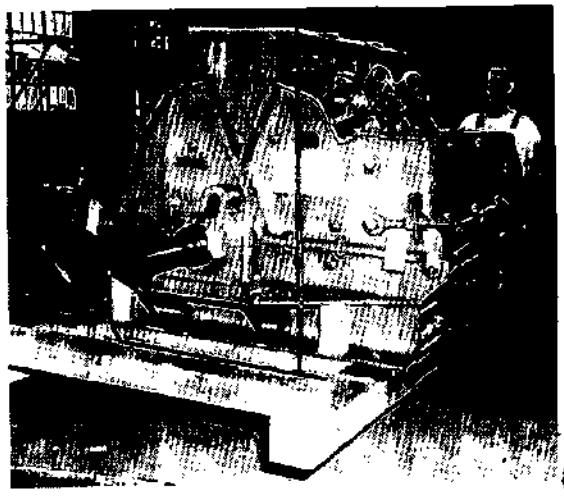


Fig. 1876

OPERATION

Starting the Mill: It is important that your Williams Mill be operated at the recommended speed. Under no circumstances should any Williams Mill be operated at a greater speed than that specified by the Williams factory, nor should the speed be lowered without factory approval. Before starting the mill, inspect the grinding chamber carefully and turn the mill by hand to be certain that it is free of all obstacles that may have found their way into the interior of the mill. **Check direction of rotation** to see that it is the same as that indicated by the direction arrows on the sides of the mill, or on Williams drawings.

When you start the mill under power, permit it to attain full speed **before any material is fed into it.**

Proper Feeding: Material being fed into a Williams Mill should be spread evenly over the entire feed opening and should be conveyed into the mill continuously and uniformly at a feed rate not greater than that recommended by the factory. Bear in mind that surge feeding is inefficient as it tends to overload the mill, thereby causing the machine to use excess power. An alternate overload and underload condition of operation will average far below the results obtained by steady feeding of the right amount of material. For some materials, automatic feeders are essential – for practically all, they are beneficial.

Feed size of material should be limited to the maximum sizes recommended by the factory. Excessively large pieces of material place undue strain on the shaft and other parts of the machine. Uncrushable material such as steel and iron should be removed from the feed before it enters the hammer mill even though the mill is equipped with a metal trap. A metal trap is by no means 100% effective and severe damage may be sustained to the mill before uncrushable material can be removed.

Handling of Product: The chute, air system, belt or screw conveyor, etc., regardless of what conveyance system is used to remove the hammer mill product, must be of **sufficient capacity** to handle peak loads without temporary accumulations of product occurring under the mill. This is necessary to prevent the product from plugging the mill and shutting down its operation.

Fineness Adjustments: Fineness adjustments are mentioned in their order of accessibility and ease of change; and will produce a finer product. Conversely, a reversal of below recommendations will produce a coarser product.

1. On mills having adjustable breaker plates adjust the breaker plate closer to the hammers to compensate for wear on the breaker plates and grinding plates (Note – on new mills the breaker plates have been correctly set at the factory and the mill is ready for operation).

OPERATION (Cont'd)

The procedure for adjusting the breaker plate assembly is as follows: – with the mill running empty, loosen the adjusting and locking bolts (or screws), adjust the breaker plate slowly by means of the adjusting bolts (or screws) until you hear the hammers graze the breaker plate. Install shims (an adequate supply is always shipped with the mill) so that the breaker plate may be withdrawn approximately 1/16". **Lock shims in place.**

Now, tighten the locking bolts so that a moderate pull is exerted on the breaker plate assembly away from the hammers – this prevents the breaker plate assembly from chattering and insures that all shock loads derived from crushing will be directed against the shims which are designed to take this load. See Fig. 1819 & 1820.

2. Changing Cage Openings: By reducing the size of the cage openings, a finer product will be made, but the output is decreased as the making of a finer product places more work on the mill. See Fig. 1158.

3. Changing the Speed: A higher speed will, generally, produce a product which is finer, however, there are many limitations. The maximum safe speed for the machine cannot be exceeded. **Too** great a speed will not allow the feed to get between the hammers, thus reducing the efficiency of the mill. An increase of speed will require more power, therefore, make no change in the mill speed without first consulting the factory.

4. Decreasing the number of hammers. In certain instances where a coarser product is more desirable, this can sometimes be obtained by removing hammers from the mill. However, we do not recommend that this be done without first consulting the factory and it is always necessary to keep in mind that the balance of the rotor must be maintained.

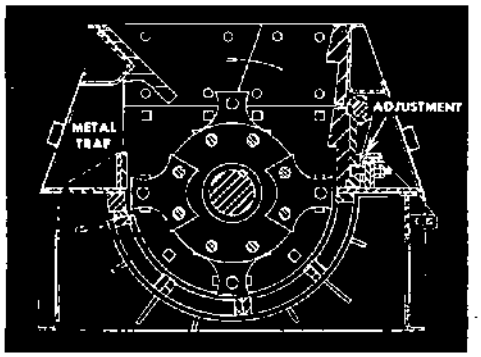


Fig. 1819 – Sectional view of GA type Rigid Arm Breaker. Note six point breaker arms.

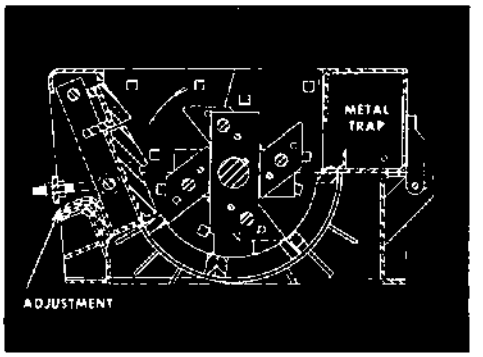


Fig. 1820 – Sectional view of 200 Series Rigid Arm Breaker showing two point breaker arms.

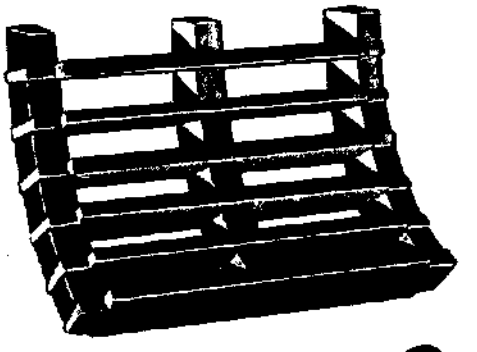


Fig. 1158 – Section of sectional bar type cage.

MAINTENANCE

Lubrication: Possibly no detail is as important to the life of a machine as proper lubrication of the contact surfaces of moving parts. We advise always that you lubricate as frequently as local conditions warrant for your installation, keeping in mind that care must be exercised to prevent over lubrication. **Too much lubrication will cause a bearing to heat.** Bearing operating temperatures vary with geographical location and ambient temperature at the installation. If there is any doubt about lubrication, consult factory or a qualified lubrication expert.

Grease Lubrication: For all moving parts which have a standard grease gun fitting supplied use Socony Mobil Grease Mobilux No. 2 or its equivalent.

Oil Lubrication: For all moving parts which use oil as a lubricant use an oil which has the following characteristics:

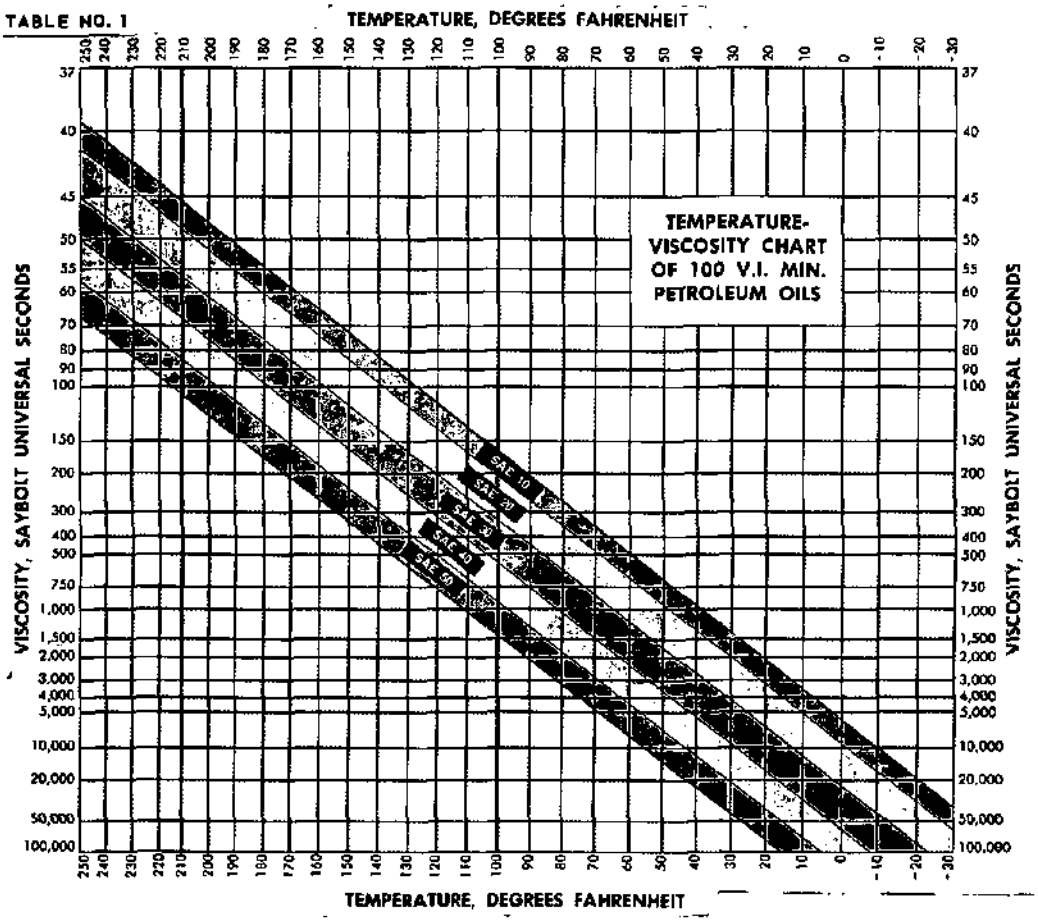
(1) The viscosity of the oil should be between 105 SSU and 150 SSU at the operating temperature of the bearing. Usual operating temperature of the bearing is within the range of 160° – 180° F.

(2) The oil should yield a "Timken Okay Load" of 45 pounds minimum.

(3) The oil should contain EP additives.

The viscosity of an oil is perhaps the most fundamental consideration in bearing applications. Table I provides a relative guide in determining the viscosity of oil at various temperatures

TABLE NO. 1



MAINTENANCE (Cont'd)

Viscosities of oils are usually given at either 100° F or 210° F. To determine this viscosity, find the intersection on the chart of the expected operating temperature and the Saybolt Universal Seconds (SSU). From this point draw a line parallel to the nearest curve. Where this line intersects the 100° F or 210° F ordinate will be found the viscosity in Saybolt Universal Seconds at either of these standard base temperatures.

Table I is simply an oil selection guide. It is based on oils with a high Viscosity Index (V.I) which are necessary for satisfactory bearing operation. **It is always preferable to consult a competent lubrication engineer for a more specific recommendation,** particularly if the conditions are in the areas above or below the family of curves.

Impactors with oil lubricated bearings have the bearing housings filled with a basic lubricant to protect the bearings only during transit. The bearings housings **must be flushed** before operating and be filled with the correct lubricant for your installation.

For installations where bearings are in an oil sump, or reservoir, we recommend that the impactor run for 45 minutes in unloaded condition to lower the viscosity of the oil to the proper operating range.

How often you should flush all bearings and reload their lubricant depends upon conditions of location and operation. However, to establish a basis for normal operating conditions, it is recommended that bearings be flushed and re-filled once a month.

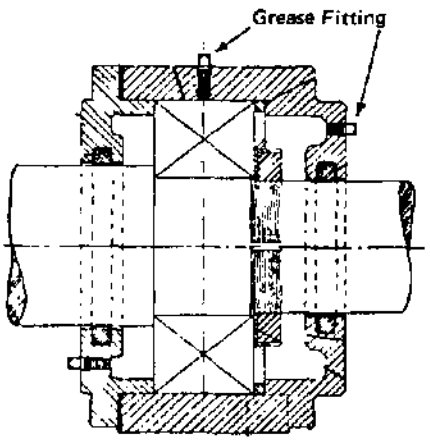


Fig. 1877. Typical Grease Lubricated Pillow Block – Location of grease fitting may vary.

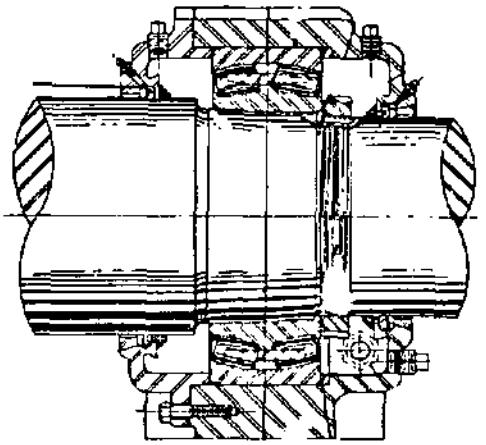


Fig. 1878. Typical Oil Lubricated Pillow Block – Manual Lubrication.*

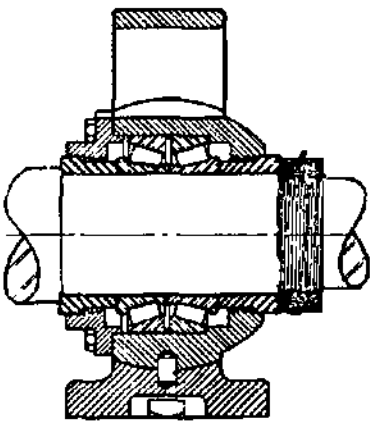


Fig. 1879

It should be a rule that any time grit is found in a bearing, the bearing is to be cleaned and inspected for wear and the defect which allowed the grit to leak into the bearing corrected immediately. All bearing housings are designed to prevent grit from entering from the outside.

Should lubrication instructions be supplied with a bearing or machine, they naturally, take precedence over those recommended here.

*A circulating oil bearing lubrication system may be required for larger bearings on certain size impactors. See separate instructions for this type of lubrication system when furnished.

MAINTENANCE (Cont'd)

Hammer Care & Adjustment: Whenever the nature of the work intended for the mill permits the efficient use of reversible hammers, one of Williams' standard reversible styles is installed. Of course, when "double end" reversible types can be used, four wearing edges are available by reversing and also inverting the hammers. See Fig. 1630 & 1747.

Adjusting holes are provided in discs in some mills which permits the continued efficient use of hammers after wear reduces their original length. New hammers are mounted from the hammer bolts in the set of holes nearest the shaft; therefore adjustment to compensate for wear to these hammers can be made by moving the hammers and hammer bolts outward to the next set of holes. After moving the hammers, always check the clearance to be sure that they cannot strike any part of the mill before starting. See Fig. 1672.

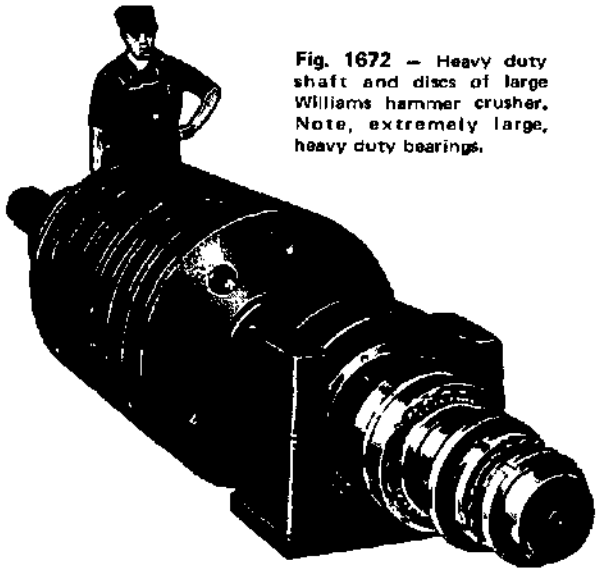


Fig. 1672 – Heavy duty shaft and discs of large Williams hammer crusher. Note, extremely large, heavy duty bearings.

Fig. 1630 – Double-end hammer as used in the Rocket & Meteor Series.

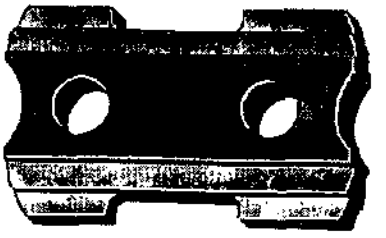


Fig. 1747 – Serrated hammer, available for certain types of grinding jobs.

With hammers which must cut by impact as well as by sharpness, such as in a wood hog or metal turnings crusher, after the hammer tips have become rounded from wear, they should be built up by welding rod or by forging as in the case of tool steel hammers. It is our experience that hammer tips worn down more than 3/4 in. are more expensive to repair than the purchase of new hammers. Therefore regular maintenance to the tips shall be a must. After building up the hammer tips or hard surfacing – if the hammers were removed – make sure that opposing hammers weigh the same when reinstalling them into the mill to maintain balance. See Fig. 1866.

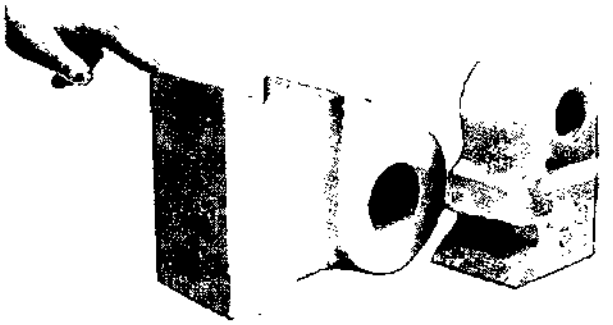


Fig. 1866 – Williams Hog Hammers have hardened abruptly-sharp edges to cut through refuse by impact.

MAINTENANCE (Cont'd)

Hammer Care & Adjustment

For any type of hammers which exhibit undue wear due to a very abrasive product, hard surfacing is recommended. Contact the factory for the proper procedure and hard surfacing rod for your particular problem.

Note: – should build up rod or hard surfacing rod be applied to hammers while they are still assembled in the hammer mill, be sure to maintain balance between opposite rows of hammers and always connect the welding ground so that the electrical circuit **does not** pass through the hammer mill bearings.

Replacement Parts should be ordered in anticipation of their need to prevent the possibility of a costly interruption to your production schedule. The grinding elements, particularly, should be carried in stock so as to be immediately available when needed. The grinding elements consist, primarily, of hammers, breaker plates, grinding plates, cage bars and/or perforated cages. A spare bearing is also a good investment.

Don't Permit The Liners To Wear Through before replacing them. Liners protect your investment by protecting the mill frame from impact and abrasion. They are furnished in all Williams Mills which are intended for heavy duty or abrasive service.

Periodical Inspections are good operating practice. At such times, bearings, discs, hammer bolts, hammers, breaker plates, liners, cages, adjusting screws, and all frame members should be inspected carefully. **Be sure all bolts are securely tightened.**

Possible Troubles:

a) Vibration. After a mill has been in service for some time, wear will affect the balance of the rotating assembly causing vibration. Another source of vibration could be from a sprung shaft. A shaft can be sprung by feeding the mill uncrushable material, loading it excessively, or feeding material larger than that originally intended for the machine.

b) Loss of Capacity of Product Size. This, again, is largely due to wear on the crushing segments and, generally, can be compensated for by adjusting the breaker plates or hammers, or replacing worn parts.

c) Clogging. Clogging as explained earlier can be caused by not conveying the product away from the mill fast enough or it can be due to worn parts which do not grind properly and thus clog the mill, or to excessive moisture, oil, etc. in the mill feed.

General Information: Always specify the serial number of your Williams Mill in all correspondence pertaining to it, and you will help us to render better service. Always specify the serial number when inquiring about, or ordering, repair parts. You will further help us to give you good service by specifying the drawing number of the repair parts required. If the name plate has been accidentally removed the serial number has been stamped into the bearing pedestal in the drive side on mills dating from June 1954 on.

Consult us if you have a special problem related to grinding, shredding, crushing, pulverizing, separating or screening. We are specialists in this field.

WILLIAMS PATENT CRUSHER & PULVERIZER COMPANY, INC.
2701 NORTH BROADWAY • ST. LOUIS, MISSOURI 63102

WILLIAMS #1 BUILD UP ROD

WARNING: **Do not apply weld in an enclosed or confined area without proper ventilation — lock out electrical controls when applying build up to hammers on rotor or inside crusher.**

Now you can use a high (14%) Manganese Steel rod as easily as a mild steel electrode. Williams #1 Build Up Rod gives a high buildup with X-Ray quality deposits. Check the list of features below:

FEATURES

1. Tough and ductile - work-hardens under heavy impact resulting in good abrasion resistance equivalent to Manganese. For heavy abrasion conditions we recommend applying Williams #2 Hard Surface Rod on top of the #1 Build Up Rod.
2. Excellent buildup.
3. Welding excellent in both vertical and horizontal positions.
4. A steady arc, sound deposit and easy slag removal - slag does not "pop".
5. Low cost, replaces stainless for manganese-to-mild steel welds.

GENERAL DESCRIPTION

Williams #1 Build Up Rod is a composite type electrode for arc welding only. A steel core wire is utilized with the alloying elements of manganese, nickel and chromium contained in the flux coating. The deposit is austenitic 14% manganese steel with chrome-nickel alloy content giving outstanding properties - tough and easy-to-handle.

TYPICAL APPLICATIONS

Williams #1 Build Up Rod is best suited for buildup and repair of manganese, Williams SMO and Williams "M" alloy steel parts where severe impact is present to fully utilize the work-hardening properties of the deposit. When used to build up ordinary ferrous parts, the deposited metal offers greater resistance to impact and abrasion than the base metal.

CURRENT: AC or DC, Reverse or Straight Polarity

RECOMMENDED CURRENT RANGE - AC OR DC

We recommend the use of 3/16" or 1/4" rod and such sizes can be shipped from stock.

Rod	Amps	Rod	Amps
5/32"	120-160	1/4"	220-300
3/16"	170-225	5/16"	270-390

PHYSICAL PROPERTIES OF WELD DEPOSIT

Brinell Hardness - as deposited - 200
Brinell Hardness - as work-hardened - 500
Nonmagnetic

Tensile Strength - 120,000 psi
Yield Strength - 75,000 psi
Elongation - 40%
Reduction of Area - 35%

TIP COLOR: Silver

STANDARD MANUAL PACKAGE: 50 pounds

PROCEDURE

1. The parent or base metal should be ground and wire-brushed to remove all cracks, oxides and dirt. Manganese and Williams "M" alloy steel castings, even without surface defects, should be ground down below the extremely work-hardened surface which has a metal structure different from the main body of the casting.

2. The electrode should be deposited using a narrow weave with electrode held at about a 45° angle in the direction of welding shown in figure 1. The width of the weave should be one to two times the electrode diameter and the arc length held quite short, with almost a "drag" technique. Welding is stopped by drawing the electrode back into the weld deposit to fill out the crater, and breaking the arc.

3. The arc is restruck ahead of the crater and then drawn back to where the crater begins as shown in figure 1 so that a smooth continuous bead is obtained.

4. Warning---Welding should not be continued until the base metal is below 400° to 500° F for Manganese or Williams "M" alloy, 700° to 800° for Williams SMO at a point 1/2 inch from the weld. In the absence of Tempilstiks, a good rule of thumb is to determine whether one's hand can be held on the base metal 6" from the weld (for manganese or Williams "M" alloy).

5. Quenching the hot weld metal is unnecessary.

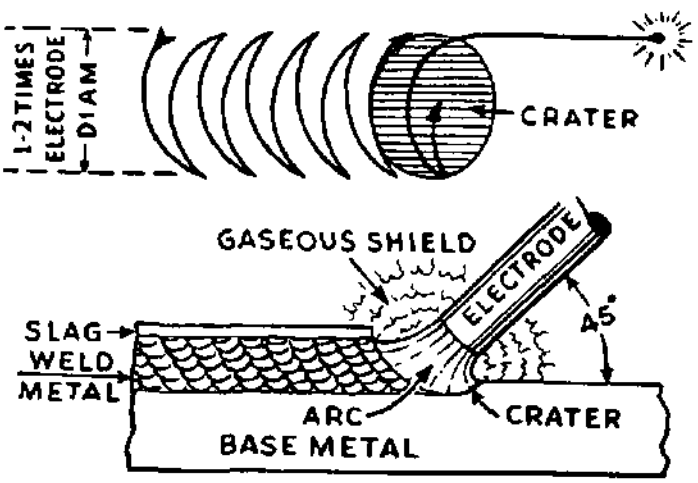


Figure 1


Figure 1926

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WILLIAMS PATENT CRUSHER & PULVERIZER COMPANY, INC.
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WILLIAMS #2 HARD SURFACE ROD

WARNING: Do not apply weld in an enclosed or confined area without proper ventilation — lock out electrical controls when applying hard surface to hammers on rotor or inside crusher.

Williams #2 Hard Surface Rod is designed to be used on either manganese steel, Williams SMO or Williams "M" alloy. It has a high rate of deposit and an excellent bead characteristic for maximum wear life.

FEATURES

1. Fast deposition rate with high buildup.
2. Best usability for all-around hardfacing.
3. Highest alloy content at lowest cost.
4. Top performance with any power - AC or DC.
5. No slag to remove - easy multilayer buildup.

GENERAL DESCRIPTION

Williams #2 Hard Surface Rod is the answer if you're looking for a fast, easy to handle, inexpensive, all-purpose hardfacing. It's the only electrode that can come close to matching Williams #1 Build Up Rod in high speed usability for all-around hardfacing work, whether AC or DC, out of position or flat. A composite electrode with lowest price and highest alloy content in its class.

TYPICAL APPLICATIONS

Williams #2 is suitable for a wide range of hardfacing jobs whether they involve impact, abrasion, or a combination of these. Good build up of sound metal, solidly bonded to the base metal - either mild, manganese steel, Williams SMO or Williams "M" alloy - gives top wear resistance in the shortest time to keep equipment on the job longer.

Do not apply hard surface deposit to over a depth of 3/16". If more metal is required use #1 Build Up Rod.

CURRENT: AC or DC, Straight or Reverse

RECOMMENDED CURRENT RANGE - AC OR DC

We recommend the use of 3/16" or 1/4" rod and such sizes can be shipped from stock.

Rod	Amps	Rod	Amps
5/32"	140-200	1/4"	230-330
3/16"	180-270	5/16"	300-460

PHYSICAL PROPERTIES OF WELD DEPOSIT

Deposit Hardness Average - 51 - 56 Rockwell C
500 - 570 Brinell

Magnetic

TIP COLOR: White

STANDARD MANUAL PACKAGE: 50 pounds

PROCEDURE

1. Williams #2 can be applied in all positions. For best results all rust, scale and battered, spalled, or work-hardened sections should be removed from the base metal with a wire brush or by grinding. A short to medium arc length should be used. Either stringer beads or wide weaving passes can be made with no difficulty.

   Do not apply hard surface deposit to over a depth of 3/16". If more metal is required use #1 Build Up Rod.

2. The electrode should be inclined at a normal angle of approximately 15° in the direction of the weld. Depending on electrode, size beads of 1/2" to 2" in width can be applied with a flat mild steel type weave. Welding is stopped by drawing the electrode back into the weld deposit to fill out the crater, and breaking the arc.

   The arc is restruck ahead of the crater and then drawn back to where the crater begins as shown in figure 1 so that a smooth continuous bead is obtained.

3. In applying these materials to heavy sections it is advisable to pre-heat to approximately 350° F except in the case of manganese steel (13%) or Williams "M" alloy steel which should never be preheated over 300° F.

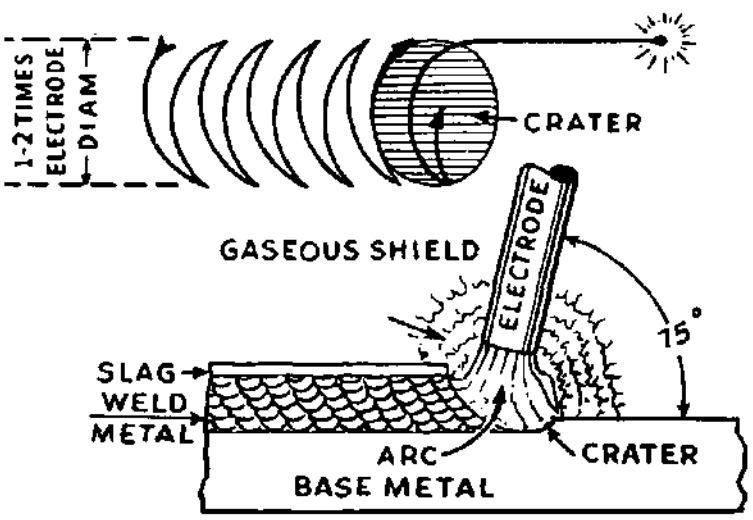

Figure 1

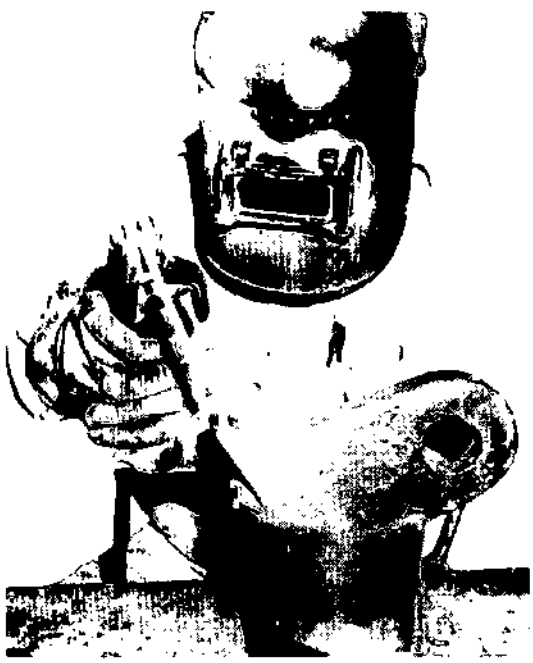
Figure 1925

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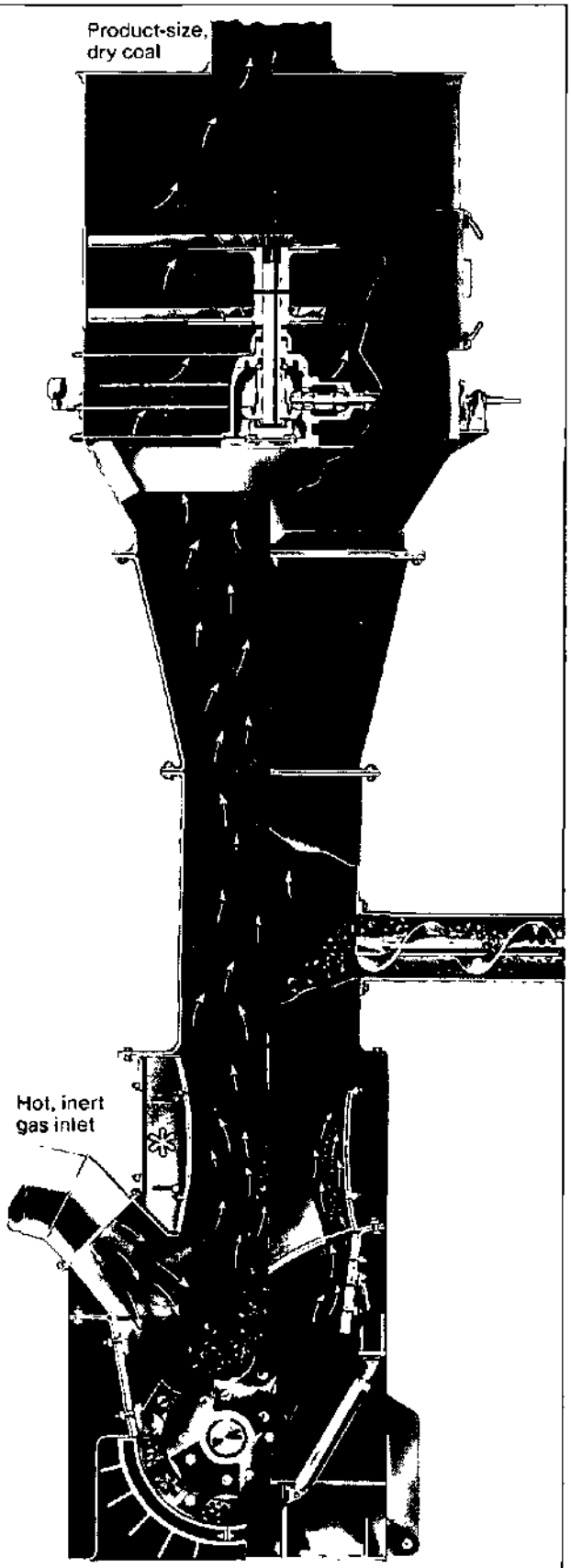


*U.S. Patent Nos. 3,794,251 and 3,826,208.

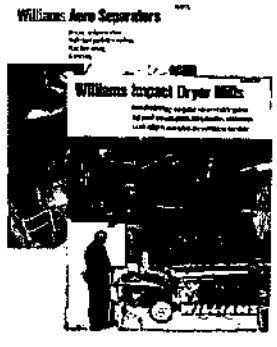
Williams Venturi* Dryer Mill System

. . . unmatched for simultaneously grinding, drying, classifying, and conveying coal for synfuels—with minimum fines.

No other size reduction system . . . integrated or unit process . . . can match ours for processing 3" x 0 coal, as received, into ¼" or 10 mesh top size without creating more than 10% 100 mesh or 5% 200 mesh fines *plus* offering these other features:

- No predrying required. Can take 30% moisture content down to under 2%.
- Totally automated and integrated continuous process.
- Completely enclosed system with inert gas under negative pressure—safe, dustless, nonoxidative.
- Venturi section prestrips fines from feed stock.
- Integrated Spinner Separator provides micrometer control of product size.
- Pneumatically conveys product to elevations of 120 feet, even more.
- Most efficient thermodynamics available—exhaust gas temperatures can be controlled to 160 - 175° F at 80% relative humidity.
- Reduces engineering and installation, as well as structural costs, by up to 30% versus unit process systems. Can cut capital equipment costs by up to 70%.

Whether you're processing 1 tph or 125 tph, it really will pay to check into the patented Williams Venturi Dryer Mill. See your local representative or write direct for full information on single source coal preparation systems.



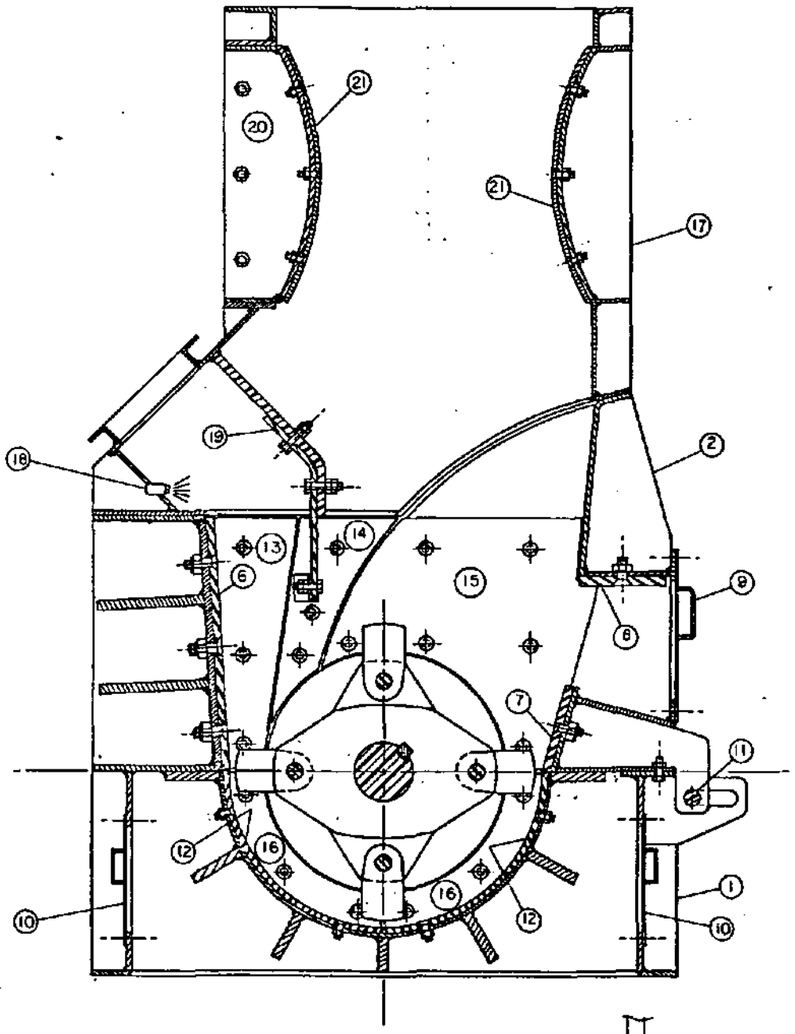
Write for Bulletins No. 882 and 883. Find out the best way to grind and dry coal for straight use or conversion.

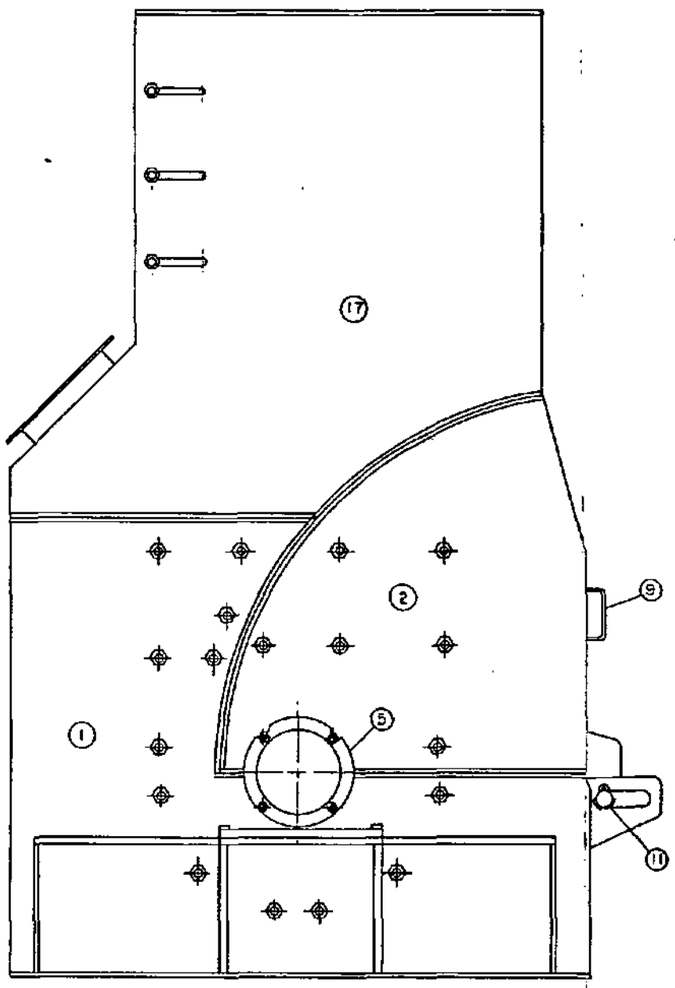
WILLIAMS...the PRODUCER

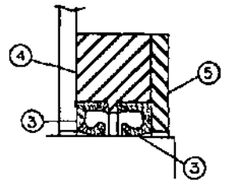
Williams Patent Crusher & Pulverizer Company, 2701 N. Broadway, St. Louis, Missouri, U.S.A. 63102
Area Code 314/621-3348 • Telex 44-7133

Printed in U.S.A.

