

## ALLEN HERSCHELL RED BARON

MFG: ALLEN HERSCHELL  
NAME: RED BARON  
TYPE: KIDDIE

PASSENGER CAPACITY: 8 PLANES, 2 PERSONS PER PLANE    SPEED: 6 RPM

### DAILY PRE-OPENING INSPECTION

(This inspection shall include but not be limited to the following)

Check the following:

Blocking, Supports

Condition of Airplanes

Safety Belts

Lighting

All pins & keys

Sweeps

Gates & Fences

Operating Controls

### OPERATION OF RIDE

1. Open entrance gate and load children assisting them as needed.
2. Secure seat belts.
3. Make sure entrance and exit gates are closed and no one is inside the ride except seated passengers.
4. Depress the operator presence switch, push start button.
5. Ride will stop at the end of timed period.
6. Unlatch seat belts, assist children out of planes and through the exit gate.
7. Close exit gate and proceed to reload the ride.

### RIDE OPERATORS POSITION AND FUNCTION

1. Read the operational manual and be aware of proper operation, maintenance, and safety procedures.
2. Before operating ride, a safety check out should be adhered to.
3. Ride operator is to remain at the ride controls and observe riders at all times that the ride is in operation.
4. Occupants on the ride must remain seated at all times that the ride is in motion.
5. Make sure exit and entrance gates are closed to prevent anyone from entering while the ride is in motion.
6. During the operation of the ride, the operator should observe passengers. Check for arms, legs or heads hanging out, for sick or uncomfortable passengers.
7. No food or drinks.
8. Regularly inspect and keep the entire area around the ride free of any obstacles.

### GENERAL SAFETY PROCEDURES

1. Passenger restrictions: 58" or less in height to ride.
2. Turn off before working on moving parts.
3. Do not attempt to repair or replace any components that you are not experienced with. For safety, get help.
4. Ensure that the ride is erected by trained personnel.
5. Regularly inspect the ride and replace any parts found worn or defective.

### EMERGENCY PROCEDURES

1. Bring the ride to a complete stop and evacuate passengers as quickly and safely as possible.

2. Notify your supervisor immediately.

#### PROCEDURE FOR AN INCIDENT

1. Call your supervisor and First Aid or other services if required.
2. DO NOT MOVE THE INJURED PERSON.
3. Assist in crowd control to make way for emergency vehicles.
4. Fill out an accident report while the incident is still fresh in your mind.

# HELICOPTER RIDE

Manual No. 217-43266

Chance Manufacturing Company, Inc. has  
ceased operations as a corporation. The  
information herein is supplied by  
Chance Rides, Inc.  
Chance Rides, Inc. SPECIFICALLY  
DISCLAIMS ANY LIABILITY  
for losses associated with rides produced by  
Chance Manufacturing Co., Inc.



*Allen Hushall  
(716) 692-1884*



NUMBER: B090R1075-0

DATE: MAY 25, 1990

SUPERSEDES: 90-148C-00

America's Largest Manufacturer of Amusement Rides

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# SERVICE BULLETIN

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Effective Serial Number: All Units - Chance Rides, Inc.  
All Units - Chance Manufacturing Co., Inc.

Chance Rides, Inc. SPECIFICALLY DISCLAIMS ANY  
LIABILITY for losses associated with rides  
produced by Chance Manufacturing Company, Inc.

Ride: All Rides

Subject: Replacement and torque  
requirements for functional  
load carrying capscrews

Capscrews used by CHANCE RIDES, INC. are classified as functional load  
carrying capscrews if:

- They are used as tension members in the erection or operation  
of a ride  
  
and/or
- They are required to resist shear through friction-type  
connections in the erection or operation of a ride

Capscrews are selected with consideration to grade, size and quantity,  
using joint capacities based on tightness torques of 60% of rated yield  
and group joint efficiency of 62.5%.

## TORQUE REQUIREMENTS

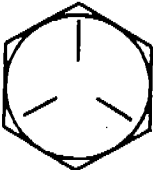
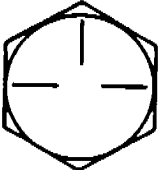
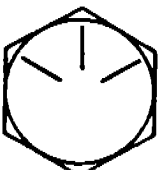



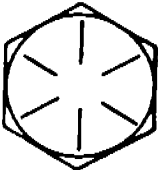

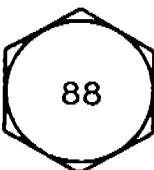


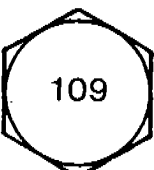
Capscrews must be tightened to the torque values listed in the Torque  
Chart. These values were selected to produce a tightening torque range  
of 60% to 70% of proof load, when tightened with a hardened washer under  
the locknut or capscrew head (whichever is accessible for tightening).  
When the capscrew is tightened from the head end, apply anti-seize  
lubricant to the shank of the capscrew. When the threads are  
lubricated, use 10% less torque to tighten the capscrew.

DO NOT TIGHTEN CAPSCREWS OVER THE RECOMMENDED TORQUE. This can damage  
the capscrew, due to variances in coefficients of friction and torque  
wrench accuracy.

Always use a torque wrench. It is impossible to accurately measure the  
tightness of a capscrew by other methods. Torque wrenches must checked  
for accuracy twice each operating season.

# GRADE MARKING for Functional Load Carrying Capscrews

Manufacturer's identification symbols must be present on all capscrews.

CORRECT MARKINGS	EXAMPLES OF UNACCEPTABLE MARKINGS
<p>SAE J429 GRADE 5 MEDIUM CARBON 81,000 YIELD</p> 	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">             GRADE 5.1 LOW CARBON         </div> <div style="text-align: center;">             GRADE 5.2 LOW CARBON MARTENSITIC         </div> </div>
<p>ASTM A325 TYPE 1 MEDIUM CARBON LONGER SHANK &amp; SHORTER THREAD LENGTH THAN GRADE 5 81,000 YIELD</p>  <p>ASTM A 325 TYPE 3 CORROSION RESISTING LONGER SHANK &amp; SHORTER THREAD LENGTH THAN GRADE 5 81,000 YIELD</p> 	<div style="text-align: center;">             ASTM A325 TYPE 2 LOW CARBON MARTENSITIC         </div>
<p>SAE J429 GRADE 8 MEDIUM CARBON 130,000 YIELD</p> 	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">             8.8         </div> <div style="text-align: center;">           ISO R898 CLASS 8.8 MEDIUM CARBON 92,000 YIELD         </div> <div style="text-align: center;">             88         </div> </div>
<p>ASTM A490 ALLOY STEEL LONGER SHANK &amp; SHORTER THREAD LENGTH THAN GRADE 8 130,000 YIELD</p> 	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">             10.9         </div> <div style="text-align: center;">           ISO R 898 CLASS 10.9 ALLOY STEEL 130,000 YIELD         </div> <div style="text-align: center;">             109         </div> </div>



Revision

527-01.1-00

Date: 9-17-79

Supersedes:

*America's Largest Manufacturer of Amusement Rides*

## SERVICE BULLETIN

Effective Serial Numbers: ALL RIDES

Ride: HELICOPTER

Subject: ORIFICE KIT

If you no longer own this ride, please notify Chance Manufacturing Co. of new owners name and address and serial number of ride.

Chance Manufacturing Co. is recommending that all Helicopter ride center bases be inspected for structural cracks as shown in Figure A below. Specifically, the weld area where the center bearing base is welded to the I-beam base should be visually inspected. Bouncing the ride vehicle on the sweep during a visual inspection should open any cracks so they can be seen with the naked eye.

If any cracks are found, Chance Manufacturing Co. should be contacted and the ride should not operate until proper repairs are made.

