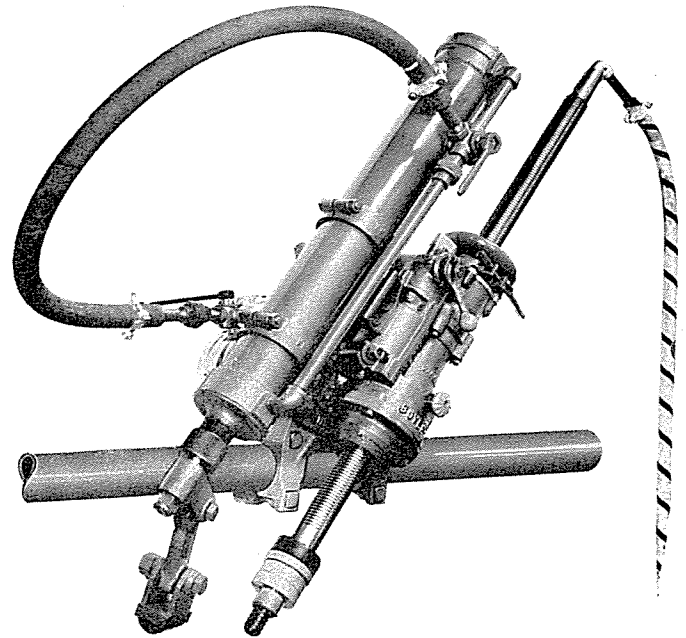


**Boyles VEG** Air powered diamond drill, manual chuck.



**Boyles VEGR** Air-powered diamond drill fitted with feedscrew to drill rod adapter and back-end water swivel.

Drills rated to 1300 ft. (396 m.) horizontal capacity or 700 ft. (213 m.) vertical capacity with EW rods and single rod puller. Utilize Model BVRG-94P (vane-type) 27 hp air motors and three variations of basic EG screwfeed swivelhead to provide performance features to meet varied drilling requirements.

**VEG DRILL** — Utilizes EG Swivelhead. Left hand thread feedscrew and 2-jaw chuck. Speeds to 3000 rpm.

**VEGR DRILL** — Utilizes EGR Swivelhead. Right hand thread feedscrew. Excellent selection for blast hole drilling, using special Boyles blast hole drill rods. Drill rod coupled by rod adapter to the feedscrew, rather than passing through and being chucked to feedscrew. Water swivel built in back of feedscrew; or option of installation in front end for drilling in confined areas. Reversing feature and feedscrew lock; allows air-motor powered make-up and break-out of rods.

**VEGRC DRILL** — Utilizes EGRC Swivelhead. Right hand thread feedscrew and 2-jaw chuck. With reversible motor, feedscrew can be rotated in either direction for rapid advancement or retraction. Jacking wheel has hand brake, providing friction feed for drilling soft formations.

Right hand feedscrew minimizes tendency to with-

draw off bottom when feed is in neutral position. Versatile drill for diamond core drilling.

**SWIVELHEAD FEATURES** — • Four feed rates can be selected without stopping by moving shifter handle. • Easily replaceable chuck jaws. • Neoprene bumper prevents metal-to-metal contact when retracting chuck; prevents jamming swivelhead. • Jacking wheel on feednut permits manual advancement or retraction of feedscrew. • Swivelhead firmly mounted on hinge-pin; can be quickly swung out of the way to handle rods. • Speeds to 3000 rpm.

**BVRG-94P AIR MOTOR** — • 27 hp at 3600 rpm. • Smooth running, constant torque characteristics; 300 to 3600 rpm operating range. • Vane-type motor with spring-loaded plunger under each blade to insure blades contact line at all times; high starting torque. • Combination throttle and directional control valve; gated handle for forward, stop, and reverse positions. • Chrome plated, precision ground liner. • O. D. and I. D. of liner and end plates concentric to facilitate regrinding and refacing. • Vane wear can be visually checked through exhaust port.

**ROD PULLER** — 6-inch (152 mm) lightweight rod puller; provided with quick acting Puller Dogs.

**BAR MOUNTING** — Rigid bar mountings to fit either 3½ in. (89 mm) or 4½ in. (114 mm.) mine columns.

**Boyles Operations**

256 Hughes Rd./Box 460/Orillia, Ontario L3V 6K3, Canada  
Tel: /705/325-6131 Telex: 068-75586 Cable: BOYLBRO

**Boyles Bros. Division, DESA-U.K. Branch**

Bowes Street Works, South Gosforth, Newcastle/Tyne NE3 1TH  
Northumberland, England/632/853-901;  
Telex 851-53553/Cable: BOYLBRO/NTYNE

**Drilling  
Equipment**

**DRESSER**

**SPECIFICATIONS  
VEG, VEGR, VEGRC AIR-POWERED  
UNDERGROUND DIAMOND DRILLS**

**BOYLES  
DIAMOND DRILLING EQUIPMENT**

	VEG-94P	VEGRC-94P	VEGR-94P
<b>CAPACITY</b> (EW Rods) + Vertical Horizontal	700 ft. (213 m.) 1300 ft. (396 m.)	700 ft. (213 m.) 1300 ft. (396 m.)	700 ft. (213 m.) 1300 ft. (396 m.)
<b>SWIVELHEAD – 360° Range</b> <b>Feedscrew</b> Thread I.D. Max Rod thru Feedscrew Feed Travel Built-in Water Swivel Manual 2-Jaw Chuck Feedscrew to Rod Adapter Feed Screw Lock	Left Hand 1-1/2 in. (38 mm.) EW 24 in. (610 mm.) No Yes No No	Right Hand 1-7/16 in. (37 mm.) EW 24 in. (610 mm.) No Yes No Yes	Right Hand 1-1/4 in. (32 mm.) — 29 in. (737 mm.) Yes No Yes Yes
<b>Feed Gears</b> Number # Feeds-Soft Formations # Feeds-Medium Formations # Feeds-Hard Formations Friction Feed (4 Revs/in.) # (Revolutions per inch (25 mm.) advance. Hard Formation Supplied unless other specified.)	4 102, 140, 207, 307 140, 207, 307, 421 207, 307, 420, 644 No	4 102, 148, 229, 364 148, 229, 364, 531 229, 364, 531, 700 Yes	4 102, 148, 229, 364 148, 229, 364, 531 229, 364, 531, 700 Yes
<b>Chuck Speed @ 3600</b> <b>Motor RPM (Bevel Gears)</b> Standard 1.8:1 Option High 1.29:1 Option 1st Low 2.33:1 Option 2nd Low 3.06:1	2000 rpm 2790 rpm 1540 rpm 1175 rpm	2000 rpm 2790 rpm 1540 rpm 1175 rpm	2000 rpm 2790 rpm 1540 rpm 1175 rpm
<b>Jacking Wheel</b> <b>Jacking Wheel Brake</b>	Yes No	Yes Yes	Yes Yes
<b>Swivelhead Weight</b> <b>Swivelring Weight</b>	135 lbs. (61 kg.) 25 lbs. (11 kg.)	135 lbs. (61 kg.) 25 lbs. (11 kg.)	140 lbs. (64 kg.) 25 lbs. (11 kg.)
<b>AIR MOTOR – BVRG-94P</b> Horsepower at 3600 rpm Operating Range Air Consumption Air Hose Fitting Size (npt) Motor Weight Dimensions	27 300 to 3600 rpm 18 to 20 cu.ft. Free air per minute/hp. (0.5 to 0.6 cu. m.) 1-1/2 inch (38 mm.) 64 lbs. (29 kg.) Length 17 in. (432 mm.); Width 7-1/2 in. (191 mm.)		
<b>ROD PULLER</b> Piston Diameter Pulling Capacity-EW Rods Length of Stroke Weight	6 in. (152 mm.) Vertical 700 ft. (213 m.); Horizontal 1300 ft. (396 m.) 32-1/2 in. (826 mm.) 114 lbs. (52 kg.)		
<b>RIGID BAR MOUNTING</b> Weight	3-1/2 in. (89 mm.) Column 33 lbs. (15 kg.)	4-1/2 in. (114 mm.) Column 60 lbs. (27 kg.)	
<b>WEIGHTS with 3-1/2" Mount</b> Less Rod Puller With Rod Puller	<b>VEG-94P</b> 257 lbs. (117 kg.) 371 lbs. (168 kg.)	<b>VEGRC-94P</b> 257 lbs. (117 kg.) 371 lbs. (168 kg.)	<b>VEGR-94P</b> 262 lbs. (119 kg.) 376 lbs. (171 kg.)
<b>SHIPPING SIZE—All Models</b> Length Height Width	58 in. (1473 mm.) 30 in. (762 mm.) 27 in. (686 mm.)		

+ Capacities shown with single 6" rod puller.

\* Indicates options; when ordering, please specify selection.

**Jeffrey Mining Machinery Division • Dresser Industries, Inc.**  
P.O. Box 1879 □ Columbus, Ohio 43216  
Tel: 614/421/3123

## OPERATING & SERVICING INSTRUCTIONS

OPERATION: Refer to Plate #450A for reference numbers shown in brackets. To obtain the maximum performance from these motors an adequate air supply must be provided. To ensure this, air supply hoses of the following minimum sizes should be used:

MODELS - 44P - 1"  
64P - 1 1/4"  
94P - 1 1/2"

Before connecting the air hose to the motor make sure all dirt, scale, water, etc., is blown from it. Check also the motor air inlet screen (450A-13) to make sure it is clean.

CONTROL VALVE: This valve controls both the direction of rotation and the speed of the motor. Its construction is such that it cannot be moved accidentally to an operating position nor can the direction of motor rotation be changed accidentally. To operate the motor in the forward or drilling direction, and assuming the operator is facing the motor, the valve lever should be pushed back and moved to the right. To reverse the motor, from the neutral position, pull the valve handle ahead and move it to the left. The distance the handle is moved from the neutral position determines the speed of the motor. As the operating load increases it may be necessary to advance the handle further to maintain speed.

LUBRICATION: All parts of the motor except the end bearings are lubricated by means of oil mixed with the air supply. The motor end bearings are lubricated through alemite fittings, on each end of the motor housing. These should be greased after each 8 hour shift.

BLADES: These should be checked for wear after each 400 hours operating period. To do this, first loosen the exhaust elbow retaining screw and remove the exhaust elbow. By looking into the motor through the exhaust outlet and through the exhaust ports the blades can be seen. Near the running edge of each blade there is a small hole. When the blade edge has worn down until only one half of this indicator hole remains, new blades should be installed. To replace the blades, first remove the rotor bevel gear and the rear motor cover. The rotor and rear end plate, can be withdrawn as an assembly. When installing new blades check each one in its respective rotor slot to see that it moves freely. Also check that the blade will go fully down into the slot. Lay a straight edge across the slot and if necessary file the back edge of the blade so the blade will set approximately 1/32 inch below the straight edge. Check also the end clearance of the blades in the rotor. They should be .010/.012 per inch of length shorter than the rotor. (e.g., 6" blade should be 5.940/5.928" long).

Mining  
Equipment

**DRESSER**

REVERSIBLE VANE TYPE AIR MOTORS

**BOYLES**  
DIAMOND DRILLING EQUIPMENT

REFERENCE NUMBERS SHOWN ORDER BY PART NUMBERS SHOWN IN PARTS LIST

PLATE

#978A

BLADES - CONTINUED:

When replacing blades in the "P" Series Motors the springs and plungers should also be checked. Remove these and clean the plunger holes thoroughly. The springs should be replaced each time new blades are installed. Cracked or chipped plungers should be replaced. When the springs, plungers and blades are re-assembled, make certain that the blades are installed so the notches line-up with the plungers. Each pair of opposing blades should be checked for maximum blade protection from the rotor. When one blade of each pair is fully into its rotor slot the blade opposite it should project no more than 9/16" from the rotor. It may be necessary to file the "plunger notches" in the back of the blades slightly deeper to obtain this dimension.

