MATTISON
GRINDING MACHINERY

MATTISON MACHINE WORKS, ROCKFORD, ILLINOIS

GENERAL PURPOSE GRINDING WHEEL

GRADE A-46-J-7-V

20" DIA.

3" WIDE

10" BORE

RECESS ONE SIDE 12 3/8 x 3/8

RECESS ONE SIDE 12 3/8 x 1"

TYPE 1

CODE - X-3449

INSTRUCTIONS FOR SETTING UP AND OPERATING THE MATTISON HIGH-POWERED PRECISION SURFACE GRINDER

PLEASE SEE THAT OPERATOR READS THESE INSTRUCTIONS AND HAS ACCESS TO THEM AT ALL TIMES: ALSO THAT SUBSEQUENT OPERATORS SEE THEM.

FOUNDATION: A firm, substantial foundation is necessary for best results and particularly for a machine which must do work of a high degree of accuracy, such as a SURFACE GRINDER. It should be of concrete, of ample depth, and isolated from vibration. Where the soil is mushy or filled-in it should be deeper and made wider at the bottom. Machine should not be backed against a wall but should have room enough allowed to draw spindle out to rear.

LEVELING MACHINE ON FOUNDATION: Note the three (or five on large machine) round pads on base as shown on foundation print. These are the main support of the machine. Remove all bracing blocks and place a precision level on the chuck, or machine table if there is no chuck, and shim at necessary points until machine is level in all directions. Put bracing blocks in place and tighten each one just enough to brace machine, but not enough to disturb the level position.

CONNECTING WIRES TO MACHINE: Check motor name plate to see that it corresponds to your current. Place a three pole switch (not furnished with machine) in the main line wires at some convenient place near machine. Internal connections are already made so it is only necessary to connect the line wires to the terminals on machine.

CHUCK CONNECTIONS: If machine is equipped with Magnetic Chuck, it must be operated by direct current. If direct current is not available, a motor-generator set or rectifier must be used.

GROUND WIRE: As a safety precaution, it is advisable to ground the machine by connecting a wire from brass connection near cable box to steam or water pipe.

LUBRICATION: Upper works and vertical ways are lubricated by Bijur One-Shot Lubricator, see chart covering this attached to back of these instructions.

Front bronze bearing and rear ball bearings on spindle are oil lubricated from pressure lubrication system at rear of wheel slide assembly.

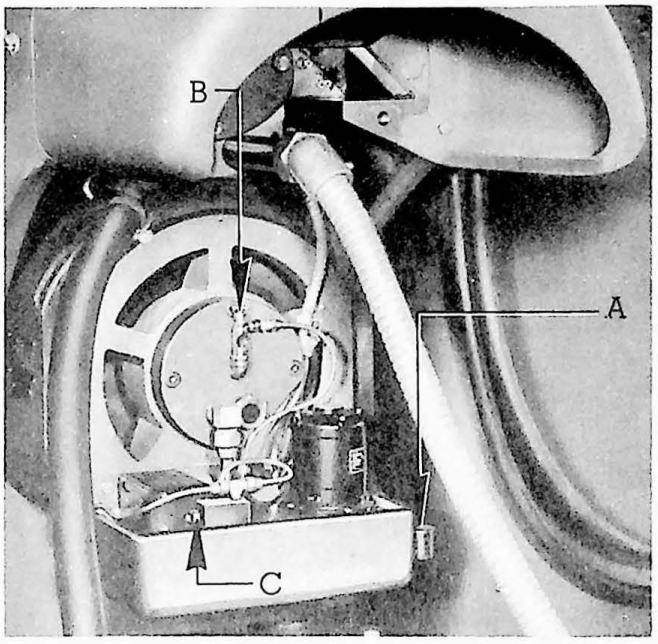
The front bearing is pressure fed and the rear ball bearing runs in a circulated bath of oil.

This system is interlocked with a pressure switch so that it is impossible to run spindle motor until lubricating pump has built up 8 to 10# pressure, thus insuring that bearings are well lubricated.