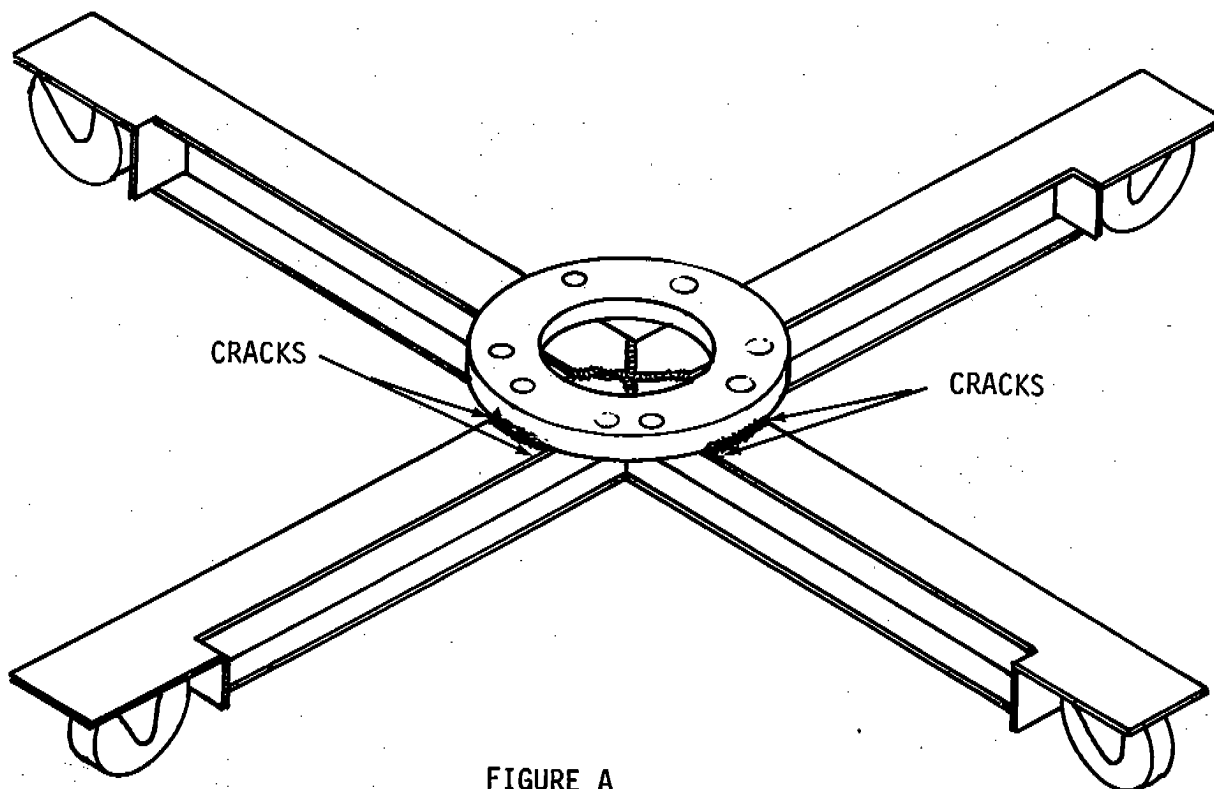


FIGURE A

Factory and Sales Office: 4219 Irving • P.O. Box 12328 • Wichita, Kansas 67277 • (316) 942-7411

## INSTALLATION OF ORIFICE KIT

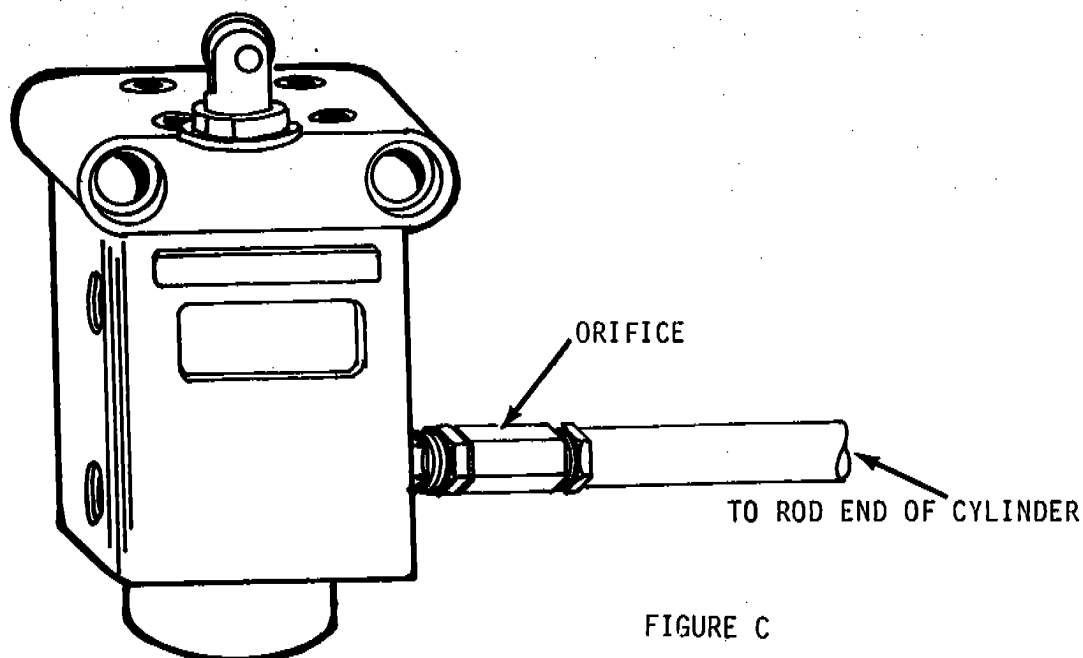
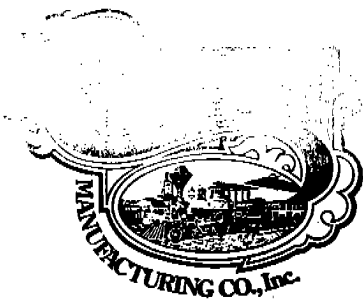


FIGURE C

Install the orifice kit as per Figure C and the following steps:

1. Disconnect hose coming from bottom of cylinder to valve (Vickers C-572) mounted on sweep.
2. Insert close nipple.
3. Insert orifice on close nipple.
4. Re-connect hose.

All work must be performed by competent, qualified mechanics capable of understanding the function of the parts and their proper installation.



Number 10

Date: 12-7-72

Supersedes: June 1969

*America's Largest Manufacturer of Amusement Rides*

## SERVICE BULLETIN

Effective Serial Numbers:

Ride: HELICOPTER RIDE

Subject: ERECTION AND CARE

### REFERENCES:

#### Blueprints:

HCC-101 Assembly Dwg.  
HC-100P Parts Number Dwg.  
HC-153 Hydraulic Circuit Dwg.  
KT-101 Foundation Drawing  
HC-169 Wiring Diagram  
HC-215 Oil Cylinder  
Waterman Valve Print  
Link Belt Parts List  
Cutler Hammer Brake Information

### ERECTION AND CARE OF MODEL "C" HELICOPTER RIDE

1. Refer to print HCC-101 for general arrangement of parts and to print HC-100P for part number identification and lubrication instructions.
2. Select a spot that is reasonably level - especially for the center of the ride and the platform assembly. NOTE: Regrade, if necessary.
3. Place the center drive assembly into position so the motor extension cords will run in the direction of the switch box to suit the operator's convenience.
4. Level the center drive assembly by placing the level which is in the tool box, on top of the beams and using the four adjusting screws and ground plates. Tighten the lock nuts.
5. Attach the four platform tie rods to center base with bolts and lock numbers. The numbers on the tie rods should match the numbers on the center base.

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Form TP-0007-883



17. At the Allan Herschell factory, the fluid drive sheave is given the proper amount of a premium grade of SAE 10-W oil. A change of oil is necessary every 5 years unless excessive slippage indicates that an earlier change is necessary. Check the oil level yearly. A slippage of 85 R.P.M. between the R.P.M. of motor and the R.P.M. of the hydrosheave is considered standard. The hydrosheave bearings are lubricated for life. The fluid drive sheave has the correct quantity of oil when it is positioned with its 2½ marking at the top center position which places the plug opening off center. Fill with proper fluid until the oil tends to run out the plug opening. Then replace the pipe plug. Use gasket compound on plug threads.