BEARINGS: Each time the blades are changed the rear rotor bearing should be checked for end play. When the end play between the rotor end and the end plate exceeds .002" or if there are other indications of bearing wear this bearing should be replaced. To replace this bearing remove the bearing locknut from the rotor end and press rotor shaft out of the bearing. Remove the bearing retaining snap ring from the end plate and withdraw the bearing. The replacement bearing should be pressed, via the outer race, into the end plate until the outer race bottoms. Re-install the retaining ring, with the flat face of the ring against the bearing. Make sure this ring is expanded into and well seated in its groove. This is extremely important as this ring absorbs the end thrust of the rotor and locates it axially. A few light taps with a hammer and punch will assist in seating this ring. Replace the bearing spacer, on the rotor shaft and then re-install the end plate and bearing assembly onto the rotor. In doing this apply pressure only on the bearing inner race until it is firmly seated. Re-install bearing lockwasher and nut. At this point the clearance between the rotor end face and the rear end plate should be checked with a feeler gauge. This clearance should be between .004 and .006". Optional length bearing spacers are available in increments of .002". If the clearance is not within the above mentioned limits another suitable length bearing spacer should be installed. Before exchanging spacers re-check that the bearing is properly seated as it should be necessary to use a different spacer when the rear end plate has been replaced or re-faced because of wear. While the rotor is out of the motor, the front bearing should also be checked for wear. If it is necessary to replace this bearing, the outer race assembly can be removed and replaced easily after retaining ring (26) is removed. To remove the inner race from the rotor, heat the race, by means of a torch, to approximately 400°F. This heat will cause the bearing locking compound to break down and the inner race may be withdrawn easily. Without heat considerable force will be required to remove this race. Do not use excessive heat on the splined section of the shaft or it will be softened. Clean the shaft thoroughly and remove all oil and grease from the replacement inner race which can not be slid onto the shaft by hand. Cement this race to the shaft with the "Loctite" compound, and follow the instructions, supplied with the new bearing. When the motor has been re-assembled the bevel gear should be installed and secured with the pinion retaining screw assembly as per the following:

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 DRESSER

REVERSIBLE VANE TYPE AIR MOTORS

**BOYLES**  
DIAMOND DRILLING EQUIPMENT

REFERENCE NUMBERS SHOWN. ORDER BY PART NUMBERS SHOWN IN PARTS LIST.

PLATE

#978A

BEARINGS - CONTINUED:-

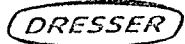
- (1) Mount the bevel gear.
- (2) Place the retaining washer (48) and the external tooth lockwasher (47) on the socket head capscrew (49), in that order.
- (3) When the socket head capscrew is screwed in tightly, there should be at least 0.005" clearance between the bevel gear and the retaining washer (48). If there is no clearance insert a shim between the retaining washer (48) and the lockwasher (47).  
If the clearance is greater than 0.005", it is all right.
- (4) Make doubly sure the socket head capscrew (49) is very tight. To do this properly, block the bevel gear to prevent the rotor from turning while tightening the capscrew (49).

LINER: To replace the liner (3) remove the rotor and rear end plate as previously described and also remove the front cover and front end plate (12 & 5). The liner can then be pressed out. If the housing and liner assembly are immersed in boiling water or can be placed in an oven at approximately 250°F., for a few minutes the aluminum housing will expand more than the liner and it will be quite easy to remove the liner. Similarly if, before installing a new liner, the housing is heated and the liner chilled it is quite easy to install the liner. Otherwise, it will be necessary to use a press for these operations. When replacing the liner observe the location identification marks on both the motor housing (stamped on each end face adjacent to the liner bore) and on the liner end faces. The marks on the liner should be lined up before assembly and should coincide after assembly with those on the housing. The liner should be installed with the two sets of elongated ports (main exhaust and reverse inlet) on the same side of the motor housing as the exhaust outlet. The liner is slightly longer (.010) than the bore into which it fits. When re-installed, the liner should project equally at each end. This allows the end plates to seat on the ground faces of the liner ends, assuring a proper air seal and alignment. When installing the motor end covers do not tighten the fastening capscrews excessively otherwise the covers can be warped.

VALVE ASSEMBLY: To dismantle the valve assembly, remove screws. The valve spool and handle assembly and retaining plates can then be withdrawn from the housing. Remove screw (38) to separate the handle assembly from the valve spool. To remove valve handle springs (35) drive out spring pin, from the valve handle. The springs may then be pushed out through the top of the handle. The hinge pin (16) can be removed.

To re-assemble the valve handle assembly, first check that the springs, (36) fits freely in the holes in the hinge pin (16) and the lever (11). Re-assemble the fixed handle (32) lever (11) and hinge pin (16) as illustrated on Plate #450A. Insert the springs through the holes in the top of the lever, into the handle (32) and through the holes in the hinge pin (16). Make sure the springs are driven right to the bottom of the holes in the handle (32). The spring retaining pin (39) may then be replaced in the lever (11).

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 DRESSER

REVERSIBLE VANE TYPE AIR MOTOR

**BOYLES**  
DIAMOND DRILLING EQUIPMENT

REFERENCE NUMBERS SHOWN. ORDER BY PART NUMBERS SHOWN IN PARTS LIST.

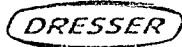
PLATE

#978A  
Page 3 of 4

VALVE ASSEMBLY - CONTINUED:-

To re-assemble the valve spool and operating handle assembly, first slide the thrust bearing (44) onto its spigot on the valve spool, followed by the end plate (10). The operating handle should be fastened to the spool such that the wider of the two ports in the valve spool is on the same side as the operating lever (11).

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REVERSIBLE VANE TYPE AIR MOTORS

**BOYLES**  
DIAMOND DRILLING EQUIPMENT

REFERENCE NUMBERS SHOWN. ORDER BY PART NUMBERS SHOWN IN PARTS LIST.

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## OPERATING & SERVICING INSTRUCTIONS

REFER TO PLATE #188C

The BUS-1JEG Swivelhead is designed for use with "E" or "EW" size drill rods and has a capacity of 1600' when used with this size equipment.

This swivelhead is a gear feed type incorporating four feeds any of which can be selected while the head is operating. A feature of this swivelhead is the ease with which it can be shifted while under load.

The standard feeds gears installed in the swivelhead are for 200, 300, 400 and 550 feeds. Additional optional feeds of 140, 475 & 650 can be installed on request. Special gears for other feeds can be made to order.

The feedshifter handle has a feed indicator (Item #78) attached to it which is numbered from 1 to 4. The gears should be installed in such a manner that number 4 on the feed indicator indicates the slowest feed and number one indicates the fastest feed. On a standard head #4 is 550 feed, #3 is 400 feed, #2 is 300 feed and #1 is 200 feed.

In between each feed indicating number is a neutral position marked "N" where the feed gears are not engaged.

### LUBRICATION

The importance of proper and regular lubrication cannot be over emphasized. All lubrication points on this swivelhead are equipped with alemite fittings.

NOTE:- Use Texaco Hytherm EP2 Grease.

FEEDNUT BEARINGS:- Alemite fitting is just below the top bearing cover. Grease every 4 to 8 hours.

UPPER DRIVE SLEEVE BEARING:- Alemite fitting is located on the right side of the swivelhead half-way up the side. Grease every 4 to 8 hours.

LOWER DRIVE SLEEVE BEARING:- Alemite fitting is located on the left side of the lower bearing cap. Grease every 4 to 8 hours.

UPPER COUNTERSHAFT BEARING:- Alemite fitting is located half-way up the countershaft housing. Grease every 2 to 4 hours.

LOWER COUNTERSHAFT BEARING:- Alemite fitting located on bottom of countershaft housing. Grease every 2 to 4 hours.

FEEDSHIFTER:- Alemite fitting located on end of shifter shaft. Grease every 1 to 2 hours.

FEEDSCREW:- Alemite fitting is located in recess in jacking back wheel. Grease frequently. Feedscrew should be kept well lubricated.

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 DRESSER

MODEL 'EG' SWIVELHEAD ASSEMBLY

**BOYLES**  
DIAMOND DRILLING EQUIPMENT

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ADJUSTMENTS:-

BEVEL GEAR FOR PROPER MESH: The bevel gear is adjusted up or down by means of shims. One (Item 50) is located between the lower bearing cover (49) and the drive sleeve housing (90). The other (Item 51) is on top of the drive sleeve bearing cup. To lower the bevel gear, add more shim stock between the lower bearing cover and the drive sleeve housing and remove the same amount of shims from the upper bearing to preserve bearing adjustment. To raise the bevel gear reverse the above procedure. See also feednut assembly and drive assembly instructions.

TO DISMANTLE SWIVELHEAD:

- 1) FEEDSCREW: Jack feedscrew down through the feednut and pull through the drive sleeve.
- 2) JACKING BACK WHEEL: Remove two locknuts (104) from the top of feednut and pull the jacking back wheel off. Remove the key from the feednut.
- 3) FEEDNUT ASSEMBLY: By removing the capscrew (113) from the feednut housing (101) this housing may be removed. This housing contains the feednut, its bearings, drive gear and the feedshifter mechanism. To remove shifter mechanism loosen screw (83) in handle hub. Pull off handle and remove key from shaft. Remove locknut, lockwasher and feed indicator disc (Items 78, 79 & 80). Shifter shaft can then be pushed out of the housing. Remove the screw (75) in the side of the housing and the locking plunger and spring can be removed through the hole. To remove the feednut take the top bearing cap (102) off. Place two bars or a piece of large pipe under the housing and press the feednut down through the thrust bearings (108). The outer races of these bearings can then be driven out from below. The feednut gear can then be pressed off the feednut.
- 4) COUNTERSHAFT ASSEMBLY:
  - (a) To remove the countershaft assembly as a unit without dismantling remainder of swivelhead, proceed as follows:-  
Jack the chuck about 4" away from the end of the drive sleeve bearing cover (49). Turn the feedshifter to the number '4' position and remove the shifter handle (77). Remove the locknut, lockwasher and feed indicator disc (Items 78, 79 & 80). Push the feedshifter pinion and shaft (73) out, making sure that the plunger locating bushing (76) remains in place. Next remove the ten capscrews that hold the countershaft cover and feednut housing (101) to drive sleeve housing (90). Lift off the countershaft cover and pull the entire feednut and feedscrew assembly back until the countershaft drive gear (71) is fully exposed. The countershaft assembly may now be lifted out.
  - (b) To remove countershaft assembly as part of general dismantling sequence, proceed from No. 3 as follows:-  
By removing the four capscrews from the countershaft cover, it can be removed, and the bearing locating snap rings and press off the bearings. The countershaft feed gears can then be slid off and the shifter key (69) driven out of the feedshifter rack (70).

Mining  
Equipment

**DRESSER**

MODEL 'EG' SWIVELHEAD ASSEMBLY

**BOYLES**  
DIAMOND DRILLING EQUIPMENT

REFERENCE NUMBERS SHOWN. ORDER BY PART NUMBERS SHOWN IN PARTS LIST.

PLATE #967A  
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TO DISMANTLE SWIVELHEAD (Continued):

- 5) DRIVE SLEEVE ASSEMBLY: Remove the capscrew (52) from the drive sleeve bearing cover (49). On removing the cover, the drive sleeve complete with gears and bearing cones will drop out. Turn the drive sleeve over with the feed gears down and support the bevel gear (or spur gear) on parallel bars or a piece of large pipe. Press the drive sleeve through the bearing cone gear and oil seal sleeve. The feed gears can then be slid off and the upper bearing cone and oil seal pressed off.

TO REASSEMBLE SWIVELHEAD:

NOTE: Cleanliness is extremely important. Before reassembly, all parts should be thoroughly cleaned and assembly work should be done in a clean, dust free area.

DRIVE SLEEVE ASSEMBLY: Place key (37) in drive sleeve and slide gears onto drive sleeve. The gear that gives the fastest feed should go on first so that it will be the top gear when the head is reassembled. The remaining gears are put on so that the slowest gear will be at the bottom, the next fastest above it etc.

Press the feed gear shield (42) on to the oil seal sleeve (43) then slide the oil seal sleeve onto the drive sleeve. Press the drive sleeve bearing shield (44) on to the bevel gear. Place the bevel gear key in its seat and press the bevel gear onto the drive sleeve. Check the alignment of the keyslot in the gear with the key in the drive sleeve before starting to press the gear on. The upper oil seal (38) is then pressed onto the drive sleeve followed by the upper bearing cone (47). Press the lower bearing cone (45) onto the bottom end of the drive sleeve. The above items should all be pressed firmly against their respective locating shoulders. Press the oil seal (39) and then the lower bearing cup (46) into the lower bearing cover (49). Place the assembled drive sleeve in its housing, place the bottom shim (50) in position and bolt the lower cover to the housing. Then tap the upper bearing cup (48) into the top of the housing until it is snug on the cone.