Oil level should be checked every day before starting machine and should be about 1/4" below top of oil filling cup "A", (shown on Page 2), when machine is idle.

At periodic intervals of approximately 500 hrs. the oil tank should be completely drained and refilled with one quart of fresh clean oil. We recommend "Universal Spindle Oil" 150 S.U.V. @ 100° F. or its equivalent.

OIL PRESSURE ADJUSTMENT: Pressure system as adjusted at factory should never be disturbed, unless spindle motor fails to run. If this should happen, it will be necessary to change pressure setting at relief valve and may be accomplished as follows: After starting lubricating pump adjust needle valve "B" for approximately 70 drops per minute. Next loosen lock nut on relief valve "C" and turn adjusting screw to the right slowly until pilot light on control panel glows. Then give screw an additional 1/2 revolution to the right and lock with nut. At no time should the adjustments of the pressure switch be tampered with as they have been properly adjusted at the factory.



Cross Slide is arranged for grease lubrication with fittings mounted on wheel guard. Grease twice each 8 hour shift.

If hydraulic pump motor has grease cups, give each cup one turn once a week.

For table ways use a good grade of machine oil Density 300 to 900 S.U.V. 100° F. See that plenty is fed to them by the force feed pump which is located near the hydraulic pump. Note indicator on front of machine which should read 4 lbs. or over pressure for normal operation. The adjustable regulating valves on the pump govern the supply. The oil level gauge at front on base indicated the oil level in the tank of the pump. Be sure there is always oil in the tank. Clean filter at rear right hand end of base every month. Keep hydraulic tank full of oil of viscosity as shown on plate near pump.

FLOODING OF TABLE WAYS: If machine is left running for considerable length of time with table stationary, too much oil will be pumped up and will overflow the ways. If machine is to be idle for a time, stop it. If oil appears in base of machine, check this point.

STARTING THE MOTORS: Before starting, be sure the wheel turns freely and is high enough to clear the chuck, fixtures, work or anything that is on the chuck or table. Note the push buttons at front of machine marked "Table Spindle Lubrication and Spindle". These controls permit starting the spindle motor or table movement independently. Spindle will not start until spindle lubrication has been started and pilot light is on.

TABLE MOVEMENT: Table control lever at front is moved slowly to the right to start the table. Move it to the left to stop table at any given position. Table speed can be regulated from about 30 ft. per minute to 100 feet per minute. The speed is controlled by regulation of the hydraulic pump. To operate, loosen the control lever button; regulate by turning the wheel to give desired table speed. Tighten control button when speed has been properly set. Table speed is also controllable by throttling the front control lever for inching table slowly in setting to work, over-running for loading, unloading and dressing the wheel. Do not throttle for regular grinding.

TABLE TRIPS are easily set to regulate the table travel according to the work. To over-travel table without disturbing the trips, stop table with start and stop lever just before trip strikes table reversing lever. Raise trip lever by hand and allow table trip to pass reversing lever. Table can then be moved to extreme end postion.

RAISING THE GRINDING WHEEL: Note shifter lever located at the side of large wheel at front of machine. To raise grinding wheel, pull this lever forward into position marked "Power Feed", then push button marked "Up" located on front cover. Pulling lever forward disengages the hand operating wheel. Lever must be pulled forward to engage gears before pushing either motor start buttons.

LOWERING THE GRINDING WHEEL: Pull the same lever forward to disengage hand feed and at same time push motor control button marked "Down". Power may be used for bringing the wheel near the work and final setting is done with the hand wheel.

POWER OPERATION OF WHEEL CROSS SLIDE: Before the hydraulic cross feed of wheel spindle will operate, it is necessary to turn selector switch on control panel to "on" position. Allow one half minute for control tube to warm up.

HAND OPERATION OF WHEEL CROSS SLIDE: Note lever back of hand wheel on upper right hand side of wheel slide housing. This lever must be moved to the right as far as possible to disengage the hydraulic power and permit cross feeding with hand wheel. Hand cross feeding will be required only when grinding shoulders, slots, etc., where it is not practical to cross feed with hydraulic power. After hand feeding, simply move the lever back to the left for engaging the hydraulic power cross feed.