18. VERTICAL SHAFT WORM REDUCER WV-35 (ceiling mounted).

- A. Follow the instructions on the nameplate, using 600W in warm weather and ½ of SAE-40 and ½ of 600-W in cold weather. Maintain proper level.
- B. Drain and refill after first 150 hours of operation.
- C. Keep breather fitting clean and open.

NOTE: In locations where 600W is not available have your local supplier recommend a substitute.

During cold weather testing of these rides, the 600-W is too heavy, which throws an overload on the motor for starting after the machine has set idle for some time. In case this happens, start the ride, giving it a little help to get it up to speed and run it for 15 minutes. After this it will be free to run normally.

19. Check the V-belts on the drive for proper tension. When new, adjustments should be made frequently until the initial stretch has been taken up.

NOTE: These are not to be too tight and need very little attention during the season.

CAUTION: Any adjustment of the belt drive should be done with the motor. Do not change the position of the gear reducer except to remove excessive backlash between the pinion and ring gear. Slide the pump base only to remove looseness in V-belts between the pump and motor.

20. CURRENT SUPPLY AND WIRING

Rides are wired as follows: See wiring diagram HC-169 Rev. 2.

- 1. When customer orders 1-phase, 3-wire, 115/230 volt supply, wiring is completed by us within the switch box for a single current supply by the customer.
- 2. When customer orders 3-phase, 4-wire, 208/120 supply, wiring is completed within the switch box for a single current supply by the customer.
- 3. When customer orders 3-phase, 3-wire, 220 volt motor supply, a separate lighting supply must be provided of 115/230 volt, 3-wire, single phase. Wiring is completed within the switch box for these two separate current supplies by the customer.

ADEQUATE VOLTAGE MUST BE MAINTAINED  
WITHIN 10% AT ALL TIMES.

#### MAINTENANCE OF HYDRAULIC SYSTEM (continued)

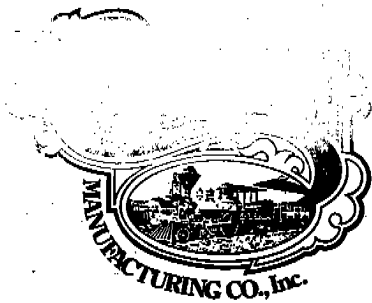
If the oil in the 50 gallon tank has become dirty, we suggest replacing it with 45 gallons of Socony DTE light oil, maintaining oil level between high and low marks on the dipstick. If oil has become excessively dirty, drain it, remove the two access doors on side of tank and clean all inside surfaces of the tank with kerosene. Apply Permatex No. 2 Formgasket compound to tank gasket, access doors and threads of capscrews before re-assembling.

If it should ever become necessary to replace or repair any part of the hydraulic plumbing system, disconnect the large suction and return hoses at the top of the oil tank. This will eliminate a syphon effect and prevent all the oil in the tank from draining out on the ground.

Keep gauge valve closed except when reading gauge pressure. This will prolong the life of the pressure gauge.

#### MAINTENANCE OF LOWER CENTER BEARING

Once a year, grease should be softened by adding automotive flushing oil through fan opening and draining entire bearing through the bottom plug. Then, regrease weekly at the six grease fittings with Mobil MP Grease or King Graphite Product KGP-24. If this is not done, the old grease will oxidize, stiffen and separate and corrosion will follow.



Date:

7-14-72

Supersedes:

2

*America's Largest Manufacturer of Amusement Rides*

## SERVICE BULLETIN

Effective Serial Numbers:

Ride: **Helicopter**

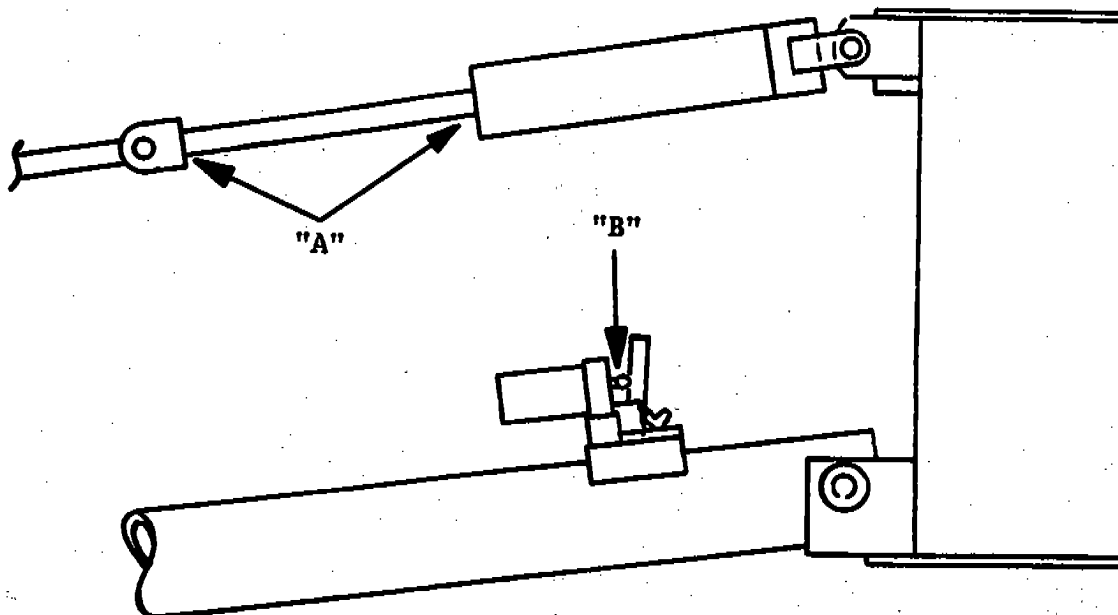
Subject: **Winter Storage**

It has been brought to our attention that in storing the Helicopter, rust is forming on vital parts. These are the lift rods and control valve plungers of which there are eight of each on a ride.

Clean thoroughly the polished area of the lift rod as shown by the arrows marked "A" on sketch and the polished plunger shown by arrow "B".

After these points are clean, coat them completely using a protective product which will not run off or permit moisture to get under it such as Mobil Kote 302. This product is obtainable from any Mobil Dealer or distributor or can be ordered from Chance Manufacturing Company.

PROTECTION OF THESE PARTS WILL HELP TO INCREASE THE LIFE OF THE SEALS AND PREVENT LEAKS IN THE HYDRAULIC SYSTEM.



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Refer to print HC-215 showing cylinder parts.

In time, through normal wear, it will become necessary to replace the packing washers (No. 5070-20) in the hydraulic lift cylinders of your Helicopter Ride.

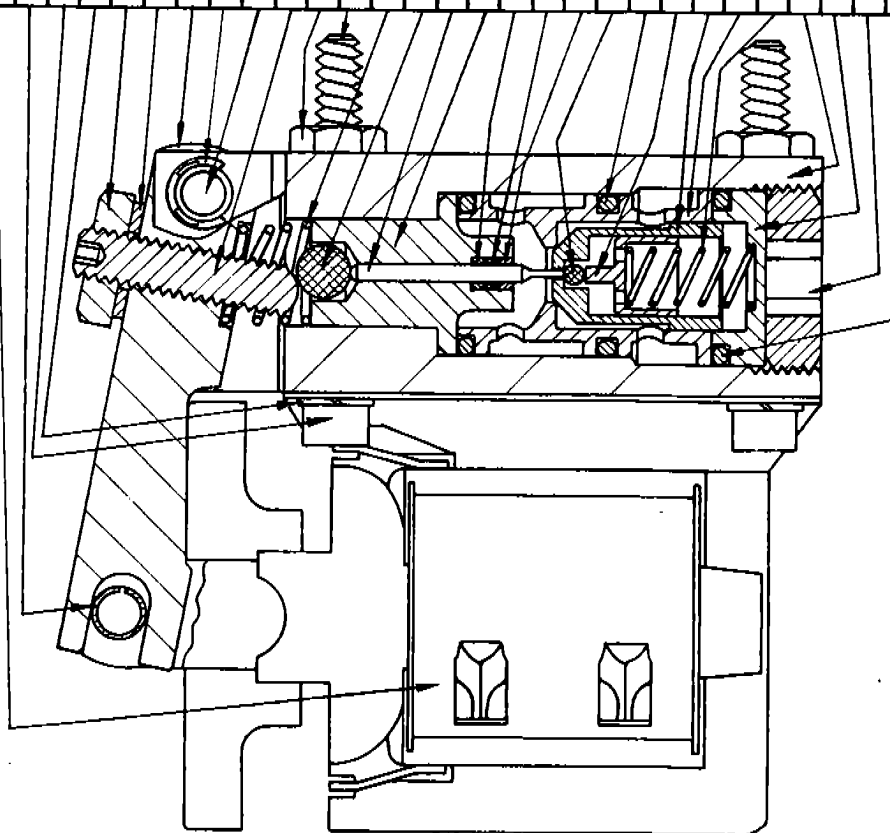
The packing washers should be replaced whenever excessive oil leakage is noted around the piston rod.