FEEDNUT ASSEMBLY: Place the feednut drive gear key (107) in its seat and press the drive gear onto the feednut, the spigot away from the shoulder. Press the lower bearing complete with outer race onto the drive sleeve with the heavy shoulder on the cone away from the gear. Then press the upper bearing cone onto the feednut with its heavy shoulder next to the lower bearing. Press the assembly into the feednut housing from the top and using a piece of pipe or small punch make sure that the bearing cup of the lower bearing is firmly against its shoulder. The bearing cup of the upper bearing is then pushed into the housing. Place the bearing shim (103) on top of the cup and bolt the cover (102) in place. Adjustment of these bearings is by means of varying the amount of shim material (103) used. The feednut should roll freely with no end play. Replace the 'O' ring (111) in the groove at the lower end of the feednut.

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**DRESSER**

MODEL 'EG' SWIVELHEAD ASSEMBLY

**BOYLES**  
DIAMOND DRILLING EQUIPMENT

REFERENCE NUMBERS SHOWN. ORDER BY PART NUMBERS SHOWN IN PARTS LIST.

**PLATE** Plate #967A  
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TO REASSEMBLE SWIVELHEAD (Continued):

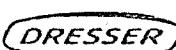
COUNTERSHAFT ASSEMBLY: Replace the inner race of the upper bearing (66) on the countershaft, pressing it firmly against the shoulder. Slide the upper thrust washer (63) onto the countershaft with the longer spigot next to the bearing. Place the shifter rack (70) in the countershaft and drive the feedshifter key into the slot in the end of it through the slots in the countershaft. Make sure that the feedshifter key projects evenly each side of the countershaft. Now slide the feed gears onto the drive sleeve, fastest first, next fastest etc. The lower thrust washer is then slid onto the countershaft with the spigot toward the gears. Press the lower bearing (64) on against its shoulder with the snap ring on the outer race toward the gears. Replace the bearing locating snap ring (65) in its groove on the countershaft. Slide the outer race of the upper bearing (66) onto its inner race of the upper bearing (66) onto its inner race on the countershaft with the snap ring away from the gears. Replace the drive gear key in its seat and press the drive gear onto the countershaft with the spigot toward the gears. Replace the snap ring (68) in its groove. By holding the feed gears and turning the feedshifter rack, work the shifter down into the bottom gear. Keep the shifter in this position during further assembly.

The countershaft assembly is then placed in position in the drive sleeve housing. Make sure that the locating rings in the upper and lower bearing are in their respective grooves in the drive sleeve housing. Then bolt the countershaft cover in place.

FEEDNUT AND DRIVE SLEEVE HOUSINGS: Place the drive sleeve bearing shim (51) on top of the upper drive sleeve bearing cup and assemble the two housings. The drive sleeve bearing adjustment is by means of varying the amount of shim material (51) used so the fit of the drive sleeve bearings should be checked at this point. The drive sleeve should roll freely with no end play.

JACKING BACK WHEEL: Place the jacking back wheel key in its seat and place the jacking back wheel on the feednut tightly against the feednut bearing cones. Lock it securely in place by means of the two locknuts (104).

FEEDSHIFTER MECHANISM: Insert the spring (75) and locking plunger (74) into the feednut housing through the outer tapped hole. Then insert the shifter lock collar (76) into the housing. Depress the lock plunger with a screw driver and slide the lock collar under it in such a position that the plunger protrudes into one of the deep grooves in the lock collar. Slide the shifter pinion shaft into the housing from the back. Before it engages the shifter rack turn it so that the keyway at the threaded end is at the "Two o'clock" position when viewed from the threaded end. Then put on the feed indicator disc (78) the lockwasher (79) and locknut (80). Turn the indicator disc so the figure '4' is opposite the arrow on the housing. Hold it in this position and tighten the locknut securely. Bend over a tab in the lockwasher to lock the nut. Place the key (81) in its seat and slide the shifter handle onto the shaft. Lock it in position by tightening the screw in its hub. Insert the plug (85) back in the side of the housing.

Mining Equipment		MODEL 'EG' SWIVELHEAD ASSEMBLY	<b>BOYLES</b> DIAMOND DRILLING EQUIPMENT
REFERENCE NUMBERS SHOWN. ORDER BY PART NUMBERS SHOWN IN PARTS LIST.			<b>PLATE</b> Plate #967A Page 4 of 4

Dresser/Boyles Vane Motors are lubricated entirely by oil mixed with the air supply.

An adequate supply of the proper oil is absolutely necessary. This is particularly important because when a good air supply is available the motors can be operated in excess of the recommended 4000 R.P.M.

Standard practice is to introduce the oil into the air through an "Air Line Lubricator" installed in the air line adjacent to the drill. The drill operator is normally responsible for the proper operation of the lubricator.

Dresser/Boyles recommended practice is the use of two lubricators in parallel so that if one lubricator should run dry, become plugged or for any reason fail to operate properly the other will ensure at least partial lubrication of the motor.

Dresser/Boyles Dual Air Line Lubricator (Part No. 1-328-005) has been specially designed for this purpose.

The "Dualfeed" Air Line Lubricator fills a long overdue need for a compact, rugged lubricator with a large oil capacity. In use, this lubricator eliminates the risk of running out of oil, reduces the number and frequency of refills, and lessens the possibility of contaminating the oil that can be caused by frequently adding oil in small quantities. Two rates of oil feed are available simply by uncoupling it and turning it end for end.

SPECIFICATIONS:

Normal Feed Rate      Fast (+) (#30 Jets), 30 to 40 ounces per average 8 hr. shift.  
                              Slow (-) (#20 Jest), 20 to 30 ounces per average 8 hr. shift.

Other jet sizes also available are #40, 35, 25 and 16.

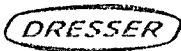
Pipe connection size 2" NPT Pipe (max.) Oil capacity 4 Imperial or 4.8 U.S. quarts.

RECOMMENDED OILS ARE LISTED FOLLOWING:

<u>-Supplier-</u>	<u>-Brand Name-</u>
Imperial Oil Company	Arox EP 45, 56 or 80
Mobile Oil Company	Alma #5
Gulf Oil Company	Rock Drill Oil 66 or 59
Shell Oil Company	Tonna 'F'
Standard Oil Company	Chevron Febis K53
Texaco Oil Company	Rock Drill Lubricant 'EP'

NOTE: An ordinary engine oil is not recommended. Its rate of consumption will be very high and it will not lubricate properly, especially at higher temperatures.

The foregoing recommendations are for average operating conditions. Where extreme conditions of heat, moisture or severe dust exist Dresser/Boyles should be consulted.

Mining Equipment		VANE MOTOR LUBRICATION	<b>BOYLES</b> DIAMOND DRILLING EQUIPMENT
REFERENCE NUMBERS SHOWN. ORDER BY PART NUMBERS SHOWN IN PARTS LIST.			PLATE #955A Page 1 of 1

## SUGGESTED OPERATING PROCEDURES

The purpose of this article is to assist those who have not had previous experience in the operation of underground diamond drills. It covers particularly those machines equipped with a reversing motor and a righthand threaded feedscrew incorporating a waterswivel and drive coupling so short taper threaded rods can be added ahead of the feedscrew.

The procedure is basically similar for operating an underground drill with a chuck and feedscrew, through which the rods pass with a waterswivel attached. If this technique is preferred, the blast hole feedscrew assembly can be removed and replaced with a right hand feedscrew with an I.D. sufficiently large to allow the rods to pass through and with provision made on the front end to attach a chuck. This method, however, is slowed and more space consuming.

The first important item required to make an efficient setup for an underground drill is a suitable column. Columns are available in various sizes and designs. The two most commonly used are 3 1/2" and 4 1/2" diameter, the lengths being determined by the working conditions of the mine in which they are to be used.

Because the thrust developed by a diamond drill is much greater than that of a percussion drill, for which columns were originally developed it is recommended that the double jackscrew design be used in preference to the single jackscrew type, the former having much greater resistance to turning.

After all loose material has been barred down and the working area made safe, the first operation in preparing a drill setup is to install the column. The operator must first determine if the column is to be set vertically or horizontally, and if vertically, whether the column is to be set behind or ahead of the drill.

One important point to remember is that the drill should be set as close to the face as working conditions will permit. As mentioned above, a diamond drill develops a great deal of thrust, therefore, the closer it is to the face, the less chance there is that the unsupported rods and feedscrew will blow out of line when pressure is applied. This is a major cause of broken couplings and feedscrews.

The necessity of setting the drill as close to the face as working conditions will allow should be the major factor in determining whether the column is set behind or ahead of the drill. Both positions have their advantages and disadvantages, so the choice will be decided by the conditions that exist for locating the foot and head blocks of the column.

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When the column is set behind the drill an eyebolt can be put into the rock about one foot to the right of the hole location and a turnbuckle used between it and the eye on the cap of the column drill mount. When tightened this will prevent the tendency of the machine to twist the column and drill off line.

When the column is set ahead of the drill the tendency to twist the column can best be counteracted by using an adjustable, tubular, steel sprag, positioned between the lug on the back of the swivel ring and the nearest rock surface that is close to being in line with the hole. If the rock being drilled is very hard it may be necessary to use more than one sprag or a combination of both sprag and turnbuckle.

Another important point to remember, when setting up a column, is to fully retract jacking screws and have the column lines up and held tight by driving wooden wedges. This should be done before the final tightening with the jacking screws. After the drill has been lined up and securely tightened to the column, it will be necessary to prepare the air and water hoses for connection to the drill.

Boyles Vane Motors are lubricated entirely by oil mixed with the air supply. An adequate supply of the proper oil is absolutely necessary. This is particularly important because when a good air supply is available the motors can be operated in excess of the recommended R.P.M. Standard practice is to introduce the oil into the air through an "Airline Lubricator" installed in the air line adjacent to the drill.

To obtain the maximum performance from a BVRG-94P drill, two 1 1/4" hoses in parallel, or one 1 1/2" hose should be used between the main air line and the airline lubricator. Boyles recommend the use of two differently adjusted lubricators in parallel, so that if one should run dry or become plugged, the other will maintain partial lubrication until the fault is noticed and rectified. Boyles Dual Air Line Lubricator (Part No. 1-328-005) has been specially designed for this purpose.

The lubricator, or dual lubricators, as the case may be, should be located close to the drill in order to reduce the length of hose, subjected to the lubricating oil, to a minimum. The length of hose connecting the lubricator to the drill motor should be 1 1/2" I.D., and for normal conditions about 8 to 12 feet long.

Under average operating conditions a drill on coring work should consume 20 to 25 ounces (550 to 688 c.c.) per shift. Blast hole drills should consume 28 to 34 ounces (770 to 935 c.c.) per shift. Boyles Dual Air Line Lubricator should be set so that one lubricator delivers 2 ounces (55 c.c.) per operating hour and the other should deliver 4 ounces (110 c.c.) per operating hour. The average regulating screw adjustments to obtain these flows are 1/2 and 3/5 turn respectively, from fully closed.

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As individual lubricators vary it is very important that their consumption be checked shortly after they have been adjusted or if the make or grade of oil is changed. Air line Lubricators should be checked and refilled twice per shift or often enough to ensure that the motor is never allowed to run dry.

An oil especially made for use in Air Line Lubricators should be used. The heavier grades having a viscosity of 55 S.S.U. @ 210° or higher are recommended. These are suitable for all temperatures above freezing.

Typical such oils are listed

- Supplier -	- Brand Name -
Imperial Oil Company	Arox EP 45, 56 or 80
Mobil Oil Company	Alma #5
Gulf Oil Company	Rock Drill Oil 66 or 59
Shell Oil Company	Tonna "F"
Standard Oil Company	Chevron Febris K53
Texaco Oil Company	Rock Drill Lubricant "EP"

An ordinary engine oil is not recommended. Its rate of consumption will be very high and it will not lubricate properly, especially at higher temperatures.