Form No. 959







CROSS SECTION
SHAFT SEAL

PARTS LIST

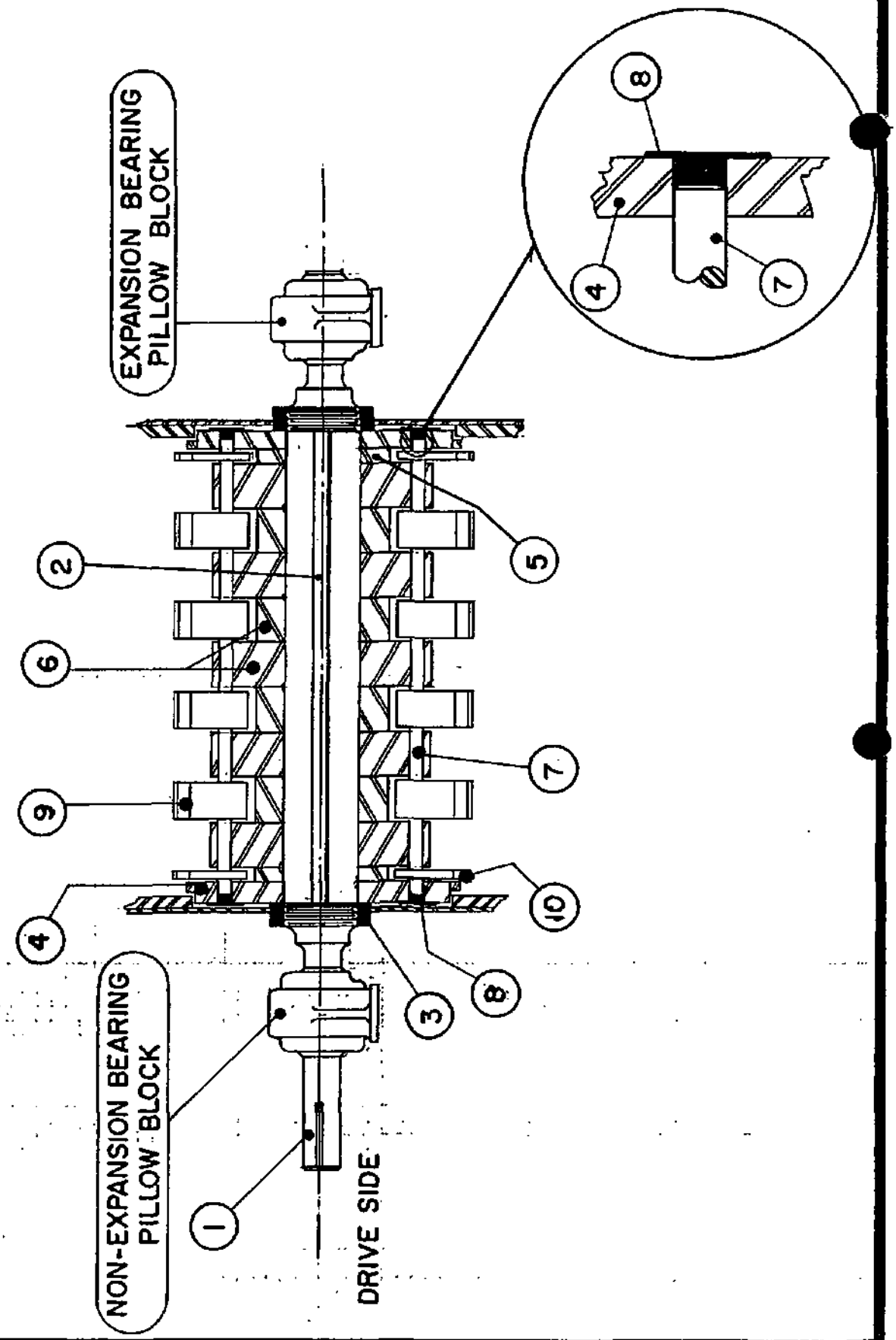
		NO. REQ'D
1	MILL BOTTOM	1
2	MILL COVER	1
3	SPLIT SHAFT SEALS	4
4	SEAL HOLDER	2
5	SEAL RETAINER	2
6	FRONT CROSS LINER	VARIES
7	REAR CROSS LINER	VARIES
8	METAL TRAP TOP CROSS LINER	VARIES
9	METAL TRAP ACCESS DOOR	2
10	MILL BOTTOM ACCESS DOOR	2
11	COVER HINGE PIN	1
12	CAGE LINER	2
13	FRONT SIDE LINER L.H. SHOWN R. H. OPPOSITE	1 EA
14	CENTER SIDE LINER L H SHOWN R H OPPOSITE	1 EA
15	COVER SIDE LINER L H SHOWN R H OPPOSITE	1 EA
16	BOTTOM SIDE LINER	4
17	VENTURI SECTION	1
18	WATER SPRAY NOZZLE (OPTIONAL)	1
19	HOT AIR BAFFLE LINER	1
20	ADJUSTABLE VENTURI	1
21	VENTURI CROSS LINER	2

☆ FOR BEARING PARTS LIST
SEE DWG 61J-8-3051
FOR ROTOR PARTS LIST
SEE DWG 181J-8-5184.

	7 J E 9068	WILLIAMS PATENT CRUSHER AND PULVERIZER CO. ST. LOUIS, MO.
		PARTS DRAWING GA IMPACT DRYER MILL
	WRW	3-4-82
		7J-E-9116

B/M No. 6936330 REV. 4

MILL SERIAL No. 18555
18560



WILLIAMS PATENT CRUSHER AND PULVERIZER CO. ST. LOUIS, MO.	ROTOR PARTS DRAWING FOR 300 SERIES MILL	SHEET NO. 1 OF 2 DRWG. NO. 181J-B-5184

PART	When Ordering Repairs Give { Part Wanted, also Quantity, This Drwg. Number and Machine Serial Number	QUANTITY IN MACHINE
1	MAIN SHAFT	1
2	SHAFT CENTER KEY	1
3	SHAFT LOCK NUT	2
4	END DISC	2
5	END CENTER DISC	2
6	CENTER DISC	
7	HAMMER BOLT	4
8	HAMMER BOLT STOP PLUG	8
9	CENTER HAMMER	
10	END HAMMER	4

EXPANSION BEARING PILLOW BLOCK
(SEE SEPARATE PARTS LIST No. 61J-B-5184)

NON-EXPANSION BEARING PILLOW BLOCK
(SEE SEPARATE PARTS LIST No. 61J-B-3051)

MILL SERIAL No. 18555, 18560

B/M No. 693E8330 REV. 4

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
ST. LOUIS, MO.

ROTOR PARTS LIST
300 SERIES MILL

SHEET NO. 2 of 2

DRWG. NO. 181J-B-5184

WILLIAMS

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Oldest and largest manufacturer of hammer mills in the world

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- Lubrication
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WILLIAMS PATENT CRUSHER & PULVERIZER CO., INC.

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FORM 911R

BEARINGS

The purpose of this manual is to provide a guide for the operation and maintenance of the roller bearing pillow blocks used on the rotors of Williams equipment. The same principles will apply for the lubrication and maintenance of all anti-friction bearings in all types of Williams equipment.

Accordingly this manual is divided into the following parts:

I Operation and Inspection

II Lubrication

III Maintenance and Service

IV Troubleshooting

BEARING OPERATION AND INSPECTION

A properly installed ani-friction type pillow block bearing on a piece of Williams equipment requires no adjustments during its normal service life. The bearing mountings and pillow blocks are engineered to rigidly support the bearing and keep it aligned.

When the rotor is properly installed in the shredder housing (See ASSEMBLY AND INSTALLATION) the bearings will automatically be aligned and in proper position for a long service life.

Long life of bearings is assured by maintaining proper alignment with the drive, proper belt tension, and good lubrication at all times. Incorrect alignment of flexible couplings or belt drives can produce vibration and thrust. Too much belt tension often causes overheating of bearings.

Prolonged operation of a bearing with a severe vibration problem above 5 mils (.005") will cause premature failure and expensive repairs. Excessive heat in a bearing (above 200° F) when operating will quickly destroy the effectiveness of the lubricant, and will result in premature failure of the bearing.

When either heat or excessive vibration develop, corrective action should be undertaken immediately to find the cause and remedy the problem.

The oil level gauge on the side of the bearing housing should be inspected several times each operating shift. The oil level should be at the center of the glass when the rotor is stationary and slightly below halfway when operating. A higher oil level will cause heat and churning of the oil in the bearing housing, which will contribute to oil oxidation.

Note any change or discoloration in the oil which would indicate contamination or oxidation is taking place, if so drain and replace the oil immediately.

Roller bearings are less sensitive to overlubrication than ballbearings, but underlubrication can destroy them quickly.

The bearing housing oil seals should be included in the daily inspection to insure they are functioning properly to retain the lubricant and keep foreign matter out of the bearing. Oil seals require *a small amount of lubricant to prevent frictional heat and subsequent destruction when the shaft* is rotating. Oil seals should permit a slight seepage of oil past the sealing surfaces to minimize seal friction and heat. If the seal leaks excessively it can easily be replaced as described in section on BEARING MAINTENANCE.

The flingers should be tight against the face of the bearing housing to protect the oil seals, and the inside flingers should be snug against inside faces of housing and cap to help prevent oil leaks. Most problems with flingers and oil seals are the result of mishandling the rotor during installation. When properly handled and installed the oil seals will function satisfactorily for years.

Several times an operating shift check the bearing housing temperature to note any abnormal rise in temperature. Normal bearing operating temperatures will be in the range of 160°—180° F which will allow the palm of the hand placed on the top of the bearing housing to remain for approximately 2-3 seconds. If the bearing housing is warmer than this, remedial steps should be taken to insure proper service life of bearing.

Periodically check to see that the bearing housing hold down bolts are tight and the stop blocks are snugly in place especially after a severe vibration or shock. A sudden rise in vibration can often be accounted for by the loosening of bearing housing hold down bolts, which should be retorqued.

Refer to the section on LUBRICATION for recommendations on types of oil or grease and frequency of changes or relubrication.

A field check on vibration can be made without instruments because a vibration level of 1 to 3 mils (.001" to .003") will allow a new nickel to stand on edge on top of the bearing housing for a few seconds. When a vibration is in the range of 3 to 5 miles (.003" to .005") at an operating speed less than 1800 RPM it is possible to stand a new nickel on edge on top of the bearing housing for 2 or 3 seconds. A vibration level more severe than this should be investigated and corrective measures taken to control the cause. This check is valid only for shredders operating without material being fed, with all the hammers free to pivot on their bolts or pins.

LUBRICATION OF BEARINGS

The importance of proper lubrication cannot be overstated in the operation of a shredder because the bearing life depends upon it. Shredder duty is among the most difficult applications for anti-friction bearings so the lubricant selection is vital to its performance. The higher speed large shredders require a circulating oil lubrication system to insure an adequate supply of oil for both cooling and lubricating the bearing.

The bearing housing is designed to provide a sump through which the rolling elements of the bearing will pass. The oil level should be no higher than the center point of the lowest rolling element which can be gauged by the center of the sight glass on the side of the bearing housing.

OILS

Oil used for shredder bearing lubrication should be a highly refined mineral oil of medium body (SAE 30 to 40) that is non-oxidizing with good defoaming properties and contain extreme pressure (EP) additives. The viscosity of the oil should be between 105° and 150° SSU at the anticipated operating temperature range of 160° to 180° F or between 500 and 750 SSU at the standard base temperature of 100° F. The oil should yield a minimum TIMKEN OK load of 45 pounds.

Oils that conform to the above specifications have been found to provide satisfactory service over the past several years in many large shredder installations. However, it is always preferable to consult a competent lubrication engineer for more specific recommendations; particularly if the conditions at the installation site are unusual.

CIRCULATING OIL SYSTEMS

When circulating oil systems are used the entry or feed is made through the center hole in the top of the housing, the drain should be made from both sides of the bottom of the housing through drain lines having inserts to maintain the proper oil level in the bearing. Lines to bearing housings should have flexible connections. Shredder bearings are given a coating of a basic lubricant at the factory to protect them from corrosion in transit and storage.

The bearing housings MUST BE FLUSHED before operating and filled with the correct lubricant for the installation.

High speed shredder installations may require the oil level be lowered below center of oil sight glass to avoid heat build up due to churning. The oil level can be controlled by adjustment of the flow control valves on the lubrication circulation system or simply draining the sump on static system.

Abnormal bearing temperature may indicate faulty lubrication. Normal temperature may range from "cool or warm to the touch up to a point" too hot to touch for more than a few seconds, depending on bearing size, speed and surrounding conditions. If the bearing is too hot to touch for more than a few seconds it is prudent to check the temperature by applying a thermometer at the top of the bearing housing. The bearing housing temperature is usually 10° F lower than the bearing temperature. If the bearing housing temperature is 180° F or higher immediate steps should be taken to determine the cause and make corrections.

If the shredder is equipped with a water cooled heat exchanger on the lubrication circulation system make certain that clean cooling water is flowing to oil cooler. Verify the cooling water passages in the heat exchanger are not obstructed preventing proper cooling of the circulating oil.

PERIODIC LUBRICATION INSPECTION AND CHANGES:

Frequency of oil changes in a static system with a bearing lubricated solely by the oil in the housing will depend on several local operating conditions.

Deterioration of oil is caused by heat, oxidation, catalytic reactions, and dirt or water contamination. Therefore, periodic oil changes must be made. The most desirable approach to the question of when to replace the oil is a continuous program of oil sampling and laboratory analysis.

After the initial two weeks of operation the oil in the bearing housings should be changed on installations without oil circulation systems.

FLUSHING BEARING HOUSING:

It is recommended that the bearing housing be thoroughly flushed out after the original oil has been drained. Fill the bearing housing to the center of the sight glass with SAE10 straight mineral flushing oil which should not contain additives. The shredder should be brought up to operating speed (without load) and immediately shut down. Drain off flushing oil and refill with recommended operating lubricant to proper level.

After the break-in procedure outlined above it is recommended that the oil be changed and the bearing housing flushed once a month to establish a basis for normal operating conditions. Then depending on the condition of the oil drained from the bearing housing the change period may be extended, but never more than every three months of operation.

In a shredder installation with an oil circulating system test the lubricant at least every 6 months. If a change in the appearance is noted check the oil immediately.

Change filters when indicating devices denote plugging of the element or when fluid analysis reveals a change is needed.

COLD WEATHER OPERATION:

The heater in the circulating lubrication system reservoir is to be connected so it will operate even when the rest of the system is shut down to maintain a uniform 80° to 90° F in the reservoir. Shredders installed in area where the ambient temperature drops below 20° F when they are shut down should have the oil circulation system operate continuously to maintain a uniform temperature on the bearings. It may be necessary to heat trace the drain lines from some outside installations to insure proper flow back to the reservoir.

GREASE LUBRICATION

The pillow block bearings on Williams equipment designed for grease lubrication are normally equipped with Zerk type fittings unless otherwise specified.

Normal procedure when regreasing bearing housings is to remove the drain plug and clean away any hardened grease from the opening so the old grease can be purged and any excess new grease can flow out.

The many greases available are of different qualities and compositions so it is necessary to select the grease carefully to insure dependable bearing service.

Bearings on Williams equipment designed for grease have been lubricated at the factory with a LITHIUM base grease that has a No. 2 consistency, which is suitable for normal operating conditions. For best results relubricate with lithium base grease or a grease that is compatible with the original lubricant. Mixing of different greases is not recommended. If necessary to change to a different grade, make, or type of lubricant, flush bearings thoroughly before changing.

GREASE SPECIFICATIONS

A good bearing grease must have the following properties:

(1) Freedom from chemical or mechanical active ingredients such as free lime, iron oxide, and similar minerals or solid substances.

(2) It must not separate or change in consistency, harden or form acid.

(3) A melting point (dropping point) considerably higher than the operating temperatures.

A grease conforming to the following specifications will provide proper lubrications for most Williams pillow block bearing applications designed for grease:

Lithium Soap Base
NLGI No. 2
Worked Penetration Range at 77° F 265/295
ASTM Dropping Point °F 380
Mineral Oil Viscosity SUS at 100° F 750
Contain Non-Corrosive, Extreme Pressure, and Lubricity Additives, and be Water Resistant.

The lubricants listed below are typical products ONLY and should not be considered as exclusive recommendations:

Normal Ambient Operating Temperature Range 0° F to 150° F
NLGI Grade No. 2

Manufacturer	Lubricant
American Oil Co.	Amolith #2
Cities Service Oil Co.	Citgo Premium Lithium #2
Fiske Bros. Refining Co.	Lubriplate #630-2
Gulf Oil Corp.	Gulfcrown Grease #2
Mobil Oil Corp.	Mobilux #2
Phillips Petroleum	Philube Multipurpose L-2
Texaco, Inc.	Marfak Heavy Duty #2

METHODS OF RELUBRICATION

Before applying grease the fitting on the bearing housing should be wiped clean, and the lever mechanism of the grease gun should be worked several times until trapped air is expelled and grease begins to come out of the nozzle. The drain plug at the bottom of the cap should be removed.

Grease should be applied while the machine is running, until used grease has been expelled, and new lighter - colored grease begins to appear at the drain.

To avoid overpacking, the drain should be left open, after the gun has been disconnected, until no more grease is expelled from the drain. This is done to make sure the volume of grease has adjusted itself to the space in the housing, and to avoid over-packing. This may require anywhere from 5 minutes to a half hour depending on the temperature and the size of the drain.

GREASING NEW BEARINGS:

Bearing and housing grease reservoir should be packed with one of the greases listed above or an equivalent. Hand packing at time of assembly is generally preferable to greasing through a fitting in that it is quicker and assures proper amount of grease will be worked into all cavities of bearing.

Complete greasing of bearing is assured if grease is worked in at one side of bearing until grease appears on opposite side.

Housing reservoirs should be packed with grease to a level approximately level with the bottom of the shaft before it is pushed on the bearing then the cap reservoir filled to the bottom of the shaft as it is slid into position.

The drain plug should be left out when the new bearings are started up so any excess grease can be expelled as the surplus grease is flung off the raceways to avoid over-filling the housing.

ROLLER BEARING MAINTENANCE AND SERVICE

Service on all taper bore Model "O" roller bearings used in Williams equipment from 5 inch through 12 inch is essentially the same. The main difference is the shaft for the 5 inch size is not gun drilled for hydraulic connections to assist in removing and replacing the bearing.

The bearings can be removed and replaced with the rotor in the shredder frame provided sufficient clearance is available at the ends of the shaft to remove the flywheel and coupling half (see section on FLYWHEEL MOUNTING) before loosening the bearing hold down bolts.

CAUTION – DO NOT REMOVE NEW BEARING FROM ITS WRAPPING UNTIL ACTUALLY READY TO MOUNT IT.

BEARING HOUSING REMOVAL

Bearing housings for 5 inch bearings are doweled to the support pedestal with two #7 taper pins that must be removed before the housing can be moved.

Bearings 8 inches and larger have stop blocks with tapered keys that lock the bearing housing to the pedestal, that must be removed before the housing can be moved. Unbolt the keepers that retain the tapered keys so they can be forced out of their slots by use of a hydraulic jack between their ends and the sides of the shredder frame. As the keys are removed identify them with their slots using a marking device or paint so they will not get mixed up at reassembly.

When the ends of the bearing housings are clear and clean, scribe a match mark at each end of the bearing housing with a mating match mark on the sole plate of the pedestal. This will insure the bearing housing is properly relocated and aligned with the rotor in the correct position when the bearing housing is reassembled.

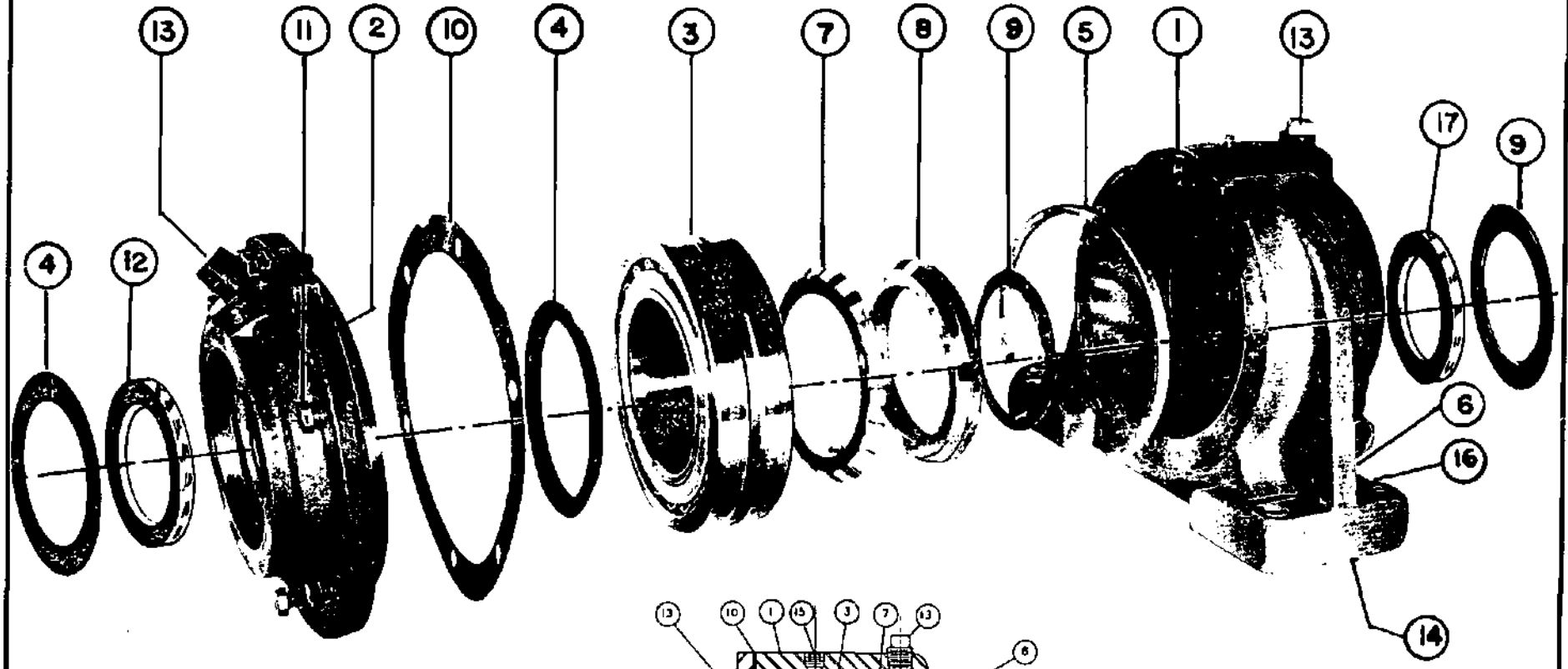
If the bearings are to be replaced while the rotor is in the shredder, the shaft will have to be supported on blocking or suspended by a cable sling when the bearing housing is removed. (See section on ROTOR REMOVAL.)

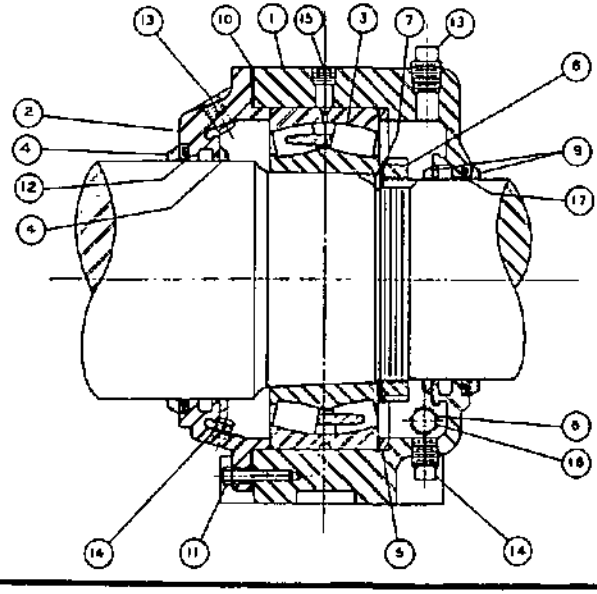
On shredders with circulating lubrication systems the hydraulic connections and drain lines will have to be disconnected and capped before the bearing housing can be removed. Be sure to provide a container to catch the oil from the bearing housing when the drain lines are removed. Depending on size of bearing there will be anywhere from a pint to several quarts of oil in the bearing housing.

The bearing housing hold down bolts for 8 and 11 inch bearings have been torqued using a slugging wrench so the same procedure will be required for their removal. The hold down bolts for 12 inch bearing housings are 3½ inches in diameter and have been tensioned while they were heated by electrical Cal-Rod units, which will have to be reconnected to heat the bolts to 350° F for removal of the nuts. (See 144-B-3906.)

When the anchor bolt nuts have been loosened several turns or about a quarter inch the rotor can be raised and blocked so the bottom of the bearing housing is about an eighth inch above the support pedestal or sole plate, if the rotor is not to be removed from the housing for the bearing change.

Item	When ordering repairs give { Part Wanted, also How Many / This Drwg. Number / Your Mill Number	Pattern Number	Quantity in Machine	Code
1	Pillow Block Housing	BC-286	1	
2	Pillow Block Cap	BC-287	1	
3	Roller Bearing		1	
4	Oil Slinger, Large Bore		2	
	(Should lightly rub Pillow Block Cap)			
5	Stabilizing Ring (Used on drive side only)		1	
6	Oil Sight Gauge		1	
7	Bearing Locknut Washer		1	
8	Bearing Locknut		1	
9	Oil Slinger, Small Bore		2	
	(Should lightly rub Pillow Block Housing)			
10	Gasket		1	
11	Capscrews		6	
12	Oil Seal, Large Bore		1	
13	Inspection Port Pipe Plug		2	
14	Oil Drain Plug		2	
15	Oil Line Connection		1	
17	Oil Seal, Small Bore		1	
16	Not Shown is a Thermocouple connection located opposite			
	to the oil sight gauge (6) in bearing housing (1)			





NOTE — SHOULD ROTOR OR BEARINGS BE REMOVED — WHEN RE-ASSEMBLING ALWAYS REMOVE INSPECTION PORTS (13) AND CHECK TO SEE IF OIL SLINGERS (9) ARE CORRECTLY POSITIONED AGAINST THEIR MATING SURFACES. IF NOT, PRY INTO POSITION.

WHEN REMOUNTING BEARING — MEASURE INTERNAL RADIAL CLEARANCE OF BEARING WITH A SHIM GAUGE — FORCE BEARING ON SHAFT IN EASY STAGES UNTIL THE ABOVE NOTED RADIAL CLEARANCE IS REDUCED .0025 IN. TO .0035 IN.

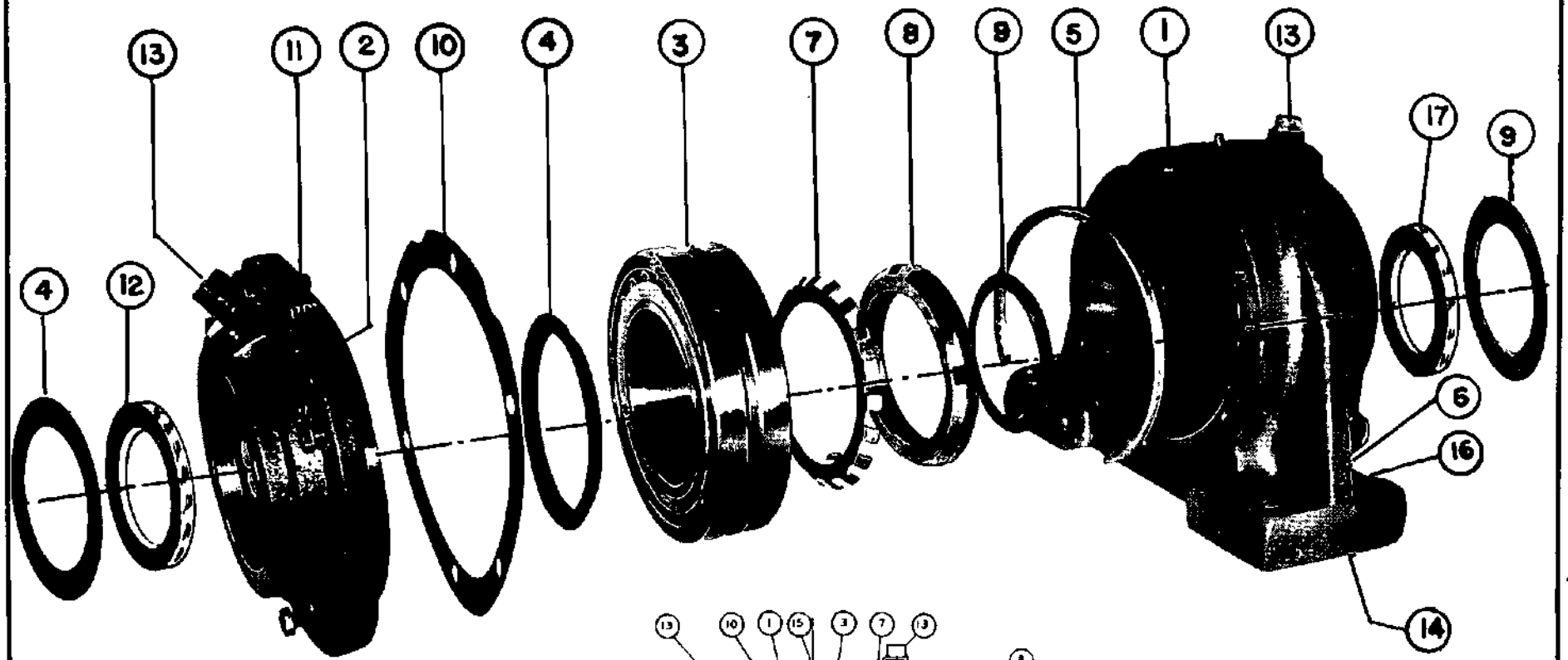
SEE CHART PAGE 10.

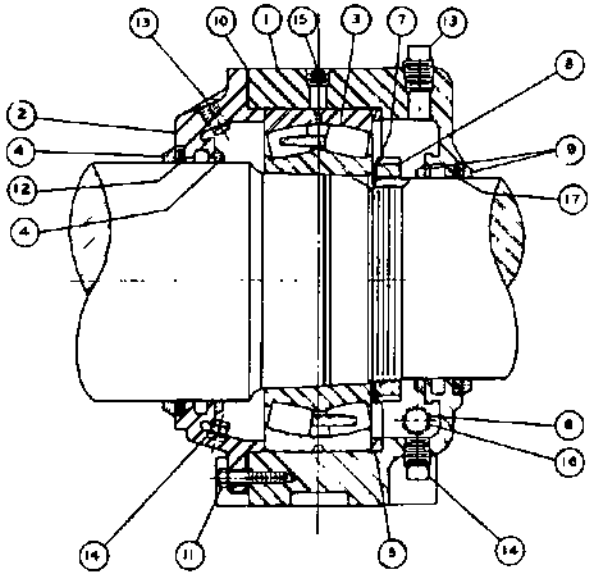
WILLIAMS PATENT CRUSHER AND PULVERIZER **CO.**
ST. LOUIS, MO.

PARTS LIST FOR MODEL "O"
5" TAPER BORE PILLOW BLOCK
WITH CONT. OIL LUBRICATION

DRAWN BY	TRACED BY	DATE A - W
DSK		SCALE
CHECKED BY	APPROVED BY	DWG NO 61J-B-3051

Item	When ordering repairs give { Part Wanted, also How Many / This Drwg. Number / Your Mill Number	Pattern Number	Quantity in Machine	Code
1	Pillow Block Housing	SS-551	1	
2	Pillow Block Cap	SS-550	1	
3	Roller Bearing		1	
4	Oil Slinger, Large Bore		2	
	(Should lightly rub Pillow Block Cap)			
5	Stabilizing Ring (Used on drive side only)		1	
6	Oil Sight Gauge		1	
7	Bearing Locknut Washer		1	
8	Bearing Locknut		1	
9	Oil Slinger, Small Bore		2	
	(Should lightly rub Pillow Block Housing)			
10	Gasket		1	
11	Capscrews		6	
12	Oil Seal, Large Bore		1	
13	Inspection Port Pipe Plug		2	
14	Oil Drain Plug		2	
15	Oil Line Connection		1	
17	Oil Seal, Small Bore		1	
16	Not Shown is a Thermocouple connection located opposite			
	to the oil sight gauge (6) in bearing housing (1)			





NOTE — SHOULD ROTOR OR BEARINGS BE REMOVED — WHEN RE-ASSEMBLING ALWAYS REMOVE INSPECTION PORTS (13) AND CHECK TO SEE IF OIL SLINGERS (9) AND (4) ARE CORRECTLY POSITIONED AGAINST THEIR MATING SURFACES. IF NOT, PRY INTO POSITION.

WHEN REMOUNTING BEARING — MEASURE INTERNAL RADIAL CLEARANCE OF BEARING WITH A SHIM GAUGE — FORCE BEARING ON SHAFT IN EASY STAGES UNTIL THE ABOVE NOTED RADIAL CLEARANCE IS REDUCED .0035 IN. TO .0050 IN.

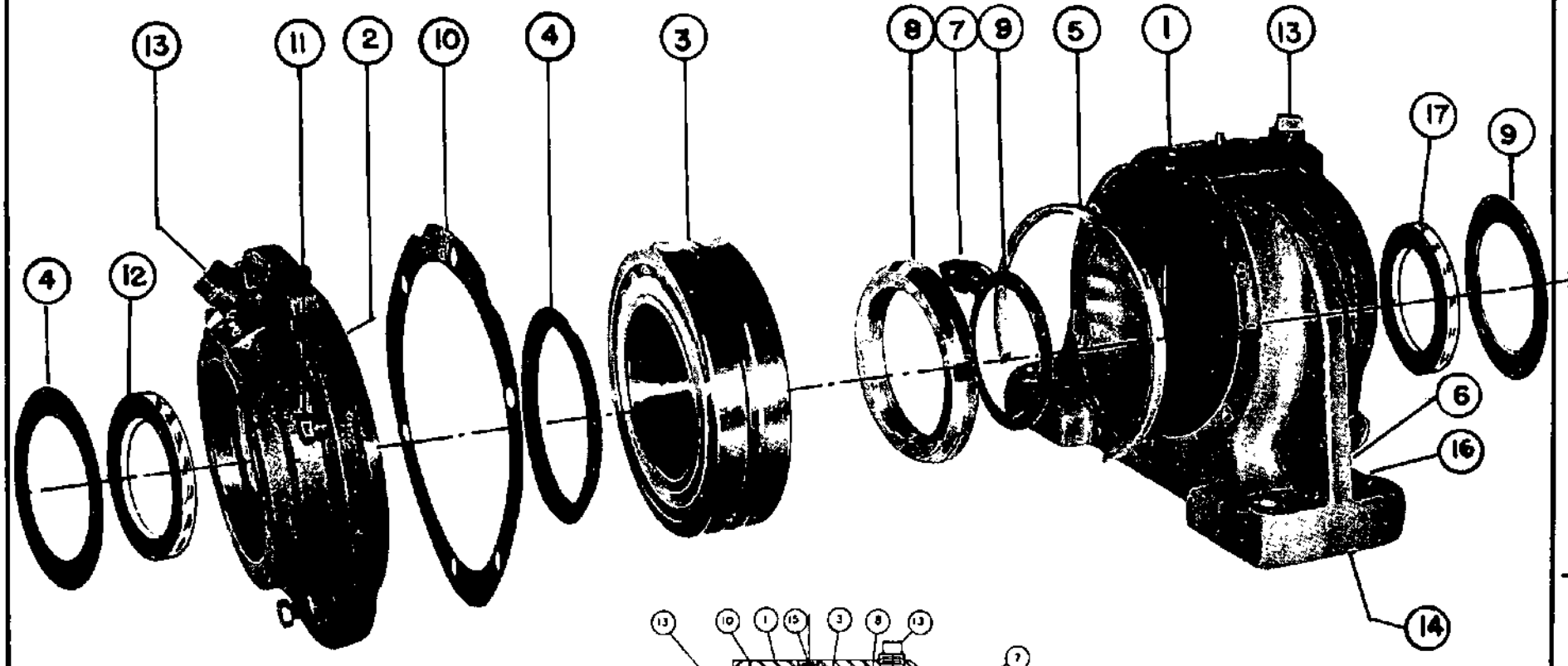
SEE CHART PAGE 10.

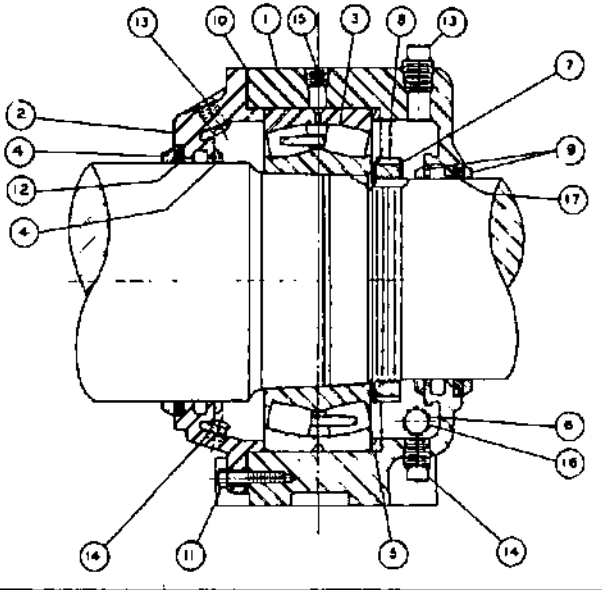
WILLIAMS PATENT CRUSHER AND PULVERIZER **CO.**
ST. LOUIS, MO.

PARTS LIST FOR MODEL "O"
8" TAPER BORE PILLOW BLOCK
WITH CONT. OIL LUBRICATION

DRAWN BY	TRACED BY	DATE A - W
D.S.K.		SCALE
CHECKED BY	APPROVED BY	DRWG NO 61J-B-3052

Item	When ordering repairs give { Part Wanted, also How Many / This Drwg. Number / Your Mill Number	Pattern Number	Quantity in Machine	Code
1	Pillow Block Housing		1	
2	Pillow Block Cap		1	
3	Roller Bearing		1	
4	Oil Slinger, Large Bore		2	
	(Should lightly rub Pillow Block Cap)			
5	Stabilizing Ring (Used on drive side only)		1	
6	Oil Sight Gauge		1	
7	Bearing Lockplate, Capscrews & Safety Wire		1	
8	Bearing Locknut		1	
9	Oil Slinger, Small Bore		2	
	(Should lightly rub Pillow Block Housing)			
10	Gasket		1	
11	Capscrews		6	
12	Oil Seal, Large Bore		1	
13	Inspection Port Pipe Plug		2	
14	Oil Drain Plug		2	
15	Oil Line Connection		1	
17	Oil Seal, Small Bore		1	
16	Not Shown is an Air Breather located on face of			
	bearing housing (1)			





NOTE — SHOULD ROTOR OR BEARINGS BE REMOVED — WHEN RE-ASSEMBLING ALWAYS REMOVE INSPECTION PORTS (13) AND CHECK TO SEE IF OIL SLINGERS (9) AND (4) ARE CORRECTLY POSITIONED AGAINST THEIR MATING SURFACES. IF NOT, PRY INTO POSITION.