NOTE: There should be a sufficient amount of oil by-passing the packing washers for normal lubrication of the piston rod.

The following is a step by step procedure for the installation of the packing washers. Use this procedure, referring to print HC-215 for the correct identification of the parts and for the order that they are to be assembled.

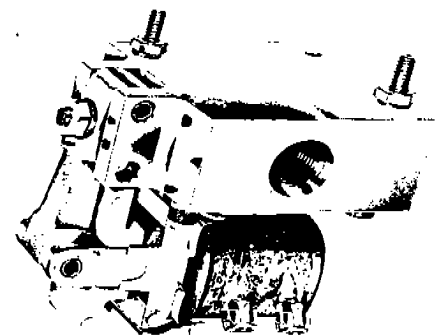
1. Disconnect tension rod at clevis pin. Remove the clevis and piston rod nut.
2. Disconnect supply line cylinder. (To prevent loss of oil, keep end of line above oil level in tank).
3. With spanner wrench, remove packing nut.
4. Push piston rod in a few inches, hold thumb over supply line inlet. A quick pull on the piston rod will pull out three packing washers and one packing adapter (bronze). Packing adapter is to be re-used.
5. Thoroughly clean the piston rod and all parts being re-used before reassembling.
6. Replacing packing adapter (bronze), assemble three new Neoprene packing washers on the protector sleeve and slide it over threaded part of piston rod. (Note the direction of the washer cup). New washers must not touch the sharp threads of piston rod.
7. Remove protector sleeve. Use special driving tool, then push the packing adapter and packing washers firmly in place.
8. Install packing nut. Use spanner wrench to draw nut up snugly.
9. Re-install supply line, piston rod nut, tension rod and clevis pin.

SOLENOID 491N-3	SUB ASSY. (XX-VOLTAGE)	1
ROLL PIN		110978-XX
SOC. HD. CAP SCREW, (2-REQD.)		10-24x3/8
SPRING LOCKWASHER, (4-REQD.)		10
HEX. JAM NUT		1/4-20
MED. LOCKWASHER		1/4
LEVER		110966
WALDES E RING (2-REQD.)		5133-18
PIN		111314
SOC. HD. SET SCREW, OVAL POINT		1/4-20x1
HEX. NUT (2-REQD.)		10-24
SOC. HD. CAP SCREW, (2-REQD.)		10-24x1-3/4
SPRING		47108
STEEL BALL, GRADE 1		1/4 DIA.
ROD		44010
PLUNGER GUIDE	SUB ASSY.	47313
LEATHER WASHER		
O-RING PACKING		
RETAINER		
STEEL BALL, GRADE 1		3/32 DIA.
O-RING PACKING (2-REQD.)		A-113
SPRING GUIDE		31012
VALVE	SUB ASSY.	44142
VALVE SEAT		
SPRING		44125
BLOCK		110965
RETAINER		44009
SCREW		44008
O-RING PACKING		A-114



### ADJUSTMENT PROCEDURE:

TO RE-ADJUST FOR PROPER OPENING, HOLD SOLENOID PLUNGER DOWN BY HAND, LOOSEN JAM NUT AND TURN SOCKET HEAD SET SCREW IN UNTIL IT BOTTOMS. RELEASE SOLENOID PLUNGER. BACK OFF SET SCREW UNTIL THERE IS CLEARANCE OF APPROXIMATELY 1/3 TURN BETWEEN SET SCREW AND 1/4" DIA. BALL. CONTACT BETWEEN SET SCREW AND BALL CAN BE DETERMINED BY FEEL WHEN PLUNGER IS DEPRESSED SLOWLY BY HAND. TIGHTEN JAM NUT.



① MODEL 491N-3 uses Solenoid Sub-assembly 47174-XX (give voltage)

② MODEL 4918-3 uses an additional spring, part 47172

For MODEL 491E-3 a metal Enclosure Assembly is used, part 47116

MODEL 491C

NORMALLY CLOSED

2-WAY A.C. SOLENOID VALVE

**WATERMAN HYDRAULICS CORPORATION**

3737 CHASE AVENUE • SKOKIE, ILLINOIS 60076 • PHONES 312-338-5200

**SA 6.1**

INFORMATION

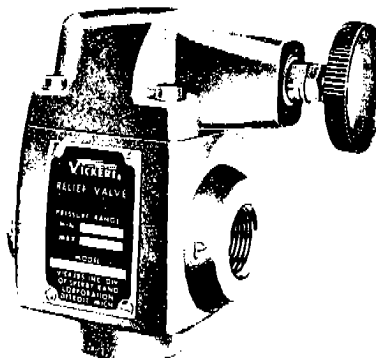
DELIVERED WITH THE

RELIEF VALVES

VICKERS

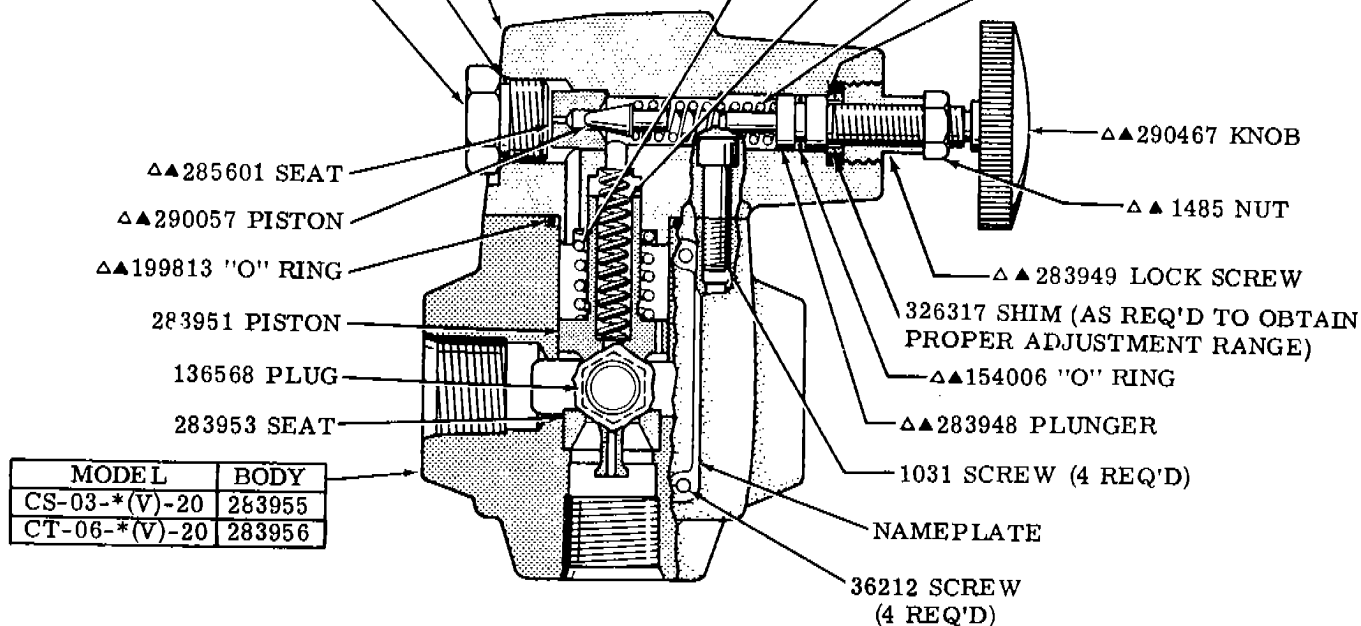
CS-03-\*(V)-20

CT-06-\*(V)-20



PLUG	"O" RING	COVER	MODEL
Δ307354	Δ154129	Δ292938	CS-03-*(V)-20
▲7076	—	▲283946	CT-06-*(V)-20

MODEL	SPRING	SPRING	SPRING	WASHER (2 REQ'D)	PRESSURE RANGE
C*-0*-B-20	—	2077	—	—	125-1000 PSI
C*-0*-BV-20	184458	—	Δ▲2280	—	500-2000 PSI
C*-0*-C-20	—	2077	—	—	1500-3000 PSI
C*-0*-CV-20	184458	—	Δ▲2282	—	—
C*-0*-F-20	—	2077	—	—	—
C*-0*-FV-20	184458	—	Δ▲2281	Δ▲ 64520	—