The foregoing recommendations are for average operating conditions. Where extreme conditions of heat, moisture or severe dust exist Boyles should be consulted.

Before connecting the air hose to the drill it is most important that it be blown out to remove any foreign matter, such as particles of rock, rust scale, from inside the air lines, water, etc. The period of blowing out should continue until all evidence of foreign matter has been removed. When coupling up a new motor or one that has stood for a long period of time, it is advisable to pour one or two ounces of oil into the air line before making the final connection.

Because the wear rate of vane motors is greatly accelerated by the presence of abrasive particles in the air. Boyles recommend the use of an auxiliary air screen which is much larger and finer than the standard screen supplied. This auxiliary air screen is located between the air hose and the inlet manifold of the motor.

The waterswivel hose should be 3/4" I.D. and have a working pressure rating of from 400 to 500 P.S.I. Like the air hose, it should be thoroughly flushed out before connecting it to the waterswivel, which is screwed into the end of the feedscrew. At this point it should be mentioned that optional waterswivels are available for use on either the back or front end of the feedscrew.

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For short holes in the neighbourhood of 100 to 200 feet, mine water pressures of from 100-150 PSI are adequate, but for longer holes of steep up angle holes, high pressures will be required. These can be obtained by increasing the head of the mine supply system by introducing a pump for the purpose of increasing the existing pressure.

One of the outstanding features of the VEGR-94P drill is that it is fitted with a right hand threaded feedscrew. This feature necessitates the use of a reversing motor, as the feedscrew must be turned backwards during the process of retraction.

When using taper threaded, blast hole drill rods, it is advisable to use a starting barrel that is threaded in the back end with a box thread to receive the taper threaded rods direct, thereby, eliminating the need of a space consuming adapter bushing.

Before commencing to collar a hole, the area where it is to be started should be smoothed and squared by use of a moil and hammer. With the starting barrel assembly (consisting of starting barrel, reaming shell, corespring and bit) securely screwed directly to the feedscrew, rod adapter coupling, the drill is ready to collar the hole.

Place the feedshifter handle in a neutral feed position and jack or run the starting barrel ahead, until the bit is about 1/8" from making contact with the rock surface.

To jack the assembly ahead by hand, place the feedshifter in a neutral feed position, engage the drive sleeve lock, release the jacking wheel brake or lock (as the case may be) and turn the jacking wheel counterclockwise by hand.

To run the assembly ahead, place the feedshifter in a neutral feed position and start the drill turning forward (clockwise when looking at the swivelhead from the back or jacking wheel end.)

To start the drill turning forward, push the upper hinged part of the combination throttle and reversing valve handle backward or away from the operator with the left hand until the lock is released. The throttle is now free to be turned clockwise. The turning of the valve should be done deliberately and slowly to prevent the motor from starting too rapidly. With the drill turning slowly, use the right hand as a brake to stop or slow down the jacking wheel. When this is done the feedscrew will advance rapidly. After advancing the required distance, stop the drill by closing the throttle, then engage the feedshifter in the slowest feed position. This will be the feed designated by the largest number because feeds are described by the number of turns the bit makes to advance one inch.

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Open the water control valve just enough to keep the face of the bit wet during the process of collaring. If the drill is not equipped with a collaring device to hold the bit on line, use a wooden pry that is notched for the purpose of holding the starting barrel in the required position. With the water on, as described above, and the bit forced slightly over to the left when facing the hole, start the drill turning slowly and let it feed forward until the bit begins to make contact with the rock. At this point the bit must be held securely as it will have a tendency to move or jump off line, until a full face contact is made with the rock. If the bit is allowed to jump during this operation, considerable damage to the diamonds may result. As soon as the face of the bit is fully in contact with rock, the drill should be stopped and bit withdrawn from the face to determine whether the hole is being started in the required position. If the hole is correctly positioned, jack the bit forward until it is again in contact with the rock. When drilling is resumed after this inspection, both the volume of water and speed of rotation can be increased.

During the process of collaring, the water will spray excessively due to the close fit of the bit, shell and starting barrel in the hole. This can be largely prevented by using a disc of soft rubber 6" to 8" in diameter, 1/4" to 3/8" thick, and having a hole in the centre to fit snugly over the starting barrel. This snug fit will cause the rubber disc to be held against the face of the rock during the drilling operation, thus acting as a deflector. Until such time as a volume of water equivalent to two or three gallons per minute can be passed through the bit, the rotation speed should be restricted to less than 500 RPM. After the bit has advanced an inch or two, it may be found more advantageous to use a faster feed.

The choice of feed is something that can best be determined by experience. However, as a guide, once the bit has been successfully started, as described above, the feed can be increased until the drill shows signs of labouring or building up pressure. Another indication of over feeding is a decreased or complete lack of water return caused by the bit mudding in soft, sticky formations. Any one of these conditions indicated that the rate of feed should be reduced.

If the drilling is being done without the aid of a corespring, it will be necessary to proceed until the bit blocks. Both the volume of water and the speed of rotation should be decreased when the starting barrel is within 1/2" to 1" of being filled and the drilling continued in this manner until a "kick" is indicated. The kick is caused by the core breaking off just back from the inside face of the bit. As soon as the kick is indicated, the drill should be stopped and the water shut off. If a corespring is used it is not necessary to proceed until a kick is indicated, but it can be done if considered advantageous. At this point the necessity of never removing a bit from bottom without first measuring the stick-up should be stressed. The stick-up in the case of a VEGR-94P Drill is the distance between the collar of the hole and the back end of the protruding rod.

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Should any trouble such as a stuck bit, broken rod, loose core, etc., develop, which will necessitate reaming, fishing or chopping, it is most important to know the exact length of the hole. To obtain this the overall length of the corebarrel and the number of lengths or the rods in the hole should always be recorded before removing same from the hole. The actual length of the hole is the sum of these items less the stick-up.

The starting barrel is now ready to be removed from the hole. To remove the starting barrel, move the feedshifter handle into a neutral feed position. Should the handle not move freely due to the feed pressure that was developed to make the bit cut, place the jacking wrench on the rim of the jacking wheel and while applying pressure in the required direction on the feedshifter handle with the left hand, turn the jacking wheel very slightly backwards (counter-clockwise). During this operation the feedshifter handle will disengage freely. Should the feedscrew turn with the jacking wheel it will be necessary to engage the feedscrew lock to prevent it from doing so, but this operation should seldom be required.

With the feed in neutral, turn the jacking wheel forward about one half turn or until the bit is freed from the bottom of the hole. With the left hand, pull the hinged portion of the throttle valve towards the operator until the lock is freed, permitting it to be moved to the left. This will start the motor and drill turning left handed or backward. When the drill starts turning, use the right hand as a brake to slow or stop the jacking wheel. This will make the feedscrew retract or run back. The rubber bumper directly behind the feedscrew to rod adapter coupling assembly should not be allowed to come closer than 1" to the front of the swivelhead casting.

The starting barrel can now be completely withdrawn from the hole and taken off for the purpose of removing the core.

To remove the starting barrel, first prevent the feedscrew from turning by engaging the feedscrew lock; then with the aid of one pipe wrench remove the starting barrel from the adapter. Under no circumstances should a second pipe wrench be placed on the feedscrew to prevent it from turning.

To make the second run with the starting barrel, place it in the hole and, if space permits, add a 2 foot rod between it and the drill. If only a 1 foot starting barrel is being used it may require two runs before a 2 foot rod can be added. Drilling with the starting barrel will have to continue until the hole is sufficiently deep to receive the regular corebarrel and allow it and the adapter rod to be coupled to the drill.

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The adapter rod is a 2 foot rod that has a standard, drill rod, pin thread on the front end and a tapered, blast hole rod, box thread on the back end. It is used as the adapter between the drill rod, box thread of the standard core-barrel and the tapered pin thread of the blast hole rod.

Should it be necessary to collar the hole with casing, the hole must be reamed the required distance at this stage to receive the casing. This is done by attaching a reaming pilot, with casing bit attached, to the adapter rod. After inserting the horn of the reaming pilot in the drilled hole, connect the assembly to the feedscrew rod adapter and proceed to drill the required distance as described.

Assuming that a 5 foot corebarrel is being used and that a full five foot run can be made, the procedure will be as follows:-

Drill until the water hose connection that is attached to the back end water-swivel elbow comes to within not less than one inch from the outer ring of the jacking back wheel. At this point, move the feedshifter into a neutral position, slowly close the throttle valve and shut off the water. Next, withdraw the rods and corebarrel from the hole approximately 1/4" by turning the jacking wheel forward. Upon completion of this operation apply the jacking wheel brake or locking pin (as the case may be).

Depending upon which is most convenient, one of two methods can be used for loosening (breaking) the feedscrew rod adapter from the rod immediately ahead of it. If there is sufficient room ahead of the adapter assembly, or if it is not too high to be reached conveniently, engage the feedscrew lock and with the use of one pipe wrench, break the rod loose from the adapter, but do not turn it more than a quarter of a turn. This is to assure that the bit is not jacked back into bottom. The alternative method is to place the pipe wrench on the rod directly ahead of the adapter assembly, in a holding position, and with the aid of the feedscrew wrench, break the adapter thread loose.

After the thread has been loosened, the feedscrew lock (if it has been used), should be disengaged. The jacking wheel brake should then be applied or the locking pin engaged (as the case may be) and the feedshifter checked to make sure that it is still in a neutral position. The drill is now ready to be run backwards for the purpose of unscrewing it from the adapter rod and retracting the feedscrew. Again the rubber bumper should be brought to within no less than one inch from the swivelhead casting. It is most important during this operation to make certain that the jacking wheel does not turn, especially during the first four or five revolutions, for if it does the feedscrew will not retract as fast as the adapter is screwing out of the rod thread. Should this happen, the bit will be forced back on bottom and this will result in damaging the thread, bending the feedscrew or forcing the drill off line.

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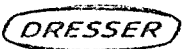
To add the next two foot rod, screw it partly into the rod protruding from the hole and hold the back end directly in line with the adapter. With the friction wheel still locked, start the drill turning very slowly forward and guide the box thread of the added rod onto the adapter as it advances. If, without holding the jacking wheel, the feedscrew advances sufficiently to allow the threads to be made up, this method can be used as an alternative at the discretion of the operator. With the feed in neutral, the jacking wheel freed and the water turned on, the drill is again ready to commence its next 2 foot run. As soon as the drill starts turning, the feedshifter should be engaged in the feed required. The addition of 2 foot rods in this manner should be continued until the corebarrel is filled or blocked.

To remove the rods and corebarrel from the hole, disconnect the adapter from the rods and run the feedscrew back as described above, then open the swivel-head. The rods and corebarrel are now free to be pulled from the hole by hand and, as this is done, the rods should be broken, with the use of two pipe wrenches, into their respective 2 foot lengths.

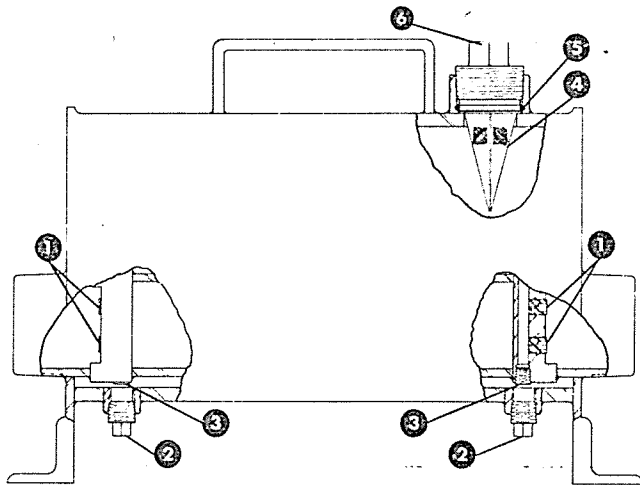
After the corebarrel has been emptied and placed back in the hole, one 5 foot standard drill rod should be added directly behind the corebarrel and followed by the 2 foot adapter rod. As the hole progresses it may be necessary to put one or two 2 foot rods in at the collar of the hole, after replacing the corebarrel and long rods, in order to adjust the length for connection to the feedscrew. When using a 10 foot corebarrel, and assuming that both 5 and 10 foot standard rods are being used, it will be necessary to have seven 2 foot blast hole rods in addition to the adapter rod, in order to make all the length combinations that may develop.