WHEN REMOUNTING BEARING – MEASURE INTERNAL RADIAL CLEARANCE OF BEARING WITH A SHIM GAUGE — FORCE BEARING ON SHAFT IN EASY STAGES UNTIL THE ABOVE NOTED RADIAL CLEARANCE IS REDUCED .0045 IN. TO .0065 IN. (11") .0050 IN. TO .0070 IN. (12").
SEE CHART PAGE 10.

WILLIAMS PATENT CRUSHER AND PULVERIZER **CO.**
ST. LOUIS, MO.

PARTS LIST FOR MODEL "O" TAPER BORE PILLOW BLOCK WITH CONT. OIL LUBRICATION

DRAWN BY D.S.K.	TRACED BY	SIZE A - W
CHECKED BY	APPROVED BY	DRAWING NO. 61J-B-3919

Install a lifting eye in the tapped hole provided in the top of the bearing housing and connect it to a lifting device that will permit the housing to be moved along the shaft and clear the end without binding or interference. CAUTION: This eye is to lift the bearing housing only and never to lift the rotor assembly.

Complete the removal of the bearing housing hold down bolts.

Listed below are the parts drawings for the different size bearings that use similar index numbers for the assembly items that are referred to in this discussion.

PILLOW BLOCK BEARING HOUSINGS

Bearing Size In.	Parts Drawing	Bearing Weight Lbs.	Housing Pattern	Weight	Cap Pattern	Weight
5	61J-B-3051	22	BC286	110	BC287	22
8	61J-B-3052	122	SS550	630	SS551	90
11	61J-B-3919	265	SS646	965	SS636	160
12	61J-B-3919	408	SS825	2255	SS717	335

BEARING HOUSING DISASSEMBLY

Before proceeding with the disassembly clean the shaft on both sides of the bearing housing of all corrosion, debris and scale until bright metal shows, then give it a coat of light oil. This will allow the flingers and oil seals to slide along the shaft without their being damaged or broken. The flingers and oil seals are molded from a compressed asbestos synthetic rubber compound that is ideal for the application, but can be damaged or broken by mishandling such as forcing or prying with improper tools. Carefully work the larger flinger (Item 4) away from the bearing housing cap toward the rotor about four inches along the cleaned and lubricated shaft. Remove the cap screws (Item 11) holding the housing cap (Item 2) to the bearing housing, and carefully pry the cap away from the housing.

OIL SEAL REMOVAL

It should not be necessary to remove the oil seal (Item 12) from the housing cap for the cap to slide along the shaft if the shaft is smooth and clean. If the oil seal (Item 12) is to be removed for inspection or replacement, use the proper tools to pull it out of its groove in the cap or housing. A cotter key puller is an ideal tool to pry into the oil seal butt joint and pull one end out of the groove until it can be grasped by the fingers. When about a fourth of the seal is clear of the groove grasp the spring with the hooked tool and pull it from the slot in the seal to relieve the pressure on the seal lip, which should allow the seal to come out the rest of the way without too much strain. Unhook the ends of the spring and remove it from the shaft. Separate the ends of the seal sideways and it can be slipped off the shaft. Inspect the oil seals for hardness and wear which would prevent them from doing their job of retaining the lubricant and keeping foreign material and moisture out of the bearing housing. If the seal appears free of defects or grooves set it aside for replacement. but it is good practice to replace the oil seals when changing a bearing.

BEARING HOUSING CAP POSITION:

Slide the housing cap along the shaft until it contacts the flinger (Item 4) that had been moved previously. The larger size bearing housing caps will have to be held upright on the shaft to keep them out of the way while changing the bearing. This can be done easily by wiring the cap to the side of the shredder housing or to the sling supporting the shaft.

The inside large diameter flinger (Item 4) can remain in place if it is in good condition while the bearing is being replaced.

REMOVING HOUSING FROM BEARING:

Slide the small diameter flinger (Item 9) away from the face of the bearing housing and off the end of the shaft using a lubricant to ease its travel along the shaft. Remove and inspect the oil seal (Item 17) from the end of the bearing housing using the procedure described previously.

It will be necessary to support the larger bearing housing so it can be moved axially without binding or interference and allow it to clear the end of the shaft for removal.

The inside of the bearing housing has been honed and lapped to a snug fit on the outer ring of the bearing so a pulling device or effort will be required to slide the housing off the bearing. Set the bearing housing aside where the finished machined surfaces will be protected and rest it on blocking so the bottom mounting pads will not be damaged.

Flush out any oil remaining inside the housing with solvent and make certain that the sight glass (Item 6) is cleaned, then dry thoroughly. Spray or wipe the machined surfaces of the housing with a light machine oil to protect them from rust while the bearing is being replaced.

The drive side bearing housing has a stabilizing ring (Item 5) which should also be cleaned and replaced in the housing.

The inside small diameter flinger (Item 9) is next removed from the shaft to be cleaned and inspected. If found to be in good condition set it aside for reassembly.

BEARING REMOVAL:

Straighten up the tabs of the lockwasher (Item 7) on 5 and 8 inch bearings or unbolt and remove the lockplate (Item 7) on 11 and 12 inch bearings so the locknut (Item 8) can be loosened. Use a spanner wrench that fits the locknut to loosen it on the shaft. If a spanner wrench is not available use a blunted bar ground to fit the locknut slots for turning the locknut. Back the locknut off a few turns until it is an 1/8" to 1/4" away from the bearing face. This will keep the bearing from shooting off the end of the shaft when it is freed from the tapered mounting seat on the shaft, by the hydraulic pressure or puller.

A conventional bearing puller that contacts the inner ring will be required to remove 5 inch bearings from the tapered mounting seat of the shaft.

CAUTION: Do not attempt to drive the bearing off the tapered mounting because of possible damage to the critical finish of the tapered mounting surface.

HYDRAULIC REMOVAL METHOD

To remove 8 inch and larger bearings connect a hydraulic pump capable of delivering 10,000 psi to the 3/8" NPT tapped hole in the end of the shaft from which the bearing is to be removed.

Slowly apply pressure with the hydraulic pump until the bearing pops free,which will sound like an explosion, but the locknut acting as a safety measure, will keep it on the shaft.

Remove the locknut and slide the bearing off the shaft using a fabric sling for the larger size bearings.

Clean the tapered mounting seat and examine it for nicks and burrs or other signs of fatigue and wear. If the tapered mounting is acceptable the shaft is ready for installing the replacement bearing.

If the large diameter flingers (Item 4) have been found satisfactory, leave them in place along with the bearing housing cap, otherwise they should be replaced at this point. Should the flingers require replacing carefully tap them onto the shaft with a soft faced hammer and move them up the shaft several inches so they will be out of the way.

Be sure to slide the bearing housing cap onto the shaft before mounting the inside flinger (Item 4) on the shaft.

MOUNTING TAPERED BORE SPHERICAL ROLLER BEARINGS:

Cleanliness of this operation is a must, and every effort should be made to provide a moisture and dust free environment. The installer should keep hands, tools and working area clean, because the bearing is a precision unit and any foreign material will be detrimental to its operation.

Unwrap the new bearing when all the necessary preceding operations have been completed and the proper tools are on hand to complete the mounting without delay to avoid contaminating the bearing with dirt or metal particles.

Do not remove the coating of "slush" — a rust preventative oil applied at the factory for protection against corrosion. This preservative is compatible with grease and oil and need not be removed unless a synthetic lubricant is to be used.

The fit of tapered bore spherical roller bearings is determined by the distance the bearing is forced onto the tapered seat. This results in a reduction of diametrical clearance (DC) in the bearing through expansion of the inner ring. It is necessary to determine the initial DC before mounting, and to check the DC reduction during mounting until the specified DC is established.

To properly determine the initial DC the following procedure is recommended. A feeler gauge *with at least 3 inch long blades with a smallest blade thickness of .0015" will be required.*

The following table of diametrical clearances before installation and recommended reduction of clearance is provided by the bearing manufacturer:

Bearing Size		Diametrical Clearance Before Installation		Reduction of Diametrical Clearance		Minimum Diametrical Clearance
in.	mm	min.	max.	min.	max.	After Mounting
5	130	.0063	.0081	.0025	.0035	.0030
8	200	.0088	.0114	.0035	.0050	.0040
11	280	.0118	.0156	.0045	.0065	.0055
12	300	.0130	.0169	.0050	.0075	.0060

CHECK DIAMETRICAL CLEARANCE:

Lubricate the tapered mounting seat with a light machine oil. Slide the bearing (Item 3) onto the shaft until it is resting firmly on the tapered mounting seat with the inner and outer ring faces parallel. Slide the lockwasher (Item 7) and the locknut (Item 8) onto the shaft and run them up against the face of the bearing just hand tight to hold it in position. Inspect the tangs of the lockwasher removed in the disassembly for cracks or signs of fatigue and replace if necessary.

Press down firmly on the top of the outer ring and oscillate the outer ring two or three times. This "seats" the inner ring and rolling elements. Position the individual roller assemblies so that a roller is at the bottom of the inner ring — on both sides of the bearing.

Press the two bottom rollers inward and upward to assure their being in contact with the center guide flanges as well as the inner ring raceways. With the rollers in the correct position insert a blade of the feeler gauge (see chart for size range) between two of the bottom rollers. Move it carefully under the bottom roller between the roller and the outer ring raceway. **NOTE: DO NOT ROTATE BEARING WHEN PASSING FEELER BETWEEN ROLLER AND OUTER RING!** Repeat this procedure using progressively thicker feeler gauge blades until one is found that will not go through. The blade thickness that preceded the "no-go" blade is the measure of diametrical clearance (DC) before installation.

Example: A 5" (130mm) bearing is to be mounted on a tapered shaft.

a) by measurement with a feeler gauge the initial DC is .0075"

b) reference to table indicates a proper fit is obtained when DC is reduced by .0025" to .0035" or approximately .0030".

Initial Clearance	.0075"
Reduction of DC	.0030"
Clearance after mounting	.0045"

c) The locknut is tightened until the DC reaches .0045".

NOTE: Tapered bore bearings must have the proper amount of diametrical clearance before installation to provide for the required mounting reduction of DC and to compensate for any further internal reduction from abnormal temperature conditions.

MOUNTING THE BEARING:

Manual Method: When the required DC reduction has been determined tighten the locknut (Item 8) with a spanner wrench until snug. If a spanner wrench is not available use a blunted bar ground to fit locknut slots for tightening.

Lay a soft steel, or brass bar along the shaft, in contact with the locknut and strike the bar several sharp blows with a hammer at several positions around the locknut. These blows drive the inner ring of bearing further up on the tapered shaft and releases the pressure on the locknut threads allowing the nut to be tightened easier. Continue to tighten the locknut (Item 8) while periodically measuring the DC at the unloaded roller, making sure it is firmly seated against the inner race and against the guide flange. When the proper amount of DC reduction is obtained the final clearance measurement on both faces of the bearing should be recorded for future comparison or reference.

Hydraulic Mounting Method: The larger size tapered bore bearings 8 inch and up can be eased onto the tapered mounting using the hydraulic method. Connect the hydraulic pump to the end of the shaft by the 3/8" NPT fitting. Tighten the locknut (Item 8) with the lockwasher (Item 7) on 8 inch bearings until it is firmly against inner ring of bearing. On 11 and 12 inch bearings the locknut (Item 8) with bolt holes outward and bearing directly against the face of the bearing inner ring. Introduce 2000-3000 psi oil pressure while tightening the locknut until proper DC is obtained.

SECURING LOCKWASHER

When the recommended reduction of DC has been attained the bearing is in its proper position on the shaft. Find a lockwasher (Item 7) tang that is nearest a slot in the locknut on 5 and 8 inch bearings. If slot is slightly past tang don't loosen nut, but further tighten so that the next nut slot clockwise meets a washer tang. Bend tang into the slot, the locknut (Item 8) on 11 and 12 inch bearings is secured by the tang of the lockplate (Item 7) inserted in a notch in the shaft then bolted and wired to the face of the locknut. Do not loosen nut but further tighten if necessary to allow tang to fit into notch on shaft.

ASSEMBLY OF BEARING HOUSING:

Slide the small diameter inside oil flinger (Item 9) on the shaft until it is within a couple inches of the locknut (Item 8) so it will contact the inside of the bearing housing.

Wipe the inside machined surfaces of the thoroughly cleaned bearing housing with a light machine oil. If this is the DRIVE SIDE bearing housing it will have the stabilizing ring (Item 5) against the shoulder inside the housing.

NOTE: Only the DRIVE SIDE bearing housing has a stabilizing ring. Wipe the outside of the bearing with a light coat of machine oil to help it slide into the bearing housing.

Check to see that the housing gasket is in place on the housing cap before proceeding.

Hoist the bearing housing (Item 1) and slide it on the end of the shaft until it contacts the outer race of the bearing. Square the bearing outer race with the bore of the bearing housing so they are concentric. The bore of the bearing housing is honed to fit snug on the bearing so it will require some force to move it onto the bearing. Several light blows on the reinforcement gussets on both sides of the bearing housing will help move the housing onto the bearing without damage.

LOCATION OF HOUSING ON BEARING:

The bearing housing is in the proper position on the drive side bearing when the inside shoulder with the stabilizing ring is flush against the bearing. This can be checked by removing the lubrication connection plug (Item 15) from the top of the housing to see if the lubrication groove of the bearing outer ring is centered in the hole. The outboard or "floating bearing" housing is in the correct position when the bearing is centered in the axial travel limits of the housing. This can be checked by observing through the lubrication connection hole (Item 15) if the inboard edge of the lubrication groove is centered in the opening.

NOTE: For impact dryer mills or hot hogs where the rotors are subjected to heat, the outboard bearing may be positioned for maximum outward expansion. Maintain 1/8" minimum clearance between the bearing and the cap.

Slide the bearing cap (Item 2) into position making certain it contacts the inner flinger (Item 4) and draw it against the bearing housing by tightening the cap screws (Item 11) equally around the cap.

Lower the rotor until the bearing housing contacts the pedestal supports or sole plate after checking to be sure the match marks on the ends of the bearing housing line up with marks on the support pedestal that were scribed prior to disassembly.

INSTALL BEARING HOUSING OIL SEALS:

The RUP pattern oil seal (Item 12 & 17) is installed in the grooves in the end of the bearing housing and cap with the lip facing inward and the butt joint at the top.

CAUTION: All split seals are presized for the proper bearing housing at the factory.
DO NOT ATTEMPT TO ALTER THE AS-RECEIVED SIZE ON JOB SITE.

1) Separate seal ends sideways and slide it over the shaft with the lip pointing toward the mounting groove. A lubrication on the seal, shaft and mounting groove will facilitate installation. Position the butt joint at the top.

2) Lubricate spring and install it around the shaft with hooked end connection 90^{O} away from butt joint. Insert the spring in the lip groove of the seal, which may require a small hooked tool to handle the spring and guide it completely into the lip groove.

3) Align seal ends and start the butt joint into the groove of housing by finger pressure, then slide the fingers around the seal simultaneously in both direction with a wrapping motion to start the inner edge of seal into the groove around its entire circumference before forcing any part fully into the groove. Then gently tap (only on the outer edge of seal) until it is seated in the housing groove, with the outer edge flush with the housing face.

Slide the outside flingers (Item 4 and 9) into position on both sides of the housing until they are contacting the machined face. Open the inspection port plugs (Item 13) to see that the inside flingers are flush against inside of housing. If the fingers were positioned properly on the shaft they were snug against inside of bearing housing and cap when drawn into position. If they are not flush they can best be moved when the shaft is rotating by using a round end rod inserted through the inspection hole (Item 13) and riding against the flinger edge until it moves flush against the inside of the housing. Use care to prevent any debris entering the bearing housing when the inspection plugs are removed and replace them promptly.

A slight leak past the oil seals when the machine is running is to be expected and will actually be helpful in lubricating the seal lip to prevent heat and wear. If leakage is severe check to see the seal is seated properly, or else it could have been damaged during installation. Sometimes additional lip pressure by shortening the seal spring will correct leakage.

COMPLETE MOUNTING THE BEARING HOUSING:

The bearing housing hold down bolts, and lubrication lines are connected along with miscellaneous other items installed in the reverse order of their removal. See section on ASSEMBLY AND INSTALLATION.

The correct procedure for installation of bearing housing hold down bolts for 12" bearings is covered in Form 895A.

INSTALLATION, LUBRICATION AND OPERATION OF STRAIGHT BORE BEARINGS

Cylinder or straight bore bearings are mounted on their shaft with a slight interference fit. Mounting is simplified by heating the bearing in an oil bath for 20 to 30 minutes at 200° to 250° F until it is expanded sufficiently to slide easily on the shaft.

See Drawing 61J-B-2668 for exploded view of bearing assembly and the index number of the items referred to in this text. All areas inside bearing housing (Item 1) and cap (Item 2) that are not machined are thoroughly cleaned and coated with GE red Glyptol or equivalent varnish.

The large felt seal (Item 8) is inserted in the groove of the housing cap (Item 2) before the cap is slid on the shaft along with the gasket (Item 9). Make certain that the drain plug (Item 12) is installed in the housing gap.

The oil bath to heat the bearing should not be allowed to go above 250° F and the tank should have support blocks and a screen to keep the bearing away from the heat source while in the oil bath that may cause localized high temperature and reduce race hardness.

The heated bearing (Item 3) is slid on the bearing seat squarely against the shoulder. The lockwasher (Item 5) and the locknut Item 6) are then installed to keep the bearing against the shoulder. As the bearing cools the locknut should be tightened holding the bearing against the shoulder.

The oil bath leaves a thin film of oil on the bearing which will prevent rust until it cools, but as soon as possible the bearing should be packed with the proper grease.

When the bearing has cooled and the locknut is fully tightened bend a tang of the lockwasher (Item 5) into a slot of the locknut (Item 6). If slot is past the tang do not loosen nut, but further tighten so that the next slot clockwise meets a washer tang.

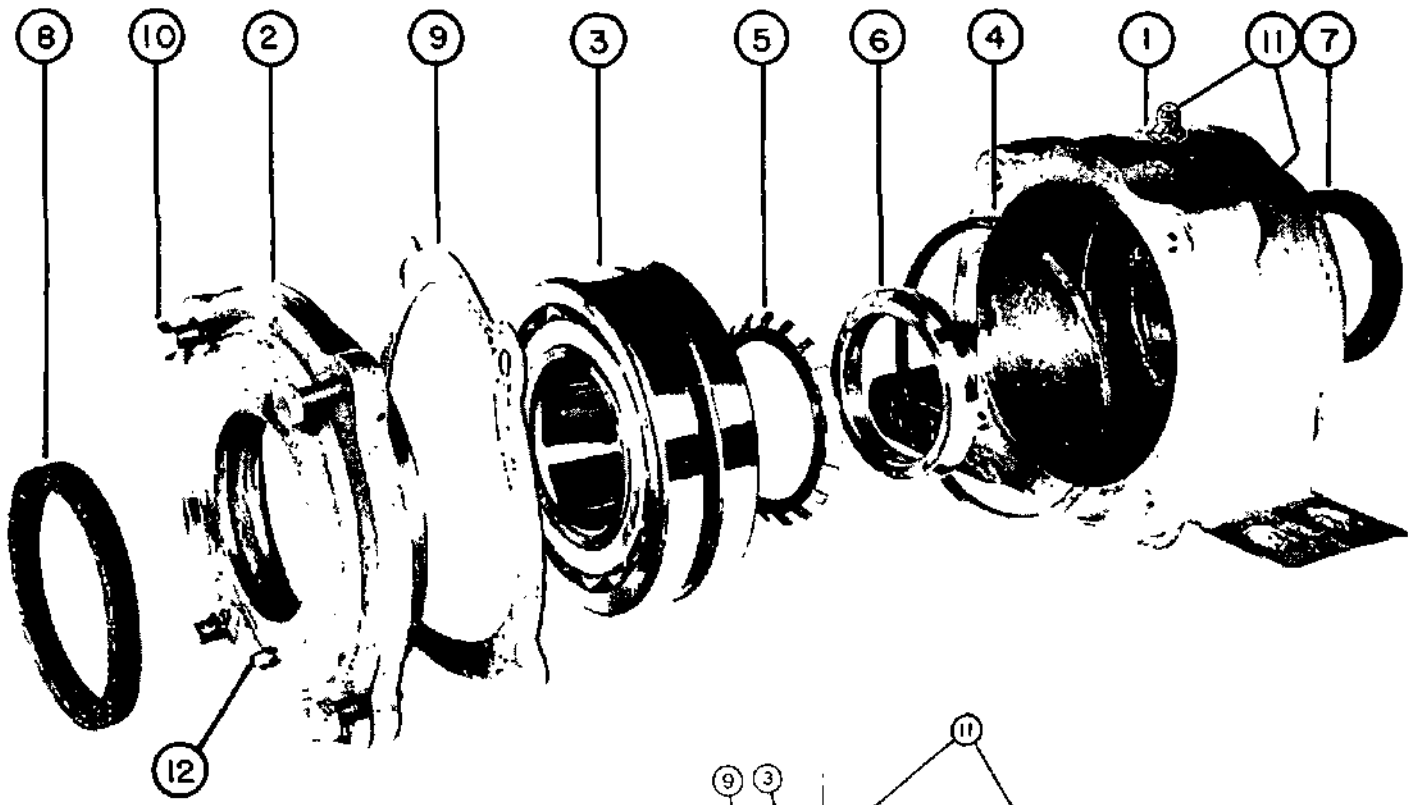
The small diameter seal (Item 7) is inserted in the groove in the outside face of the bearing housing (Item 2). To minimize fretting corrosion during operation and to ease the installation on the bearing coat the inside of the housing with a light machine oil. The drive side bearing has the stabilizing ring (Item 4) inserted in the bearing housing before it is slid on the bearing.

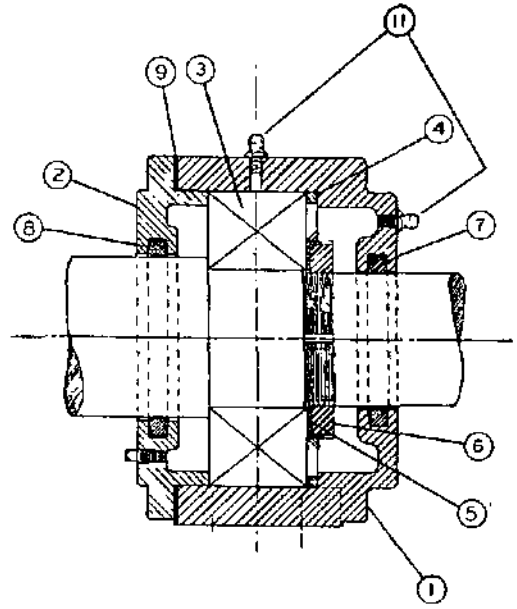
Make certain the outer ring of the bearing is square with the housing bore before attempting to slide it in place. If the outer ring becomes misaligned and stuck do not force it further into the housing. Use a brass or soft steel bar and tap the outer ring until it becomes free and is realigned.

Check to see that the bearing housing is approximately one third to half full of grease when the housing cap (Item 2) is slid into place. Tighten the cap screws (Item 10) with the gasket (Item 9) in place to hold the housing cap firmly in place. The assembly is complete when the lubrication plug (Item 11) is in place on the bearing housing.

The flywheel side or outboard bearing is assembled in the same manner as above except the stabilizing ring (Item 4) is not used.

Item	When ordering repairs give { Part Wanted, also How Many / This Drwg. Number / Your Mill Number }	Pattern Number	Quantity in Machine	Code
1	Pillow Block Housing		1	
2	Pillow Block Cap		1	
3	Bearing - Ball or Roller		1	
4	Stabilizing Ring (Used on drive side only)			
5	Bearing Locknut Washer		1	
6	Bearing Locknut		1	
7	Outside Dust Seal Ring		1	
8	Inside Dust Seal Ring		1	
9	Gasket		1	
10	Cap Screws			
11	Lubrication Fitting (For Location See Below)		1	
12	Lubrication Drain Plug		1	
	NOTE: Location of Item No. 11 (Lubrication Fitting)			
	may vary. May be located either on top or on			
	side of Pillow Block Housing (Item No. 1)			





OPERATIONS FOR MOUNTING BEARING ASSEMBLY

A. Slip bearing cap (2) over shaft.
B. Slip bearing housing gasket (9) in place on cap.
C. Press bearing (3) on shaft. Apply pressure to inner race only.
D. Mount & tighten lock washer (5) & lock nut (6).
E. Slip stabilizing ring (4) in housing for drive side only.
F. Slip housing (1) over bearing and fasten cap (2) to housing.
G. Bolt down housing to bearing pedestal.
FOR DISMANTLING - REVERSE PROCEDURE.

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
ST. LOUIS, MO.

PART LIST- TYPE "O" ROLLER & BALL BEARING PILLOW BLOCKS

DRAWN BY	TRACED BY	DATE H - 5
RW		SCALE SHEET 1 OF 2
CHECKED BY	APPROVED BY	DRWG. NO. 61J-B-2668

DISASSEMBLY

The removal of a bearing is the reverse of the preceding steps except a hydraulic or mechanical split ring puller is used to push the inner ring of the bearing off the shaft.

INSTALLATION

The rotor with the bearing assemblies is installed in the frame so the end disc are centered in the opening when the drive side or fixed bearing is securely bolted to its pedestal. The outboard or flywheel side bearing housing is slid along the shaft as far as it can move in both directions and the limits of its travel is marked on the shaft. The bearing housing is then centered between these marks so the bearing can "float" in the housing when the shaft expands or contracts.

LUBRICATION

Straight bore bearing housings are designed for grease lubrication of the bearing unless specified otherwise.

The grade and type of grease used for the bearing depends on the application and temperature as well as the daily hours of operation.

An anti-friction bearing requires a comparatively small amount of lubricant and over lubrication will only cause trouble.

An important rule to remember is **DO NOT OVER LUBRICATE** anti-friction bearings; however, lubrication must always be present in the bearing to avoid damage.

In the higher speed ranges too much grease will cause churning and overheating that results in separation of the grease components and breakdown in lubricating values.

Normal operating temperatures are in the range of 150° to 170° F with a slight showing of grease at the seals to indicate the bearing is properly lubricated.

Many factors such as bearing size and speed and the environment determine how often the bearing should be relubricated. It is not possible to predetermine when new grease must be added because of the gradual way the lubricating value is reduced over a period of time. In establishing a greasing schedule previous experience with similar equipment operating under comparable conditions is the best guide. Bear in mind that it is better to add a small amount of grease at frequent intervals than a large amount infrequently.

The bearing size (bore diameter) and speed compared with the operating hours serve as a good estimate of the lubrication frequency or period.

The following chart lists various size mills and the suggested maximum greasing period:

MILL SIZE	MAXIMUM OPERATING SPEED	MAXIMUM GREASING INTERVAL HOURS
GP106	3600	2000
GP-1512-18	3600	1200
Rocket 10-30	3600	1200
Meteor 6-18	1800	1200
111 Impactor	3600	1200
C Series	1800	300
200 Impactor	1800	300
Meteor 20-24	1800	300
240 Impactor	1800	150

When applying grease to the bearing housing through the fitting make certain the fitting is wiped clean before connecting the grease gun and the drain plug is removed from the housing cap to allow purging of the old grease. Sufficient grease should be added at each greasing to fill the bearing housing cavity from one third to one half full. If fill cannot be determined visually make an estimate of the size of the cavity and measure the amount of grease expelled by a stroke of the gun.

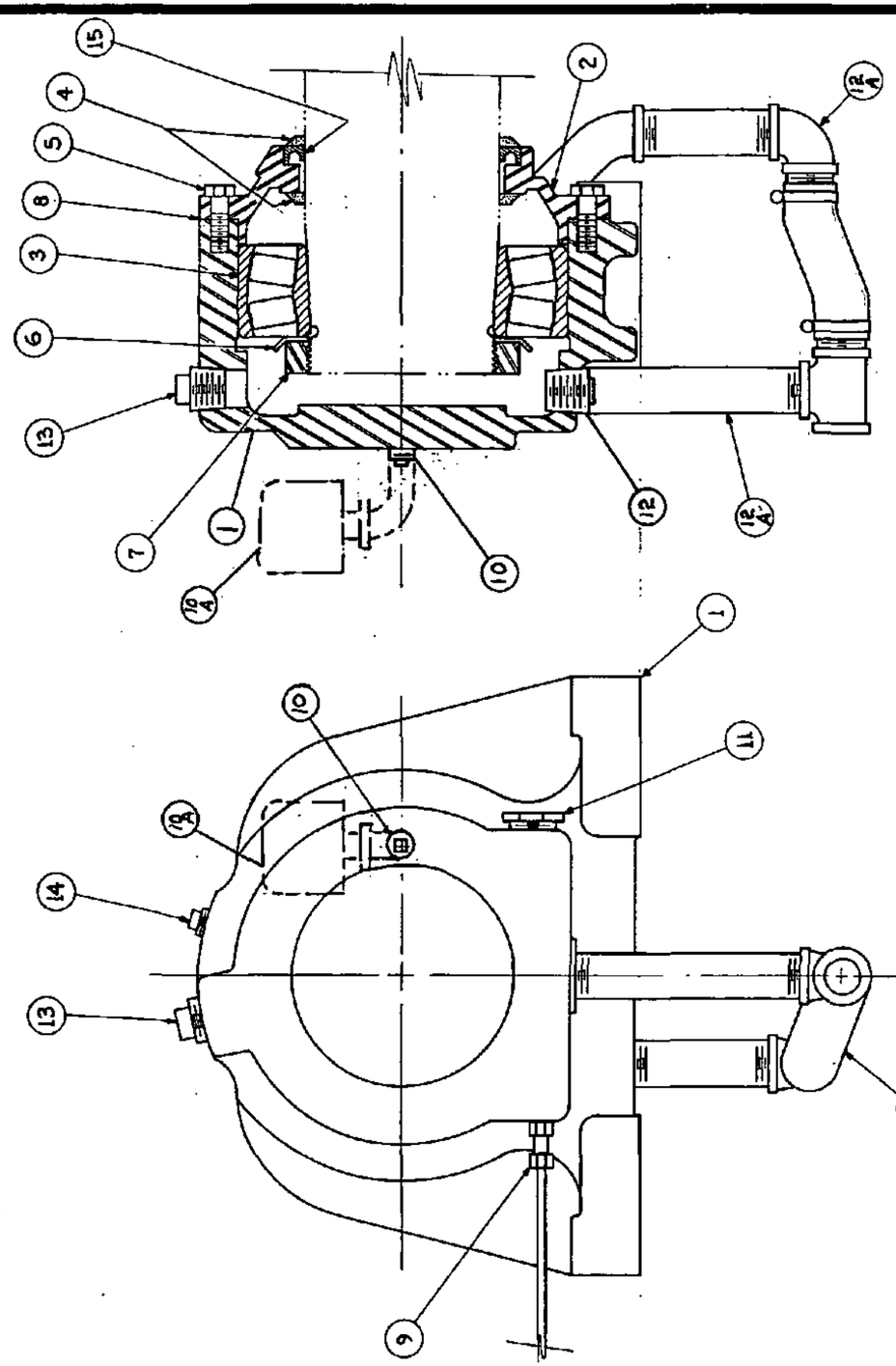
TROUBLE	OBSERVED CHARACTERISTICS	PROBABLE CAUSE	CORRECTIVE ACTION
TEMPERATURE	High bearing temperature after first start	Grease redistribution	Allow machine to cool then restart
	Continuously high during operation	Churning of lubricant	Use lower oil level or less grease, or stiffer grade of grease
		No lubricant	Add lubricant, check seals
		Excessive axial load	Check outer ring location in housing of "floating" bearing to allow thermal expansion
	Hottest at center of bearing housing	Bearing misaligned	Bearing outer ring should be square in housing and housing perpendicular to shaft in both directions
		Bearing housing pinching bearing ring	Debris under bearing housing causes a distortion of housing when holding bolts are drawn down, that pinches outer ring of bearing Clean and true bearing pedestal
		Excessive radial load	Use correct fit of inner ring on shaft for straight bore bearings. Use bearings with greater internal diametrical clearance. For preloaded paired bearings use lighter preloads. Balance rotor
		Raceways pitted	Pitting usually result of electrical current flow due to improper ground when welding on rotor — replace bearing
	Hottest at faces of bearing housing	Flingers dragging against seal	Ease flinger away from face of seal a slight amount for clearance of 1/32" or less

TROUBLE	OBSERVED CHARACTERISTICS	PROBABLE CAUSE	CORRECTIVE ACTION
EXCESSIVE VIBRATION	During acceleration or de-acceleration periods	Critical speed of machine components or feed chute	Isolate feed chute from mill, stiffen or support ducts or other components to change their criticals
	During operation at fixed speed	Foundation critical	May require change in operating speed of mill to avoid critical
		Unbalanced rotating parts	Dynamically balance rotating parts. Determine if rotor or the hammers are the cause of the unbalance by running rotor without hammers
		Running at higher than rated speed	Refer to instruction manual for correct speed
		Misalignment	Align to tolerances called for in instruction manual
		Bearing brinelled	Replace bearing, avoid excessive loading at mill or operating with unbalanced rotor
		Machine loose on foundation	Retighten hold down bolts, but do not distort frame, which will increase vibration
	During operation at fixed speed but at a changing amplitude	Hammers held out of position by feed material	Reduce feed of oversize material into the mill or increase hammer size
		Structural critical	Dynamically de-couple mill from forcing frequency by stiffening frame or isolating components that are responding to vibration from mill operation. May require changing mill speed if isolation is not practical. Condition can be positively identified by vibration analysis
		Cover or Components loose	Tighten all bolts holding accessories and covers on regular schedule

TROUBLE	OBSERVED CHARACTERISTICS	PROBABLE CAUSE	CORRECTIVE ACTION
NOISE	High pitch steady tone	Excessive axial load	Correct outer ring location in floating bearing housing to allow for thermal expansion
		Excessive radial load	Check internal clearance on preloaded roller bearings and increase clearance to allowable maximum
		Misalignment of bearings	Correct alignment so that bearings are square with shaft in all directions
		Lack of lubricant	Regrease or add oil as necessary — Determine cause
		Bearing exposed to vibration while machine is idle	Carefully examine bearing for wear spots separated by distance equal to ball or roller spacing — replace bearing. Condition known as false brinelling
		Wrong type of grease or oil causing breakdown of lubricant	Refer to lubrication instructions for proper type of grease or oil for bearing
		Replacement bearing selected with inadequate internal clearance for operating conditions where heat is conducted through shaft and expanding the inner ring	Replacement bearings should have identical markings as original factory equipment

(Continued on page 4)

TROUBLE	OBSERVED CHARACTERISTICS	PROBABLE CAUSE	CORRECTIVE ACTION
NOISE	Intermittant rumbles, rattles, clicks, etc.	Too much clearance in bearing	Adjust preload on bearing
		Excessive wear in bearing raceways	Replace bearing
		Loose machine parts or bearing housing hold down bolts	Tighten all hold down bolts, closures and other machine components
	Low pitch clicking	Foreign material in bearing	Flush bearing, replace oil and check seals for wear or use better practice in handling relubrication of bearing
	Intermittant high pitch noise or squeal	Rollers or balls skidding	Use thinner grease or oil. Possibly preload of bearing not adequate, check clearance
	Low pitch continuous or intermittant noise or rumble	Rotor or shaft rubbing housing	Correct machine parts or position of cover
		Too much clearance in bearing	Check for correct preload on bearing
		Raceways pitted	Clean all parts and replace bearing and seals. Pitting usually result of electric current going through bearing when welding on rotor without proper ground
		Bearing brinelled	Replace bearing and avoid overloading
		Resonant vibration of machine or hopper	Isolate hopper from mill stiffen or sound deaden thin panels and large flat surfaces. Tighten all hold down bolts on mill and support structure



PART	When Ordering Repairs Give { Part Wanted, also Quantity, This Drwg. Number and Machine Serial Number	QUANTITY IN MACHINE
1	Pillow Block Housing	1
2	Pillow Block Cap	1
3	Roller Bearing	1
4	Oil Sling (should lightly rub Pillow Block Cap	2
5	Cap Screw	6
6	Bearing Locknut Washer	1
7	Bearing Locknut	1
8	Gasket	1
9	Thermocouple (optional)	
10	Pipe Plug	
10A	Air Breather (with Oil Lube System only)	
11	Oil Sight Glass	1
12	Oil Drain Plug	
12A	Return Oil Outlet (with Oil Lube System only)	
13	Inspection Port Pipe Plug	2
14	Oil Line connection fitting	1
15	Oil Seal	1

B/M No. _____ REV. _____

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
ST. LOUIS, MO.

PARTS LIST FOR MODEL "O" 5"
CLOSED END TAPER BORE BEARING

SHEET NO. 1 OF 2
DRWG. NO. GLJ-B-5459

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
ST. LOUIS, MO.