MODEL	COVER S/A INCLUDES PARTS MARKED Δ
CS-03-B(V)-20	941622
CS-03-C(V)-20	941623
CS-03-F(V)-20	941624

MODEL	COVER S/A INCLUDES PARTS MARKED ▲
CT-06-B(V)-20	941625
CT-06-C(V)-20	941626
CT-06-F(V)-20	941627

Revised 9-1-73

INDUSTRIAL DIVISION  
TROY, MICHIGAN 48064

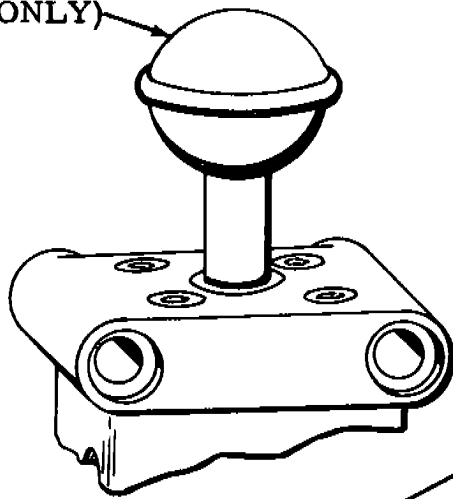
I-3301-S



NOMINAL CAPACITY-3 GPM  
PIPING CONNECTIONS-1/4 IN.

USED ON "E" SUFFIX  
MODELS ONLY  
36276 PIN  
5460 PIN  
2556-X ROLLER

3312 KNOB (USED ON  
"K" SUFFIX MODELS  
ONLY)



1052 SCREW (4 REQ'D)

36141 COVER

36484 BUSHING  
217-10220

6475 SEAL  
217-64470

34822 WASHER

39339 GASKET  
217-27867

7077 PLUG

MODEL	BODY	SPOOL
C-552-E	36115	36132
C-572-E		36131
C-552-K	36074	39991
C-552-K-NS		39993
C-572-K		
C-572-K-NS		

217-71810

35529 GUIDE  
18578 SPRING  
NOT USED ON " NS "  
SUFFIX MODELS

To insure sustained efficiency and maximum trouble-free life of this precision equipment, initial and continuous filtration of the fluid medium to 25 microns or less is essential. (For information pertaining to Vickers economical 10 micron filters, see installation drawing I & M 229847.)

# SELECTION TABLE—AGMA LUBRICANT NUMBERS

DRIVE TYPE	UP TO 100 R.P.M. USE AGMA NO.	100 TO 1000 R.P.M. USE AGMA NO.	1000 TO 10000 R.P.M. USE AGMA NO.	IN HOURS	
				INITIAL	PERIODIC
ROLLER CHAIN	2	3	5	500	2500
SILENT CHAIN					
P.I.V. VARIABLE SPEED ▲	3	7■	8■	150	2500
V.R.D. VARIABLE SPEED	1	3	5	150	2500
DRIVE TYPE	AMBIENT TEMPERATURE		OIL CHANGES		
	15° TO 60°F USE AGMA NO.	50° TO 125°F USE AGMA NO.	IN HOURS		
			INITIAL	PERIODIC	
IN-LINE MOTOGEAR GEARMOTOR ELECTROFLUID MOTOGEAR	2	4	150	2500	
PARALLEL SHAFT UP TO 1800 RPM					
H-41 TO H-81 HD-36 TO HD-61 HT-41 TO HT-61	2	3	150	2500	
H-101 TO H-180	2	4	150	2500	
HD-70 TO HD-130 HT-70 TO HT-130 S-200 TO S-330 D-150 TO D-250	3	4	150	2500	
T-150 TO T-250	4	5	150	2500	
1800 TO 3600 R.P.M. ALL SIZES ABOVE	2	3	150	2500	
OVER 3600 R.P.M. ALL SIZES ABOVE	1	2	150	2500	
WORM GEAR					
UP TO 6" CTRS. * WORM SPEED UP TO 700 R.P.M. * WORM SPEED OVER 700 R.P.M.	7 COMP.	8 COMP.	150	2500	
	7 COMP.	8 COMP.			
OVER 6" CTRS. TO 12" CTRS. * WORM SPEED UP TO 450 R.P.M. * WORM SPEED OVER 450 R.P.M.	7 COMP.	8 COMP.	150	2500	
	7 COMP.	7 COMP.			
OVER 12" CTRS. TO 18" CTRS. * WORM SPEED UP TO 300 R.P.M. * WORM SPEED OVER 300 R.P.M.	7 COMP.	8 COMP.	150	2500	
	7 COMP.	7 COMP.			
SPIRAL BEVEL GEAR	3	5	150	2500	

■ NO. 7 TO BE STRAIGHT MINERAL OIL OF SAME VISCOSITY AS NO. 7 COMP.  
NO. 8 TO BE STRAIGHT MINERAL OIL OF SAME VISCOSITY AS NO. 8 COMP.

\* WORM SPEED IS THE R.P.M. OF THE INPUT SHAFT ON SINGLE REDUCTION DRIVES AND THE R.P.M. OF THE SECONDARY WORM SHAFT ON DOUBLE REDUCTION DRIVES.

AGMA LUBRICANT NUMBERS SHOWN IN THE ABOVE TABLE APPEAR ON INDIVIDUAL NAMEPLATES ATTACHED TO POWER TRANSMISSION DRIVES OR CASINGS. REFER TO DWG. 342Y171 FOR LISTING OF NAMEPLATES.