The foregoing instructions are primarily intended to explain the use of a diamond drill fitted with a right hand threaded feedscrew that has a water-swivel attached, either at the front or back end, and is powered by a reversing motor.

For those who are not familiar with underground drilling, a few general instructions have been included. These instructions are not complete and are not intended to cover the entire procedure of operating a diamond drill underground.

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## OPERATING INSTRUCTIONS



### PARTS LIST

ITEM NO.	JET NO.	PART NUMBER	ITEM NO.	DESCRIPTION & PART NUMBER	NO. REQ.
1	# 16	1-328-100	2	Drain Plug 5-200-078	2
	# 20	1-328-101*	3	Blowout Plug 5-200-125	2
	# 25	1-328-102	4	Screen 2-600-209	1
	# 30	1-328-103*	5	"O" Ring 5-030-725	1
	# 35	1-328-104	6	Filler Plug 1-328-007	1
	# 40	1-328-105			

\*STANDARD

Dresser/Boyles "DUALFEED" LUBRICATOR should always be used resting on its feet in a horizontal position or as near to the horizontal position as possible. The "DUALFEED" LUBRICATOR is clearly marked with a PLUS sign at one end and a MINUS sign at the other. The PLUS end has the nozzle with LARGE "TWIN-JETS" and the MINUS end has the nozzle with SMALL "TWIN-JETS". The HOSE to the DRILL or PUMP is connected to the end of the "DUALFEED" LUBRICATOR having the jets that will give the required oil feed.

The STANDARD MODEL "DUALFEED" LUBRICATOR has #30 JETS in the PLUS end and #20 JETS in the MINUS end.

Other JET SIZES available: #16, #25, #35, and #40.

FOR WARM TEMPERATURE and/or LIGHT OILS, we recommend #25 JETS (two) for the PLUS END and #16 JETS (two) for the MINUS END.

FOR LOW TEMPERATURES and/or HEAVY OILS, we recommend #40 JETS (two) for the PLUS END and #30 JETS (two) for the MINUS END.

To Remove the Jets: The JETS (1) can be easily removed by first disconnecting the air hoses and then, by using a 3/16" hexagon socket head wrench, (3/16" across the Flats) the JETS can be screwed out for cleaning or replacing.

To Drain the OIL: Remove one of the two bottom pipe plugs (2).

To 'Blow-Out' the Nozzles: Remove both the drain plugs (2) and the nozzle drain plugs (3) (Use a 3/16" hexagon socket head wrench) then 'Blow-Out' with compressed air.

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DRESSER/BOYLES DUALFEED LUBRICATOR

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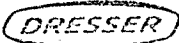
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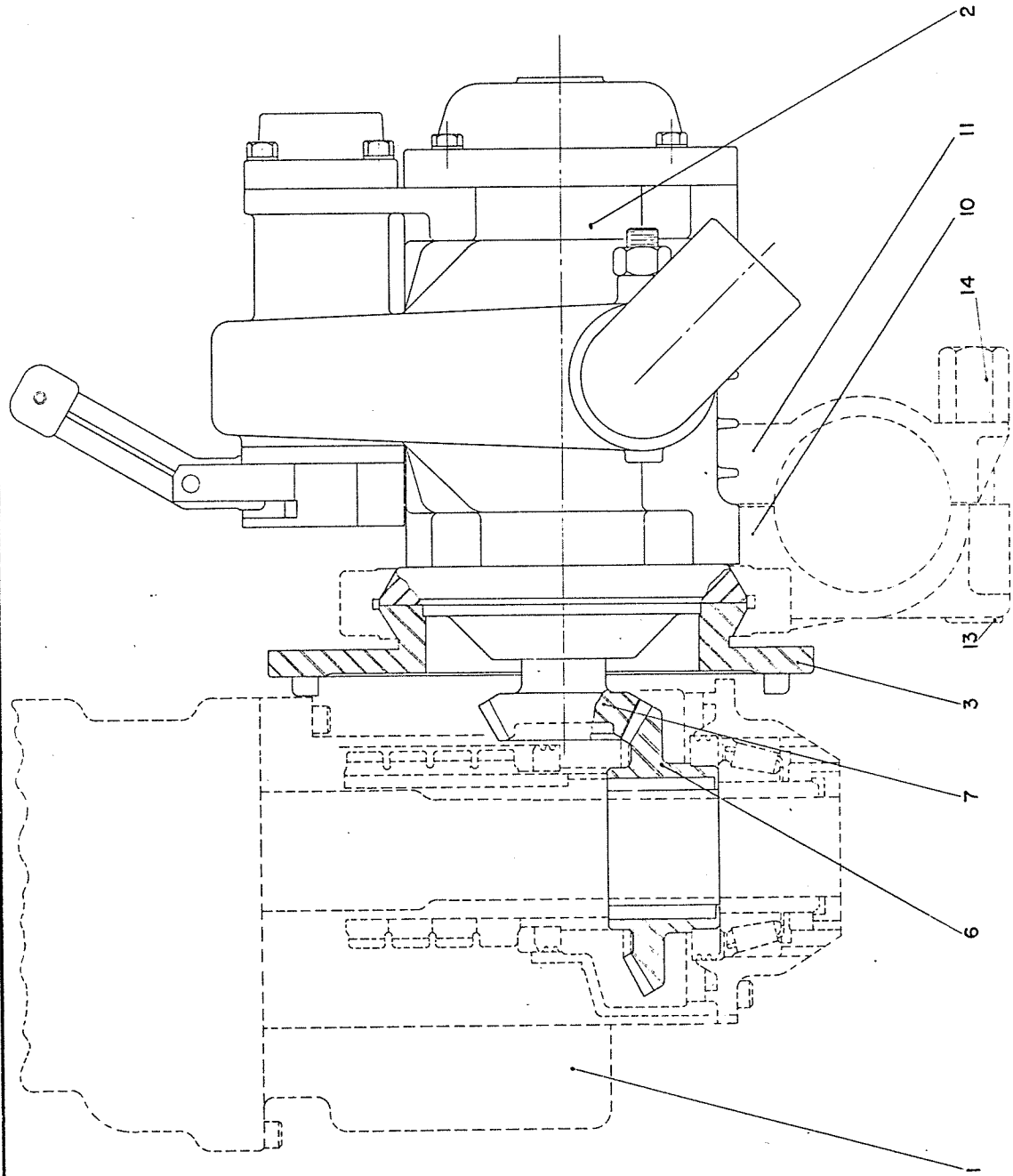
Filler Screen: Remove filler screen (4) periodically and clean. (The screen (4) is held in place by 'O' ring (5)).

Check Oil Frequently:

NOTE: Do not use two different sizes of JETS in ONE nozzle. Do not use only ONE JET in a nozzle. This practice nullifies the safety feature of the "TWIN-JETS".

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MODELS VAG & VEG UNDERGROUND DRILLS  
DRESSER/BOYLES INDUSTRIES LIMITED

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PLATE N<sup>o</sup> 503

REFER TO PLATE #503

Ref. No.	Part No.	No. Req'd.	Description
1		1	Model BUS-1JEG Swivelhead Assembly (Refer to Plate #188C, #473 & Parts List)
2		One to Suit	Model BVRG-64P Vane Motor Assembly (Refer to Plate #450 & Parts List) Model BVRG-94P Vane Motor Assembly (Refer to Plate #450 & Parts List)
3	3-002-157	1	Swivel Ring (Ref. Only see Swivel Ring Group on Swivelhead Assy.)  <u>BEVEL GEAR GROUP</u>
6	3-002-161 3-002-162 3-002-163 3-002-160	One to Suit	Drive Sleeve Bevel Gear (Ratio 1.29:1) Drive Sleeve Bevel Gear (Ratio 1.8:1) Drive Sleeve Bevel Gear (Ratio 2.33:1) Drive Sleeve Bevel Gear (Ratio 3.06:1)
7	2-503-316 2-503-314 2-503-311 2-503-312	One to Suit	Motor Bevel Gear (Ratio 1.29:1) Motor Bevel Gear (Ratio 1.8:1) Motor Bevel Gear (Ratio 2.33:1) Motor Bevel Gear (Ratio 3.06:1)  <u>3 1/2" RIGID BAR MOUNTING GROUP</u>
10	2-600-002	1	Rigid Bar Mounting c/w Items below - (For use with 3 1/2" Dia. Bar) - Standard
11	2-600-302	2	Rigid Bar Mounting Cap
13	5-129-203	4	3/4-10 UNC x 5" Lg. Hex. Hd. Bolt
14	2-600-305	4	Rigid Bar Mounting Cap Nut
	2-600-304	2	Rigid Bar Mounting Stud Nut
	2-600-303	2	Rigid Bar Mounting Stud
	5-222-320	2	Roll Pin 3/16 x 1 1/4" (For Locking Stud)  <u>4 1/2" RIGID BAR MOUNTING GROUP</u>
10	2-600-003	1	Rigid Bar Mounting c/w Items below - (For use with 4 1/2" Dia. Bar)
11	2-600-307	2	Rigid Bar Mounting Cap
13	5-152-403	4	1 1/8-7 UNC x 6" Lg. Hex. Hd. Bolt
14	2-600-268	4	Rigid Bar Mounting Cap Nut
	2-600-304	2	Rigid Bar Mounting Nut
	2-600-303	2	Rigid Bar Mounting Stud
	5-222-320	2	Roll Pin 3/16 x 1 1/4" (For Locking Stud)

IMPORTANT - Always quote Serial Number when ordering Spare Parts



REFER TO PLATE #503

Ref. No.	Part No.	No. Req'd.	Description
			<u>3 1/2" SWIVEL BAR MOUNTING GROUP</u>
	2-600-000	1	Swivel Bar Mounting Assembly Consists of: Motor Mount & Clamp Assembly plus Saddle Assembly (For use on 3 1/2" Dia. Bar)
	2-600-110	1	Swivel Bar Motor Mount & Clamp
	5-129-808	2	Motor Mount Clamp Bolt 3/4-10 UNC x 8" Lg. Sq. Hd. Bolt
	2-600-305	2	Motor Mount Clamp Bolt Nut
	2-600-037	1	Mine Bar Saddle Assembly c/w Items below:
	2-600-267	2	Saddle Cap
	5-160-026	2	Saddle Clamp Bolt - 1"-8 UNC x 9" Lg. Sq. Hd. Bolt
	5-151-308	4	Saddle Cap Bolt - 1"-8 UNC x 5 1/2" Lg. Sq. Hd. Bolt
	5-160-027	6	Nut
	2-600-265	1	Saddle Clamp
	2-600-270	1	Saddle
			<u>4 1/2" SWIVEL BAR MOUNTING GROUP</u>
	2-600-001	1	Swivel Bar Mounting Assembly Consists of: Motor Mount & Clamp Assembly plus Saddle Assembly (For use on 4 1/2" Dia. Bar)
	2-600-110	1	Swivel Bar Motor Mount & Clamp
	5-129-808	2	Motor Mount Clamp Bolt - 3/4-10 UNC x 8" Lg. Sq. Hd. Bolt
	2-600-305	2	Motor Mount Clamp Bolt Nut
	2-600-038	1	Mine Bar Saddle Assembly c/w Items below -
	2-600-324	2	Saddle Cap
	5-160-026	2	Saddle Clamp Bolt - 1"-8 UNC x 9" Lg. Sq. Hd. Bolt
	5-151-508	4	Saddle Cap Bolt - 1" -8 UNC x 6 1/2" Lg. Sq. Hd. Bolt
	5-160-027	6	Nut
	2-600-265	1	Saddle Clamp
	2-600-325	1	Saddle