PARTS LIST FOR MODEL "O" 5"
CLOSED END TAPER BORE BEARING

SHEET NO. 2 of 2
DRWG. NO. 61J-B-5459

Item	When ordering repairs give {Part Wanted, also How Many / This Drwg. Number / Your Mill Number}	Pattern Number	Quantity in Machine	Code
1	Pillow Block Housing	BC-286	1	
2	Pillow Block Cap	BC-287	1	
3	Roller Bearing		1	
4	Oil Slinger, Large Bore		2	
	(Should lightly rub Pillow Block Cap)			
5	Stabilizing Ring (Used on drive side only)		1	
6	Oil Sight Gauge		1	
7	Bearing Locknut Washer		1	
8	Bearing Locknut		1	
9	Oil Slinger, Small Bore		2	
	(Should lightly rub Pillow Block Housing)			
10	Gasket		1	
11	Capscrews		6	
12	Oil Seal, Large Bore		1	
13	Inspection Port Pipe Plug		2	
14	Oil Drain Plug		2	
15	Oil Line Connection		1	
17	Oil Seal, Small Bore		1	
16	Not Shown is a Thermocouple connection located opposite			
	to the oil sight gauge (6) in bearing housing (1)			

Williams PATENT CRUSHER AND PULVERIZER **Co.** ST. LOUIS, MO.	Parts List for Model "O" 5" Taper Bore Bearing with Continuous Oil Lubrication	Code Sheet 2 of 2 Drwg. No. 61J-B-3051

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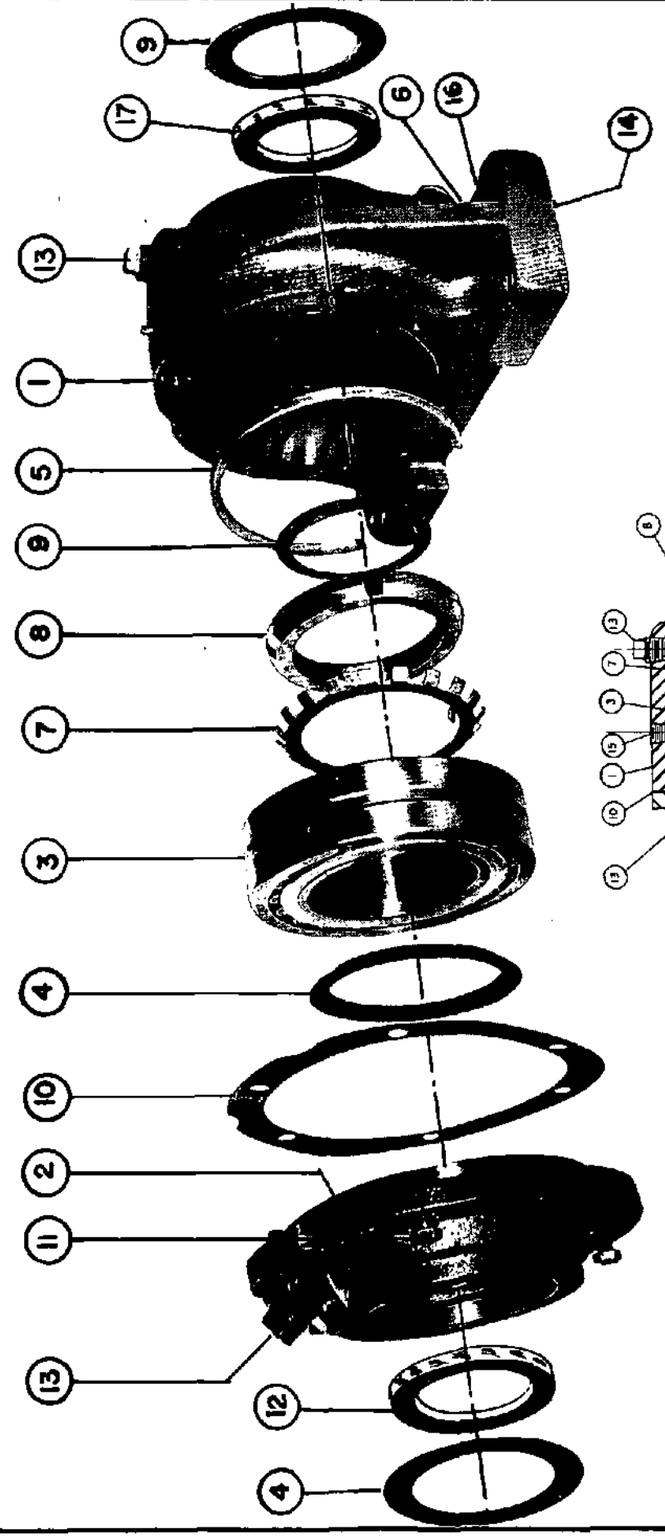
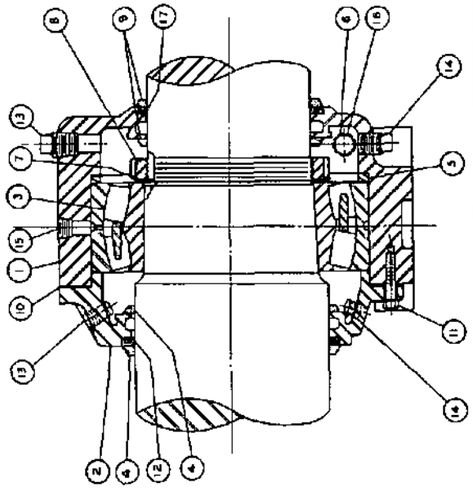




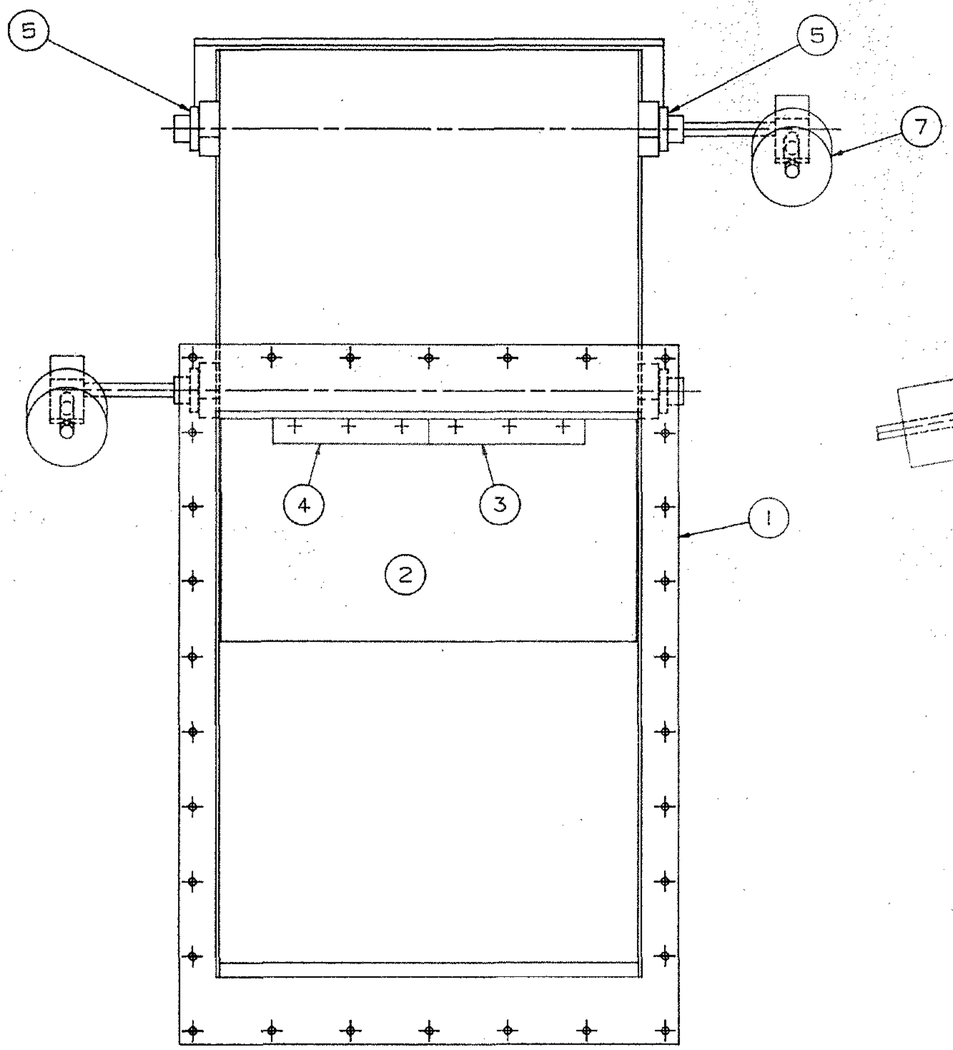
WILLIAMS PATENT CRUSHER AND PULVERIZER CO. ST. LOUIS, MO.

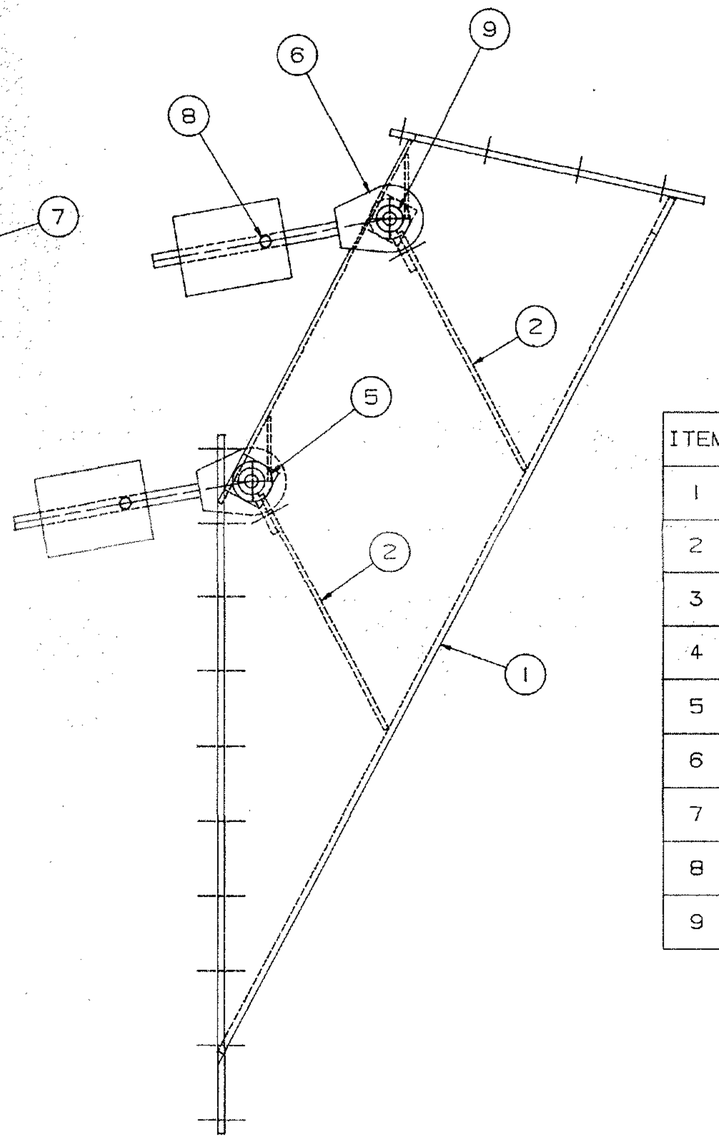
PARTS LIST FOR MODEL "O" 5" TAPER BORE PILLOW BLOCK WITH CONT. OIL LUBRICATION

DRAWN BY DSK | TRACED BY | CHECKED BY | APPROVED BY | DATE | SCALE A-W | DRWG NO 61J-B-3051

NOTE - SHOULD ROTOR OR BEARINGS BE REMOVED - WHEN RE-ASSEMBLING ALWAYS REMOVE INSPECTION PORTS (13) AND CHECK TO SEE IF OIL SLINGERS (9) ARE CORRECTLY POSITIONED AGAINST THEIR MATING SURFACES, IF NOT, PRY INTO POSITION.

WHEN REMOUNTING BEARING-MEASURE INTERNAL RADIAL CLEARANCE OF BEARING WITH A SHIM GAUGE & FORCE BEARING ON SHAFT IN EASY STAGES UNTIL THE ABOVE NOTED RADIAL CLEARANCE IS REDUCED .0025 IN.





PARTS LIST

ITEM	DESCRIPTION	QTY
1	DOUBLE FLOP GATE ASSEMBLY	1
2	GATE PLATE	2
3	ROTOR SHAFT ASSEMBLY W/O SHAFT EXTENSION (ONE REQ'D AS SHOWN, ONE REQ'D OPPOSITE)	1 EA
4	ROTOR SHAFT ASSEMBLY WITH SHAFT EXTENSION (ONE REQ'D AS SHOWN, ONE REQ'D OPPOSITE)	1 EA
5	CLAMP TYPE SET COLLAR	4
6	SWING ARM ASSEMBLY	2
7	SWING ARM WEIGHT	2
8	SWING ARM ADJUSTING BOLT	2
9	SWING ARM LOCKING ASSEMBLY	2

DOUBLE FLOP GATE FEEDER

THIS DRAWING AND THE INFORMATION IT CONTAINS IS CONFIDENTIAL AND THE PROPERTY OF WILLIAMS PATENT CRUSHER AND PULVERIZER CO. AND MUST NOT BE MISUSED OR COPIED IN ENTIRE OR IN PART WITHOUT OUR WRITTEN PERMISSION.

ZONE	SYM.	DATE	INITIALS	REVISION DESCRIPTION

THIS PRINT WAS ISSUED

THIS DRG. SUPERSEDED BY

THIS DRG. SUPERSEDES

TOLERANCES
Fractional Dimensions ± 1/64"
Decimal Dimensions
Zero to 1.999" ± .001"
From 2" Up ± .002"
All Threads U.S. Form NC.
Class 3 unless otherwise noted

FINISHES
f_1 Rough Cut to Clean Up
f_2 Fine Lathe Cut
f_3 Fine Lathe Cut & File Smooth
f_4 Fine Lathe Cut & Grind

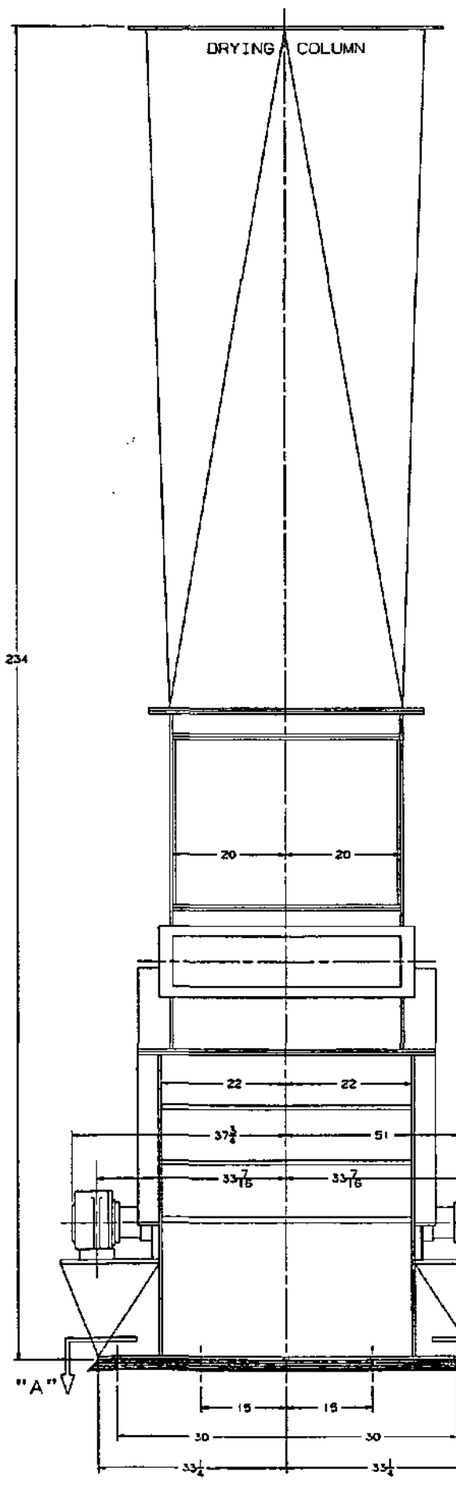
WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
ST. LOUIS, MO.

PARTS LIST: DOUBLE FLOP GATE FEEDER

DRAWN BY	TRACED BY	DATE	SCALE
DA		M-TL-YY	NONE

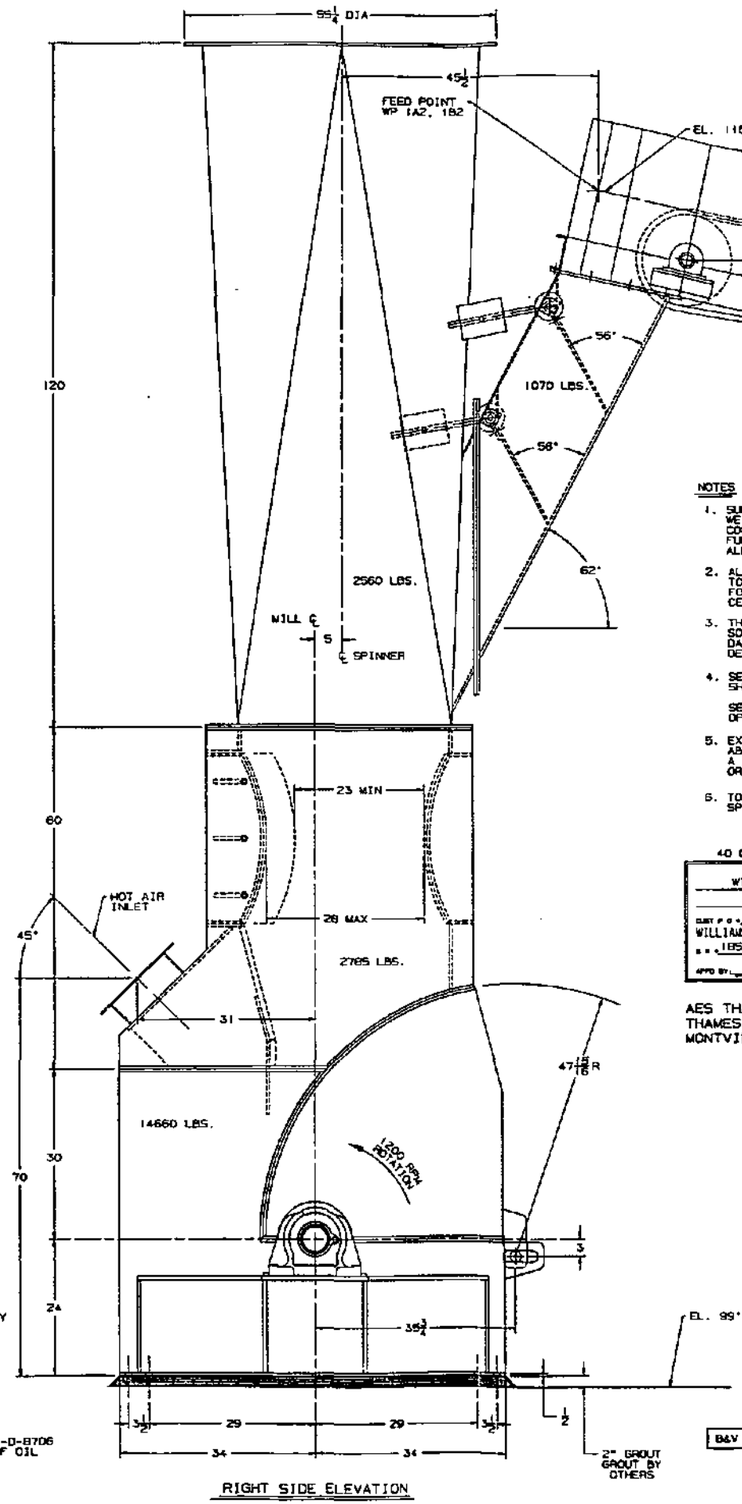
CHECKED BY	DRWG NO	REVISION
	7J-D-10828	

STD. -D- DWG. SHT



FRONT ELEVATION

SEE DRAWING 61-D-8706 FOR LOCATION OF OIL CONNECTIONS.

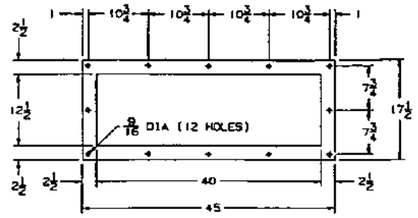


RIGHT SIDE ELEVATION

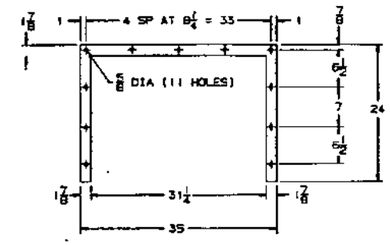
NOTES

1. SUPPORT MILL ON CONCRETE FOUNDATION HAVING WEIGHT OF 3-4 TIMES WEIGHT OF MILL/SPINNER COMBINED. DESIGN FOUNDATION TO SUPPORT FULL LENGTH OF BASE FLANGES UNDER BEARINGS. ALL FOUNDATIONS BY OTHERS.
2. ALL DIMENSIONS ARE IN INCHES & ARE SUBJECT TO CHANGE UNLESS CERTIFIED FOR CONSTRUCTION. FOR CONSTRUCTION OR INSTALLATION USE A CERTIFIED SHEET ONLY!
3. THIS MILL TO BE SECURELY FASTENED TO A SOLID FOUNDATION DESIGNED TO PROVIDE DYNAMIC DAMPING FREE OF ANY RESONANT INTERFERENCE AT DESIGNED OPERATING SPEED.
4. SERIAL NUMBER 18555 TO BE RIGHT HAND DRIVE AS SHOWN.

   SERIAL NUMBER 18560 TO BE LEFT HAND DRIVE OPPOSITE AS SHOWN.
5. EXTEND ANCHOR BOLTS A MINIMUM OF 5 INCHES ABOVE CONCRETE PAD AND ALLOW FOR A NUT AND A JAM NUT. ANCHOR BOLT MATERIAL TO BE ASTM-A36 OR BETTER.
6. TOTAL WEIGHT OF DRYER MILL INCLUDING SPINNER SEPARATOR IS 22,565 LBS.



HOT AIR INLET



FEEDER INLET

DRIVE INFORMATION

MOTOR:
150HP, 1200RPM, 3PH/60HZ/460VOLT, NEMA FRAME 445T. (MOTOR BY WILLIS & PAUL)

DRIVE SHEAVE:
8V, 5GV, 17.00 O.D. WITH QD "J" BUSHING

DRIVEN SHEAVE:
8V, 5GR, 17.00 O.D. WITH QD "J" BUSHING TO OPERATE MILL AT APPROXIMATELY 1200 RPM

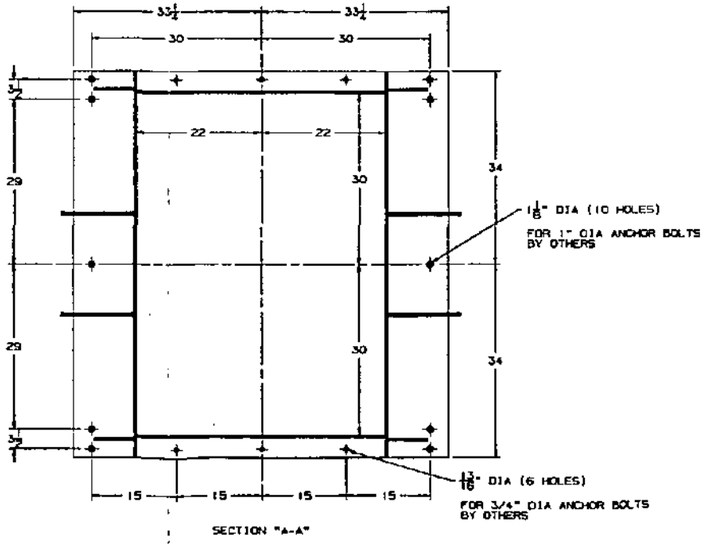
DRIVE BELTS:
4 - 8V1700 BELTS MATCHED AND TIED FOR CENTER TO CENTER DISTANCE OF 58.3". COMPLETE WITH DSHA V-BELT GUARD.

(BELT DRIVE & GUARD BY WILLIAMS)

40 GA IMPACT DRYER MILL
DIMENSIONS CERTIFIED 7/20/87

WILLIS & PAUL GROUP
AES THAMES, INC.
QUOTE P.O.'s 008742-01BAL
WILLIAMS PAT.CRUSHER & PULV.CO,INC
S.O.'s 18555, 18560 S.O.'s 871448
APPD BY: Dan Agee DATE 8-13-87

AES THAMES, INC.
THAMES CO-GENERATION PLANT
MONTVILLE, CONN.



SECTION "A-A"

B&V DRAWING NO. 12713.61.0403.05-11002

TAG: 1BMC-PLV-1A and 1B

ALT.	A	BY	DA	ADD WILLIS & PAUL COMMENTS

TOLERANCES
Fractional Dimensions ± 1/64"
Angular Dimensions
Two Place Decimals ± .02"
Three Place Decimals ± .005"
All Finish Marks 63

FINISHES
F_1 Finish on machined surfaces
F_2 Finish on machined surfaces
F_3 Finish on machined surfaces
F_4 Finish on machined surfaces

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
ST. LOUIS, MO.

40GA
IMPACT DRYER MILL

DRAWN BY	TRACED BY	DATE	SCALE
DA		K-HY-YK	1"=1'-0"

DWG. NO. 7H-E-10067 REV. A

WILLIAMS

CRUSHERS · CONVEYORS · SHREDDERS · GRINDERS

Oldest and largest manufacturer of hammer mills in the world

CRUSHER FOUNDATIONS

WILLIAMS PATENT CRUSHER & PULVERIZER CO., INC.

2701 North Broadway • St. Louis, Missouri 63102, U.S.A.

FORM 902

FOUNDATIONS

While it is not the purpose of this bulletin to make specific recommendations for a crusher foundation, it is meant to serve as a helpful guide to avoid vibration disturbances that could be prevented by a properly designed foundation. The time to correct foundation problems is in the planning stage. The information offered here is for the normal circumstances where the purchaser assumes the responsibility to provide the foundation structure under the crusher.

A rigid, level foundation is a must for any crusher installation. It assures the crusher and its driver will remain in alignment at the design elevation while damping operating vibrations and minimizing maintenance costs.

To design a suitable foundation that will serve the crusher and its connected equipment requires a complete study and evaluation of local conditions. The services of a structural designer, experienced in planning foundations for heavy machinery, should be obtained to insure a proper supporting structure.

The design of the crusher is predicated upon the assumption that the support structure will be adequately designed, because there are no provisions for operation with foundation abnormalities.

BASIC CONSIDERATIONS

The best foundation is provided by a well-engineered, poured in place reinforced concrete structure under both the crusher and its driver. A well designed foundation will have the required rigidity to withstand the axial and transverse loading of the rotating machinery it will support. The foundation should be arranged to provide the maximum restraint perpendicular to the crusher rotor because the impacts and vibration will occur in this direction.

A generally accepted rule-of-thumb is that the weight of the concrete foundation structure be at least three (3) times the total weight of all the equipment it will support. This weight acts as an inertia block to stabilize the foundation. The optimum distribution of the foundation mass would be to have as much weight as possible directly under the crusher to provide the maximum inertia damping next to the rotating equipment. The height of the foundation should never be greater than the width perpendicular to the rotor unless an integral pad or spread footing is used beneath the structure.

Whenever possible arrange the discharge from the crusher to be carried transverse to the rotor to allow solid support under the sides of the mill and the bearing pedestals.

It is advisable that the foundation for the crusher rest on bed rock or solid earth, completely independent of other foundations and separated from all adjacent concrete work by shock absorbing pads between the meeting surfaces.

The foundation must be designed to avoid resonant vibration conditions originating from normal excitation forces. The forcing or exciting frequency of the crusher equals its rotating speed.

SOIL BEARING SUPPORT

The soil structure beneath the foundation should be well drained and stable enough to prevent uneven settlement of the foundation. Soil support conditions vary widely with location, so the safest procedure is to make an investigation of the installation site. The soil type and analysis of the effect the design loading will have on the soil are very important. The elevation and proximity of the ground watertable will directly influence the size and shape of the foundation.

The desirability of low soil loading under a foundation subject to vibration cannot be overemphasized. It is not safe to use conventional static soil bearing support values for dynamic loading conditions.

A good rule-of-thumb would be to allow a soil bearing value of about a fourth of the recommended static load values for the soil type when designing for dynamic conditions under a crusher foundation. Where soil moisture conditions are prevalent, the allowable soil loading pressure should be further reduced to provide safe resonant free bearing values. The foundation contact area should be designed to impose a soil loading condition no greater than 500 pounds per square foot to resist its settling and the resulting soil resonance set up by the crusher operation.

Crusher equipment is subject to vibration due to unbalance resulting from operation, which will have a frequency equal to the crusher's operation speed. It is possible this vibrating force could interact with the soil's natural frequency causing a resonant condition that would produce excessive vibration when the concentrated foundation load deflects the supporting soil under the structure into its critical zone. The nature of the soil is directly related to its inherent frequency.

When poor soil conditions such as non-cohesive strata, wet sand and clay or high porosity wet sand or swamp lands are encountered, it will require piling to supplement the foundation support and avoid settling.

ANCHOR BOLT LOCATIONS

Check the certified dimension drawings for the anchor bolt location and size. When anchor bolts or inserts are cast in the concrete, it is very important to construct a well braced template to accurately locate and position the anchor bolts or inserts in the foundation until the concrete has set. To compensate for small measuring errors, place a sleeve around each bolt to allow for adjustments when the concrete has set. The sleeve should have about an inch clearance around the bolt, which will require a plug at the top to keep out the concrete, and center the bolt in the sleeve.

BEDPLATES AND SHIMS

When the foundation design calls for a structural bedplate cast in the concrete foundation, the centerlines and elevation must be established by a survey so the crusher will be in the correct position called for on the certified dimension drawing when set on the bedplate.

To determine the necessary length the anchor bolt must project above the foundation, check the certified dimension drawings for shaft centerline elevation and its height above the foundation. Then allow for the grout or shim thickness, the crusher bottom flange thickness, the height of the nuts and washers and extra threads for drawdown.

Usual practice is to allow two to three inches of grout beneath large crushers with wide bottom flanges to facilitate placing the grout. Allow up to 3/8 inch for shims when installing a large crusher on a structural bedplate to compensate for irregularities of the wide bottom flanges and bedplate. For smaller equipment, the shim allowance can be reduced to 3/16 inch for narrower flanges.

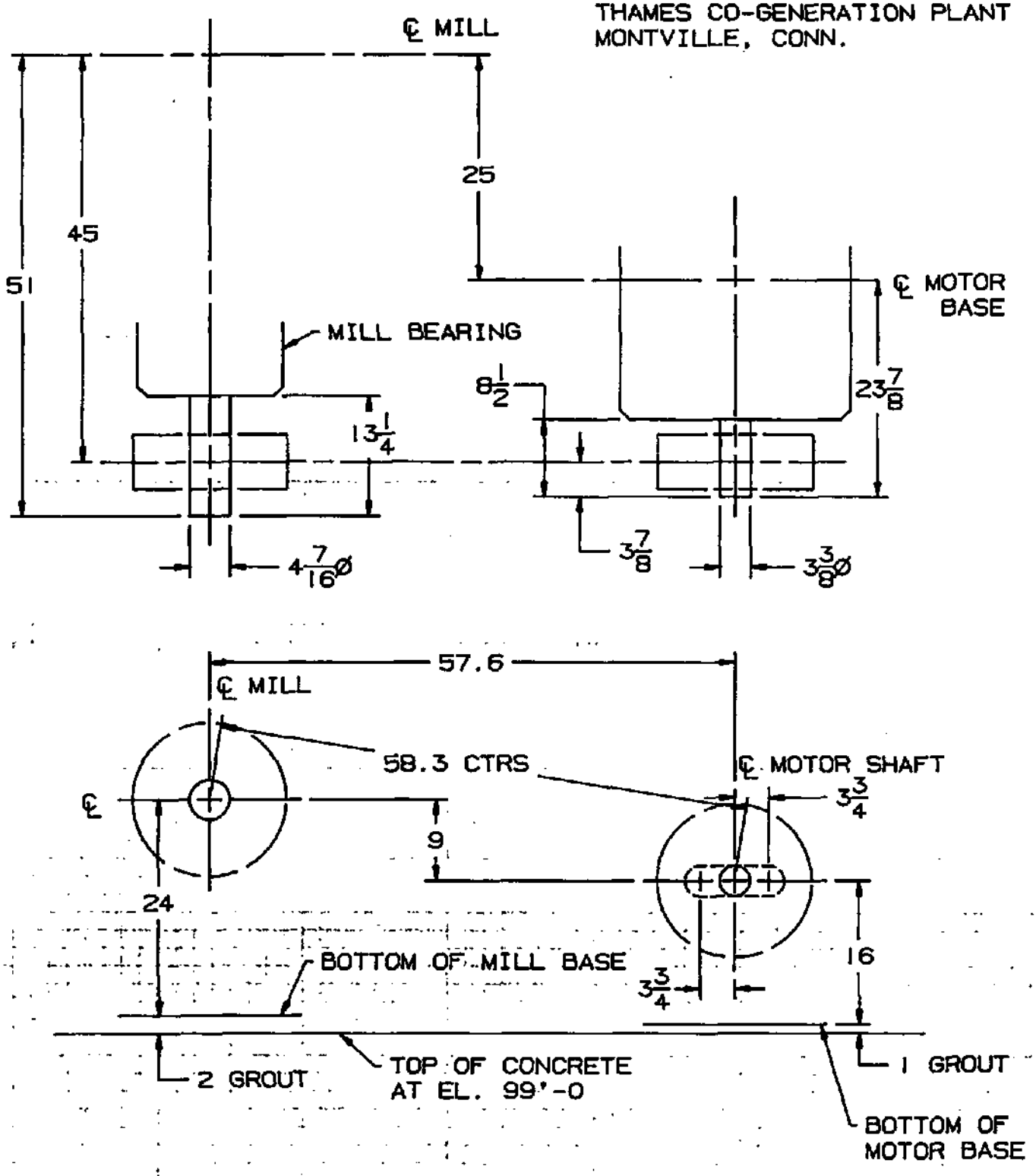
STRUCTURAL STEEL FOUNDATIONS

When a structural steel foundation is required for any crusher installation, it should be carefully designed to avoid vibration criticals and sufficiently rigid to assure permanent alignment of the crusher and its driver. It must be designed to carry with minimum deflection the weight of the equipment, plus the loads imposed by the material handled and the dynamic forces set up from the crushing operation.

The crusher frame is to be rigidly connected to the structural foundations using shims to adjust for foundation and frame irregularities to prevent distortion of the crusher frame. Resilient mounting pads between the bottom flange of the crusher and the structural steel foundation are to be avoided at all times, unless they are beneath an inertia base supporting both the crusher and its driver.

All structural steel crusher foundation plans should be submitted for review by Williams Eingineering Department.

AES THAMES, INC.
THAMES CO-GENERATION PLANT
MONTVILLE, CONN.



DRIVE ARRANGEMENT SHOWN IS FOR PULVERIZER 1B, PULVERIZER 1A DRIVE IS OPPOSITE, SEE WILLIS & PAUL 8742-G0851 FOR FLOOR PLAN AT EL. 99'-0

WILLIAMS PATENT CRUSHER AND PULVERIZER CO. ST. LOUIS, MO.	DRYER MILL DRIVE GUARD LAYOUT SKETCH	SHEET NO. 1 OF 1 DRWG. NO. SKDA2-2-88

ALL DIMENSIONS ARE IN INCHES AND ARE SUBJECT TO CHANGE UNLESS CERTIFIED. FOR CONSTRUCTION OR INSTALLATION, USE A CERTIFIED SHEET ONLY.

HOLES WILL MATCH WITH HOLES IN IMPACT DRYER MILL DRYING COLUMN.

SEE DRIVE ASSEMBLY DRAWING 52-E-9696 FOR ORIENTATION OF DRIVE, ACCESS DOOR, DP TAP, OIL FILLER AND BREATHER, AND NPT COUPLINGS FOR TEMPERATURE MEASUREMENT DEVICES.

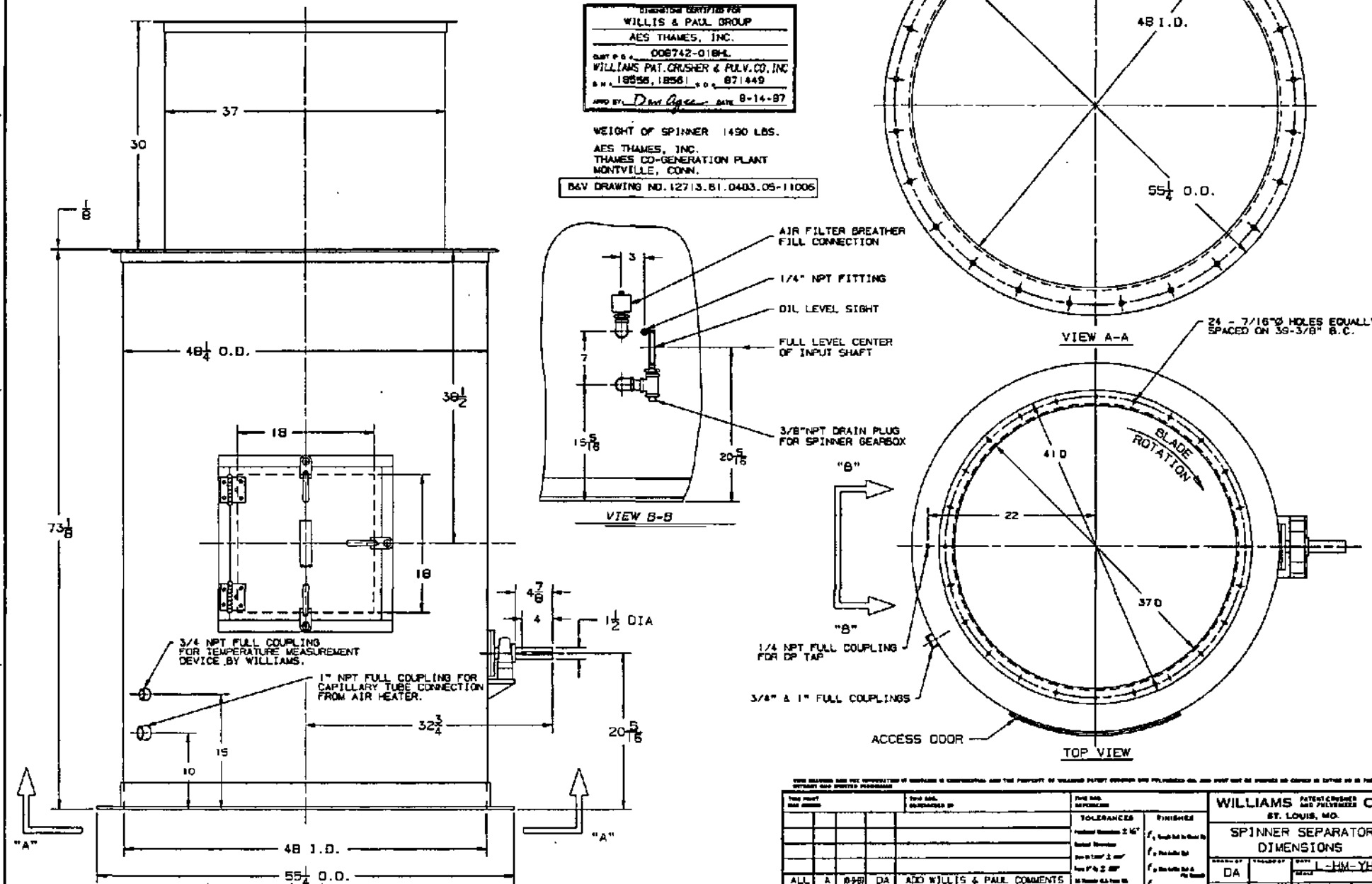
4 FT. DIA. SPINNER SEPARATOR

Dimensional Certified for
WILLIS & PAUL GROUP
AES THAMES, INC.
Cust P.O.# 008742-018HL
WILLIAMS PAT. CRUSHER & PULV. CO. INC
S.N.# 18556, 18561 W.O.# 871449
Appd By: Dave Agee Date 8-14-87

WEIGHT OF SPINNER 1490 LBS.

AES THAMES, INC.
THAMES CO-GENERATION PLANT
MONTVILLE, CONN.

B&V DRAWING NO. 12713.81.0403.05-11006



VIEW B-B

VIEW A-A

TOP VIEW

ALL	A	8-3-88	DA	ADD WILLIS & PAUL COMMENTS	

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
ST. LOUIS, MO.

SPINNER SEPARATOR DIMENSIONS

DRAWN BY: DA
SCALE: 1-HM-YH
52H-D-9934
REVISION: A

FORM 982

INSTRUCTIONS FOR INSTALLATION & OPERATION OF WILLIAMS SPINNER SEPARATORS FOR USE WITH DRYER MILLS

Air System Assembly: The purpose of the air system is to convey ground material from the mill to the Separator (where it is classified and the oversize particles are automatically returned for regrinding) and then to convey the finished product to the cyclone (where it is deposited for convenient handling). The circuit is completed by returning the air to the windbox (from where it enters the grinding chamber of the mill). A small amount of excess air, which enters the system thru the feeder or balacing air dampers, is discharged to the dust collector (where extreme fines are extracted before the excess air is discharged into the atmosphere).

Since the Separator and Cyclone are on the intake side of the fan, the portion of the air system in which they are located will operate under partial vacuum (specifically stated as "condition or rarefaction"). This means that the pressure inside this part of the system will be lower than the atmosphere pressure outside.

Set the Separator on top of the mill and bolt it securely in place, placing gasket supplied between mill and Separator. Remove wood blocking around the spinner blades. The cyclone, fan and dust collector should be installed next but, because it may be advantageous to shift them when the piping is connected, make these installations temporary.

Connect the piping, as shown on your installation drawing, matching the flanges by the numbers which are painted on the pipe sections (1/1, 2/2, 3/3, etc). Use gaskets or RTV Silicone Sealant in all joints so that the completely assembled air system will be air-tight, since air leaks will impair the efficiency of your mill.

To facilitate assembly and to allow for minor variations in locating equipment, there will be a slip-joints flange on each straight run of pipe. This will allow a variation of approximately 3 inches. The elbows will also have one loose flange for the same reasons. The adjustable sleeves and elbow flanges must be field-welded into position to be air tight.