POUR POINT OF LUBRICANT MUST BE LESS THAN THE AMBIENT TEMPERATURE -  
SEE DATA SHEET 342Z151

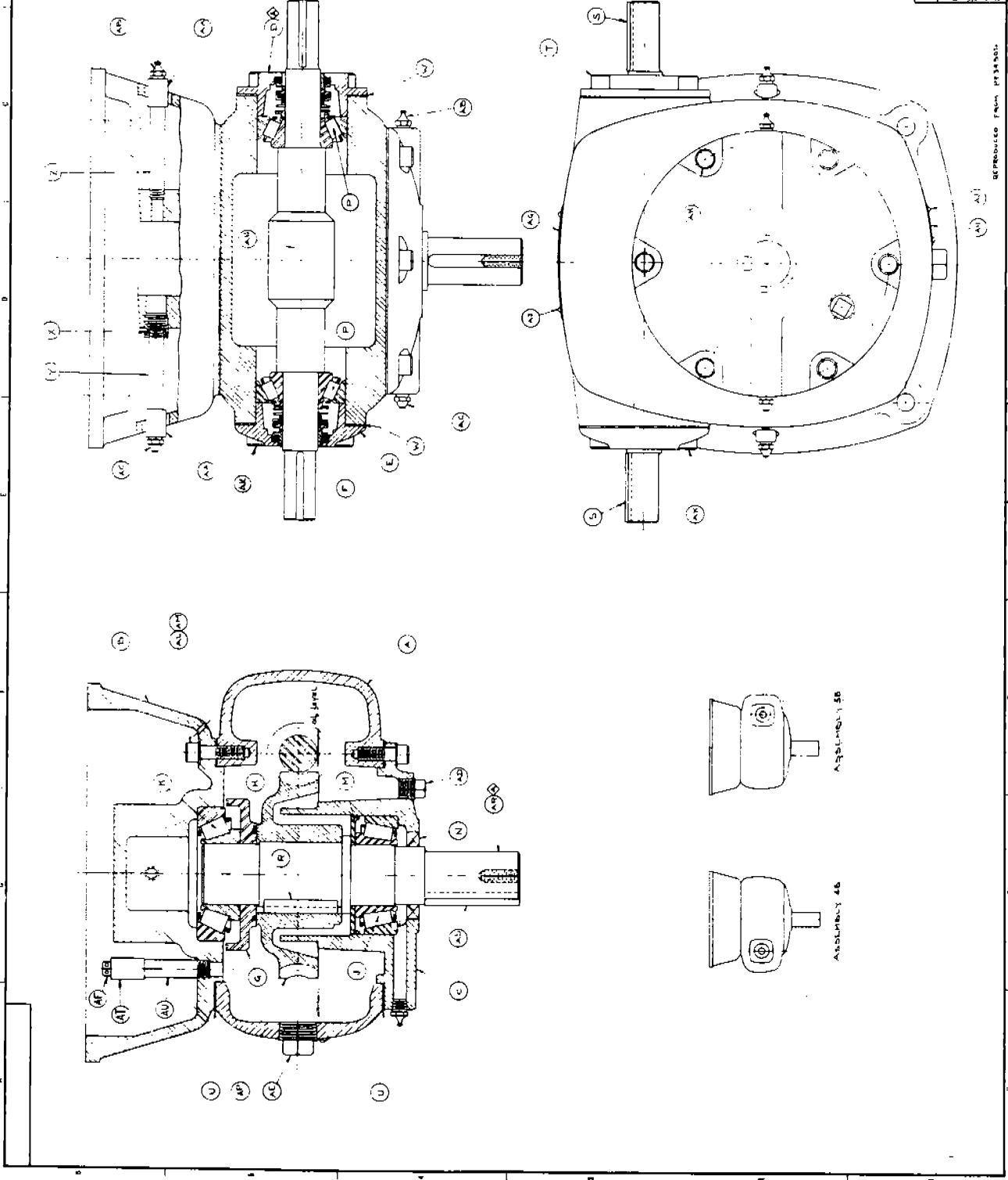
▲ SEE DATA SHEET 342Y170, FOR TYPICAL MANUFACTURER'S OILS.

BOOK NO.

DATE 1-25-57	REV.	3-4-57	9-5-57	LINK-BELT COMPANY	342Y152
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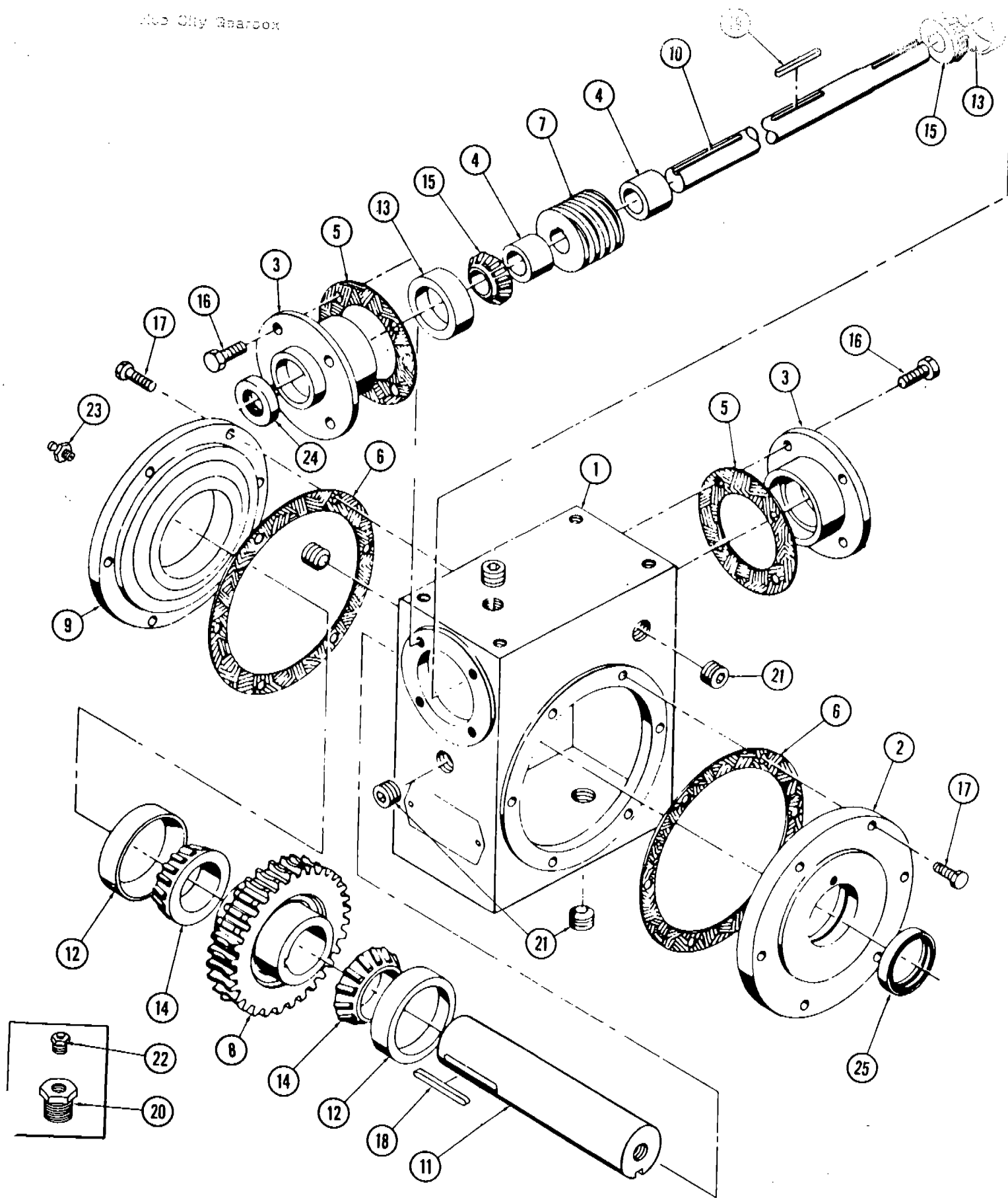


PART NAME		QUANTITY		MATERIAL LIST	
ITEM NO.	DESCRIPTION	QTY	UNIT	ITEM NO.	DESCRIPTION
1	FLANGE	1	PC	1	FLANGE
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3	FLANGE	1	PC	3	FLANGE
4	FLANGE	1	PC	4	FLANGE
5	FLANGE	1	PC	5	FLANGE
6	FLANGE	1	PC	6	FLANGE
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PREPARED BY: LINK-BELT CO. ORDER NO. 11100  
 DRAWING NUMBER: 11100  
 MATERIAL LISTED: 11100  
 PARTS LISTED: 11100  
 QUANTITY LISTED: 11100  
 DATE: 11/11/00  
 BY: 11100  
 CHECKED: 11100  
 APPROVED: 11100  
 LINK-BELT COMPANY