SHOULDER GRINDING: When grinding shoulders on side of wheel, grinding channels, radii, bevels and contours, cross feeding must be done by hand. A graduated dial is provided in connection with the hand wheel to indicate the amount of cross feed as required. On this type of work it is important that the side of the wheel be relieved with a hand dresser to provide clearance in the cut. Also it is advisable to slow down the table feed to about 60 feet per minute to obtain best results on side grinding. Tighten wheel slide lock handle to eliminate backlash.

FAST TRAVERSE CROSS TRAVEL: For rapid travel of wheel slide to extreme forward or rear position simply place the table reversing lever in a vertical position. To stop wheel at any desired point return table reversing lever to normal position. Direction of cross feed travel will be determined by position of reversing lever for cross feed.

CONTROL OF CROSS TRAVEL: The amount of cross travel of the wheel is determined by setting of the two pawl levers on the ratchet at front of machine just right of the table start and stop lever. These pawls should be set so the wheel travel will reverse according to the width of the work being ground. On flat work of narrow width it is important that the wheel travel a sufficient distance to bring the entire width of the wheel into service so the wheel may wear evenly across the full width. Also the wheel should overrun the work an equal distance at front and back edge of the work(about one half the width of the wheel). Reversal of wheel cross travel by hand is accomplished with the vertical reversing lever on control panel, just left of the ratchet and pawl housing.

SETTING FOR DOWN FEED: Place shifter lever in position marked "Hand Feed" and use the large hand wheel for bringing the wheel slowly into the work until it sparks faintly. The table should be operating when this setting is made. One turn of the large hand wheel lowers the grinding wheel fifty thousandths (.050). A large adjustable dial graduated in thousandths located under hand wheel may be used for rough work or where limits are all not so close.

MICROMETER SETTING: Move shifter lever into position marked Micro Feed and turn micrometer dial located on top of hoist unit, to left until stop is reached. After this stop is reached turn same micrometer dial to right or clockwise the amount it is desired to lower wheel; then begin feeding wheel into work with large handwheel, a small amount each pass until stop is encountered. The micro dial is graduated in .0001. One complete turn of micro dial allows wheel to be lowered .002".

MOUNTING GRINDING WHEELS: All wheels should be marked by a scratch or file mark on inside diameter of bore. When putting wheels back on wheel sleeve always spot this mark at top and center of hub on wheel sleeve. This procedure will locate balance and periphery of wheel in relation to last previous dressing and will require a minimum of wheel loss in re-dressing. Be sure wheel is well tightened on the sleeve and entire assembly is well balanced. If not well tightened, the inertia and momentum in starting and stopping may cause a shift in position. CAUTION: Do not use paper washers supplied by wheel manufacturer. Wheel should bite into lead facings of flanges. Make sure the wheel sleeve lock bolts are tight. With the use of extra wheel sleeves, grinding wheels may be locked permanently on sleeves, and wheels changed by removing entire assembly of wheel and sleeve. To remove assembly, loosen hexagon nut on spindle and use wheel puller to remove sleeve from taper on spindle.

DRESSING THE WHEEL: Place diamond in holder provided at right hand end of table. Then set the extreme right hand table dog so that table will stop with the diamond approximately 1/4" to left of center of wheel. Then by operating wheel dresser lever located just below table reversing lever the wheel will travel across diamond. The knurled knob to the right of wheel dresser lever controls the speed of wheel travel while dressing. Rotating knob to the right decreases speed and rotating to left increases speed. Use faster speed for coarse dressing or roughing and use slower speed for fine dressing or finish grinding. For high production dressing where extreme accuracy is not required, the diamond holder mounted in vertical slide may be used.