After the air system ducts have been completely assembled, permanently anchor the cyclone, fan and dust collector to their foundations.

All pipe work must be properly supported and braced independent of equipment. The return air duct entering the fan must be readily removable to permit inspection of the fan, therefore do not support pipe by means of the fan.

Pipe elbows manufactured by others are to have a throat radius of at least two pipe diameters.

All pipe and collectors that are not heated are to be insulated to prevent condensation during cold weather.

System Start Up: Start the Spinner Separator. The setting on the variable speed drive should be in accord with whether the mill is to grind relatively fine (100 mesh) or coarse (40-60 mesh). For fine grinding the drive should be set near its highest speed and conversely for coarser grinding. Do not adjust the variable speed drive unless the drive motor is running.

Start the Rotary Valve below the Cyclone and also the Rotary Valve below the Secondary Collector.

Start the Secondary Exhaust Fan and Secondary Exhaust Collector (if provided).

Start the Main Fan.

Open the slide gate in the mill rotary feeder housing if it is closed and if this type of feeder is used.

Start the Mill.

Permit the feeder to operate until the load in the mill is heavy enough to make the mill run quietly.

Once the quiet operating condition has been reach, turn the feeder selector switch to the "Off" position and note the vacuum setting on the gauge. When the mill becomes noisy, start the feeder again by placing the selector switch in the "Hand" position and feeding unitl the mill becomes quiet. Again, notice the vacuum gauge reading.

Continue the process until the system stabilizes and the "quiet condition" vacuum setting remains the same - it is expected that the setting will have steadily risen as the system is loaded with material.

NOTE: If the feeder cannot feed fast enough to obtain a quiet condition for the mill - increase the feeder speed by adjusting the variable speed drive.

A check of the finished ground product should now be made. If the product is not fine enough, increase the Spinner Separator speed, or decrease the Spinner speed if it is too fine.

If the product cannot be made fine enough at the Spinner Separator's top speed, add spinner blades. Check the power required so as not to overload the drive. If the spinner drive is overloaded, cut back on the air delivered by the main fan using the damper usually ahead on the fan or slow down the fan.

Once the correct fineness of product is obtained, the automatic feed control panel is ready to be adjusted as outlined above.

Flash Drying: If hot air is to be introduced into the mill for drying purposes, an exhaust fan is supplied. A splitter valve then is not required as the exhaust fan will regulate the quantity of air exhausted from the air system.

An exhaust fan is recommended because it now becomes important to maintain an accurate control over the amont of air exhausted from the system as an equal amount of secondary air will be drawing thru the heater and mixed with the combustion gases. By so doing the temperature inside the furnace and hot air piping can be controlled together with the dew point of the system. The temperature for the air piping should not exceed 800 to 900 degrees F. A damper is provided ahead of the exhaust fan to control the amount of exhaust air, and temperature gauges along with an alarm system are provided with Williams Furnaces. See "Furnace Instructions" for further information.

If you are drying and grinding simultaneously, it is necessary to give special attention to lubrication. The lubricants recommended in this book may not be suitable and the suggested frequency of lubrication may not be ample. For all installations in which hot air is introduced into the mill, consult the factory about proper lubricants and make a lubrication schedule to fit your special requirements.

Mill Operation
Possible Troubles:

a) **Product Too Coarse:** Increase Spinner speed, or try adding a 1/2 set spinner blades (maintaining spinner dynamic balance) or decrease air volume of fan using fan damper.

b) **Product Too Fine:** Decrease Spinner Separator speed, or remove 1/2 set spinner blades, or increase air volume of fan.

Lubrication: Possibly no detail is more important to the life of a machine than the proper lubrication of the contact surfaces of moving parts. Table 1 is a good general purpose guide to proper lubrication of Williams Separator Mills. However, we advise that you lubricate as frequently as local conditions warrant for your installation, keeping in mind that care be exercised to prevent over lubrication. Too much lubrication will cause a bearing to heat. Bearing operating temperatures will vary with geographical location and ambient temperature at the installation. If there is any doubt about lubrication, consult the Williams factory or a qualified lubrication expert.

Table 1 - Lubrication Guide

Element	Type Lubrication	Frequency of Lubrication
Spinner Separator Outboard Bearing	Mobiltemp 78	Weekly
Spinner Separator Top Gear Housing	Mobiltemp 78	Weekly
Spinner Separator	Mobil DTE 26 (below 150 degrees F) Mobil DTE Oil AA (above 150 degrees F)	Inspect Daily

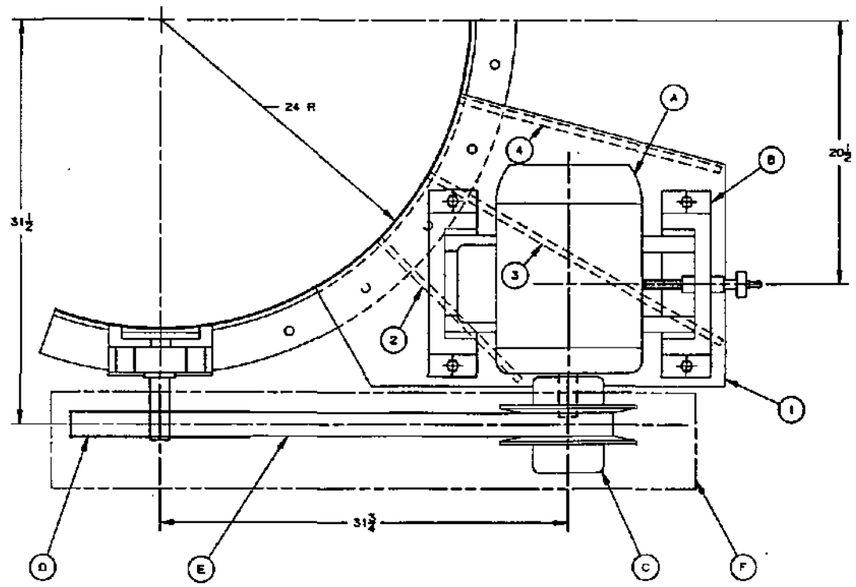
Spinner Separator Gear Housing: The Spinner Separator gear housing must be lubricated when received from the factory. This can easily be done from the outside as an oil pipe has been supplied with a sight glass. All gear housings are shipped without oil because of traffic regulations.

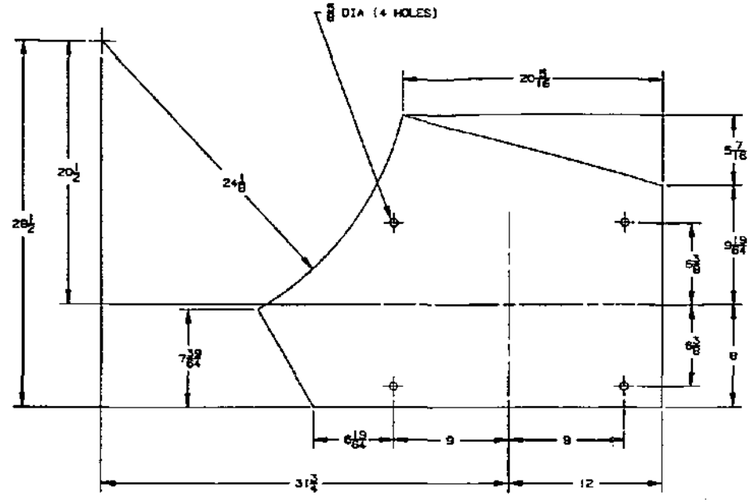
Fill the gear houisng to the level of the sight glass. A visual check of ths sight glass will assure the mill operator that the Spinner Separator has the proper oil level during operation.

Note the outboard bearing of the Spinner Separator located on the outside of the Separator housing is to be grease lubricated. Generally the upper bearing of the spinner drive will also be grease lubricated. If so, a grease fitting is located directly above the air vent on the outside of the Spinner Separator housing which connects to a pipe leading directly to the upper bearing of the gear unit inside the Separator. If a grease line is not provided, the upper bearing will be lubricated by an internal splash system.

For grease and oil lubrication recommendations, see Table 1. Change oil monthly or more often as necessary.

All motors, speed reducers, vari-speed drives, etc. should be lubricated only as directed by the manufacturer.





(1) DRIVE BASE (1 REQ'D)
MATERIAL - 1/2" PLATE
F0028

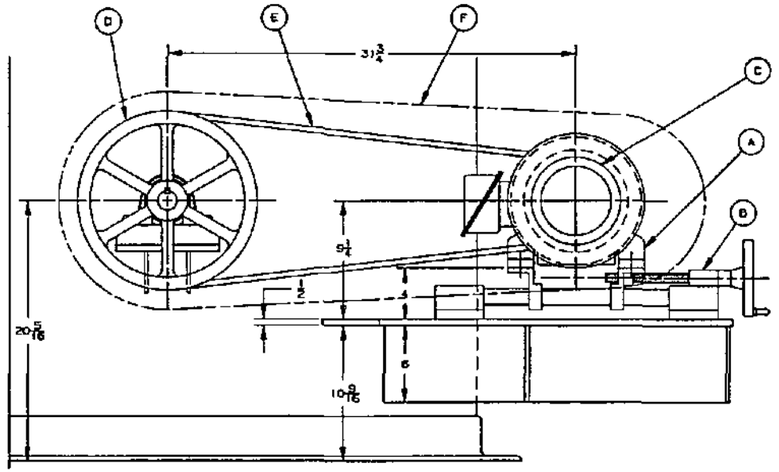
(2) GUSSET (1 REQ'D)
MATERIAL - 1/2" X 6" B.S. X 15-1/2" LONG

(3) GUSSET (1 REQ'D)
MATERIAL - 1/2" X 6" B.S. X 26" LONG

(4) GUSSET (1 REQ'D)
MATERIAL - 1/2" X 6" B.S. X 20-3/4" LONG

4'-0 Ø SPINNER SEPARATOR
Dimensions controlled from
WILLIS & PAUL GROUP
AES THAMES, INC.
PART P.O.: 009742-0184
WILLIAMS PAT.CRUSHER & PULV.CO,INC
S/N: 18556, 18561 P.O.: 871449
APPD BY: Dave Ayer DATE: 10-9-87

(A) AES THAMES, INC.
THAMES CO-GENERATION PLANT
MONTVILLE, CONN.



(A) DRIVE MOTOR, 5 HP, 1200 RPM, TEFC, 215T FRAME
1.15 S.F., MILL & CHEMICAL DUTY MOTOR BY SIEMENS

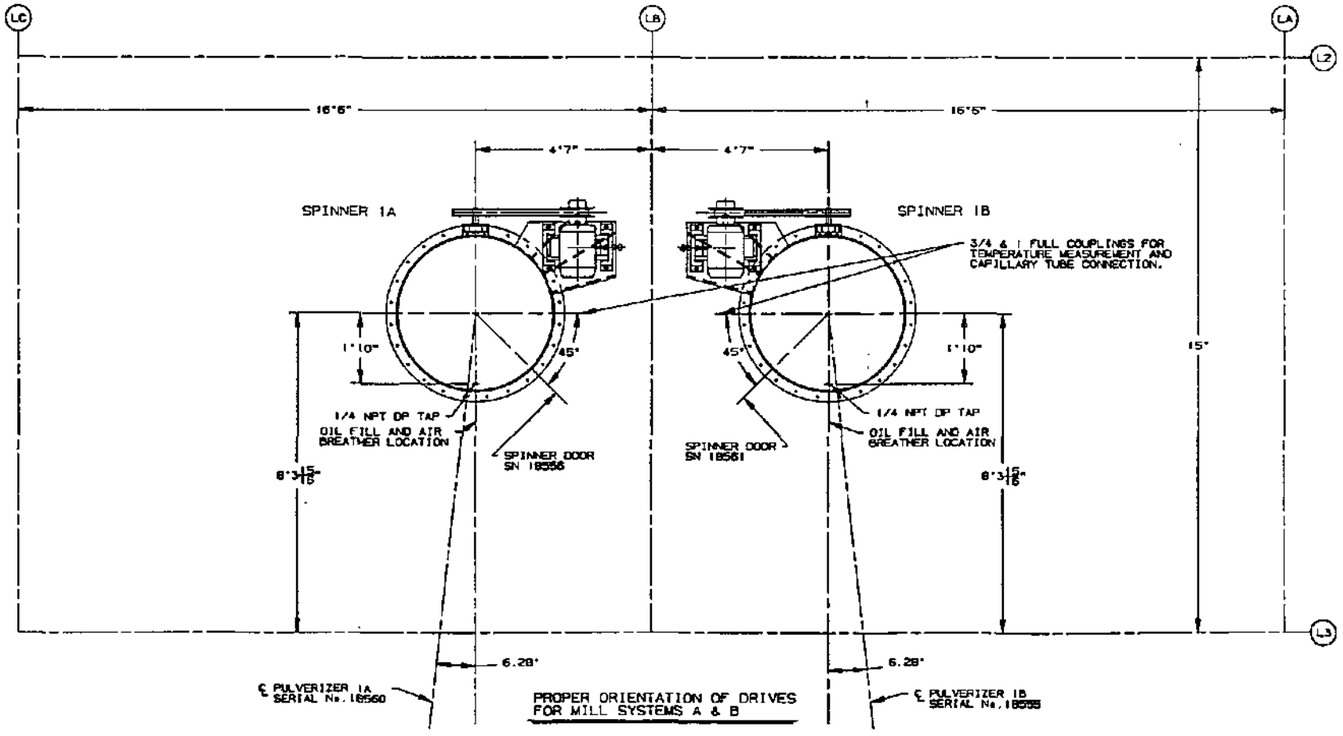
(B) GERBING 3B MOTOR BASE FOR 215T FRAME MOTOR

(C) GERBING 2907 V.P. QUADRA-KEY PULLEY

(D) GERBING 3S-140 COMPANION PULLEY

(E) GERBING 2926V966 BELT

(F) DRIVE GUARD
SEE GUARD DRAWING 160-B-5962.



FIRST USED ON S/N 18556, 18561.

B&V DRAWING NO. 12713.61.0403.05-11003

(A)

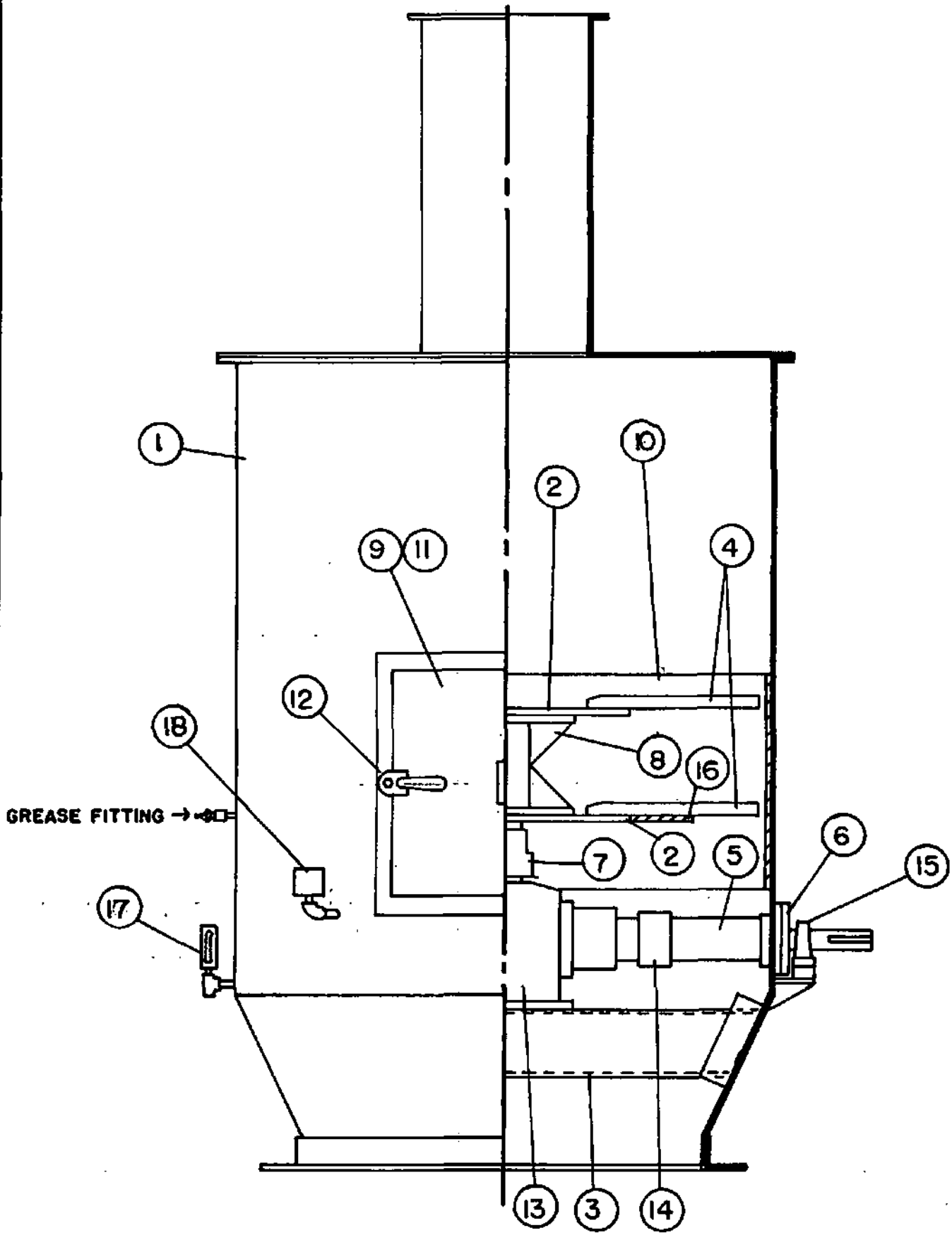
ALL	B	1-5-88	DA	ADD BELT GUARD AND INFEED ANGLE	
ALL	A	10-9-87	DA	ADD WILLIS & PAUL COMMENTS	

TOLERANCES
FINISHES

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
ST. LOUIS, MO.

4'-0 SPINNER DRIVE ASSEMBLY AND DETAILS

DRAWN BY: DA DATE: 7-15-83
APPROVED BY: DATE: 3/15/81
SIZE: D
52-E-9696
REVISION: B



WILLIAMS PATENT CRUSHER AND PULVERIZER CO. ST. LOUIS, MO.	PARTS DRAWING: SPINNER SEPARATOR	SHEET NO. 1 OF 2 DRWG. NO. 52 J-B-5348

PART	When Ordering Repairs Give { Part Wanted, also Quantity, This Drwg. Number and Machine Serial Number	CODE	QUANTITY IN MACHINE
1	Spinner Body		1
2	Spinner Plate (requires 4 bolts & locknuts per plate)		2
3	Support Channels (requires 4 bolts & locknuts per channel)		2
4	Spinner Blades (requires 2 bolts & locknuts per blade)		
5	Shaft Cover		1
6	Pipe Seal (requires 2 bolts & locknuts)		1
7	Spacer (requires one set screw)	RC96	
8	Spinner Plate Support (requires 1 roll pin)	RC95	1
9	Access Door Liner (requires bolts & locknuts)		1
10	Cylinder Liners (requires 6 bolts & locknuts per Liner)		
11	Access Door		1
12	Access Door Closure Handles (requires 1 locknut per handle)	FA35	
13	Right Angle Gear Box (requires 4 bolts & locknuts)		1
14	Shaft Cover Spacer		1
15	Outboard Shaft Pillow Block (requires 2 bolts & locknuts)		1
16	Spinner Plate Baffle (requires 12 bolts and locknuts per Baffle)		4
17	Oil Filler	1236	1
18	Air Filter	A1-104-2-005	
19	Air Seal Piping (optional equipment) Not Shown		1 Lot

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
ST. LOUIS, MO.

PARTS LIST: SPINNER SEPARATOR

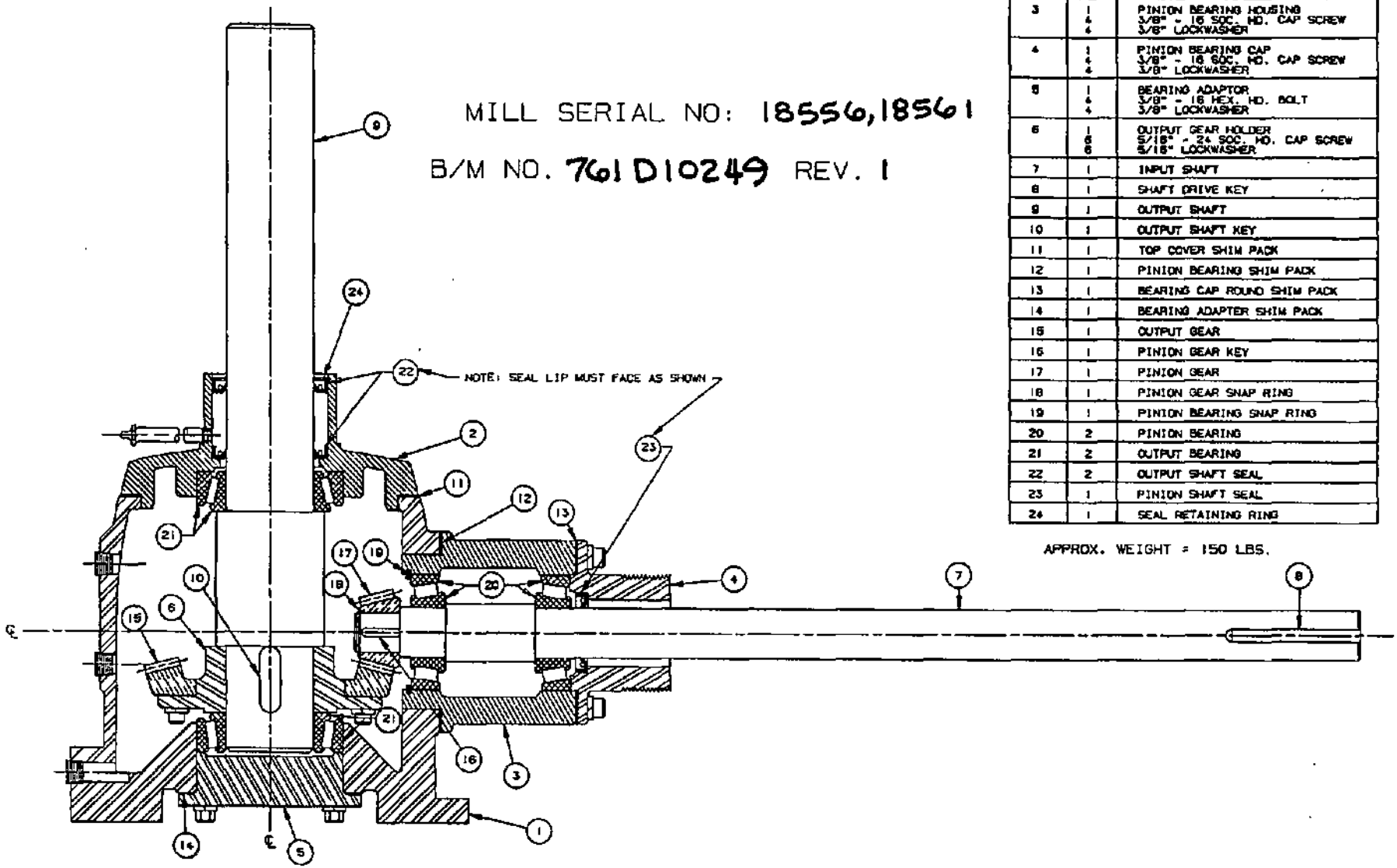
SHEET NO. 2 of 2

DRWG. NO. 52J-B-5348

WHEN ORDERING REPAIRS GIVE { PART WANTED, ALSO QUANTITY, THIS DRAWING NUMBER AND MACHINE SERIAL NUMBER

MILL SERIAL NO: 18556,18561

B/M NO. 761D10249 REV. 1



DETAIL NO.	NO. REQ'D	DESCRIPTION
1	1 3	HOUSING 3/8" - 18 NPT PIPE PLUG
2	1 4 4	TOP COVER 3/8" - 16 SOC. HD. CAP SCREW 3/8" LOCKWASHER
3	1 4 4	PINION BEARING HOUSING 3/8" - 16 SOC. HD. CAP SCREW 3/8" LOCKWASHER
4	1 4 4	PINION BEARING CAP 3/8" - 16 SOC. HD. CAP SCREW 3/8" LOCKWASHER
5	1 4 4	BEARING ADAPTOR 3/8" - 16 HEX. HD. BOLT 3/8" LOCKWASHER
6	1 6 6	OUTPUT GEAR HOLDER 5/16" - 24 SOC. HD. CAP SCREW 5/16" LOCKWASHER
7	1	INPUT SHAFT
8	1	SHAFT DRIVE KEY
9	1	OUTPUT SHAFT
10	1	OUTPUT SHAFT KEY
11	1	TOP COVER SHIM PACK
12	1	PINION BEARING SHIM PACK
13	1	BEARING CAP ROUND SHIM PACK
14	1	BEARING ADAPTER SHIM PACK
15	1	OUTPUT GEAR
16	1	PINION GEAR KEY
17	1	PINION GEAR
18	1	PINION GEAR SNAP RING
19	1	PINION BEARING SNAP RING
20	2	PINION BEARING
21	2	OUTPUT BEARING
22	2	OUTPUT SHAFT SEAL
23	1	PINION SHAFT SEAL
24	1	SEAL RETAINING RING

APPROX. WEIGHT = 150 LBS.

C4	B	1-07-85	DA	ADDED RETAINING RING
GEN	A	1-18-84	CF	ADDED LOCKWASHERS

WILLIAMS GEAR COUPLINGS AND PULLEYS CO.
ST. LOUIS, MO.

PARTS LIST:
RA-4 GEAR REDUCER
(3:1)

DRAWN BY CRB — DATE 11-18-83 — SCALE 1/2" = 1" — 155J-D-10250 — B

TOLERANCES ± 1/16" — FINISHES

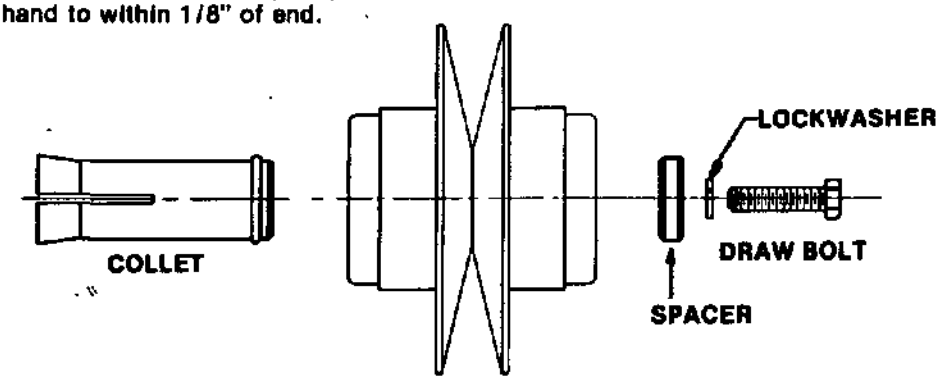
QUADRA-KEY™

NO. 716

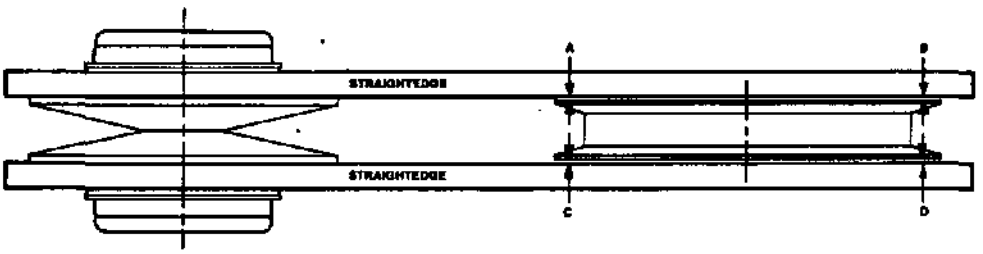
VARIABLE SPEED PULLEY INSTALLATION AND SERVICE INSTRUCTIONS

INSTALLATION:

1. Set motor base in its approximate position. Do not bolt to floor. Bolt motor to base.
2. Secure companion sheave to driven shaft using instructions furnished with bushing. If an outboard support is used on driven shaft, place belt in sheave groove before fastening support.
3. Check shaft on which **QUADRA-KEY** pulley is to be mounted. Remove all burrs and remove key from the shaft. (The collet used with the **QUADRA-KEY** pulley does not require a key.)
4. Insert collet into bore of **QUADRA-KEY** pulley. Insert spacer, lockwasher and draw bolt into opposite end of pulley and tighten bolt by hand to within 1/8" of end.



5. Mount **QUADRA-KEY** pulley on shaft. Push on until shaft bottoms in collet then pull out 1/8", or until the **QUADRA-KEY** pulley is approximately in line with the companion sheave.
6. Adjust motor base until the driver and driven shafts are 1" closer than the desired minimum center distance and the base cannot travel further inward.
7. Align the driver and driven pulleys using the method shown below.



Place straightedge across side of **QUADRA-KEY** pulley flange making sure that it touches at both edges of disc. Measure distance from straightedge to companion sheave rim at points A & B. Repeat for other side at points C & D. Measured distance at points A, B, C & D must be within 1/32" of each other. Misalignment will result in vibration and premature belt and pulley failure.

8. Secure motor base to floor and tighten collet draw bolt. Recommended torque on collet draw bolt is shown in the following table. Recheck alignment.

QUADRA KEY MODEL	DRAW BOLT TORQUE (FT./LBS.)
2303, 2305	42
2907, 2910	67
3215, 4415 3220, 4420 3225, 4425 3230, 4430	92

9. Adjust motor base to extreme forward position and place belt in grooves of both pulley and sheave. Rotating the drive by hand, adjust motor base until belt top is flush with O.D. of **QUADRA-KEY** flanges. This places belt at **QUADRA-KEY** maximum pitch diameter.
10. Start drive under load and stop. Check drive alignment. If necessary to adjust alignment loosen collet draw bolt until it is backed off approximately 1/4". Tap head of draw bolt firmly with a hammer until pulley becomes loose on the shaft. Move **QUADRA-KEY** pulley to correct alignment. Re-tighten draw bolt as outlined in step 8 above.

GERBING MANUFACTURING
P. O. BOX 727 • ELGIN, ILLINOIS 60120
PHONE 312/888-5400 • TELEX 722 467
*FORMSPRAG COMPANY * ADIVISION OF DANA CORPORATION*

Gerbing Formsprag | DANA

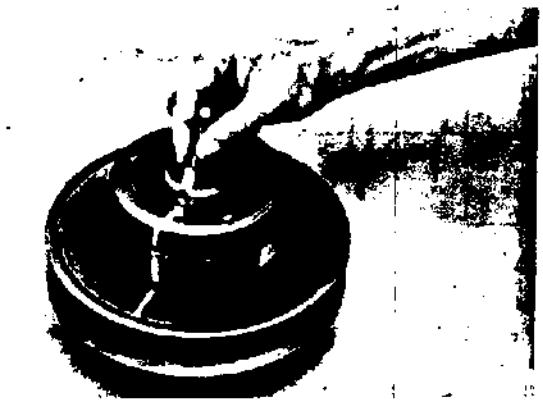
REMOVAL:

1. Adjust motor base to extreme forward position. Turn off motor. Remove belt from **QUADRA-KEY** pulley.
2. Loosen collet draw bolt until it is backed off approximately 1/4".
3. Tap head of draw bolt firmly with a hammer until pulley becomes loose on the shaft.
   NOTE: If the pulley does not come loose after tapping the head of the draw bolt several times, a standard sheave puller may be used in following manner. Remove draw bolt and spacer and insert puller bolt into back end of pulley until it comes to rest against the collet. Position puller arms over **inboard** disc flange and **hand-tighten** bolt. Tap bolt with a hammer until **QUADRA-KEY** becomes loose on collet.
4. Remove puller and slide pulley and collet off shaft.

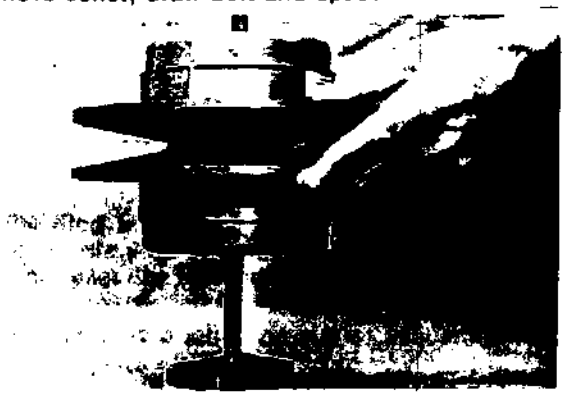
SERVICE:

—WARNING—

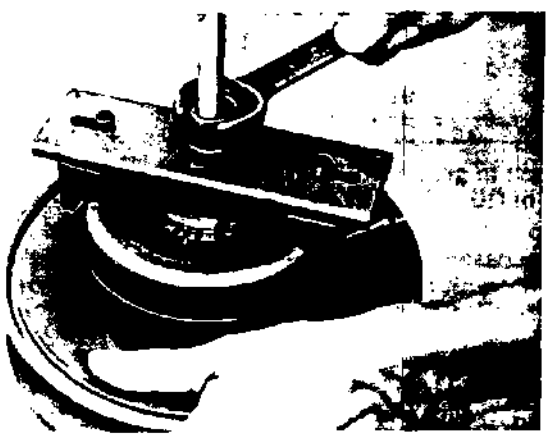
IMPROPER DISASSEMBLY MAY CAUSE INJURY. SPRING UNDER HIGH COMPRESSIVE LOAD. READ THE FOLLOWING INSTRUCTIONS COMPLETELY BEFORE DISASSEMBLING PULLEY.



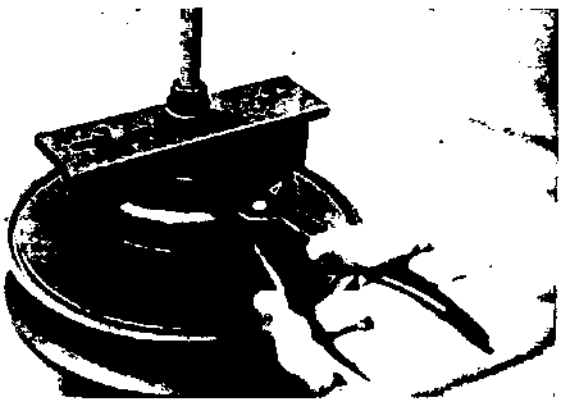
1. **IMPORTANT!** Before disassembly mark all parts so that they can be replaced in their same relative location or an unbalance condition will result.
2. Remove collet, draw bolt and spacer.



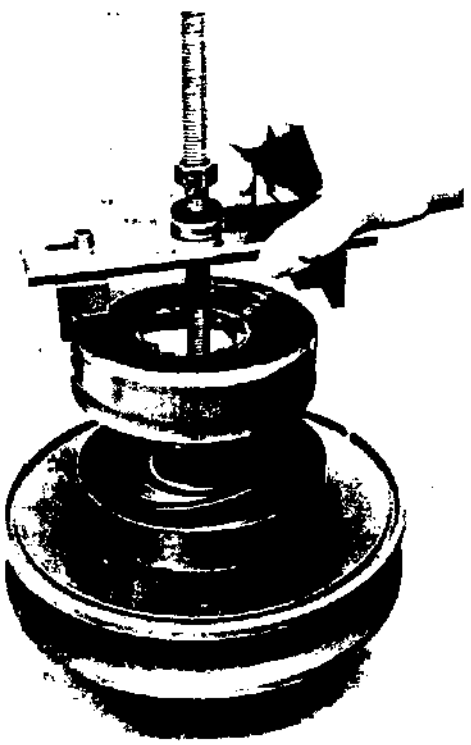
3. Insert **QUADRA-KEY** disassembly tool in bore of pulley. Adjust tool so that the tool will not interfere with the removal of the retaining ring on the hub.



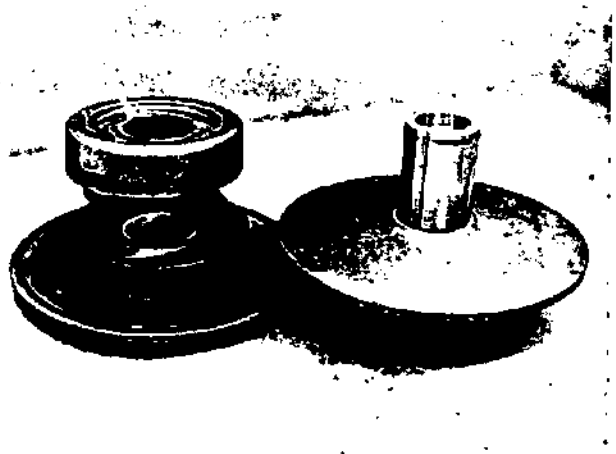
4. Compress spring can 1/8" by tightening nut on disassembly tool so that there is no load on the retaining ring.

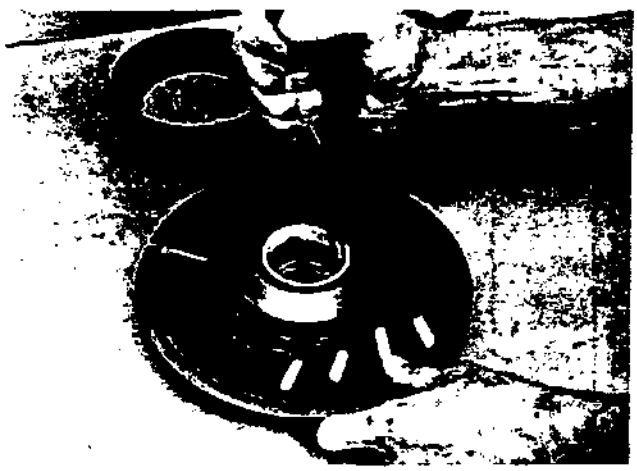


5. Remove retaining ring and back off on nut allowing spring to come to its free length and remove tool from pulley. Use Tru-Arc Plier No. 6.

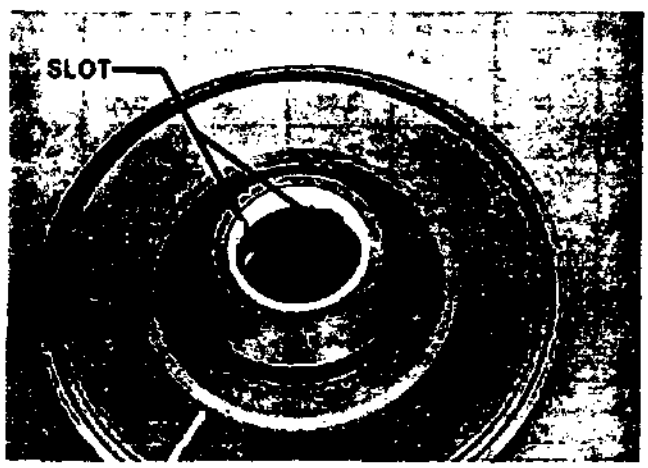


6. Slide spring covers, spring and one disc off of the hub. The opposite disc and spring will remain trapped between two retaining rings and will stay on the hub. Do not remove at this time.