IMPORTANT - Always quote Serial Number when ordering Spare Parts

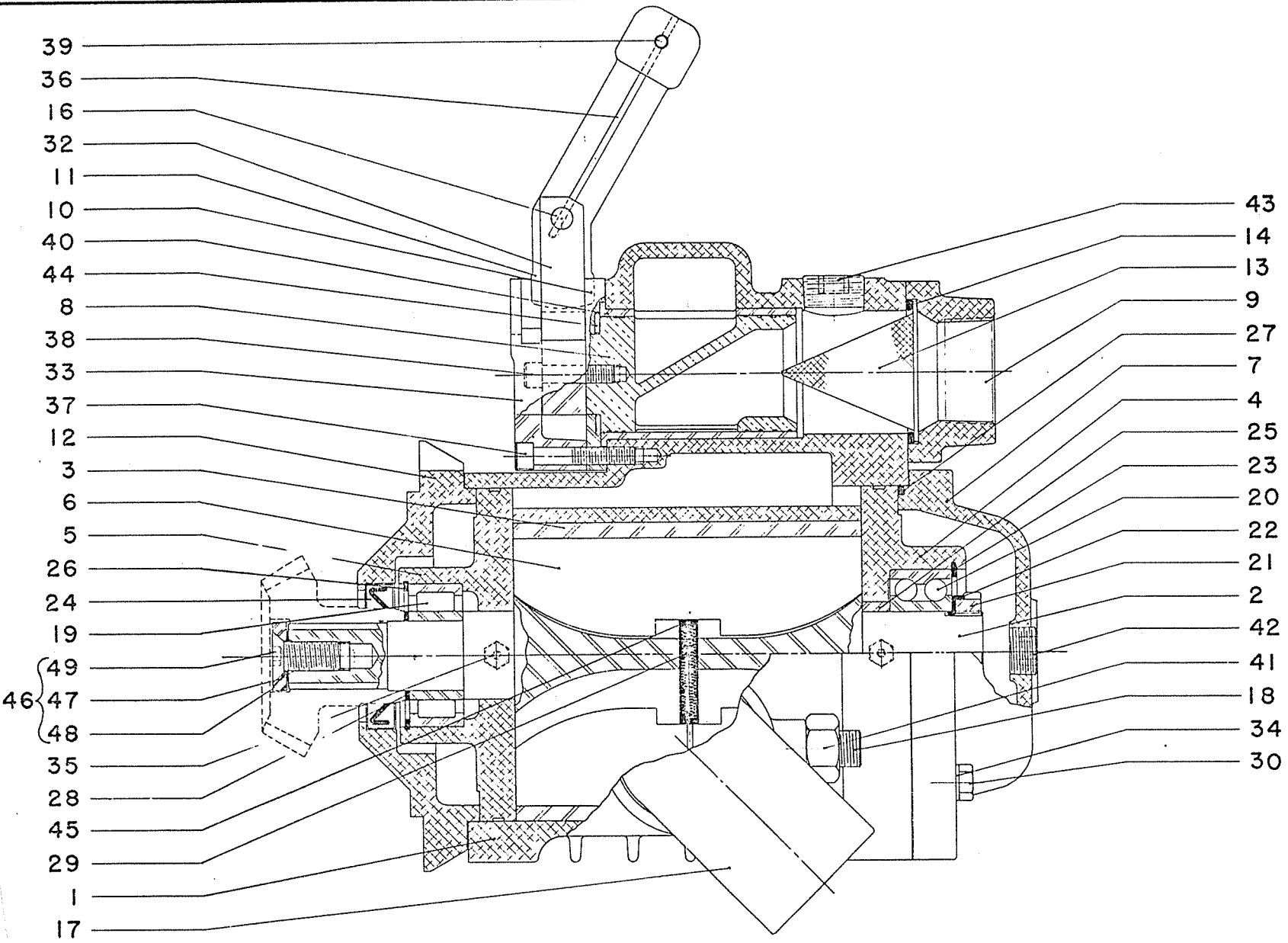
REFER TO PLATE #503

Ref. No.	Part No.	No. Req'd.	Description
			<u>TOOLS</u>
	3-002-179	1	Jacking Back Wheel Wrench & Gate Wrench
	3-002-430	1	Chuck Wrench
			<u>OPTIONAL TOOLS &amp; EQUIPMENT</u>
	5-201-441	1	#4 Truarc Pliers (External)
	5-201-442	1	#5 Truarc Pliers (Internal)
	5-201-435	1	10" Crescent Wrench
	5-201-436	1	Screw Driver #504
	5-201-438	1	Hand Oiler #135C
	5-201-437	1	Pair Pliers #H26
	5-201-427	1	Box End Wrench 1 1/4 x 1 7/16
	5-201-401	1	Grease Gun
	5-201-440	1	Gate Wrench #733
	2-503-008	1	Auxiliary Air Strainer
	1-328-005	1	Dual Feed Lubricator

IMPORTANT - Always quote Serial Number when ordering Spare Parts

REFERENCE NUMBERS SHOWN, ORDER BY PART NUMBERS SHOWN IN LIST OF PARTS.

PLATE No 450A



BVRG REVERSIBLE VANE MOTOR  
MODELS 44, 44P, 64, 64P, 94, 94P  
BOYLES BROS. DRILLING CO. LTD. VANCOUVER, CANADA.

Ref. No.	Part No.	No. Req'd.	Description
			<u>Refer to Plate #450A</u>
	2-503-005		BVRG-94P Vane Motor Assembly (Includes Ref. Nos. 1 - 49 Inclusive)
1	2-503-330	1	Motor Housing
2	2-503-310	1	Rotor
3	2-503-337	1	Liner
4	2-503-333	1	Rear End Plate
5	2-501-104	1	Front End Plate
6	2-503-319	6	Rotor Blade
7	2-503-332	1	Housing Rear Cover
8	2-503-339	1	Valve Spool
9	2-501-108	1	Air Inlet Flange
10	2-503-341	1	Valve Spool End Plate
11	2-503-342	1	Reversing Valve Handle
12	2-501-111	1	Vane Motor Mounting Ring
13	2-503-123	1	Air Inlet Screen
14	5-030-805	1	'O' Ring 2 3/8 x 2 1/8 x 1/8
16	2-503-343	1	Valve Handle Pin
17	2-503-336	1	Air Outlet Elbow
18	2-502-124	1	Elbow Lockscrew & Nut
19	5-010-006	1	Front Bearing
20	5-000-147	1	Rear Bearing
21	5-176-307	1	Locknut SKF N-07
22	5-181-307	1	Lockwasher SKF W-07
23	5-052-315	1	Retaining Ring Beveled Internal
24	5-040-038	1	Oil Seal
25		1	Rear Bearing Spacer - Refer to Page 2
26	5-050-244	1	Retaining Ring
27	5-030-832	1	'O' Ring 5 3/4 x 5 1/2 x 1/8
28		1	Pinion Shim - Refer to Page 3
29	2-503-347	3	Spring
30	5-113-003	4	3/8-16 UNC x 1 1/2" Lg. Hex. Hd. Capscrew
31	5-103-616	4	3/8-16 UNC x 1" Lg. Soc. Hd. Capscrew
32	2-503-340	1	Valve Spool Handle (Fixed)
33	2-503-344	1	Valve Handle Retaining Plate
34	5-180-506	4	3/8 Standard Lockwasher
35	5-200-800	2	1/8 Alemite Fitting (Straight)
36	2-503-345	2	Valve Handle Spring
37	5-112-116	3	5/16-18 UNC x 1 3/4" Lg. Soc. Hd. Capscrew
38	5-102-823	1	5/16-18 UNC x 1 1/4" Lg. Soc. Hd. Capscrew
39	5-222-420	1	1/4 Dia. x 1 1/4 Lg. Sel-Lok Pin

IMPORTANT - Always quote Serial Number when ordering Spare Parts

Ref. No.	Part No.	No. Req'd.	Description																				
			<u>Refer to Plate #450A</u>																				
40	2-501-113	1	Valve Sleeve																				
41	5-171-410	1	5/8 UNC Jam Nut																				
43	5-200-134	3	3/4 NPT Pipe Plug																				
44	5-010-108	1	Thrust Bearing																				
45	2-503-315	6	Rotor Plunger																				
46	2-503-370	1	Bevel Gear Retaining Screw Assembly Consists of Ref. Nos. 47, 48 & 49.																				
47	5-180-808	1	1/2" External Tooth Lockwasher																				
48	2-503-371	1	Pinion Retaining Washer																				
49	5-105-863	1	1/2-20 UNF x 1 1/4" Lg. Flat Hd. Capscrew																				
			<u>Note:</u>																				
			Rear Bearing Spacers and Pinion Shims are available in various lengths to compensate for variations in parts and should be selected from the following tables.																				
			<u>Rear Bearing Spacer - Ref. No. 25</u>																				
			<table border="0"> <thead> <tr> <th><u>Part No.</u></th> <th><u>Variation from Nominal Size</u></th> </tr> </thead> <tbody> <tr> <td>2-501-365</td> <td>+ .010</td> </tr> <tr> <td>2-501-364</td> <td>+ .008</td> </tr> <tr> <td>2-501-351</td> <td>+ .006</td> </tr> <tr> <td>2-501-348</td> <td>+ .004 Std.</td> </tr> <tr> <td>2-501-346</td> <td>+ .002</td> </tr> <tr> <td>2-501-343</td> <td>.000</td> </tr> <tr> <td>2-501-340</td> <td>- .002</td> </tr> <tr> <td>2-501-338</td> <td>- .004</td> </tr> <tr> <td>2-501-336</td> <td>- .006</td> </tr> </tbody> </table>	<u>Part No.</u>	<u>Variation from Nominal Size</u>	2-501-365	+ .010	2-501-364	+ .008	2-501-351	+ .006	2-501-348	+ .004 Std.	2-501-346	+ .002	2-501-343	.000	2-501-340	- .002	2-501-338	- .004	2-501-336	- .006
<u>Part No.</u>	<u>Variation from Nominal Size</u>																						
2-501-365	+ .010																						
2-501-364	+ .008																						
2-501-351	+ .006																						
2-501-348	+ .004 Std.																						
2-501-346	+ .002																						
2-501-343	.000																						
2-501-340	- .002																						
2-501-338	- .004																						
2-501-336	- .006																						

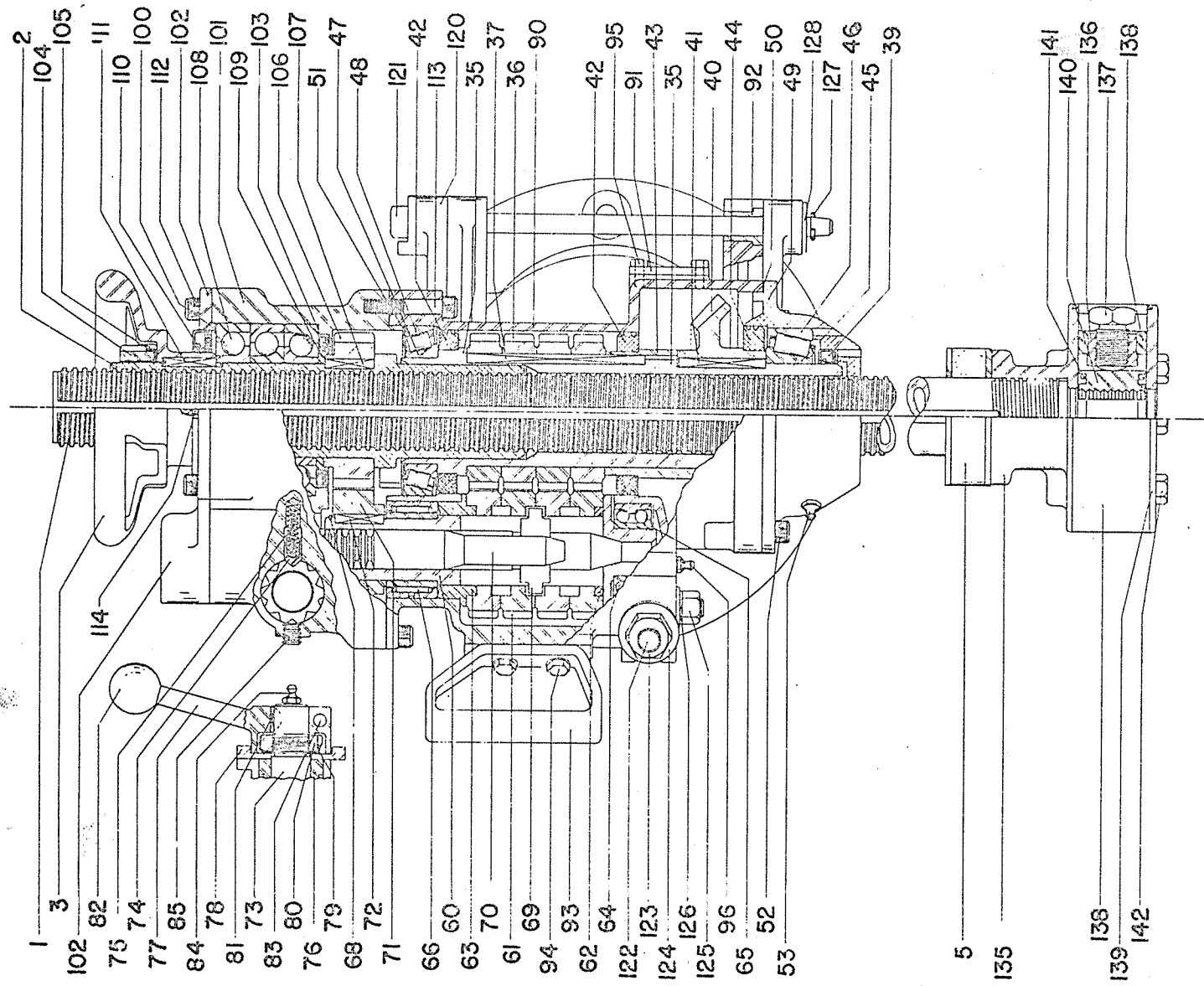
IMPORTANT - Always quote Serial Number when ordering Spare Parts