Red City Gearbox



## HUB CITY HELICOPTER GEAR BOX #02-21-04621-1127

CHANCE D.P. NO. 1127

<u>LINE</u> <u>NO.</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>CHANCE D.P. NO.</u>	<u>QTY.</u>
1	02-23-01844-320	HOUSING		1
2	02-23-01845-320	CAP, OPEN		1
3	02-23-01847-320	CAP, OPEN		2
4	02-23-01901-320	SPALTER		2
5	02-23-01909-320	CASKET		10
6	02-23-01910-320	CASKET		10
7	02-23-01944-320	WORM	217-88416	1
8	02-23-02977-320	GEAR, WORM	217-30136	1
9	02-23-03098-320	CAP, CLOSED		1
10	02-25-07337-1121	SHAFT, INPUT	217-65806	1
11	02-25-07338-1127	SHAFT, OUTPUT	217-65807	1
12	8-32-20-58-006	CUP, BEARING TIMKEN LM48510	217-04559	2
13	8-12-20-58-074	CUP, BEARING TIMKEN 1220	217-04560	2
14	8-32-20-58-005	CONE, BEARING	217-04561	2
15	8-32-20-68-074	CONE, BEARING TIMKEN 1280	217-04562	2
16	8-47-14-04-023	SCREW, HEX CAP 3/8 NC x 1		8
17	8-47-14-04-027	SCREW, HEX CAP 5/16NC x 3/4		12
18	8-47-17-05-058	KEY, P & W 5/16 SQ. x 2		1
19	8-47-17-05-103	KEY, P & W 3/16 SQ. x 1 3/4		1
20	8-63-17-51-002	BUSHING, PIPE 1/2 x 1/8 NPT		1
21	8-63-17-61-004	PLUG, PIPE, SOCKET 1/2 NPT		4
22	8-63-12-71-001	PLUG, VENTED ALEMITE 317400		1
23	8-63-12-91-005	FITTING, GREASE ALEMITE 1610B		1
24	8-74-21-25-006	SEAL C/R 8060	217-64375	2
25	8-74-21-25-017	SEAL C/R 13535	217-64376	1

# How to Keep Hydraulic Systems Clean

P. H. EMRICH  
Vickers Incorporated, Detroit, Mich.

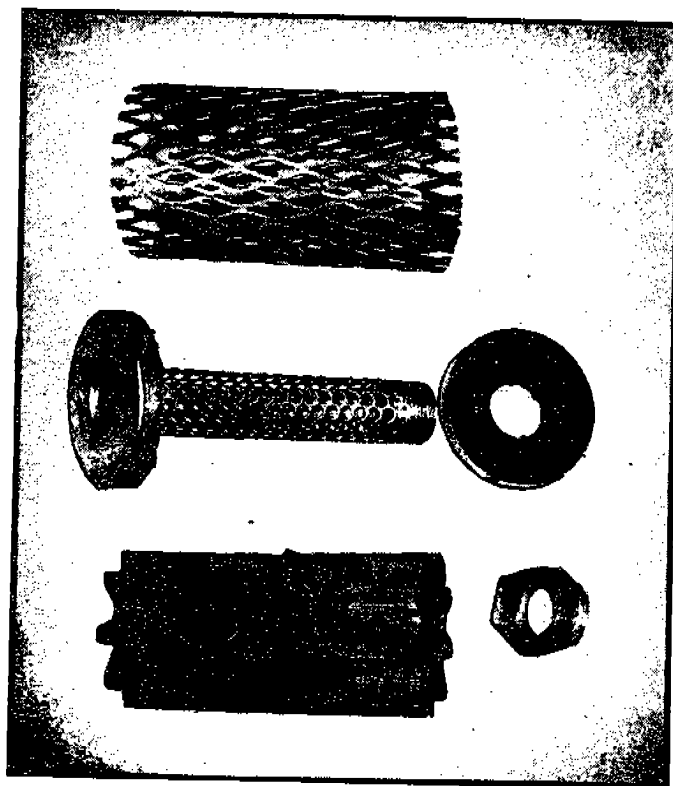
To obtain maximum life from the components of a hydraulic system involves not only the proper design of the system and selection of fluid cleaning elements, but also a rigorous maintenance schedule and the intelligent selection and care of the hydraulic fluid. The operating components of a system are well lubricated, usually protected from overload and can be stalled without damage. Since the hydraulic fluid serves the dual function of a power medium and lubricant, successful operation basically depends on keeping the complete hydraulic system clean and free of contaminants.

System contaminants can consist of metallic grit, particles of packing, moisture, carbon deposits, sludge from the fluid and many other similar items. The following material considers the various elements of a typical hydraulic system, with recommendations on service and maintenance procedures to keep the system clean and operating properly.

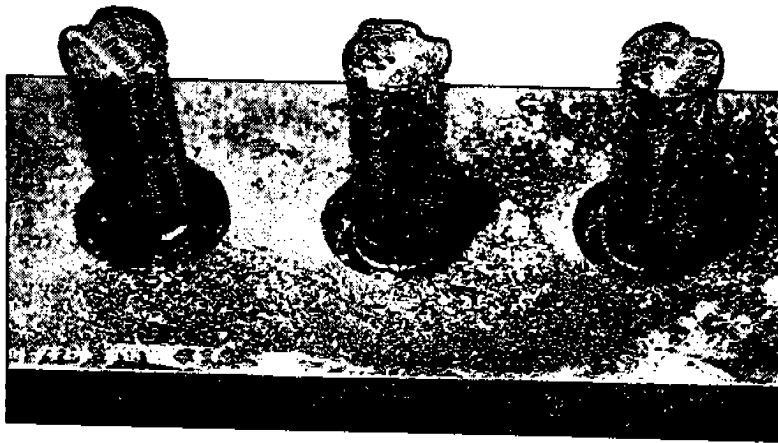
*Control and power components.* The operating components of a hydraulic system, including pumps, valves and motors, usually have close fitting parts that tend to wear in. The resultant wear particles or metallic grit must be removed or trapped to prevent additional (regenerative) wear. When regenerative wear occurs, early assembly and system failure can result. In (A) is shown two vane pump bushings that have been worn and scored from metallic grit.

Other system contaminants that usually come directly from the operating components are sand from castings, burrs from machining and fragments from damaged seals, packing and gaskets. (B) shows typical particles on a screen used for trapping this type of contaminant.

OVER

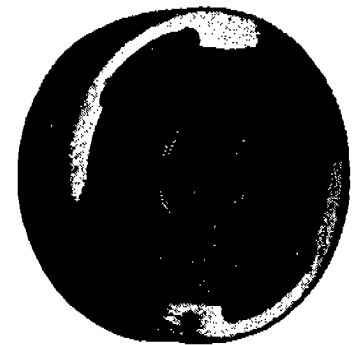
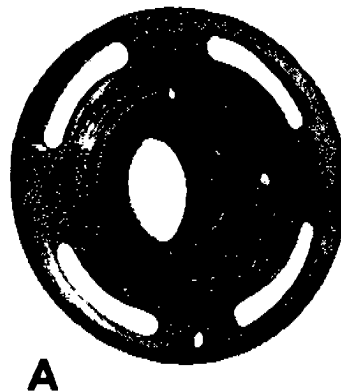


**2. Inlet filters and strainers at pump.** Filters, strainers, coolers, heaters and magnetic plugs are accessory components. They do not generate wear particles and are used to condition the fluid. Pump inlet filters usually have many small openings (about 0.005 in. dia) and are therefore easily clogged. The accompanying illustration shows a typical filter after removal from the system. A cleaning schedule of every three months is recommended for average usage. If the filters are not kept clean, the pump will be starved for oil (make noise like pumping rocks) and an early failure will result.



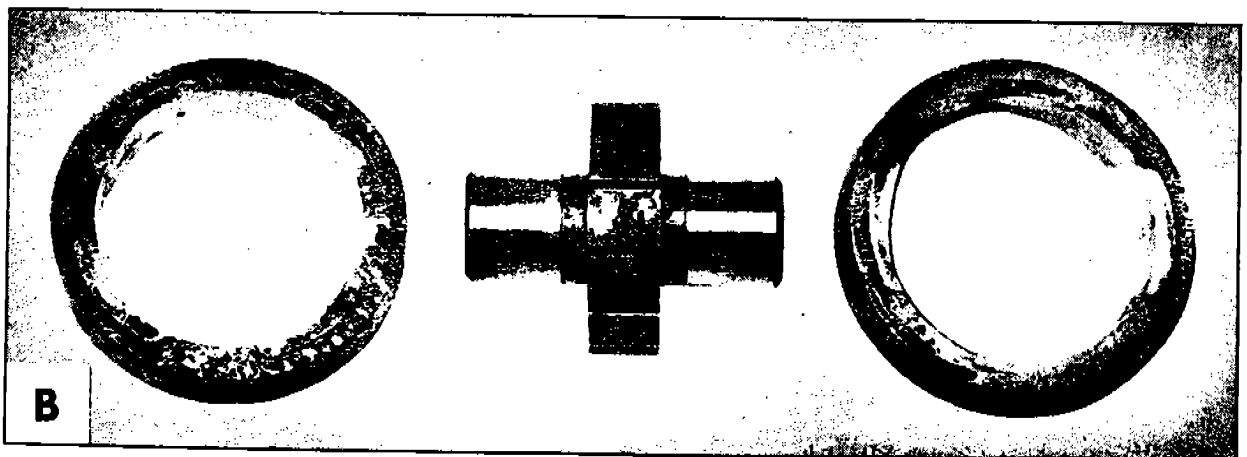
7. *Magnetic plugs.* Magnetic plugs can be used effectively to trap particles of magnetic materials. These plugs require removal and cleaning after the first three months of operation and about every six months thereafter. The figure shows typical magnetic plugs after several months of use.