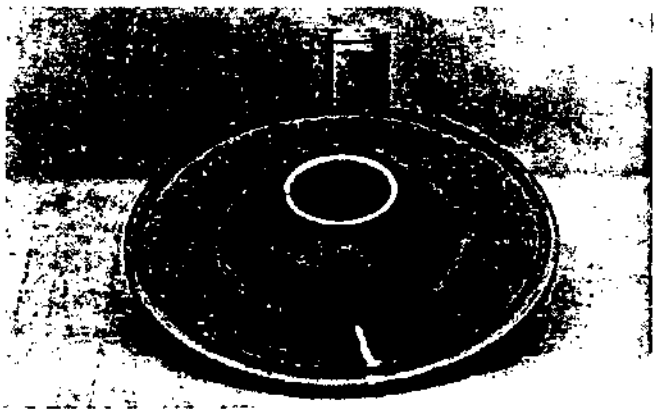




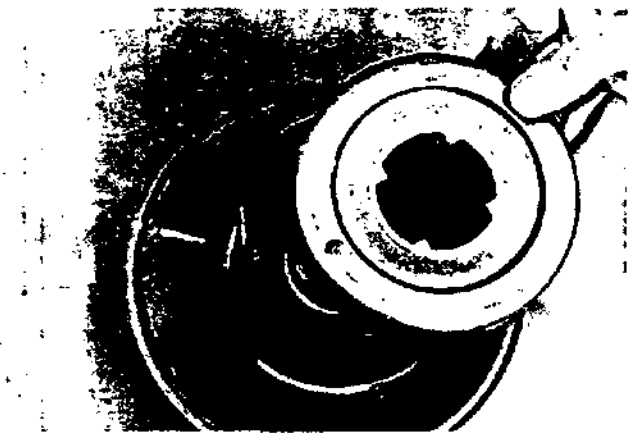
7. In the bore of the removed disc, there are four keys and two bushings. The keys will fall out. The bushings have an axial slot. They are removed by pulling bushing in towards the center of the hub starting at the slot.
8. Clean and inspect hub O.D. and disc bore. These should be free from scratches pitting or other damage. The hard anodized finish of the belt face of the disc should be free of major defects and not worn off.



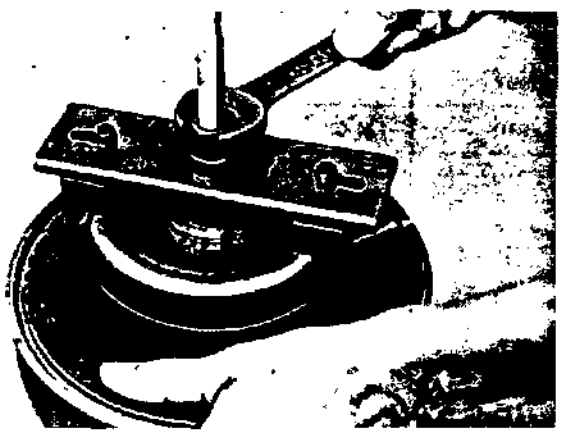
9. Install two new bushings. They will snap into the retaining groove in the disc. Position one bushing so slot is in line with keyway in the disc bore. Position second bushing so slot is in line with a keyway at 90° to the slot of the first bushing.



10. Install the new keys. Note that two edges of the keys are sharp corners while two are flat. Place flatted edge into disc keyway using small amount of grease to hold keys in place.
11. Grease the hub, align marks and slide disc onto hub.

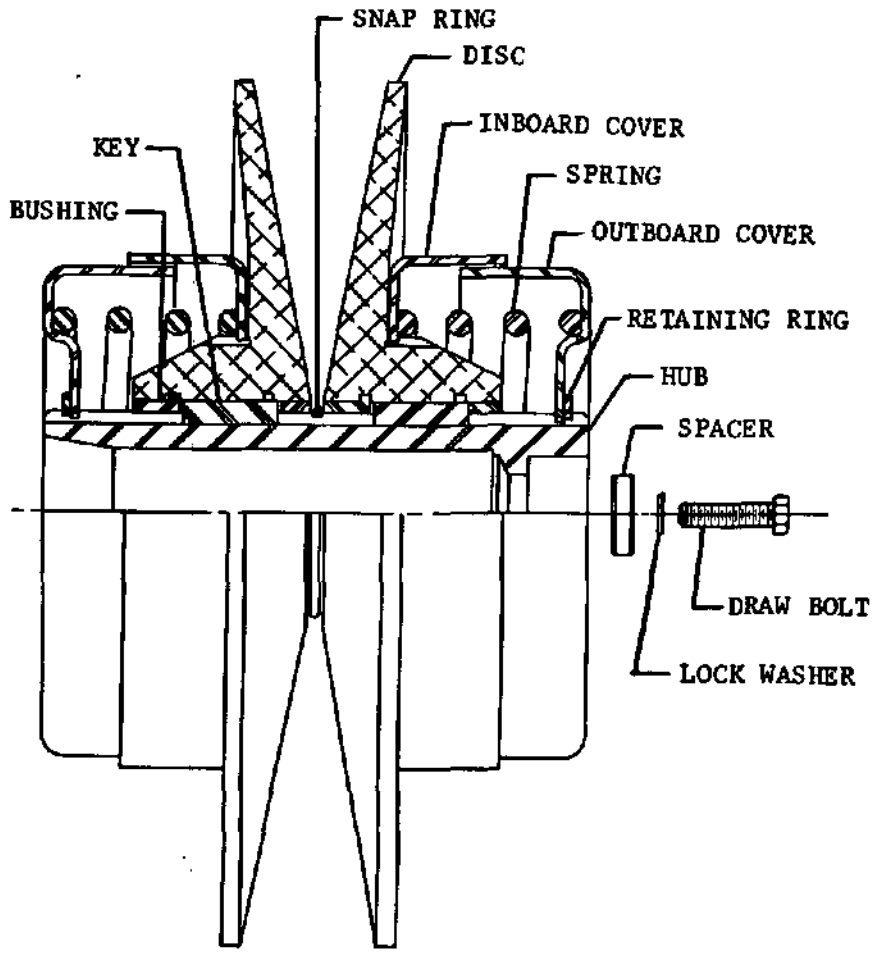


12. Place large diameter spring cover on disc. Set spring and outboard spring cover on inboard cover engaging the ends of the spring with the tabs on the covers. These tabs help align the covers for assembly. Make sure that the marks from Step #1 are aligned.
13. Insert the disassembly tool back into the hub and lay the retaining ring on the outboard can so that it can be installed later.



14. Using the disassembly tool, compress the spring taking care to align the projections on the outboard spring cover with the keyways in the hub.
15. Install retaining ring in the groove in the hub. Remove the disassembly tool from the pulley after making sure retaining ring is properly seated in groove.
16. Repeat Steps 1 through 15 for the other half of the pulley. The pulley can now be reinstalled by following the installation instructions.

PARTS AND PRICE LIST



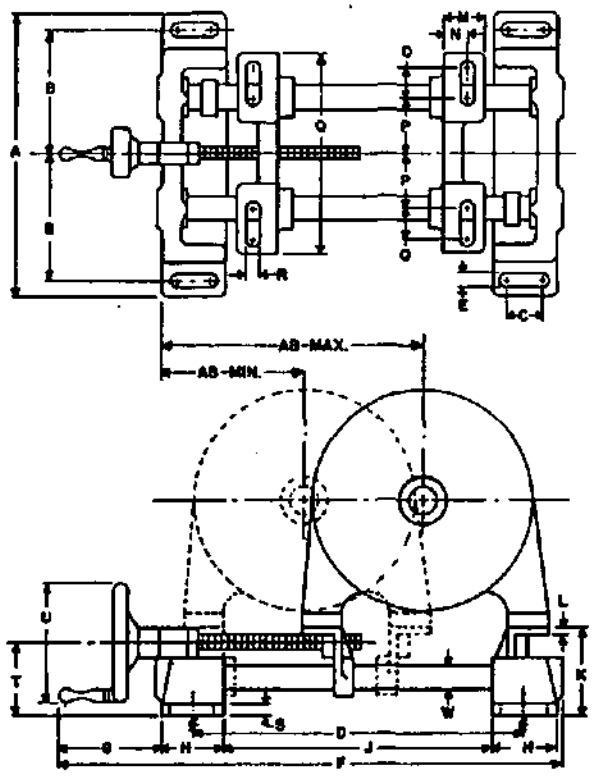
QUADRA-KEY MODEL	Disc	Hub	Inboard Cover	Outboard Cover	Spring	Retaining Ring	Snap Ring	Spacer	Draw Bolt	Lock-Washer	Bushing Set (4/Set)	Key Set (8/Set)
2303	$110.00	$ 91.00	$4.30	$6.50	$23.00	$2.00	$.50	$14.60	$2.40	$.30	$20.40	$5.80
2305	110.00	91.00	4.30	6.50	25.00	2.00	.50	14.60	2.40	.30	20.40	5.80
2905	131.00	100.00	5.90	6.50	25.00	2.00	.50	15.30	2.40	.30	21.20	7.10
2907	131.00	100.00	5.90	6.50	27.00	2.80	.50	15.30	2.40	.30	21.20	7.10
2910	131.00	100.00	5.90	6.50	29.00	2.80	.50	15.30	2.40	.30	21.20	7.10
3210	174.00	127.00	6.90	10.60	34.00	5.30	.50	17.30	2.40	.30	23.90	7.50
3215	174.00	127.00	6.90	10.60	36.00	5.30	.50	17.30	2.40	.30	23.90	7.50
3220	174.00	127.00	6.90	10.60	38.00	5.30	.50	17.30	2.40	.30	23.90	7.50
3225	174.00	127.00	6.90	10.60	40.00	5.30	.50	17.30	2.40	.30	23.90	7.50
3230	174.00	127.00	6.90	10.60	43.00	5.30	.50	17.30	2.40	.30	23.90	7.50
4410	182.00	127.00	6.90	10.60	34.00	5.30	.50	17.30	2.40	.30	23.90	9.20
4415	182.00	127.00	6.90	10.60	36.00	5.30	.50	17.30	2.40	.30	23.90	9.20
4420	182.00	127.00	6.90	10.60	38.00	5.30	.50	17.30	2.40	.30	23.90	9.20
4425	182.00	127.00	6.90	10.60	40.00	5.30	.50	17.30	2.40	.30	23.90	9.20
4430	182.00	127.00	6.90	10.60	43.00	5.30	.50	17.30	2.40	.30	23.90	9.20

NOTES: 1. SPECIFY PULLEY MODEL NUMBER AND PART NAME WHEN ORDERING.
2. ALL PULLEYS DYNAMICALLY BALANCED. IF EITHER DISC OR SPRING REPLACED, PULLEY MUST BE RE-BALANCED.

Base No.	N.E.M.A. Frame	Pulley No.	Wt. in Lbs.	DIMENSIONS IN INCHES																		
				A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	W
1B	56 ,66 143T, 182 145T, 184	56S, 56T 145S, 145T 182S, 182T	22	10½	4⅝	1¼	11¾	7/16	17⅛	2⅝	2⅛	9¼	3⅜	5/16	1⅜	15/16	1¾	1½	7¾	7/16	7/16	2⅞	4	1
2B	182T, 213 184T, 215 213T	182S, 182T 184S, 184T 213S, 213T	26	10½	4⅝	1¼	15¾	7/16	21⅛	2⅝	2½	13¼	3⅜	⅜	2	1	1¼	2¼	9	½	7/16	2⅞	4	1
3B	254U, 215T 256U, 254T	213S, 213T 215S, 215T 254S, 254T	60	14½	6⅜	2	18	⅝	25⅞	4	3⅝	14¼	4	⅝	2¼	1¼	2	3⅛	12¼	9/16	¾	3⅝	6	1¼
4B	284U, 256T 286T, 286U 284T, 324U	254S, 254T 256S, 256T 284S, 284T	121	20	9	2½	20¾	¾	29⅝	4¼	4½	16¼	5	¾	3	1¾	1¾	4¼	15½	¾	⅞	4½	6	1¾

"AB" MINIMUM AND MAXIMUM DIMENSIONS

Base No.	N.E.M.A. MOTOR FRAME NUMBER																					
	OLD									NEW												
	66	203	204	224	225	254	284	324	326	56	143T	145T	182 182T	184 184T	213 213T	215 215T	254U 254T	256U 256T	284U 284T	286U 286T	324U	326U
1B	4½ 10⅞	5 9/16 9 9/16	5 9/16 9 9/16							4 10⅞	4 5/16 10 9/16	4 5/16 10 9/16	5 5/16 9 9/16	5 5/16 9 9/16	5 11/16 9 9/16							
2B	4 5/16 11 9/16	5⅛ 12⅝	5⅛ 12⅝	5⅞ 12 11/16	5⅞ 12 11/16							4⅝ 11⅞	5⅜ 12⅞	5¼ 12⅝	5⅝ 12⅞	5⅝ 12⅞						
3B			5 15/16 14 1/16	6 7/16 14 9/16	6 7/16 14 9/16	6 15/16 14 13/16	7 7/16 14 15/16									6 3/16 14 5/16	6 15/16 14 13/16	6 15/16 14 13/16	7 7/16 14 15/16			
4B							8 15/16 17¼	9 11/16 16½	9 11/16 16½									8½ 17	8 15/16 17¼	8 15/16 17¼	9 11/16 16½	9 11/16 16½



Base NO. 3B
Customer P.O.
Gerbing S.O.
Date By

GERBING MANUFACTURING CORPORATION
ELGIN, ILLINOIS

DRAWN GT
CHECKED
DATE 2-72
SCALE none
MATERIAL
TOLERANCES UNLESS OTHERWISE NOTED
FRACTIONAL
DECIMAL .XX ±.03 .XXX
ANGLE

TITLE CERTIFIED DIMENSIONS TYPE 'B' ADJ. MOTOR BASES

NO. A-20721-2

REVISIONS | DATE

20721-2

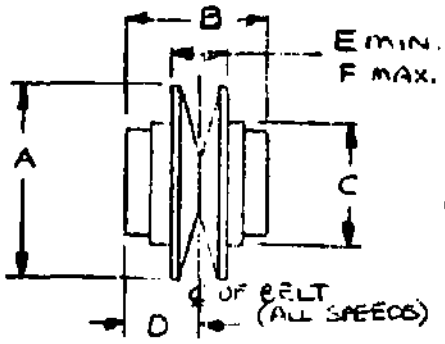
DO NOT SCALE

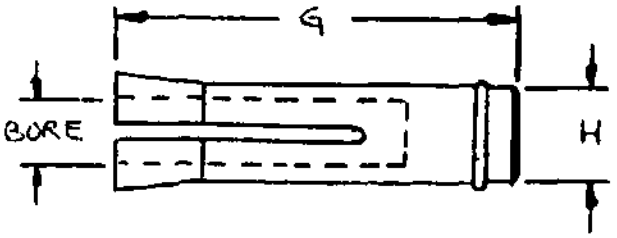
80008

CUSTOMER P.O. R7081

GERBING S.O. 2907 x 1-3/8

DATE 4/5/88 BY mpa





RECORD OF CHANGES

LETTER	CHANGE	BY & DATE	E. C. N.

MODEL	HP @ 1750 RPM	PITCH DIA. Max.	PITCH DIA. Min.	BELT SECTION	A	B	C	D	E	F	WEIGHT (lbs.)	COLLET NUMBER
2303	3	8.80	2.93	2322V	9.05	5.75	5.4	2.88	1.94	3	15	2300C
2305	5	8.80	2.93	2322V	9.05	5.75	5.4	2.88	1.94	3	15	2300C
2905	5	10.25	3.42	2926V	10.5	7.48	5.4	3.74	2.31	3.81	22	2900C
→ 2907	7.5	10.25	3.42	2926V	10.5	7.48	5.4	3.74	2.31	3.81	22	2900C
2910	10	10.25	3.42	2926V	10.5	7.48	5.4	3.74	2.31	3.81	22	2900C
4410	10	12.75	4.25	4430V	13	9.6	6.67	4.8	3.31	5.56	37	3244C
4415	15	12.75	4.25	4430V	13	9.6	6.67	4.8	3.31	5.56	37	3244C
4420	20	12.75	4.25	4430V	13	9.6	6.67	4.8	3.31	5.56	37	3244C
4425	25	12.75	4.25	4430V	13	9.6	6.67	4.8	3.31	5.56	37	3244C
4430	30	12.75	4.25	4430V	13	9.6	6.67	4.8	3.31	5.56	37	3244C
3210	10	12.1	6.0	3230HV	12.35	9.6	6.67	4.8	2.5	4.13	34	3244C
3215	15	12.1	6.0	3230HV	12.35	9.6	6.67	4.8	2.5	4.13	34	3244C
3220	20	12.1	6.0	3230HV	12.35	9.6	6.67	4.8	2.5	4.13	34	3244C
3225	25	12.1	6.0	3230HV	12.35	9.6	6.67	4.8	2.5	4.13	34	3244C
3230	30	12.1	6.0	3230HV	12.35	9.6	6.67	4.8	2.5	4.13	34	3244C

COLLET NUMBER	G	H	DEPTH OF ALL BORES	STOCK BORES
2300C	4.53	1.44	3.31	7/8, 1, 1-1/8
2900C	5.86	1.68	3.50	1, 1 1/8, 1-1/4, 1-3/8
3244C	7.71	2.18	4.75	1-1/8, 1-1/4, 1-3/8
3244C	7.71	2.18	6.30	1-5/8, 1-7/8

GERBING MANUFACTURING
FORMSPRAG COMPANY A DIVISION OF DANA CORPORATION
ELGIN, ILLINOIS 60120

GERBING Formsprag — DANA

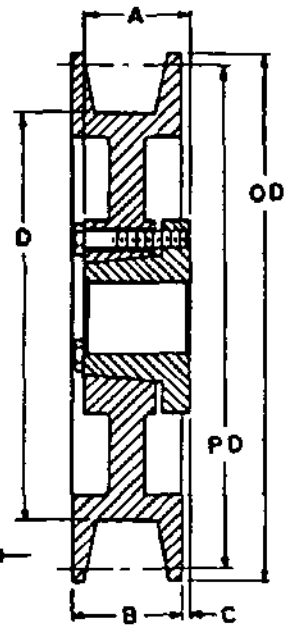
DRAWN: GT | CHECKED | DATE: 12-76 | MATERIAL | USED ON

TITLE: QUADRA-KEY PULLEY CERTIFIED DIMENSIONS

NO: A 80008

SPECIFICATIONS 3S-140

FOR 1922 SERIES BELT — ⅞" TOP WIDTH									FOR 1922 SERIES BELT — 1¹³⁄₁₆" TOP WIDTH							
Part No.	Pitch Dia.	Outside Dia.	A	B	C	D	Bushing	Wt.†	Part No.	Pitch Dia.	Outside Dia.	A	B	C	D	Bushing	Wt.†
S-55	5.25	5.5	1⅛	1⅛	⅛	4¼	JB	2.6	1S-60	5.75	6.0	1⅛	1¹³⁄₁₆	0	4½	JB	3.8
S-60	5.75	6.0	1⅛	1⅛	⅛	4¾	JB	3.3	1S-70	6.75	7.0	1⅛	1¹³⁄₁₆	0	5½	JB	5.0
S-70	6.75	7.0	1⅛	1⅛	⅛	5¾	JB	4.1	1S-80	7.75	8.0	1⅛	1¹³⁄₁₆	0	6½	JB	6.5
S-80	7.75	8.0	1⅛	1⅛	⅛	6¾	JB	5.3	1S-90	8.75	9.0	1⅛	1¹³⁄₁₆	0	7½	JB	8.0
S-90	8.75	9.0	1⅛	1⅛	⅛	7¾	JB	6.1	1S-100	9.75	10.0	1⅛	1¹³⁄₁₆	0	8½	JB	9.5
S-100	9.75	10.0	1⅛	1⅛	⅛	8¾	JB	7.4	1S-110	10.75	11.0	1⅛	1¹³⁄₁₆	0	9½	JB	10.8
S-110	10.75	11.0	1⅛	1⅛	⅛	9¾	JB	8.1	1S-120	11.75	12.0	1⅛	1¹³⁄₁₆	0	10½	JB	13.0
S-120	11.75	12.0	1⅛	1⅛	⅛	10¾	JB	8.8	1S-140	13.75	14.0	1¾	1¾	⅛	12½	SDS	14.8
S-140	13.75	14.0	1¾	1⅛	⅜	12¾	SDS	10.6	1S-160	15.75	16.0	1¾	1¾	⅛	14½	SDS	15.8
									1S-180	17.75	18.0	1¾	1¾	⅛	16½	SDS	18.0



FOR 2322 SERIES BELT — 1-7/16" TOP WIDTH									FOR 2520 SERIES BELT — 1-13/16" TOP WIDTH								
Part No.	Pitch Dia.	Outside Dia.	A	B	C	D	Bushing	Wt.†	Part No.	Pitch Dia.	Outside Dia.	A	B	C	D	Bushing	Wt.†
2S-75	7.25	7.5	1-7/16	1-11/16	— 1/16	6	SDS	8.0	3S-80	7.75	8.0	2	2-1/16	— 1/32	6-3/8	SD	10.0
2S-80	7.75	8.0	1-7/16	1-11/16	— 1/16	6-1/2	SDS	9.0	3S-90	8.75	9.0	2	2-1/16	— 1/32	7-3/8	SD	12.0
2S-90	8.75	9.0	1-7/16	1-11/16	— 1/16	7-1/2	SDS	9.5	3S-100	9.75	10.0	2	2-1/16	— 1/32	8-3/8	SD	14.5
2S-100	9.75	10.0	1-7/16	1-11/16	— 1/16	8-1/2	SDS	10.3	3S-110	10.75	11.0	2	2-1/16	— 1/32	9-3/8	SD	16.5
2S-110	10.75	11.0	1-7/16	1-11/16	— 1/16	9-1/2	SDS	12.0	3S-120	11.75	12.0	2	2-1/16	— 1/32	10-3/8	SD	18.0
2S-120	11.75	12.0	1-7/16	1-11/16	— 1/16	10-1/2	SDS	14.8	3S-140	13.75	14.0	2	2-1/16	— 1/32	12-3/8	SD	22.0
2S-140	13.75	14.0	1-7/16	1-11/16	— 1/16	12-1/2	SDS	16.0	3S-160	15.75	16.0	2	2-1/16	— 1/32	14-3/8	SD	25.0
2S-160	15.75	16.0	1-7/16	1-11/16	— 1/16	14-1/2	SDS	18.3	3S-180	17.75	18.0	2	2-1/16	— 1/32	16-3/8	SD	28.0
2S-180	17.75	18.0	1-7/16	1-11/16	— 1/16	16-1/2	SDS	20.5	3S-200	19.75	20.0	2	2-1/16	— 1/32	18-3/8	SD	32.0

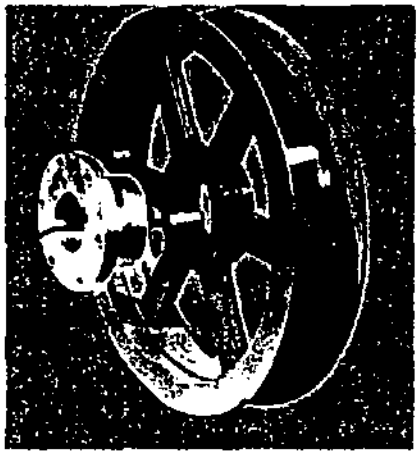
FOR 3230 SERIES BELT — 2" TOP WIDTH									FOR 4430 SERIES BELT — 2-3/4" TOP WIDTH								
Part No.	Pitch Dia.	Outside Dia.	A	B	C	D	Bushing	Wt.†	Part No.	Pitch Dia.	Outside Dia.	A	B	C	D	Bushing	Wt.†
3SS-80	7.75	8.0	2	2-1/4	— 3/16	6-3/8	SD	11.0	4S-110	10.75	11.0	2-1/16	3	— 1/4	8-7/8	SF	23.0
3SS-90	8.75	9.0	2	2-1/4	— 3/16	7-3/8	SD	13.0	4S-120	11.75	12.0	2-1/16	3	— 1/4	9-7/8	SF	25.3
3SS-100	9.75	10.0	2	2-1/4	— 3/16	8-3/8	SD	16.0	4S-125	12.25	12.5	2-1/16	3	— 1/4	10-3/8	SF	26.0
3SS-110	10.75	11.0	2	2-1/4	— 3/16	9-3/8	SD	18.0	4S-130	12.75	13.0	2-1/16	3	— 1/4	10-7/8	SF	27.3
3SS-120	11.75	12.0	2	2-1/4	— 3/16	10-3/8	SD	21.0	4S-140	13.75	14.0	2-1/16	3	— 1/4	11-7/8	SF	28.8
3SS-140	13.75	14.0	2	2-1/4	— 3/16	12-3/8	SD	24.0	4S-160	15.75	16.0	2-1/16	3	— 1/4	13-7/8	SF	34.0
3SS-160	15.75	16.0	2	2-1/4	— 3/16	14-3/8	SD	28.0	4S-180	17.75	18.0	2-1/16	3	— 1/4	15-7/8	SF	38.0
3SS-180	17.75	18.0	2	2-1/4	— 3/16	16-3/8	SD	31.0	4S-200	19.75	20.0	2-1/16	3	— 1/4	17-7/8	SF	43.0
3SS-200	19.75	20.0	2	2-1/4	— 3/16	18-3/8	SD	35.0	4S-220	21.75	22.0	2-1/16	3	— 1/4	19-7/8	SF	50.0
									4S-240	23.75	24.0	2-1/16	3	— 1/4	21-7/8	SF	60.0

†Weight based on average weight of bushing.

All GERBING Companion Sheaves are of precision machined rugged cast iron. Spoke type construction for reduced inertia. Dynamically balanced to assure vibration free operation. Precision groove angles to provide greater effective pulling power and increase belt life. Designed for use with standard QD-type bushings.

BUSHING SIZE	STOCK BORE RANGE*			
	MINIMUM	MAXIMUM		
		With Standard K.W.	With Shallow K.W.**	No. K.W.
JB	½	1⅛	1¾	—
SDS and SD	½	1¾	1¾	2
SF	½	2¼	2¼	2¾

*Available bores range from ½ to maximum in increments of ¼. **Furnished with rectangular key to fit standard keyway in shaft.



HOW TO INSTALL . . . The tapered, split part of the bushing is drawn into the sheave by three cap screws. Put the sheave and bushing together loosley, with the screws in place, and slip them onto the shaft as a unit. Tighten the screws until the bushing begins to grip the shaft but can still be moved easily. Align the sheave. Tighten the screws evenly and progressively. Tightening force on the screws is multiplied many times by the wedging action of the tapered surface. This action compresses the bushing for a snug fit on the shaft. If extreme screw tightening forces are applied in mounting the bushing, bursting pressures will be created in the hub of the sheave which may cause it to crack.

Never allow the flange of the bushing to be drawn in contact with the sheave. This gap should be from ⅛" to ¼".

HOW TO REMOVE . . . To remove the sheave remove the three cap screws and insert them as jackscrews in the tapped holes provided for that purpose. As the screws are turned in the jackscrew holes, they force the sheave from the split tapered bushing, removing pressure and permitting easy removal of the entire unit from the shaft.

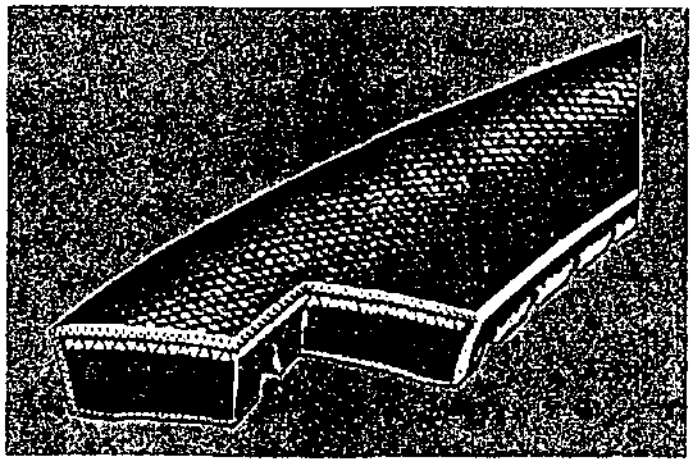
VARIABLE SPEED V-BELT

● The GERBING vari-speed V-belt is designed to provide greater speed variation and flexibility, and to withstand the lateral thrust of the spring loaded pulley discs while transmitting full power capacity.

These belts are made with specially developed synthetic compounds to provide optimum service under excessive oil, heat and static conditions.

Listed on this page are the standard GERBING vari-speed V-belt cross sections and pitch lengths with their corresponding part numbers.

Manufacturing tolerance on the pitch length of variable speed belts is ±1%.

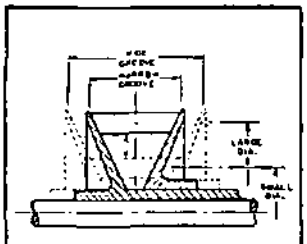


Note: To determine approximate minimum center distance for belts listed below, but not listed on Pulley General Dimension pages use the formula...

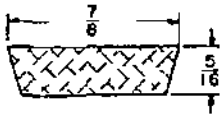
$$C = \frac{L}{2} - (D + d)\ .785$$

Where L = Pitch Length of Belt
D = Max. P.D. of variable speed Pulley
d = Pitch Dia. of Companion Sheave

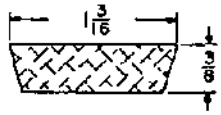
FOR ADDITIONAL BELT SELECTION REFER TO "GERBING VARIABLE SPEED BELT CATALOG"



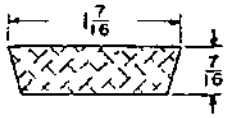
Lateral Rigidity, deep sidewalls and flexibility assure stability and high power transmitting capacity of the GERBING belt as it moves through the pitch diameter range as shown above. It can be noted from this sketch that the top width of the belt determines the amount of pitch diameter variation.



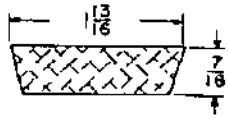
BELT NO.	PITCH LENGTH
1422V 300	30.0"
1422V 360	36.0
1422V 400	40.0
1422V 420	42.0
1422V 460	46.0
1422V 480	48.0
1422V 540	54.0
1422V 600	60.0
1422V 660	66.0
1422V 720	72.0
1422V 780	78.0



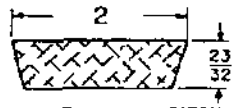
BELT NO.	PITCH LENGTH
1922V 256	25.6"
1922V 282	28.2
1922V 298	29.8
1922V 302	30.2
1922V 321	32.1
1922V 363	36.3
1922V 381	38.1
1922V 386	38.6
1922V 403	40.3
1922V 417	41.7
1922V 426	42.6
1922V 443	44.3
1922V 454	45.4
1922V 484	48.4
1922V 544	54.4
1922V 604	60.4
1922V 646	64.6
1922V 666	66.6
1922V 751	75.1
1922V 756	75.6
1922V 891	89.1



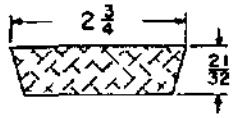
BELT NO.	PITCH LENGTH
2322V 364	36.4"
2322V 384	38.4
2322V 421	42.1
2322V 441	44.1
2322V 461	46.1
2322V 481	48.1
2322V 521	52.1
2322V 541	54.1
2322V 601	60.1
2322V 621	62.1
2322V 661	66.1
2322V 681	68.1
2322V 701	70.1
2322V 721	72.1
2322V 801	80.1
2322V 826	82.6
2322V 886	88.6
2322V 921	92.1
2322V 1001	100.1
2322V 1061	106.1



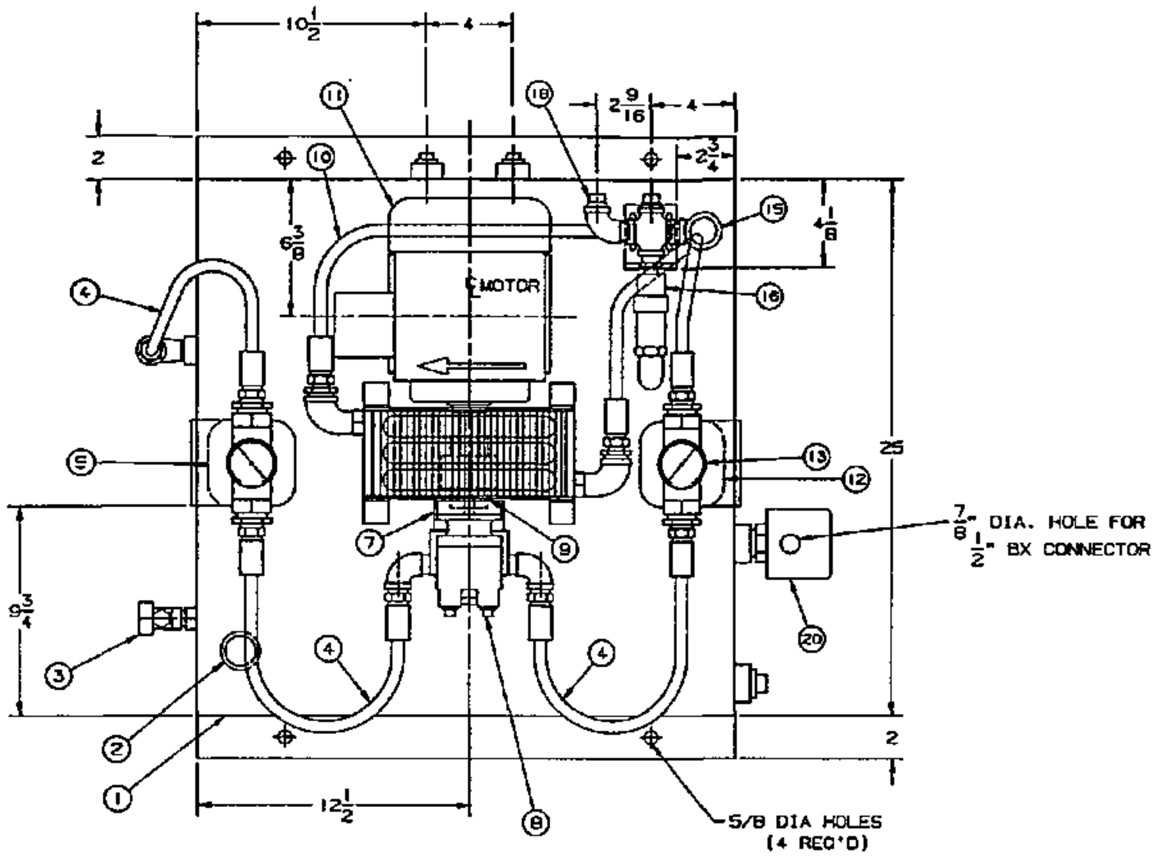
BELT NO.	PITCH LENGTH
2926V 366	36.6"
2926V 400	40.0
2926V 426	42.6
2926V 471	47.1
2926V 477	47.7
2926V 486	48.6
2926V 491	49.1
2926V 521	52.1
2926V 546	54.6
2926V 574	57.4
2926V 586	58.6
2926V 606	60.6
2926V 616	61.6
2926V 636	63.6
2926V 646	64.6
2926V 666	66.6
2926V 686	68.6
2926V 706	70.6
2926V 726	72.6
2926V 776	77.6
2926V 786	78.6
2926V 834	83.4
2926V 856	85.6
2926V 891	89.1
2926V 906	90.6
2926V 966	96.6
2926V 1006	100.6

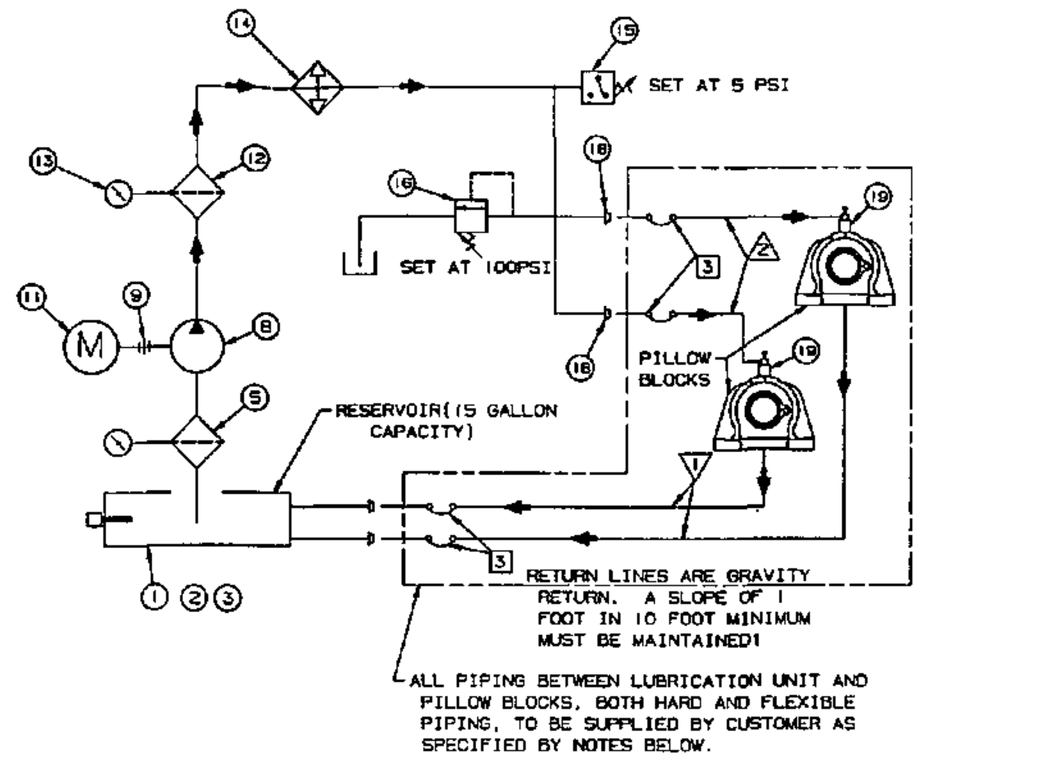


BELT NO.	PITCH LENGTH
3230HV 389	38.9"
3230HV 432	43.2
3230HV 528	52.8
3230HV 546	54.6
3230HV 553	55.3
3230HV 570	57.0
3230HV 585	58.5
3230HV 603	60.3
3230HV 613	61.3
3230HV 620	62.0
3230HV 626	62.6
3230HV 644	64.4
3230HV 656	65.6
3230HV 670	67.0
3230HV 685	68.5
3230HV 702	70.2
3230HV 723	72.3
3230HV 821	82.1
3230HV 856	85.6
3230HV 931	93.1
3230HV 960	96.0



BELT NO.	PITCH LENGTH
4430V 548	54.8"
4430V 555	55.5
4430V 578	57.8
4430V 610	61.0
4430V 630	63.0
4430V 660	66.0
4430V 670	67.0
4430V 690	69.0
4430V 700	70.0
4430V 730	73.0
4430V 740	74.0
4430V 772	77.2
4430V 790	79.0
4430V 850	85.0
4430V 910	91.0
4430V 970	97.0
4430V 1030	103.0
4430V 1090	109.0
4430V 1150	115.0
4430V 1320	132.0
4430V 1410	141.0

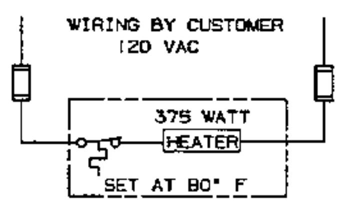




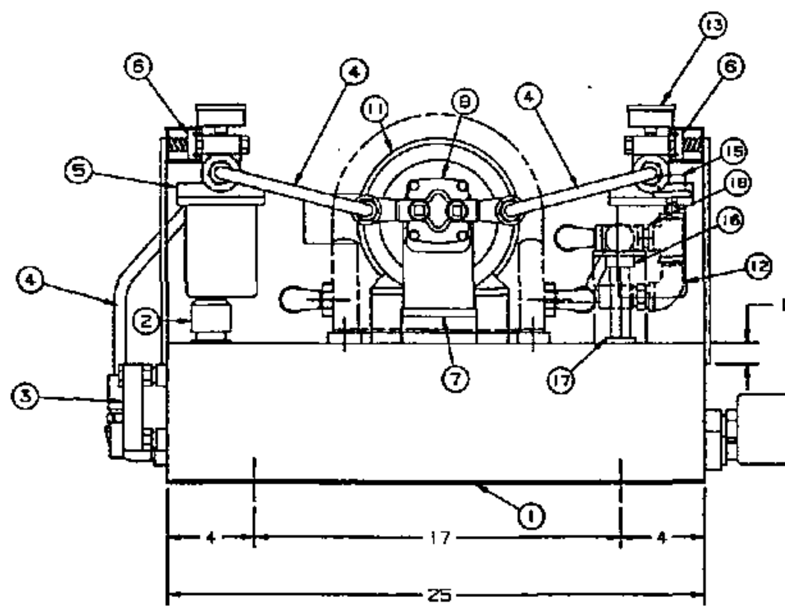
HYDRAULIC SCHEMATIC

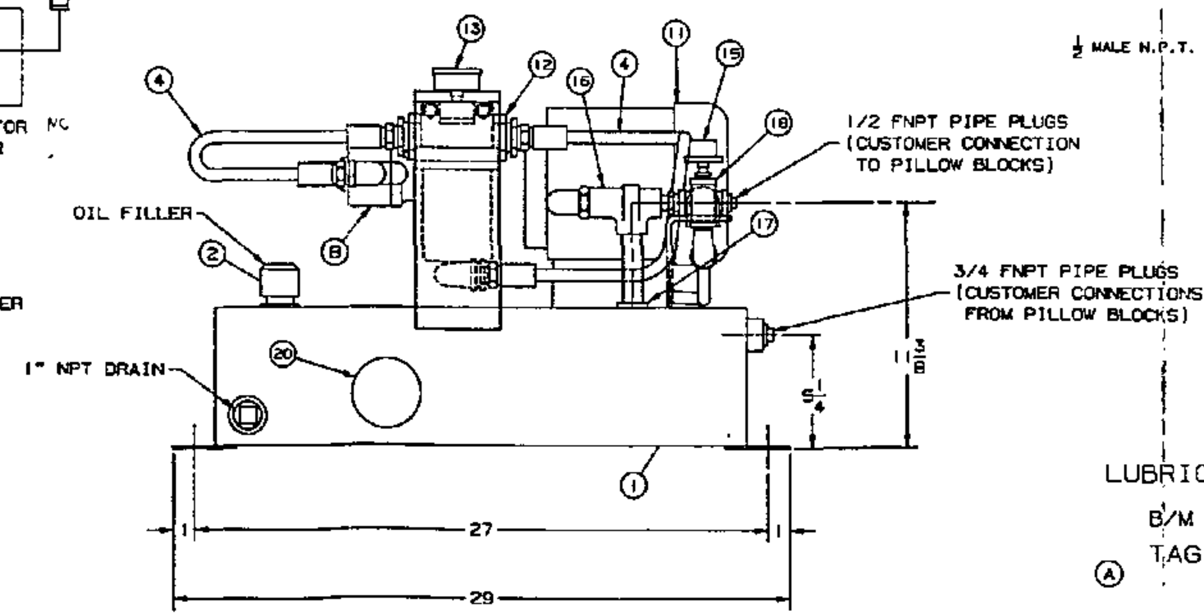
NOTES

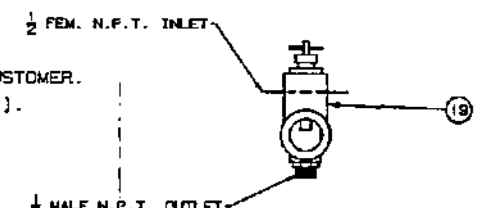
1. OIL RETURN LINES TO BE 1-1/2" NPT WITH A 1 FOOT IN 10 FOOT SLOPE MINIMUM.
2. OIL SUPPLY LINES TO BE 1/2" NPT, SCH. 80.
3. FLEXIBLE HOSE ASSEMBLIES REQUIRED BETWEEN LUBRICATION UNIT AND HAMMER MILL PILLOW BLOCKS(SUPPLIED BY CUSTOMER).
4. ALL PIPING BETWEEN LUBRICATION UNIT AND PILLOW BLOCKS SUPPLIED BY CUSTOMER.
5. OIL VISCOSITY TO BE 105-150 SSU AT OPERATING TEMPERATURES (160°-180°). OIL TO HAVE A "TIMKEN" OK LOAD OF 45 LBS. MINIMUM AND EP ADDITIVES.