Ref. No.	Part No.	No. Req'd.	Description														
			<p><u>Pinion Shim - Ref. No. 28</u></p> <table border="0"> <thead> <tr> <th><u>Part No.</u></th> <th><u>Variation from Nominal Size</u></th> </tr> </thead> <tbody> <tr> <td>2-502-136</td> <td>+ .045</td> </tr> <tr> <td>2-502-135</td> <td>+ .030</td> </tr> <tr> <td>2-502-134</td> <td>+ .015</td> </tr> <tr> <td>2-502-133</td> <td>Standard</td> </tr> <tr> <td>2-502-132</td> <td>- .015</td> </tr> <tr> <td>2-502-131</td> <td>- .030</td> </tr> </tbody> </table>	<u>Part No.</u>	<u>Variation from Nominal Size</u>	2-502-136	+ .045	2-502-135	+ .030	2-502-134	+ .015	2-502-133	Standard	2-502-132	- .015	2-502-131	- .030
<u>Part No.</u>	<u>Variation from Nominal Size</u>																
2-502-136	+ .045																
2-502-135	+ .030																
2-502-134	+ .015																
2-502-133	Standard																
2-502-132	- .015																
2-502-131	- .030																

IMPORTANT - Always quote Serial Number when ordering Spare Parts

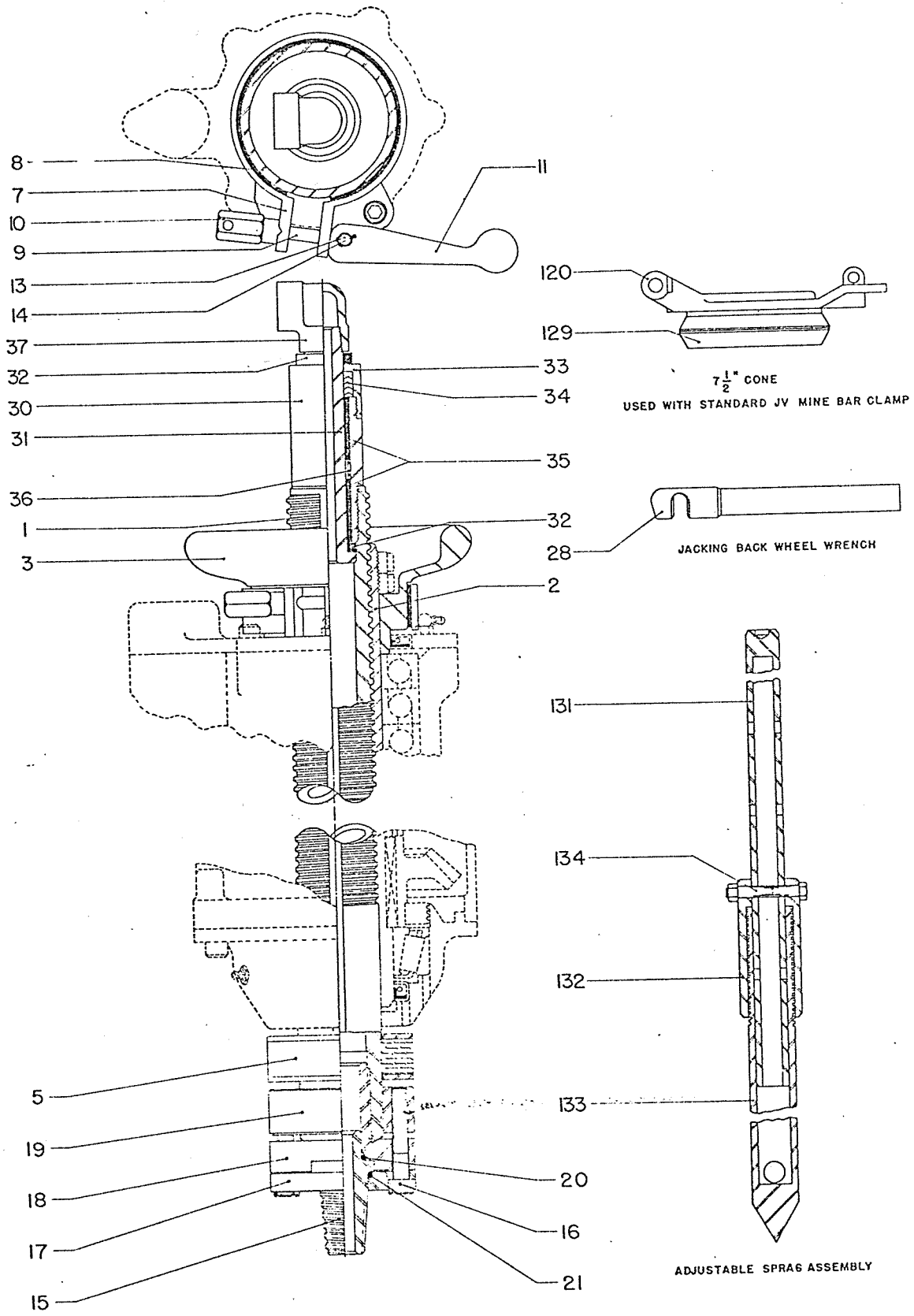
MATING MOTOR AND DRIVE SLEEVE BEVEL GEARS FOR USE WITH VANE MOTORS

<u>SWIVELHEAD MODEL</u>	<u>MOTOR BEVEL GEAR PART NO.</u>	<u>DRIVE SLEEVE BEVEL GEAR PART NO.</u>	<u>RATIO</u>	<u>MOTOR BEVEL GEAR MOUNTING METHOD</u>
VEG	2-503-316	3-002-161	1.29:1	MOUNTS DIRECTLY
VEG	2-503-314	3-002-162	1.8:1	ON
VEG	2-503-311	3-002-163	2.33:1	MOTOR SHAFT.
VEG	2-503-312	3-002-160	3.06:1	ADJUSTMENT BY
VAG	2-503-318	3-004-141	2.65:1	SHIM
VAG	2-503-350	3-004-140	2.04:1	SEE PAGE 3



MODEL BUS-1JEG  
 SERIAL NUMBERS 570000 AND LATER  
 SWIVEL HEAD ASSEMBLY.





MODEL BUS-1JEG  
 BLAST HOLE FEEDSCREW ASSEMBLY AND ACCESSORIES  
 DRESSER/BOYLES INDUSTRIES LIMITED

REFER TO PLATE #188C

Ref. No.	Part No.	No. Req'd.	Description
<u>FEEDSCREW &amp; FEEDNUT GROUP</u>			
1	3-002-023) 3-002-029) 3-002-027)	One	Feedscrew (24" Feed) c/w Tack Welded Feedscrew (18" Feed) Feedscrew Bushing Feedscrew (30" Feed) 3-002-026 for 'E' Rod
	3-002-166) 3-002-165) 3-002-167)	to Suit	Feedscrew (24" Feed) 1 1/2 I.D. Less Feedscrew (18" Feed) 1 1/2 I.D. Feedscrew Feedscrew (30" Feed) 1 1/2 I.D. Bushing
	3-002-030	1	Feedscrew Bushing (XRT Rod)
	3-002-026	1	Feedscrew Bushing ('E' Rod)
2	3-002-050	1	Feednut
	5-030-805	1	Feednut 'O' Ring (2 1/8 ID x 2 3/8 OD x 1/8)
3	3-002-081	1	Jacking Back Wheel
5	3-002-025	1	Rubber Bumper
	3-002-134	3	Drive Sleeve Key
35	3-002-133	1	Drive Sleeve
36		4	Drive Sleeve Feed Gear (State Feed Desired) Refer to Page 5 for available feeds.
37	3-002-060	1	Drive Sleeve Feed Gear Key
39	5-040-066	1	Drive Sleeve Oil Seal
40		1	Drive Sleeve Bevel Gear - See Page 6 for ratios available and mating bevel gears.
41	3-002-047	2	Drive Sleeve Bevel Gear Key
42	3-002-126	2	Drive Sleeve Feed Gear Shield
43	3-002-125	1	Oil Seal Sleeve
44	3-002-117	1	Drive Sleeve Bearing Shield
45	5-010-081	1	Bearing Cone
46	5-010-080	1	Bearing Cup
47	5-010-085	1	Bearing Cone
48	5-010-072	1	Bearing Cup
49	3-002-034	1	Drive Sleeve Bearing Cover
50	3-002-036	1 Set	Drive Sleeve Bearing Cover Shim
51	3-002-041	1 Set	Drive Sleeve Bearing Shim
52	5-103-649	4	3/8-24 UNF x 1" Lg. Soc. Hd. Capscrew
53	5-200-800	1	Alemite Fitting (Straight)

IMPORTANT - Always quote Serial Number when ordering Spare Parts

REFER TO PLATE #188C

Ref. No.	Part No.	No. Req'd.	Description
90	3-002-052C	1	Drive Sleeve Housing
91	3-002-055	1	Inspection Hole Cover
	5-101-236	2	1/4-28 UNF x 1/2" Lg. Hex. Capscrew
	5-180-804	2	1/4 External Tooth Lockwasher
92	5-020-011	2	Hinge Bolt Bushing
93	3-002-173	1	Swivelhead Handle
94	5-102-436	2	5/16-24 UNF x 3/4" Lg. Hex. Capscrew
95	5-103-649	4	3/8-24 UNF x 1" Lg. Soc. Hd. Capscrew
	5-102-849	2	5/16-24 UNF x 1 1/4" Lg. Soc. Hd. Capscrew
96	5-200-800	1	Alemite Fitting (Straight)
<u>COUNTERSHAFT GROUP</u>			
60	3-002-112	1	Countershaft
61		4	Countershaft Feed Gear - State Feed Desired Refer to Page 5 for available feeds.
62	3-002-120	1	Countershaft Feed Shifter Key Stop (Lower)
63	3-002-119	1	Countershaft Feed Gear Thrust Washer (Upper)
64	5-000-046	1	Countershaft Bearing
65	5-051-118	1	Countershaft Snap Ring
66	5-010-015	1	Countershaft Bearing
68	5-051-156	1	Countershaft Snap Ring
69	3-002-089	1	Feed Shifter Key
70	3-002-122	1	Feed Shifter Rack
71	3-003-071	1	Countershaft Drive Gear
72	3-002-040	1	Countershaft Drive Gear Key
73	3-002-123	1	Feed Shifter Pinion
74	3-002-151	1	Feed Shifter Locking Plunger
75	3-002-152	1	Plunger Spring
76	3-002-164	1	Feed Shifter Locking Collar
77	3-002-110	1	Feed Shifter Handle
78	3-002-121	1	Feed Indicator
79	5-181-305	1	Lockwasher
80	5-176-305	1	Locknut
81	5-070-004	1	Woodruff Key (1/8 x 5/8)
83	5-102-436	1	5/16-24 UNF x 3/4" Lg. Hex. Capscrew
84	5-200-800	1	Alemite Fitting (Straight)
85	5-200-201	1	1/4 NPT Caplug