6. *Heat exchangers.* These are used to heat or cool a hydraulic system for best performance. Heaters can scorch or char the hydraulic fluid and the resultant carbon and fluid breakdown can cause abnormal wear or malfunction of operating components. (A) shows pump cartridge elements with both wear and carbon deposits caused by burned oil. Conditions such as this can be prevented by completely submerging the heater and controlling with a thermostat close to the heater element. This avoids localized overheating.



Coolers can leak water into the hydraulic system and cause corrosion of the operating components. (B) shows typical pump elements that were subject to entrained moisture. Hydraulic fluids should be checked frequently for water content and a low pres-

sure relief valve used to protect the cooler from hydraulic pressure surges and subsequent internal failure and leakage. If cooling coils are used inside a reservoir, they must be completely submerged at all times to prevent sweating since this condition introduces undesirable moisture into the system.



S-4 217-09171-1" Bore  
10 1/2" x 4" Filler

## INSTRUCTION SHEET For Bulletin 511 Type "S" 4" A-c Brake

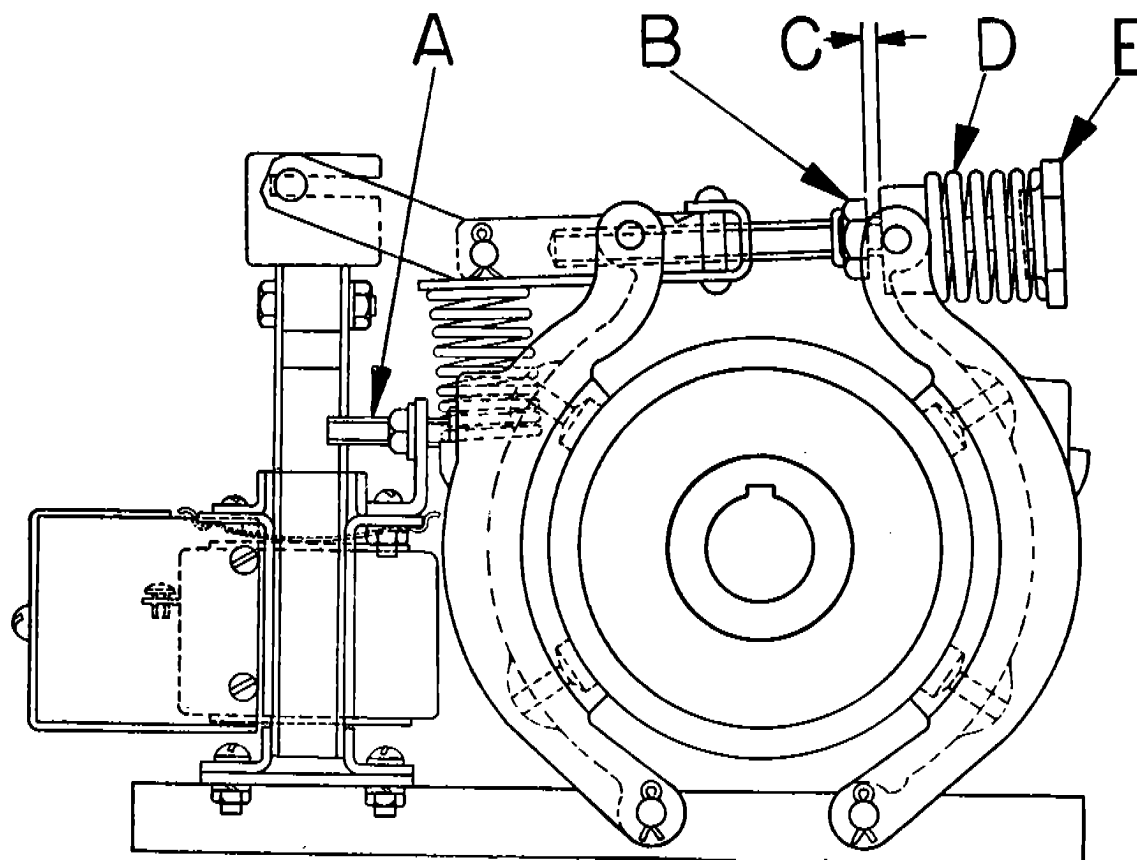


Fig. 1

### INSTRUCTIONS (See Fig. 1)

**1—MOUNTING:** Clamp the brake on the wheel by compressing torque spring "D" by tightening the adjusting nut "E". Insert shims between the mounting stand and the base of the brake until the brake is setting solid on base.

**2—ADJUSTMENT:** a. Compress the torque spring "D" until the desired torque is obtained. The approximate compressed length of this spring, to obtain rated torque, is 1-1/16 inch. Further minor adjustment may be necessary.

While making this adjustment maintain a clearance

of 1/64" at "C" when the brake is applied. When the desired torque is obtained be sure that the clearance "C" is 1/64". The lock nut "B" will secure itself in this position.

b. Equalize the clearance between the shoes and wheel when the brake is released by setting screw "A".

**3—RE-ADJUSTMENT:** When the lining wears, the clearance "C" decreases. Never permit this clearance to become zero since complete loss of braking torque will result. When the clearance "C" becomes low, again adjust to 1/64" by turning screw "E". No change in torque will result from this adjustment if nut "B" is not changed.

Torque Rating	Compressed Length of Spring "D"
10 Lbs. Ft.	1-1/16"

## INSTRUCTIONS

## ASSEMBLY:

1. Cylindrical Ring Assemblies are bored to a close tolerance for a slip fit on the shaft. The fit between the shaft and the ring assembly should be made so that the ring can be locked securely to the shaft without runout or danger of slipping.
2. The brush holders are shipped loose on the stud and must be aligned to the rings at assembly. Adjust the brush holders so that about 1/8 inch of brush protrudes below the bottom of the brush holder box.
3. The brushes are ground to fit the ring contour. However, the brushes should be seated after assembly by using a strip of sandpaper around the ring and rocking the ring assembly until the brushes are seated. Do not use emery cloth.
4. Check brush fit in the brush-box and brush holder trigger to be sure that the brush slides easily and the trigger is free. The trigger should provide about 2 lb. per in.<sup>2</sup> pressure on the brush. Check pigtail to be sure that it does not interfere with brush operation or touch uninsulated parts.
5. Be sure rings, brush holders and studs are fastened tightly and all lead connections to the studs are secure.

## MAINTENANCE:

1. As rings become coated with grease and dirt they should be cleaned periodically by polishing with fine crocus cloth.
2. Brushes should be checked for wear.
3. Pigtails should be checked for fraying and to be sure they do not interfere with brush movement. Triggers should be checked to be sure that they are free and not gummed up with grease and dirt. Clean with solvent when necessary.
4. If rings show signs of wear or heavy pitting, check amperes to be sure that value is within brush capacity.

## INSTRUCTIONS

NOTE: Copper brushes should be used at or near capacity ratings for good life. A copper brush riding on a copper ring will cause excessive wear when operated at zero or low current values. For operation over a wide range of current, electrographitic brushes will provide more satisfactory ring and brush life.