WIRING SCHEMATIC FOR IMMERSION HEATER







PART	WHEN ORDERING REPAIRS GIVE (PART WANTED, ALSO QUANTITY, THIS DRAWING NUMBER AND MACHINE SERIAL NUMBER)	QUANTITY IN MACHINE
1	15 GALLON HYDRAULIC RESERVOIR	1
2	FILLER/BREATHER ASSEMBLY	1
3	FLUID LEVEL AND TEMPERATURE GAUGE	1
4	FLEXIBLE HOSE ASSEMBLIES	3
5	10 MICRON SUCTION FILTER WITH PRESSURE GAUGE (When ordering filter, specify entire assembly or replacement element only)	1
6	FILTER CLAMPING NUT WITH SPRING	4
7	HYDRAULIC PUMP MOUNTING BRACKET	1
8	HYDRAULIC PUMP	1
9	MOTOR COUPLING	1
10	FLEXIBLE HOSE ASSEMBLY	1
11	ELECTRIC MOTOR: 1 Hp, 1800 RPM, TEFC, 460 VOLTS, 60 Hz., 3 Ph.	1
12	10 MICRON HI PRESSURE FILTER (When ordering filter, specify entire assembly or replacement element only)	1
13	FILTER MOUNTED PRESSURE GAUGE 0-100 PSI, DUEL SCALE	1
14	AIR-TO-OIL HEAT EXCHANGER	1
15	HI - LOW OPTIONAL PRESSURE SWITCH	1
16	PRESSURE RELIEF VALVE	1
17	RESERVOIR MOUNTED OIL RETURN BUSHING FOR PRESSURE RELIEF VALVE	1
18	$\frac{1}{2}$ FNPT (2) OUTLET PIPE ASSEMBLY	1 SET
19	FLOW CONTROL/FLOW SIGHT VALVE TO BE MOUNTED ON BEARINGS	2
20	IMMERSION HEATER - .375 KW, 120 VOLTS	1

DIMENSIONS CERTIFIED FOR
WILLIS & PAUL GROUP
AES THAMES, INC.
CUST P.O. 008742-018HL
WILLIAMS PAT.CRUSHER & PULV.CO.INC
S.O. 18558,18563 S.O. 671451
APPD BY Dan Agee DATE 10-22-87

AES THAMES, INC.
THAMES CO-GENERATION PLANT
MONTVILLE, CONN.

B&V DRAWING NO.12713.61.0403.05-11027

LUBRICATION UNIT SERIAL No. 18558, 18563
B/M No. 1345E10114 REV. 0
TAG: 1BMC-OLU-1A; 1B

ALL	A	1-14-88	DA	ADD WILLIS & PAUL COMMENTS & TAG NO.

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
ST. LOUIS, MO.
141-E-9602
MODEL "E" LUBE UNIT (AIR TO OIL HEAT EXCHANGER)
DA 10-9-87 1/4"=1"
141-E-10114 A

RELIANCE ELECTRIC

Pulverizer

DATA TRANSMITTA AND CERTIFICATIO

REFER TO THIS NUMBE IN ALL CORRESPONDEN

CUSTOMER ORDER NO.	DATE	REQ. NO.	S.O. NO.
008742016HL	08/25/87		01MAF33492

OLD TO:
[redacted]ILLIS & PAUL GROUP
[redacted]-P CONVEYOR SYSTEMS DIV
66 FORD RD
DENVILLE N J 07834

SHIP TO:
SAME AS "SOLD TO" UNLESS SHOWN
N
S
T

DATA PROVIDED WITH THIS TRANSMITTAL AND CERTIFICATION IS:

- ☐ FOR CUSTOMER APPROVAL BY DATE: _____
  Return of approval prints by the above date is required to assure scheduled shipment. delay in return and/or revision of approval prints may require shipment reschedule. Return approved D/S to data source.
- ☒ FINAL, APPROVED FOR CONSTRUCTION OR INSTALLATION.
- ☐ PRELIMINARY, ENGINEERING IS COMPLETED.
- ☐ REVISED, SUPERSEDES DATA PREVIOUSLY ISSUED.
- ☐ SEE REMARKS.

TRANSMITTAL AND CERTIFICATION ISSUED BY: ACK DATE 10 19 87 CK BY _____ DATE _____

RELIANCE ELECTRIC CO.
COLLINS IND. DRIVE
ATHENS, GA 30613

DATE PRINTED: 10/16/87

ITEM	USED FOR	USERS PLANT	MOTOR OR GEN. D/S:
1-1			604961-12

QTY.	FRAME		SERV. FA	TYPE	R.P.M.	C BOX D/S
2	445T	150 HP	1.15	P B	1200	

PH/HZ/VOLTS-WINDING	DUTY	ENCLOSURE	AMB./INSL.	PWR. CODE	MOTOR OR GEN. C/D:
3/60 /460	CONT	TEFC-XEX	40 /F /FE		1575-BA (25)

BEARINGS	MOUNTING & METHOD OF DRIVE	RAILS OR BASE	MODEL NUMBER	REDUCER OR AUX D/S:
BALL	F1 CPLD	BASE		

ROTAT FROM OPP. DR. END	D-C FIELD EXCITATION	DOUBLE SHAFT EXTEN.	BRAKE OR AUX. D/S
CCW			

[redacted]CER STYLE	CLASS	FRAME	RATIO	OUTPUT RPM	ASSEMBLY	BLOWER MOTOR PH/HZ/VOLTS/HP

BRAKE TYPE	SIZE	RATING FT/LB	DUTY	P.O.

D-C MOTOR ARMATURE CURRENT: _____ AMPS
FIELD CHARACTERISTICS PER CURVE: _____
F_1—F_2 _____ MAX. AMPS _____ _____ RPM
F_{11}—F_{22} _____ MAX. AMPS _____ _____ RPM
F_3—F_4 _____ MAX. AMPS _____ _____ RPM

A-C MOTOR INFORMATION FOR SELECTION OF STARTER HEATERS:
CODE: G LOCKED AMPS: _____
F.L. CURRENT: 173. AMPS.

ADDITIONAL MOTOR OR GEN DATA:
LD LOC - STD
FR CONST RGD
SPCL MAIN C/B REQUIRED

SPECIAL FEATURES:
LIMESTONE PULVERIZER 1A(TAG1) LIMISTONE PULVERIZER 1B(TAG 1)
SHAFT SEALS (LIP TYPE) BOTH ENDS, CROUSE-HINDS TYPE ECD DRAI
OVERSIZE CONDUIT BOX, BURNDY LEAD LUGS, GREAST FITTINGS; 120
VOLT SPACE HEATERS, ROTATION ARROW, ROUTINE TEST AND REPORT,
CLASS FE INSULATION WITH "B" RISE AT BOTH 1.0 & 1.15 S.F.
EXTENDED WARRANTY

CERTIFIED DRAWINGS AND DATA:
APPR DWG 2 REP 8 PRNTS 11-6 OR
[redacted]& FIN DWG, 2 REP 8 PRNT 2
[redacted]KS AFTER RETURN APPR DWG &
MANL-2 COPIES FOR APPR 11-6 OR
B4 24 COPIES 2 WKS AFTER APPR
8 SETS P/L B6 11-6 OR B4

AES THAMES, INC.
THAMES CO-GENERATION PLANT
MONTVILLE, CONN.

B&V DRAWING NO.12713.61.0403.05-10085

REL. S.O.	FRAME	HP	TYPE	PHASE/ HERTZ	RPM	VOLTS
1MAF33492	445T	150	P	3/60	1189	460

AMPS	DUTY	AMB°C/ INSUL.	S.F.	NEMA DESIGN	CODE LETTER	ENCL.
173	CONT	40/F/FE	1.15	B	G	TEFC-XEX

E/S	ROTOR	TEST S.O.	TEST DATE	STATOR RES.@25°C OHMS (BETWEEN LINES)
599528	418143-71JE	---	---	.0323

PERFORMANCE

LOAD	HP	AMPERES	RPM	% POWER FACTOR	% EFFICIENCY
NO LOAD	0	60.8	1200	4.09	0
1/4	37.5	73.4	1197	51.7	92.8
2/4	75.0	101	1195	73.3	95.2
3/4	112	135	1192	81.8	95.6
4/4	150	173	1189	85.2	95.4
5/4	187	214	1186	86.3	94.9

SPEED TORQUE

	RPM	TORQUE % FULL LOAD	TORQUE LB.-FT.	AMPERES
LOCKED ROTOR	0	144	955	1085
PULL UP	350	132	875	1000
BREAKDOWN	1146	236	1565	606
FULL LOAD	1189	100	662	173

AMPERES SHOWN FOR 460. VOLT CONNECTION. IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE

REMARKS: TYPICAL DATA
XE MOTOR-NEMA NOM. EFF. 95.4%

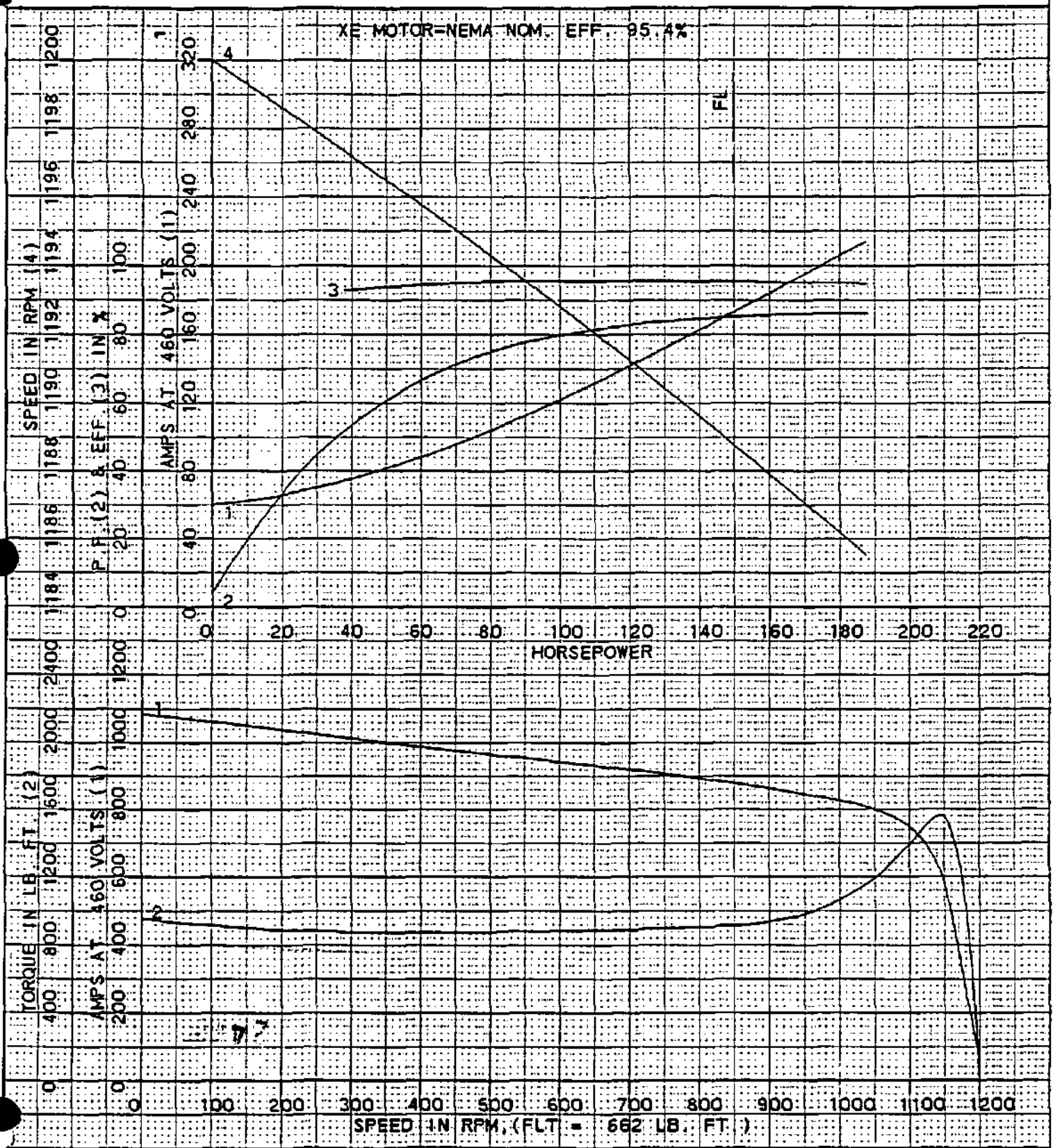
RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY D.M. BYRD
CK. BY D.M. BYRD
APP. BY J.P. TSAO
DATE 02/15/87

A-C MOTOR PERFORMANCE DATA E07705-A-B001
ISSUE DATE 02/15/87

File Y82899

REL S.O. 1MAF33492	RPM 1189	S.F. 1.15	ROTOR 418143-71JE
FRAME 445T	VOLTS 460	NEMA DESIGN B	TEST S.O. TYPICAL DATA
HP 150	AMPS 173	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE TEFC-XE	STATOR RES. @ 25°C .0323
PHASE/HERTZ 3/60	AMB°C/INSUL	E/S 599528	OHMS (BETWEEN LINES)



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY O.M. BYRD
CK. BY O.M. BYRD
APP. BY J.P. TSAO
DATE 02/15/87

A-C MOTOR PERFORMANCE CURVES

E07705-A-B001
ISSUE DATE 02/15/87

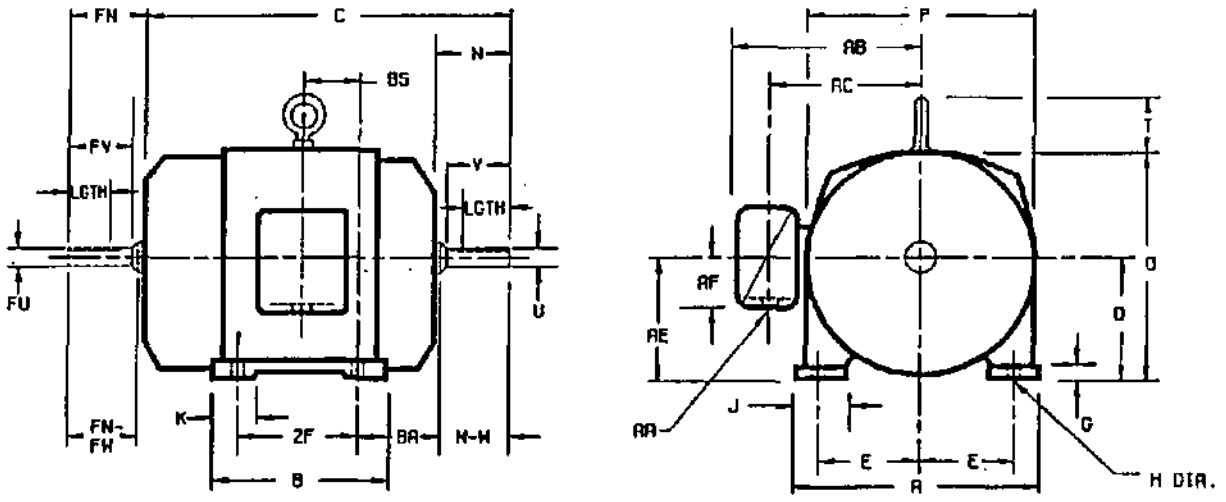
DUTY MASTER ALTERNATING CURRENT MOTORS

SQUIRREL-CAGE INDUCTION

ENCLOSURE: TOTALLY ENCLOSED **COOLING: FAN-COOLED**
MOUNTING: FOOT

OVERSIZE CONDUIT BOX STEEL

FRAMES 404T THRU 445TS



DIMENSIONS ARE IN INCHES

FRAME	A	D(2)	E	O	H	J	K	O	P	T	BA	AA	AB	AC	AF	AE
404T-405TS	19.00	10.00	8.00	1.12	.81	3.25	4.62	21.31	22.50	2.94	6.62	4	19.31	15.25	4.12	10.00
444T-445TS	21.00	11.00	9.00	1.12	.81	3.25	5.25	23.62	25.25	3.06	7.12	4	23.37	18.12	7.00	11.00
(1)																

FRAME	C	BS	B	2F	BACKEND SHAFT AND KEYWAY N	N-W	U(3)	V	LGTH	SQ. KEY	FRONT END SHAFT AND KEYWAY FN	FN-FW	FU(3)	FV	LGTH	SQ. KEY	WEIGHT
404T	38.31	6.88	16.00	12.25	7.62	7.25	2.875	7.00	5.62	.75	8.00	5.25	2.125	5.00	3.88	.50	975
404TS	35.31	6.88	16.00	12.25	4.62	4.25	2.125	4.00	2.75	.50	7.00	4.25	2.125	4.00	2.75	.50	975
405T	38.31	6.88	16.00	13.75	7.62	7.25	2.875	7.00	5.62	.75	8.00	5.25	2.125	5.00	3.88	.50	1100
405TS	35.31	6.88	16.00	13.75	4.62	4.25	2.125	4.00	2.75	.50	7.00	4.25	2.125	4.00	2.75	.50	1100
444T	44.62	8.25	19.00	14.50	8.94	8.50	3.375	8.25	6.88	.88	8.88	5.88	2.375	5.62	4.25	.62	1350
444TS	40.88	8.25	19.00	14.50	5.19	4.75	2.375	4.50	3.00	.62	7.75	4.75	2.375	4.50	3.00	.62	1350
445T	44.62	8.25	19.00	16.50	8.94	8.50	3.375	8.25	6.88	.88	8.88	5.88	2.375	5.62	4.25	.62	1500
445TS	40.88	8.25	19.00	16.50	5.19	4.75	2.375	4.50	3.00	.62	7.75	4.75	2.375	4.50	3.00	.62	1500
(1)																	

(1) SPECIAL DIMENSIONS ON THIS LINE.

(2) "D" VARIES +.00, -.06

(3) "U" & "FU" VARY 1.625 AND LARGER +.000,-.001

CONDUIT BOX LOCATED ON OPPOSITE SIDE WHEN F-2, W-1, W-4, W-5, W-7, OR C-1 MOUNTING IS SPECIFIED.

STANDARD DOUBLE SHAFT SUPPLIED ONLY WHEN SPECIFIED. IF MOUNTING CLEARANCE DETAILS ARE REQUIRED CONSULT FACTORY.

MAXIMUM PERMISSIBLE SHAFT RUNOUT WHEN MEASURED AT END OF STD. SHAFT EXTENSION IS .002 T.I.R. UP TO AND INCLUDING 1.625 DIA. AND .003 T.I.R. 1.625 TO 5 INCH DIA.

FRAME- _____ TYPE- _____ CERTIFIED FOR- _____ PLANT/UNIT- _____ QUANTITY- _____

ORDER- _____ ITEM- _____ HP- _____ RPM- _____ PH- _____ HZ _____ VOLTS _____

RELIANCE SALES ORDER- _____ APPROVED BY- _____ DATE _____

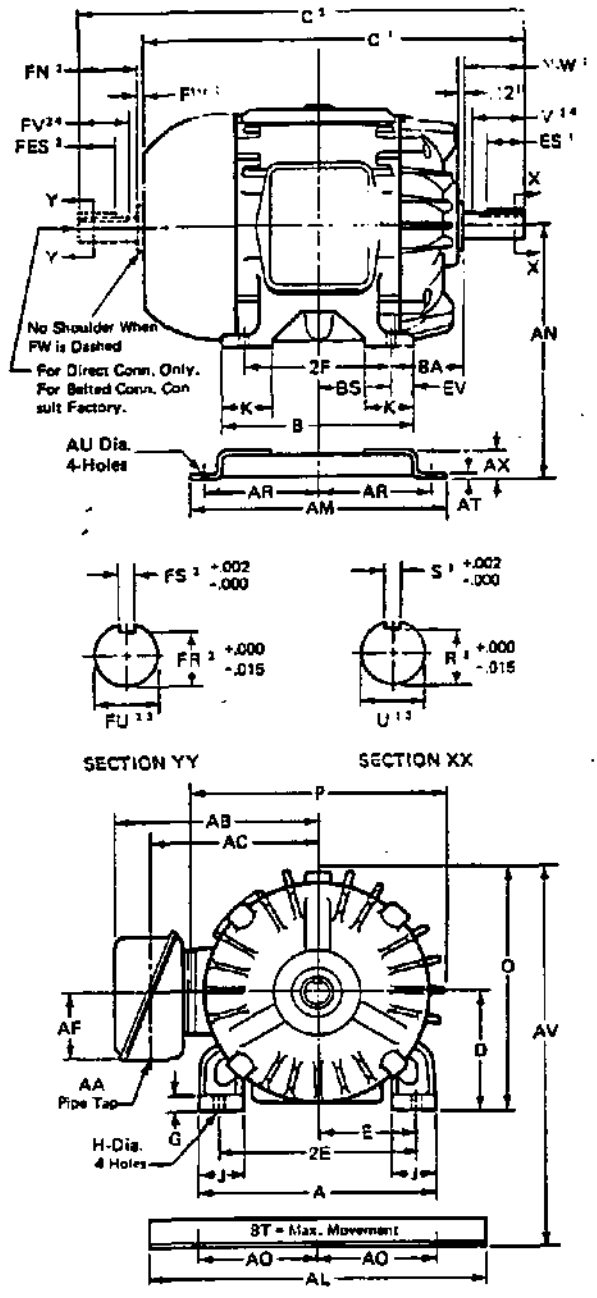
RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY DHM
CK. BY LTF
APP. BY TF
DATE 5-25-76

DIMENSION SHEET **604961-12**

ISSUE DATE: NOVEMBER 12, 1985

Antifriction Bearing (Belted or Direct Connection) FRAMES 143T-256T (No Ribs on Frames 143T-[illegible]T)



STANDARD DIMENSIONS — IN INCHES

FRAME	143T	145T	182T	184T	213T	215T	254T	256T
A	6.5	6.5	9.0	9.0	10.5	10.5	12.2	12.2
B	6.0	6.0	6.5	7.5	7.0	8.5	10.2	12.0
C ¹	12.4	13.4	14.4	15.4	18.1	19.6	21.4	23.1
D	3.50	3.50	4.50	4.50	5.25	5.25	6.25	6.25
E	2.75	2.75	3.75	3.75	4.25	4.25	5.00	5.00
2E	5.50	5.50	7.50	7.50	8.50	8.50	10.00	10.00
2F	4.00	5.00	4.50	5.50	5.50	7.00	8.25	10.00
G	.4	.4	.5	.5	.7	.7	.8	.8
H	.34	.34	.41	.41	.41	.41	.53	.53
J	1.0	1.0	1.8	1.8	2.0	2.0	2.4	2.4
K	—	—	—	—	—	—	2.8	2.8
N-W ¹	2.25	2.25	2.75	2.75	3.38	3.38	4.00	4.00
O	7.4	7.4	9.8	9.8	11.2	11.2	13.4	13.4
P	7.7	7.7	9.7	9.7	11.2	11.2	13.4	13.4
U ¹ ³	.875	.875	1.125	1.125	1.375	1.375	1.625	1.625
V ¹ ⁴	2.00	2.00	2.50	2.50	3.12	3.12	3.75	3.75
BA	2.25	2.25	2.75	2.75	3.50	3.50	4.25	4.25
AL	10.5	10.5	12.8	12.8	15.0	15.0	17.8	17.8
AM	7.5	8.5	9.5	10.5	11.0	12.5	15.1	16.9
AN	5.00	5.00	6.00	6.00	7.00	7.00	8.25	8.25
AO	3.75	3.75	4.50	4.50	5.25	5.25	6.25	6.25
AR	3.38	3.88	4.25	4.75	4.75	5.50	6.62	7.50
AT	.13	.13	.13	.13	.16	.16	.19	.19
AU	.38	.38	.50	.50	.50	.50	.62	.62
AV	8.8	8.8	11.3	11.3	12.6	12.6	15.0	15.0
AX	1.50	1.50	1.50	1.50	1.75	1.75	2.00	2.00
BS	2.00	2.50	2.25	2.75	2.75	3.50	4.12	5.00
BT	3.0	3.0	3.0	3.0	3.5	3.5	4.0	4.0
EV	1.00	.50	1.00	1.00	.75	.75	1.00	1.00
AA	.75	.75	.75	.75	1.00	1.00	1.25	1.25
AB	5.5	5.5	6.5	6.5	8.6	8.6	10.2	10.2
AC	4.5	4.5	5.5	5.5	7.0	7.0	8.2	8.2
AF	1.4	1.4	1.4	1.4	2.5	2.5	3.5	3.5
C ²	14.4	15.4	17.0	18.0	21.0	22.5	25.1	26.9
S ¹	.188	.188	.250	.250	.312	.312	.375	.375
R ¹	.771	.771	.986	.986	1.201	1.201	1.416	1.416
ES ¹	1.38	1.38	1.75	1.75	2.38	2.38	2.88	2.88
FS ²	.188	.188	.188	.188	.250	.250	.312	.312
FR ²	.517	.517	.771	.771	.986	.986	1.201	1.201
FES ²	.88	.88	1.38	1.38	1.75	1.75	2.38	2.38
FN ²	2.00	2.00	2.62	2.62	2.88	2.88	3.75	3.75
FU ² ³	.625	.625	.875	.875	1.125	1.125	1.375	1.375
FV ² ⁴	1.38	1.38	2.00	2.00	2.50	2.50	3.12	3.12
FW ²	.38	.38	.38	.38	.12	.12	.38	.38
Approx. Ship. Wt. Lbs.	45	55	85	100	130	160	241	276

Conduit box can be turned in steps of 90°. When conduit box is to be located on opposite side, same dimensions apply.

For direct connection, shims may be necessary under feet: 1/32" when dimension D is 8" or less; 1/16" when D is greater than 8".

¹ For single shaft extension motor only.

² For double shaft extension motor only.

³ Shaft limits for dimensions U and FU: up through 1-1/2" diameter, +.0000 - .0005"; above 1-1/2" diameter, + .000 - .001".

⁴ Shaft length available for coupling, pinion or pulley hub.

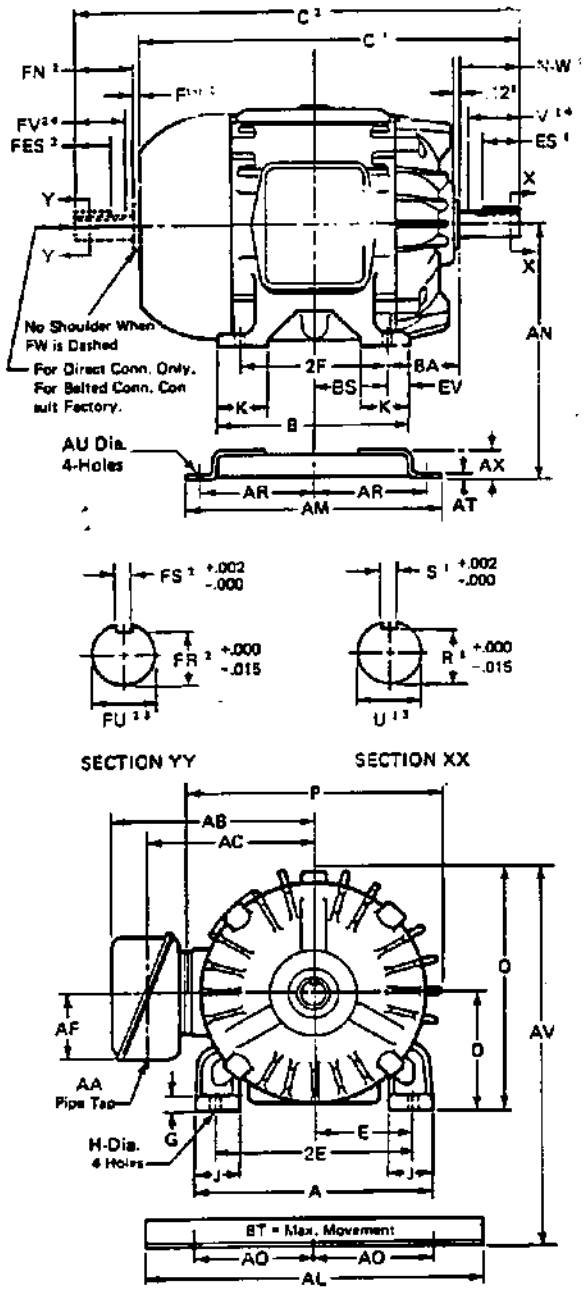
NOT FOR CONSTRUCTION, INSTALLATION OR APPLICATION PURPOSES UNLESS CERTIFIED

CERTIFICATION

CUSTOMER WILLIAMS PATENT CRUSHER
P.O. 300887 ITEM 2
S.O. _____ ITEM _____
H.P. 5 RPM 1200 FR. 215T
PH/HZ/VOLTS 3/60/230-460
BY DOT BRUMFIELD DATE 10-13-8

WITH 120V/1Ø SPACEHEATERS

Antifriction Bearing (Belted or Direct Connection)
FRAMES 143T-256T
(No Ribs on Frames 143T-145T)



CERTIFICATION

CUSTOMER WILLIAMS PATENT CRUSHER
P.O. 300887 ITEM 1
S.O. ITEM
H.P. 1 RPM 1800 FR 143T
PH/HZ/VOLTS 3/60/230/460
BY DOT BRUMFIELD DATE 10-13-87

STANDARD DIMENSIONS — IN INCHES

FRAME	143T	145T	182T	184T	213T	215T	254T	256T
A	6.5	6.5	9.0	9.0	10.5	10.5	12.2	12.2
B	6.0	6.0	6.5	7.5	7.0	8.5	10.2	12.0
C ¹	12.4	13.4	14.4	15.4	18.1	19.6	21.4	23.1
D	3.50	3.50	4.50	4.50	5.25	5.25	6.25	6.25
E	2.75	2.75	3.75	3.75	4.25	4.25	5.00	5.00
2E	5.50	5.50	7.50	7.50	8.50	8.50	10.00	10.00
2F	4.00	5.00	4.50	5.50	5.50	7.00	8.25	10.00
G	.4	.4	.5	.5	.7	.7	.8	.8
H	.34	.34	.41	.41	.41	.41	.53	.53
J	1.0	1.0	1.8	1.8	2.0	2.0	2.4	2.4
K	—	—	—	—	—	—	2.8	2.8
N-W ¹	2.25	2.25	2.75	2.75	3.38	3.38	4.00	4.00
O	7.4	7.4	9.8	9.8	11.2	11.2	13.4	13.4
P	7.7	7.7	9.7	9.7	11.2	11.2	13.4	13.4
U ³ ⁴	.875	.875	1.125	1.125	1.375	1.375	1.625	1.625
V ¹ ⁴	2.00	2.00	2.50	2.50	3.12	3.12	3.75	3.75
BA	2.25	2.25	2.75	2.75	3.50	3.50	4.25	4.25
AL	10.5	10.5	12.8	12.8	15.0	15.0	17.8	17.8
AM	7.5	8.5	9.5	10.5	11.0	12.5	15.1	16.9
AN	5.00	5.00	6.00	6.00	7.00	7.00	8.25	8.25
AO	3.75	3.75	4.50	4.50	5.25	5.25	6.25	6.25
AR	3.38	3.88	4.25	4.75	4.75	5.50	6.62	7.50
AT	.13	.13	.13	.13	.16	.16	.19	.19
AU	.38	.38	.50	.50	.50	.50	.62	.62
AV	8.8	8.8	11.3	11.3	12.6	12.6	15.0	15.0
AX	1.50	1.50	1.50	1.50	1.75	1.75	2.00	2.00
BS	2.00	2.50	2.25	2.75	2.75	3.50	4.12	5.00
BT	3.0	3.0	3.0	3.0	3.5	3.5	4.0	4.0
EV	1.00	.50	1.00	1.00	.75	.75	1.00	1.00
AA	.75	.75	.75	.75	1.00	1.00	1.25	1.25
AB	5.5	5.5	6.5	6.5	8.6	8.6	10.2	10.2
AC	4.5	4.5	5.5	5.5	7.0	7.0	8.2	8.2
AF	1.4	1.4	1.4	1.4	2.5	2.5	3.5	3.5
C ²	14.4	15.4	17.0	18.0	21.0	22.5	25.1	26.9
S ¹	.188	.188	.250	.250	.312	.312	.375	.375
R ¹	.771	.771	.986	.986	1.201	1.201	1.416	1.416
ES ¹	1.38	1.38	1.75	1.75	2.38	2.38	2.88	2.88
FS ²	.188	.188	.188	.188	.250	.250	.312	.312
FR ²	.517	.517	.771	.771	.986	.986	1.201	1.201
FES ²	.88	.88	1.38	1.38	1.75	1.75	2.38	2.38
FN ²	2.00	2.00	2.62	2.62	2.88	2.88	3.75	3.75
FU ³ ⁴	.625	.625	.875	.875	1.125	1.125	1.375	1.375
FV ² ⁴	1.38	1.38	2.00	2.00	2.50	2.50	3.12	3.12
FW ²	.38	.38	.38	.38	.12	.12	.38	.38
Approx. Ship. Wt. Lbs.	45	55	85	100	130	160	241	276

Conduit box can be turned in steps of 90°. When conduit box is to be located on opposite side, same dimensions apply.

For direct connection, shims may be necessary under feet: 1/32" when dimension D is 8" or less: 1/16" when D is greater than 8".

¹ For single shaft extension motor only.

² For double shaft extension motor only.

³ Shaft limits for dimensions U and FU: up through 1-1/2" diameter, +.0000 - .0005"; above 1-1/2" diameter, + .000 - .001".

⁴ Shaft length available for coupling, pinion or pulley hub.

NOT FOR CONSTRUCTION, INSTALLATION OR APPLICATION PURPOSES UNLESS CERTIFIED

MOTOR Lubrication Pump

SPEC 61.0403
PROJECT 12713

MOTOR DATA TO BE SUBMITTED

MANUFACTURER SIEMENS MODEL

HP 1 , VOLTS 460 , PHASE 3 , HERTZ 60

SERVICE FACTOR 1.15 , NEMA DESIGN LETTER B , FULL LOAD SPEED 1745 RPM

ENCLOSURE: TYPE RGZ-SD (TEFC) FRAME SIZE 143T

INSULATION SYSTEM: CLASS F STANDARD X SEALED , AMB TEMP 40° C

TEMP. RISE 80° C BY RESISTANCE AT SERVICE FACTOR OF 1.0 X , 1.15 .