COOLANT TANK: The coolant tank is located outside to the left rear of base. It is made up of four compartments. The first and second compartments catch light or floating grindings, and are provided with an underflow outlet to third compartment which is provided with an overflow to the fourth compartment from which is pumped the clean coolant to wheel. Coolant tank should be cleaned of grindings as often as is necessary. Where shoulder, contour or straight line grinding is done (without cross travel of wheel) or where very fine surface finish is required it is advisable to install a coolant filter to prevent possibility of grindings being brought up which may cause streaking on the work.

REMOVING SPINDLE MOTOR: If for any reason it should be necessary to remove the spindle motor refer to drawing showing the spindle bearing and motor assembly. These are shaftless motors, built-in, and are easily removed.

CLEANING MACHINE: Machine should be thoroughly wiped clean at least once each week. A soft rag or waste dipped in kerosene will remove accumulated grindings and dust and preserve appearance of machine. Care should be exercised that dirt is not wiped onto table ways or cross-slide ways. Grindings will be found to accumulate in water return trough at rear of table. These grindings should be removed as often as necessary rather than let them return to coolant tank.

GUARANTEE: Any parts of our own manufacture which fail due to fault in material or workmanship within one year from date of installation will be repaired or replaced free of charge F.O.B. Rockford. Old parts to be returned for inspection to determine cause of failure. Units purchased complete for installation in the machine, such as hydraulics, chucks, ball bearings, motors and electrical equipment are subject to the standard guarantee of the manufacturers thereof. No credit will be allowed for expense incurred for repairs done without our knowledge and consent, and guarantee will be forfeited if repairs or changes are so made.

IRREGULARITIES OF FINISH AND MACHINE OPERATION WHICH CAN BE CORRECTED BY OPERATOR.

1. CHATTER OR VIBRATION MARKS IN FINISH.

   A. Grade of wheel too hard for material being ground.
   B. Wheel in need of dressing.
   C. Wheel out of balance.
   D. Wheel loose on sleeve.
   E. Cross slide gib loose.
   F. Bearings too loose.

   WARNING: Make certain that chatter marks are not caused by A, B, C, D, or E before adjusting bearings. To adjust bearings see detailed instructions for adjustment on Page 9.

2. LONGITUDINAL LINES IN FINISH CAUSED BY EDGE OF WHEEL.

   A. Cross slide gib too loose or in need of greasing.
   B. Wheel dressed too finely and not free cutting.

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   A. Cross slide gib too loose or in need of greasing.
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3. INACCURATE GRINDING.
   A. Magnetic Chuck bolts loose.
   B. Wheel not dressed evenly.
   C. Wheel glazed and not cutting freely.
   D. Magnetic Chuck in need of dressing. To dress chuck, grease cross slide, dress wheel evenly with diamond and take as light as possible a cut over chuck and let spark out fully.
   E. Nuts holding cylinder rams at either end of table must be loose so that table end bracket floats on rams. A Clearance of .003" is necessary between table end bracket and cylinder ram nuts to prevent rams raising table off oil film on ways.
   F. Wheel slide gib too loose.

4. SCRATCHY FINISH.
   A. Wheel too soft for material being ground, causing grain structure to break down.
   B. Grinding in coolant. Clean out tank.

5. JERKY, UNEVEN MOVEMENT OF TABLE.
   A. Cross slide gib too tight.
   B. Air in table cylinders. Drain small quantity of oil from each cylinder through small petcock at end of cylinder while table is in operation.

6. INDEXING DIAL INACCURATE.
   A. Vertical slide gibs located on rear ways of columns too tight.

C A U T I O N

READ CAREFULLY BEFORE ADJUSTING SPINDLE BEARING.

Remember that with the Mattison Grinder you are operating a machine combining such rigidity and high power that care must be taken not to force a heavier cut than the wheel will actually make.

The wheel is the limiting factor and the machine cannot be forced beyond the free cutting capacity of the wheel without causing trouble.

Of first importance is the selection of wheels best suited to the jobs in hand. A wheel that is too hard will quickly glaze over while one that is too soft will break down unduly fast.

Even a wheel of proper grain and grit, if not dressed often enough, will load up and glaze over.