IMPORTANT - Always quote Serial Number when ordering Spare Parts

Mining  
Equipment

DRESSER

MODEL BUS-1JEG  
SWIVELHEAD ASSEMBLY  
LEFT HAND-STANDARD CORE DRILLINGBOYLES  
DIAMOND DRILLING EQUIPMENT2262A  
11-10-77REFER TO PLATE #188C

Ref. No.	Part No.	No. Req'd.	Description
			<u>FEEDNUT HOUSING GROUP</u>
100	3-002-041	1 Set	Bearing Shim
101	3-002-115	1	Feednut Housing
102	3-002-116	1	Feednut Housing Cover
103	5-040-083	1	Oil Seal
104	3-002-086	1	Feednut Locknut
105	3-002-087	1	Feednut Lockwasher
106	3-003-022	1	Feednut Drive Gear
107	3-002-040	1	Feednut Drive Gear Key
108	5-000-075	3	Bearing
109	3-002-051	1	Feednut Bearing Seal Spacer
110	5-040-071	1	Feednut Oil Seal
111	3-002-083	1	Jacking Back Wheel Key
112	5-103-649	6	3/8-24 UNF x 1" Lg. Soc. Hd. Capscrew
	5-103-849	2	3/8-24 UNF x 1 1/4" Lg. Soc. Hd. Capscrew
	5-113-049	1	3/8-24 UNF x 1 1/2" Lg. Soc. Hd. Capscrew
113	5-113-249	3	3/8-24 UNF x 2" Lg. Soc. Hd. Capscrew
114	5-200-803	1	Alemite Fitting (90°)
			<u>SWIVEL RING GROUP</u>
120	3-002-014)	One	Swivel Ring for use with JV Motor & Standard JV Mine Bar Clamp
	3-002-018)	to	Swivel Ring for use on BBS-15 (up to Serial #2-412-00./79 Only)
	3-002-157)	Suit	Swivel Ring for use on VEG Drill
121	3-002-053	1	Hinge Bolt
	5-020-011	2	Hinge Bolt Bushing
122	3-002-019	1	Swivelhead Eye Bolt
123	5-176-510	1	Swivelhead Eye Bolt Nut (High)
124	5-180-032	1	Swivelhead Eye Bolt Washer
125	5-171-008	1	1/2-20 UNF Hex. Nut
	5-115-236	1	1/2-20 UNF x 2" Lg. Hex. Hd. Capscrew (Not shown)
126	5-180-508	1	1/2 Std. External Tooth Lockwasher
127	5-221-043	1	1/8 x 1 1/2 Lg. Cotter Pin

IMPORTANT - Always quote Serial Number when ordering Spare Parts

2262A  
11-10-77

REFER TO PLATE 188C

Ref. No.	Part No.	No. Req'd.	Description
			<u>CHUCK ASSEMBLIES</u>
	3-002-400	1	Chuck Assembly Complete for XR & XRT Rods
	3-002-401	1	Chuck Assembly Complete for 'E' Rods
	3-002-402	1	Chuck Assembly Complete for 'EW' Rods
			<u>CHUCK GROUP</u>
135	3-002-425	1	Chuck Flange
136	3-002-426	2	Chuck Bushing
137	3-002-427	2	Chuck Bolt
138	3-002-428	1	Chuck Body
139		1	Chuck Plate (See Below)
140		2	Chuck Jaw (See Below)
141	3-002-429	2	Chuck Jaw Spring
142	5-116-503	4	1/2-13 UNC x 2 3/4" Lg. Hex. Capscrew
			<u>CHUCK PLATES AVAILABLE IN THE FOLLOWING SIZES</u>
	3-002-431	1	Chuck Plate for 'XRT' & 'XR' Rods
	3-002-433	1	Chuck Plate for 'E' & 'EW' Rods
			<u>CHUCK JAWS AVAILABLE IN THE FOLLOWING SIZES</u>
	3-002-437	2	Chuck Jaws for 'XRT' & 'XR' Rods
	3-002-438	2	Chuck Jaws for 'E' Rods
	3-002-439	2	Chuck Jaws for 'EW' Rods
			<u>TOOLS - Supplied with Swivelhead</u>
	3-002-179B	1	Jacking Back Wheel & Gate Wrench
	3-002-430A	1	Chuck Wrench

IMPORTANT - Always quote Serial Number when ordering Spare Parts

DRIVE & FEED GEARS USED WITH LEFT HAND FEEDSCREWCountershaft Feed Gear

<u>Feeds</u>	<u>Part No.</u>
25 F	3-002-350
35 F	3-002-370
50 F	3-002-352
70 F	3-002-371
102 F	3-002-354
140 F	3-002-355
207 F	3-002-356
307 F	3-002-360
420 F	3-002-363
644 F	3-002-366

Drive Sleeve Feed Gear

<u>Feeds</u>	<u>Part No.</u>
25 F	3-002-300
35 F	3-002-320
50 F	3-002-302
70 F	3-002-321
102 F	3-002-304
140 F	3-002-305
207 F	3-002-306
307 F	3-002-310
420 F	3-002-313
644 F	3-002-316

Countershaft Drive Gear

30 T	3-003-071
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Feednut Drive Gear

35 T	3-003-022
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FEED GEAR SET COMPLETE

	<u>Part No.</u>	<u>Feeds</u>			
	<u>Complete Set</u>				
SET A	3-002-375	102	140	207	307
SET B	3-002-376	140	207	307	420
SET C (Std)	3-002-377	207	307	420	644

On all orders for feed gears, of a different feed from those listed above, a feed from the above list closest to the one ordered will be supplied. Special feed gears can be supplied on request but they will only be made to order and will carry a premium of 50% over the list price of a standard gear. However, if special gears are ordered in batches of six or more, there will be no extra charge.

2262A  
11-10-77

Drive Sleeve  
Bevel Gear

Mating  
Drive Gear

<u>Part No.</u>	<u>Ratio</u>	<u>Part No.</u>	<u>Drive Gear Mounting Method</u>
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MODEL JV AIR MOTOR

3-002-045	1 to 1	2-600-220	Mounts on Flange 2-600-214. Adjustment by Shims at Flange.
3-002-046	1 to 1.3	2-600-222	Mounts on Flange 2-600-214. Adjustment by Shims at Flange.
3-002-048	1.29 to 1	2-600-229	Mounts directly on Shaft. Adjustment by Shims at end of Hub.
3-002-158	1.47 to 1	2-600-311	Mounts directly on Shaft. Adjustment by Shims at end of Hub.)Used only with
3-002-049	1.8 to 1	2-600-227	Mounts directly on Shaft. Adjustment by Shims at end of Hub.)Swivel Ring Pt. No. 3-002-157

VANE MOTOR MODELS 44P; 64P; & 94P

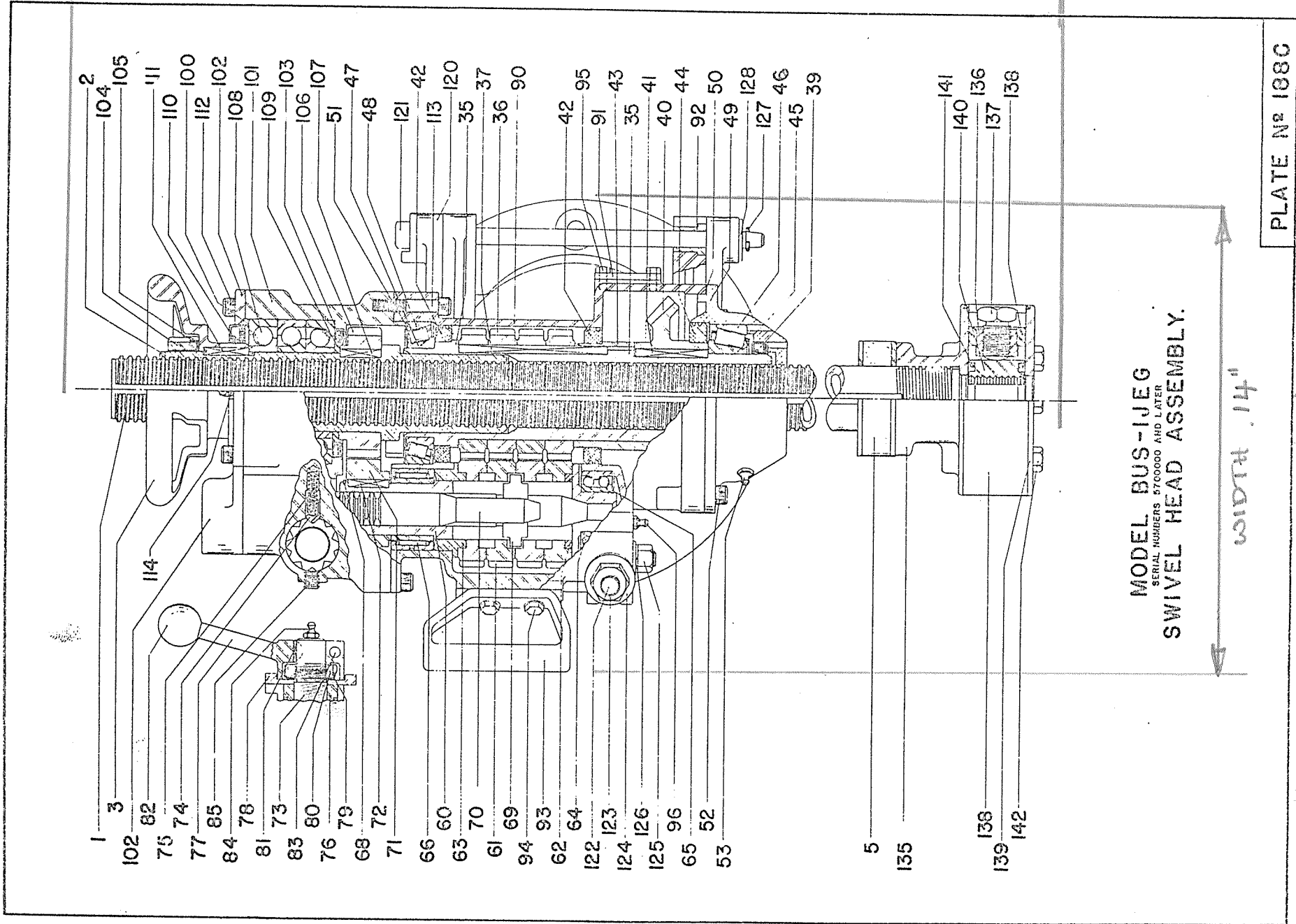
3-002-161	1.29 to 1	2-503-316	Mounts directly on Vane Motor Shaft
3-002-162	1.8 to 1	2-503-314	Mounts directly on Vane Motor Shaft
3-002-163	2.33 to 1	2-503-311	Adjustment by Shims - Part No.
3-002-160	3.06 to 1	2-503-312	2-503-322 - between Bearing & Gear

MODEL BBU-2

3-002-045	1 to 1	2-600-220	Mounts on Flange. Adjustment by Shims at Flange
3-002-046	1 to 1.3	2-600-222	Mounts on Flange. Adjustment by Shims at Flange
3-002-048	1.29 to 1	2-550-162	Mounts directly on Shaft. Adjustment by Shims behind end of Hub.

MODEL BBS-15 (Up to Serial #2-412-00./79 only)

3-002-045	1 to 1	2-600-220	Mounts on Flange 2-104-136. Adjustment by Shims at Flange.
3-002-046	1 to 1.3	2-600-222	Mounts on Flange 2-104-136. Adjustment by Shims at Flange.
3-002-048	1.29 to 1	2-204-103	Mounts directly on Shaft. Adjustment by Shims behind end of Hub.



LENGTH 57"

MODEL BUS-IJEG  
 SERIAL NUMBERS 570000 AND LATER  
 SWIVEL HEAD ASSEMBLY.

width 14"

PLATE No 1080