FULL LOAD CURRENT 1.73 AMPS, LOCKED-ROTOR CURRENT 15.0 AMPS

SPACE HEATER (IF FURNISHED): NUMBER OF UNITS , UNIT RATING, WATTS

VOLTS , PHASE

BEARINGS: TYPE BALL AFBMA L-10 RATING LIFE, NOT LESS THAN 15 YEARS HRS

LUBRICATION: TYPE GREASE SYSTEM

SOUND LEVELS:

SOUND POWER LEVEL
RE 10^{-12} WATTS dBA
FREE FIELD
60 DBA AT 3FT

OVERALL MEAN NO-LOAD SOUND PRESSURE LEVEL
RE 20 MICROPASCALS (0.0002 MICROBAR) REFERENCE DISTANCE
OF 1 METER 2 METERS : dBA FREE FIELD

TOTAL MOTOR WT 45 LBS

FOR MULTISPEED MOTORS:
VARIABLE TORQUE , CONSTANT TORQUE , CONSTANT HORSEPOWER
MOTOR TERMINAL CONNECTION DIAGRAM NO. (ATTACH COPY OF DIAGRAM)

FOR WOUND ROTOR MOTORS:
SEC. VOLTS , SEC. AMPS , SEC. RES., OHMS M-M AT 25 C

FOR MOTORS IN HAZARDOUS LOCATIONS:
MOTOR ENCLOSURE SURFACE TEMPERATURE. C AT SERVICE FACTOR OF 1.0 1.15 .
WILL MOTOR CONTAIN A SURFACE TEMPERATURE CONTROL THERMOSTAT REQUIRING CONNECTION INTO THE MOTOR STARTER CONTROL CIRCUIT: YES , NO

FOR DUST IGNITION-PROOF MOTORS: MOTOR ENCLOSURE SURFACE TEMPERATURE RISE UNDER ANY ABNORMAL OPERATING CONDITION INCLUDING OVERLOAD, SINGLE-PHASING, ETC., ASSUMING ENCLOSURE SURFACE TEMPERATURE OF 120 C WHEN ABNORMAL CONDITION DEVELOPS:

MINIMUM TIME TO REACH 165 C SECS

MAXIMUM RATE OF RISE C IN 5 SECS

ADDITIONAL MOTOR DATA FOR MOTORS LARGER THAN 200 HP AND FOR ALL MOTORS RATED ABOVE 600 VOLTS SHALL BE SUBMITTED ON SHEETS 2 AND 3.

BLACK & VEATCH
CONSULTING ENGINEERS

SHEET 1 OF 3

MOTOR
INFORMATION SHEET

SIEMENS-ALLIS

Small Motor Division

Siemens-Allis, Inc.
14000 Dineen Drive,
Little Rock, Arkansas 72206
Telephone 501-897-4905

SIEMENS-ALLIS
ELECTRICAL MOTOR DATA

CUSTOMER: WILLIAMS PATENT CRUSHER

CUSTOMER'S ORDER NO.: 300887

SERIAL NO. _____

TYPE & ENCLOSURE:	RGZ (TEFC)
HORSEPOWER:	1
VOLTS:	460
PHASE	3
HERTZ:	60
FRAME:	143T
SYNCHRONOUS R.P.M.:	1800
FULL LOAD R.P.M.	1745
EFFICIENCY:	
1/2 Load:	60.5
3/4 Load:	68.5
FULL LOAD:	72.0
POWER FACTOR:	
1/2 Load:	54.5
3/4 Load:	66.5
FULL LOAD:	75.0
FULL LOAD AMPS:	1.73
LOCKED ROTOR AMPS:	15.0
FULL LOAD TORQUE-LB. FT.:	3.0
STARTING TORQUE-LB. FT.:	8.3
PULLOUT TORQUE-LB. FT.:	9.0
INSULATION:	F
SERVICE FACTOR	1.15
AMBIENT TEMPERATURE:	40°C

MOTOR Spinner Separator

SPEC 61.0403
PROJECT 12713

MOTOR DATA TO BE SUBMITTED

MANUFACTURER SIEMENS MODEL _____

HP 5 . VOLTS 460 . PHASE 3 . HERTZ 60

SERVICE FACTOR 1.15 . NEMA DESIGN LETTER B . FULL LOAD SPEED 1745 RPM

ENCLOSURE: TYPE RGZ-SD(TEFC) FRAME SIZE 184T

INSULATION SYSTEM: CLASS F STANDARD X SEALED ____, AMB TEMP 40° C

TEMP. RISE 80° C BY RESISTANCE AT SERVICE FACTOR OF 1.0 X . 1.15 ____ .

FULL LOAD CURRENT 6.72 AMPS, LOCKED-ROTOR CURRENT 46.0 AMPS

SPACE HEATER (IF FURNISHED): NUMBER OF UNITS ____ . UNIT RATING, WATTS 30

VOLTS 115 . PHASE 1

BEARINGS: TYPE BALL AFBMA L-10 RATING LIFE, NOT LESS THAN _____ HRS

LUBRICATION: TYPE GREASE SYSTEM _____

SOUND LEVELS:

SOUND POWER LEVEL
RE 10^{-12} WATTS _____ dBA
FREE FIELD 64 DBA AT 3 FT

OVERALL MEAN NO-LOAD SOUND PRESSURE LEVEL
RE 20 MICROPASCALS (0.0002 MICROBAR) REFERENCE DISTANCE
OF 1 METER _____ 2 METERS _____ ; _____ dBA FREE FIELD

TOTAL MOTOR WT 100 LBS

FOR MULTISPEED MOTORS:
VARIABLE TORQUE _____ . CONSTANT TORQUE _____ . CONSTANT HORSEPOWER _____
MOTOR TERMINAL CONNECTION DIAGRAM NO. _____ (ATTACH COPY OF DIAGRAM)

FOR WOUND ROTOR MOTORS:
SEC. VOLTS _____ . SEC. AMPS _____ . SEC. RES., OHMS M-M AT 25 C _____

FOR MOTORS IN HAZARDOUS LOCATIONS:
MOTOR ENCLOSURE SURFACE TEMPERATURE _____ C AT SERVICE FACTOR OF 1.0 _____ 1.15 _____ .
WILL MOTOR CONTAIN A SURFACE TEMPERATURE CONTROL THERMOSTAT REQUIRING CONNECTION INTO THE MOTOR STARTER CONTROL CIRCUIT: YES _____ . NO _____

FOR DUST IGNITION-PROOF MOTORS: MOTOR ENCLOSURE SURFACE TEMPERATURE RISE UNDER ANY ABNORMAL OPERATING CONDITION INCLUDING OVERLOAD, SINGLE-PHASING, ETC., ASSUMING ENCLOSURE SURFACE TEMPERATURE OF 120 C WHEN ABNORMAL CONDITION DEVELOPS:

MINIMUM TIME TO REACH 165 C _____ SECS

MAXIMUM RATE OF RISE _____ C IN 5 SECS

ADDITIONAL MOTOR DATA FOR MOTORS LARGER THAN 200 HP AND FOR ALL MOTORS RATED ABOVE 600 VOLTS SHALL BE SUBMITTED ON SHEETS 2 AND 3.

ISSUED

BLACK & VEATCH CONSULTING ENGINEERS		SHEET 1 OF 3
	MOTOR INFORMATION SHEET	

SIEMENS-ALLIS

Small Motor Division

Siemens-Allis Inc
14000 Dineen Drive
Little Rock Arkansas 72206
Telephone 501-847-4905

SIEMENS-ALLIS
ELECTRICAL MOTOR DATA

CUSTOMER: WILLIAMS PATENT CRUSHER

CUSTOMER'S ORDER NO.: 300887

SERIAL NO. _____

TYPE & ENCLOSURE:	RGZ(TEFC)
HORSEPOWER:	5
VOLTS:	460
PHASE	3
HERTZ:	60
FRAME:	215T
SYNCHRONOUS R.P.M.:	1200
FULL LOAD R.P.M.	1150
EFFICIENCY:	
1/2 Load:	81.5
3/4 Load:	83.0
FULL LOAD:	82.5
POWER FACTOR:	
1/2 Load:	59.5
3/4 Load:	71.0
FULL LOAD:	77.0
FULL LOAD AMPS:	7.37
LOCKED ROTOR AMPS:	46.0
FULL LOAD TORQUE-LB. FT.:	22.8
STARTING TORQUE-LB. FT.:	34.2
PULLOUT TORQUE-LB. FT.:	49.1
INSULATION:	F
SERVICE FACTOR	1.15
AMBIENT TEMPERATURE:	40°C

SIEMENS

Installation • Operation • Maintenance

Instructions

Induction Motors
143-449 Frame

TABLE OF CONTENTS

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens Sales Office.

The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

SIEMENS

INDUSTRIAL MOTOR DIVISION

INTRODUCTION

THIS EQUIPMENT CONTAINS HAZARDOUS VOLTAGES, ROTATING PARTS AND HOT SURFACES. SEVERE PERSONAL INJURY OR PROPERTY DAMAGE CAN RESULT IF SAFETY INSTRUCTIONS ARE NOT FOLLOWED. ONLY QUALIFIED PERSONNEL SHOULD WORK ON OR AROUND THIS EQUIPMENT AFTER BECOMING THOROUGHLY FAMILIAR WITH ALL WARNINGS, SAFETY NOTICES, AND MAINTENANCE PROCEDURES CONTAINED HEREIN. THE SUCCESSFUL AND SAFE OPERATION OF THIS EQUIPMENT IS DEPENDENT UPON PROPER HANDLING, INSTALLATION, OPERATION AND MAINTENANCE.

QUALIFIED PERSON

For the purpose of this manual and product labels, a qualified person is one who is familiar with the installation, construction and operation of the equipment, and the hazards involved. In addition, he has the following qualifications:

a) Is trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.

b) Is trained in the proper care and a use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.

c) Is trained in rendering first aid.

DANGER

For the purpose of this manual and product labels, **DANGER** indicates death, severe personal injury or substantial property damage will result if proper precautions are not taken.

WARNING

For the purpose of this manual and product labels, **WARNING** indicates death, severe personal injury or substantial property damage can result if proper precautions are not taken.

CAUTION

For the purpose of this manual and product labels, **CAUTION** indicates minor personal injury or property damage can result if proper precautions are not taken.

INSPECTION

Care is taken at the factory to assure that the motor arrives at its destination in first class condition. If there is evidence of rough handling or damage in shipping, file a claim at once with the carrier and notify your Siemens Sales Office.

Examine the outside of the motor carefully for damage, with particular attention to conduit box, fans, and covers. Inspect and tighten all hardware and accessories which may have become loosened during shipping and handling. Turn the shaft by hand to be sure that it rotates freely. If the motor has been mishandled sufficiently to break external parts, the end shield should also be removed to check for internal damage unless the motor is explosion-proof. See warning below on explosion proof motors.

WARNING

Explosion-proof motors—these motors are constructed to comply with the U.L. Label Service Procedure Manual. When repairing and reassembling a motor that has an underwriter's label, it is imperative that the unit be reinspected and:

1. All original fits and tolerance be maintained.
2. All plugs and hardware be securely fastened.
3. Any parts replacements, including hardware, be accurate duplicates of the originals.

Repair work on explosion-proof motors can only be done by the original manufacturing or U.L. certified shops. Violations of any of the above items will invalidate the significance of the U.L. Label.

STORAGE

Motors must be stored in a clean, dry, well ventilated location free from vibration and rapid or wide temperature variations. If the unit is to be stored longer than three months, consult factory. Ball bearing motors are shipped from the factory properly lubricated and ready to operate. When in storage, the motor shaft must be turned several rotations every month and the bearing relubricated every year. On non-explosion-proof TEFC motors, a removable plug in the bottom of the frame or housing permits removal of accumulated moisture. Drain regularly if storage atmosphere results in formation of condensation.

INSTALLATION

Installation must be handled by qualified service or maintenance personnel. The motor foundation must rigidly support all four feet in the same plane. Place shims under the motor feet, as required, so they will not be pulled out of plane when mounting bolts are tightened. All wiring to the motor and control must be in accordance with the National Electrical Code and all local regulations. Before drive is connected, momentarily energize motor to check that direction of rotation is proper. For direct drive, accurate alignment is 0.004 inch/ft. (radius to dial indicator = one foot.)

Any change in shims requires rechecking alignment. When alignment is within limits, dowel two feet of each unit. When installing flat belt pulley, V-belt sheave, spur or helical pinion or chain drives, be certain that they are within NEMA limitations. Refer to NEMA motor and general standards, MG-1 14.07 and 14.42.

OPERATION

Repeated trial starts can overheat the motor and may result in motor burnout (particularly for across the line starting). If repeated trial starts are made, allow sufficient time between trials to permit heat to dissipate from windings and rotor to prevent overheating. Starting currents are several times running currents, and heating varies as the square of the current.

After installation is completed, but before motor is put in regular service, make an initial start as follows:

1. Check motor starting and control device connections against wiring diagrams.

2. Check voltage, phase, and frequency of line circuit (power supply) against motor nameplate.

3. If possible, remove external load (disconnect drive) and turn shaft by hand to ensure free rotation. This may have been done during installation procedure; if so, and conditions have not changed since, this check may not be necessary.

   a. If drive is disconnected, run motor at no load long enough to be certain that no unusual conditions develop. Listen and feel for excessive noise, vibration, clicking, or pounding. If present, stop motor immediately. Investigate the cause and correct before putting motor in service.

   b. If drive is not disconnected, interrupt the starting cycle after motor has accelerated to low speed. Carefully observe for unusual conditions as motor coasts to a stop.

4. When checks are satisfactory, operate at minimum load and look for unusual condition. Increase load slowly to maximum. Check unit for satisfactory operation.

CAUTION

Guard against overloading. Overloading causes overheating and overheating means shortened insulation life. A motor subjected to a 10°C temperature rise above the maximum limit for the insulation may cause the insulation life to be reduced by 50%. To avoid overloading, be sure motor current does not exceed nameplate current when nameplate voltage is applied.

Electric motors operating under normal conditions become quite warm. Although some places may feel hot to the touch, the unit may be operational within limits. Use a thermocouple to measure winding temperature when there is any concern.

The total temperature, not the temperature rise, is the measure of safe operation. Investigate the operating conditions if the total temperature measured by a thermocouple placed on the winding exceeds:

230°F (110°C) for class "B" insulation

275°F (135°C) for class "F" insulation

302°F (150°C) for class "H" insulation

VOLTAGE REGULATION

Motors will operate successfully under the following conditions of voltage and frequency variation, but not necessarily in accordance with the standards established for operation under rated conditions:

a. When the variation in voltage does not exceed 10% above or below normal, with all phases balanced.

b. When the variation in frequency does not exceed 5% above or below normal.

c. When the sum of the voltage and frequency does not exceed 10% above or below normal (provided the frequency variation does not exceed 5%).

MAINTENANCE

Failure to properly maintain the equipment can result in severe personal injury and product failure. The instructions contained herein should be carefully reviewed, understood and followed. The following maintenance procedures should be performed regularly:

1. Bearing lubrication

2. Insulation resistance check

3. Cleaning

This checklist *does not represent an exhaustive survey of maintenance steps necessary* to ensure safe operation of the equipment. Particular applications may require further procedures. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens Sales Office.

Dangerous voltages are present in the equipment which can cause severe personal injury and product failure. Always de-energize and ground the equipment before maintenance. Maintenance should be performed only by qualified personnel.

The use of unauthorized parts in the repair of the equipment, tampering by unqualified personnel, or removal or alteration of guards or conduit covers will result in dangerous conditions which can cause severe personal injury or equipment damage. Follow all safety instructions contained herein.

BEARING LUBRICATION

CAUTION

Do not lubricate motor while in operation, since excess grease will be forced through the bearings and into the motor before it will force its way out of the drain plug. Excess grease accumulation on windings reduces insulation life.

Bearing life is assured by maintaining proper alignment, proper belt or chain tension, and good lubrication at all times.

Prior to shipment, motor bearings are lubricated with the proper amount and grade to provide six months of satisfactory service under normal operation and conditions.

For best results, grease should be compounded from a polyurea base and a good grade of petroleum oil. It should be of No. 2 consistency and stabilized against oxidation. Operating temperature range should be from −15°F to + 250°F for class B insulation, and to +300°F for class F and H. Most leading oil companies have special bearing greases that are satisfactory.

Relubricate bearings every six months (more often if conditions require), as follows:

1. Stop the motor. Lock out the switch.
2. Thoroughly clean off pipe plugs and remove from housings.
3. Remove hardened grease from drains with stiff wire or rod.
4. Add grease to inlet with hand gun until small amount of new grease is forced out of drain.
5. Remove excess grease from ports, replace inlet plugs, and run motor ½ hour before replacing drain plug.
6. Put motor back in operation.

INSULATION RESISTANCE

Check insulation resistance periodically. Any approved method of measuring insulation resistance may be used, provided the voltage across the insulation is at a safe value for the type and condition of the insulation. A hand cranked megger of not over 500 volts is the most convenient and safest method. Standards of the Institute of Electrical and Electronics Engineers, Inc. (IEEE) recommend that the insulation resistance of stator windings at 75°C, measured at 500 volts DC, after one minute should not be less than:

$$\frac{\text{Rated Voltage of Machine} + 1000}{1000} = \text{Insulation Resistance In Megohms}$$

This formula is satisfactory for most checks. For more information, see IEEE Standard No. 43, "Recommended Practice for Insulation Resistance Testing of AC Rotating Machinery".

CLEANING

WARNING

Do not attempt to clean motor while it is operating. Contact with rotating parts can cause severe personal injury or property damage. Stop the motor and lock out switch before cleaning.

The motor exterior must be kept free of oil, dust, dirt, water, and chemicals. For fan cooled motors, it is particularly important to keep the air intake openings free of foreign material. Do not block air outlet or inlet.

On non-explosion-proof TEFC motors, a removable plug in the bottom center of the motor frame or housing permits removal of accumulated moisture. Drain regularly.

VERTICAL MOTOR THRUST BEARINGS

Top bearings — high external thrust from the driven unit is usually carried by the top bearing or bearings. If replacement is necessary, the new bearing must be the same size and type as the original. Duplex bearings must also be the same type and mounted in an identical manner. When angular contact type bearings are replaced, the new bearing must have the same thrust capacity.

Bottom bearings — grease lubricated lower bearings are adequately lubricated at the factory for at least three months operation. The relubrication procedure is the same as outlined above under "Bearing Lubrication". It is important to maintain the lower cavity full of grease at all times.

The correct replacement bearings are given on the nameplate by AFBMA (Anti-Friction Bearing Manufacturers Association) number.

SERVICE

For immediate action on your motor problems call your certified service center or contact your nearest Siemens District Office.

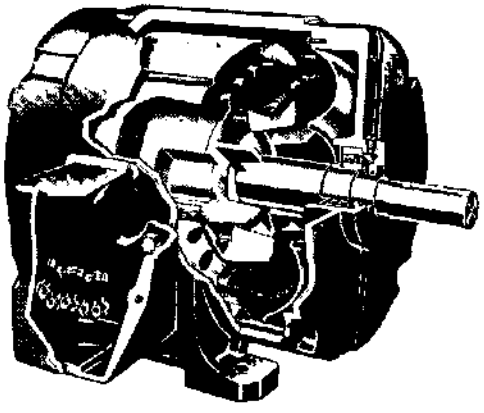
Siemens Energy & Automation, Inc.
Industrial Motor Division
14000 Dineen Drive
Little Rock, Arkansas 72206
(501) 897-4905

SIEMENS

Parts Lists

Horizontal
Induction Motors
143-449 Frame

SPARE PARTS



TYPE RG

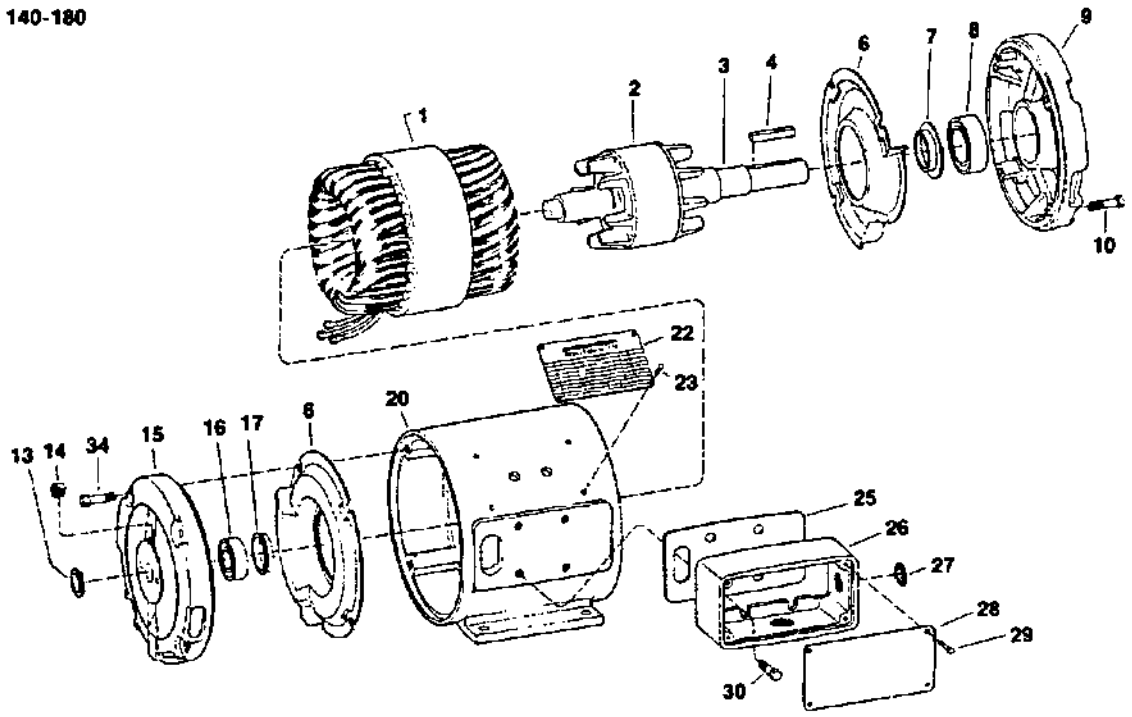
PARTS LIST

KEY NO.	PART NAME
1	Stator Assembly
2	Rotor Core
3	Shaft, Rotor
4	Key, Square
5	Cap, End - Rear (Stationary)
6	Deflector, Air
7	Cap, End - Rear (Rotating)
8	Bearing - Rear
9	Housing, Bearing - Rear
10	Bolt, Hex Head (Rear Bearing Housing)
11	Seal, Shaft
12	Bolt, Hex Head (Rear Bearing Cap)
13	Plug, End Cap
14	Plug, Pipe
15	Housing, Bearing - Front
16	Bearing - Front
17	Cap, End - Front (Rotating)
18	Cap, End - Front (Stationary)
19	Bolt, Hex Head (Front Air Deflector)
20	Yoke Stator
21	Eyebolt, Lifting
22	Plate, Rating
23	Pin, Escutcheon
24	Bolt, Hex Head (Air Deflector - Rear)
25	Gasket (Conduit Box to Yoke)
26	Box Conduit
27	Plug - Conduit Box
28	Cover, Conduit Box
29	Bolt, Hex Head (Conduit Box Cover)
30	Bolt, Hex Head (Conduit Box)
31	Bolt, Hex Head (Front Bearing Housing)
32	Bolt, Hex Head (Front Bearing Cap)
33	Gasket, Cond. Box Parting

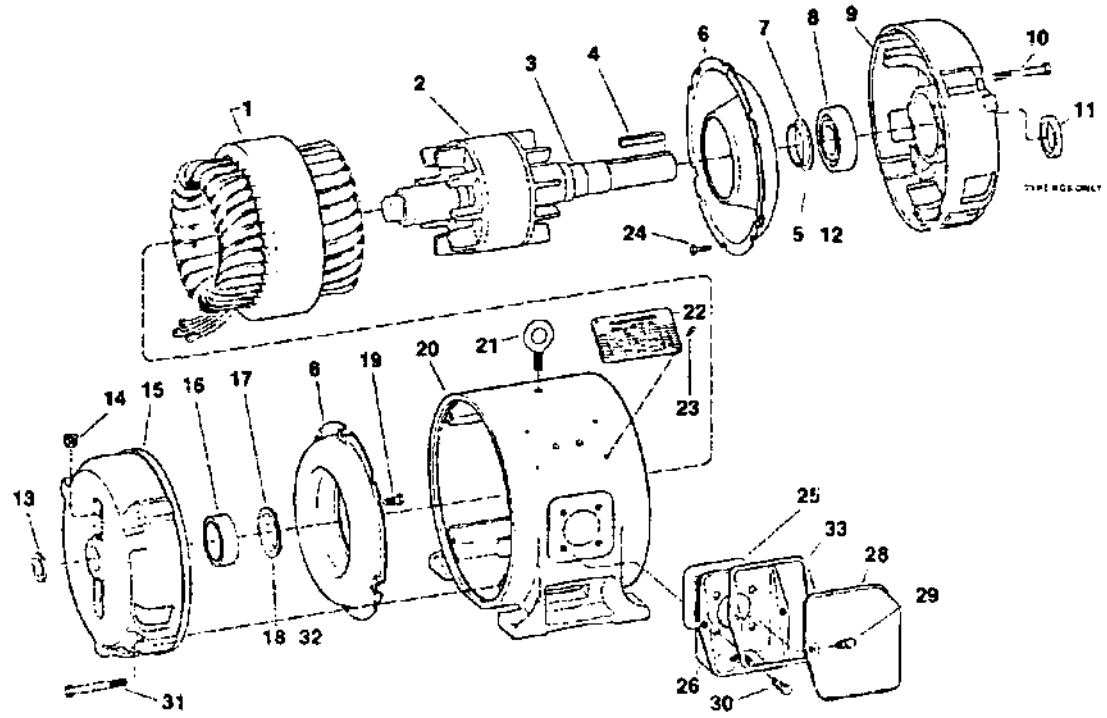
SPARE PARTS

TYPE RG

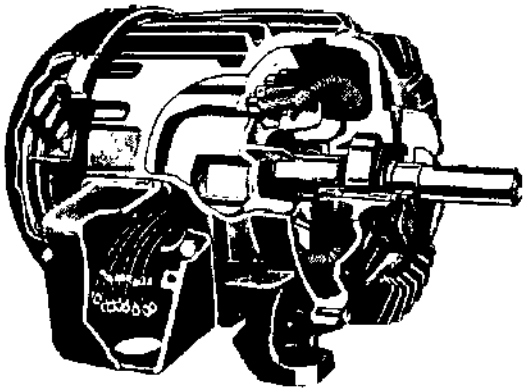
RG 140-180



RG 210-440



SPARE PARTS



TYPE RGZ

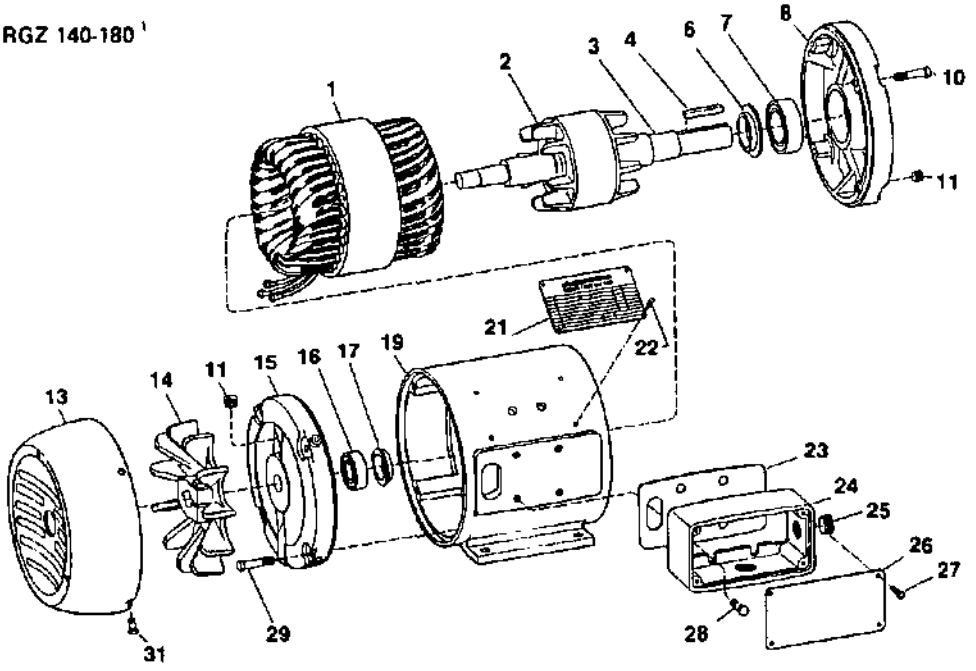
PARTS LIST

KEY NO.	PART NAME
1	Stator Assembly
2	Rotor Core
3	Shaft, Rotor
4	Key, Square
5	Cap, End - Rear (Stationary)
6	Cap, End - Rear (Rotating)
7	Bearing - Rear
8	Housing, Bearing - Rear
9	Seal, Shaft
10	Bolt, Hex Head (Rear Bearing Housing)
11	Plug, Pipe
12	Bolt, Hex Head (Rear Bearing Cap)
13	Bowl, Fan and Grid
14	Fan
15	Housing, Bearing - Front
16	Bearing - Front
17	Cap, End - Front (Rotating)
18	Cap, End - Front (Stationary)
19	Yoke Stator
20	Eyebolt, Lifting
21	Plate, Rating
22	Pin, Escutcheon
23	Gasket (Conduit Box to Yoke)
24	Box Conduit
25	Plug, Pipe Conduit Box
26	Cover, Conduit Box
27	Bolt, Hex Head (Conduit Box Cover)
28	Bolt, Hex Head (Conduit Box)
29	Bolt, Hex Head (Front Bearing Housing)
30	Bolt, Hex Head (Front Bearing Cap)
31	Bolt, Hex Head (Fan Bowl)
32	Coupling Pipe
33	Nipple Pipe
34	Gasket, Conduit Box Parting

SPARE PARTS

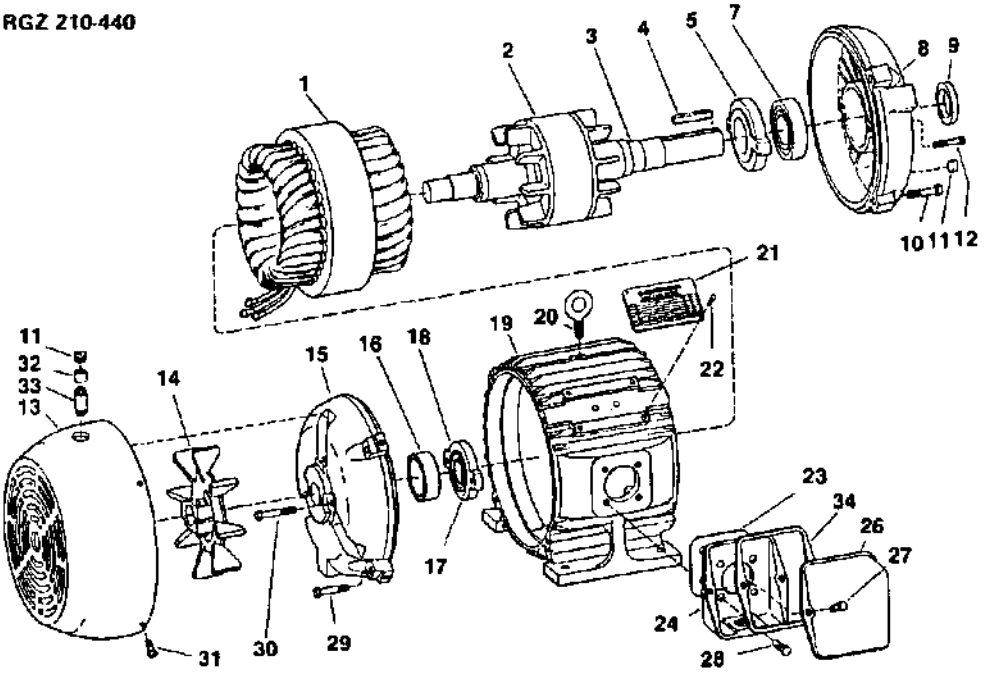
TYPE RGZ

RGZ 140-180 [1]



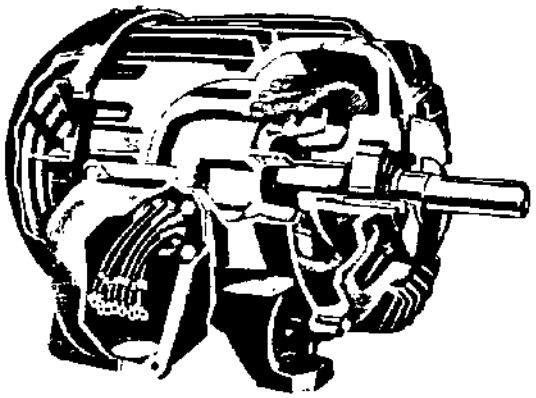
[1] Parts 6 and 17 are not required on 140 frame

RGZ 210-440



NOTE: 447 & 449 Frames may have a fan on shaft end of motor.

SPARE PARTS



TYPE RGZZ

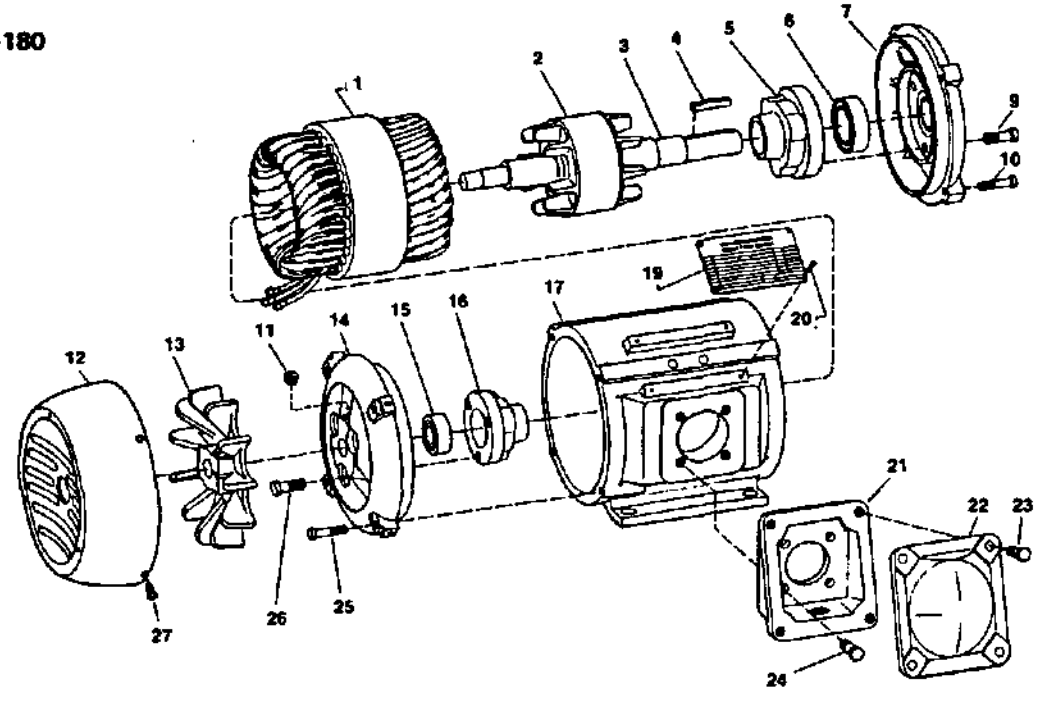
PARTS LIST

KEY NO.	PART NAME
1	Stator Assembly
2	Rotor Core
3	Shaft, Rotor
4	Key, Square
5	Cap, End - Rear (Stationary)
6	Bearing - Rear
7	Housing, Bearing - Rear
8	Seal, Shaft
9	Bolt, Hex Head (Rear Bearing Cap)
10	Bolt, Hex Head (Rear Bearing Housing)
11	Plug, Pipe
12	Bowl, Fan and Grid
13	Fan
14	Housing, Bearing - Front
15	Bearing - Front
16	Cap, End - Front (Stationary)
17	Yoke Stator
18	Eyebolt, Lifting
19	Plate, Rating
20	Pin, Escutcheon
21	*Box Conduit*
22	Cover, Conduit Box
23	Bolt, Hex Head (Conduit Box Cover)
24	Bolt, Hex Head (Conduit Box)
25	Bolt, Hex Head (Front Bearing Housing)
26	Bolt, Hex Head (Front Bearing Cap)
27	Bolt, Hex Head (Fan Bowl)
28	Coupling Pipe
29	Nipple Pipe

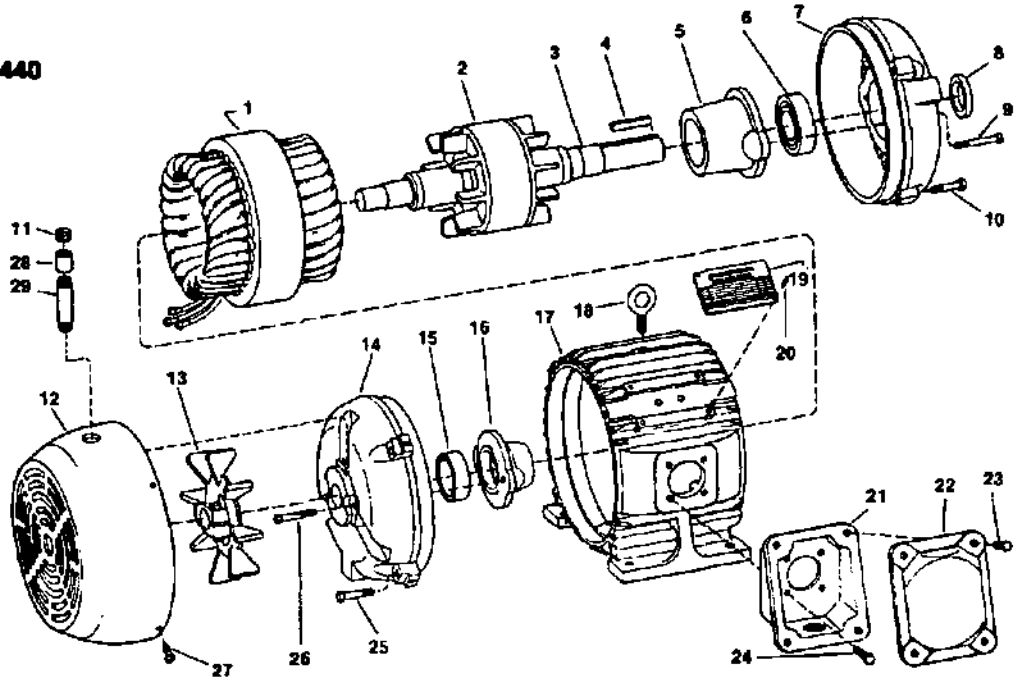
SPARE PARTS

TYPE RGZZ

RGZZ 140-180



RGZZ 210-440



SIEMENS

Siemens Energy & Automation, Inc.
Industrial Motor Division
14000 Dineen Drive
Little Rock, Ark. 72206
501-897-4905

MOTOR SERVICE RECORD

Serial No. _____ Horsepower _____ Type _____

Speed _____ Volts _____ Amperes _____ Phase _____ Cycles _____

Insulation Class _____ Temperature Rise _____ °C Frame Size _____

Connection Diagram - Rotor _____ Stator _____

Owner Order No. _____ Item No. _____ Date Purchased _____

MACHINE TYPE	BEARINGS	SHAFT EXTENSION
☐ Horizontal ☐ Vertical ☐ Open Drip-Proof ☐ Totally-Enclosed ☐ Explosion Proof ☐ Weather Protected	☐ Ball ☐ Roller ☐ Sleeve Size: Front _____ Rear _____ Lubrication _____	Length _____ Diameter _____ Internal Thread _____ External Thread _____ Keyway _____

Date Installed	Location	Application

Date Repaired or Replaced	Repairs or Parts Replaced (1)	Fault	Repaired by	Total Cost

(1) Name of Part	No. Per Machine	Manufacturer's No.	Date	Quan. Repl.	Cost	Date	Quan. Repl.	Cost	Date	Quan. Repl.	Cost
Rotor											
Stator Coils											
Bearing, Front											
Rear											
Other											
.....											

INSPECTION												
Date Checked												
Bearings												
Lubrication												
Excess Heat												
Excess Noise												
Speed												
Voltage												
Amps												
Insulation												
Clean												
Alignment												
Vibration												
Temperature												

Litho in U.S.A.
IMD 1001