When a wheel becomes glazed, it will not carry through the cut but is forced to ride over the surface instead of cutting its way free. This generates heat, causing the work to expand and then if the operator continues to crowd the feed, a tremendous strain is built up on the spindle bearings and cross slide. Thepower and strength of the machine will drive the wheel over the work, but a penalty must be paid in bearing and slide wear. Use this power for the useful purpose intended by proper attention to wheels and their handling.

Chatter appearing in the work is a thing that may be very misleading as to cause.

A wheel that is too hard for the work, or becomes glazed, will cause chatter. Loose slides will cause chatter, dressing a wheel with the diamond set too far off the center line of the wheel will cause chatter. An overloaded wheel that cannot clear itself in the cut will cause chatter. Lastly, a loose bearing will cause chatter. So do not make the mistake of jumping to the conclusion that bearings need tightening every time a little chatter appears, but first check all other possible causes. Overtightened bearings are sooner or later bound to stick or burn out.

The manufacturers will not assume responsibility for damage to wheels or bearings caused by crushing overloads due to over-feeding, neglect in keeping the machine in proper adjustment, the use of improper wheels, or failure to dress wheels properly.

Selection of wheels is very important. Do not assume that because a certain grit and grade of wheels work well on one surface grinder it will do equally well on another make or type. Difference in power R.P.M., width of wheel, and operating conditions may require a distinctly different make-up of wheels. Ask for cooperation of the wheel manufacturer and machine manufacturer in determining the type of wheel best suited to the jobs in hand.

Operator must learn from experience to detect when a wheel is not clearing itself in the cut. A free cutting wheel gives a clear, singing sound. A wheel too hard or in need of dressing indicates a degree of laboring -- sometimes actually a groaning sound. First be sure you have the right wheel for the job, then dress as often as necessary to keep it from loading.

Pay particular attention to wheel dressing. If you are turning out a lot more work than previous machine, remember the wheel must be dressed correspondingly oftener. If doing more work, the element of time comparison does not apply but the amount of stock removed is the point to consider.

-IMPORTANT-

DO NOT ADJUST bearing until it is definitely established that there is actually play in it.

ADJUSTMENT OF PRESSURE LUBRICATED SPINDLE BEARING

1. Remove L. H. threaded nut on end of spindle and pull wheel sleeve from spindle.

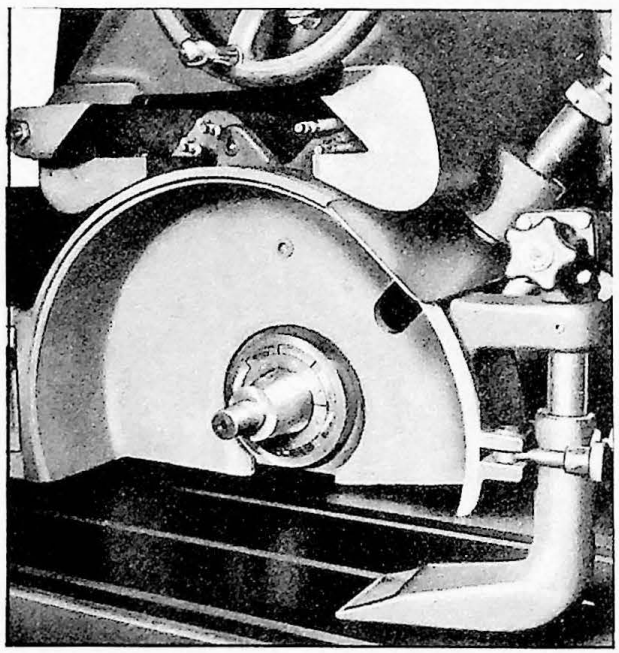
2. Rotate bearing nut to right with bearing wrench until it can be turned no further by hand. Then loosen all nuts on the wedge bolts on R. H. side of wheel slide housing directly in back of wheel guard.

3. Rotate bearing nut to the right, forcing bearing into tapered sleeve to reduce bearing clearance. One revolution of nut will reduce bearing size .007" in dia.

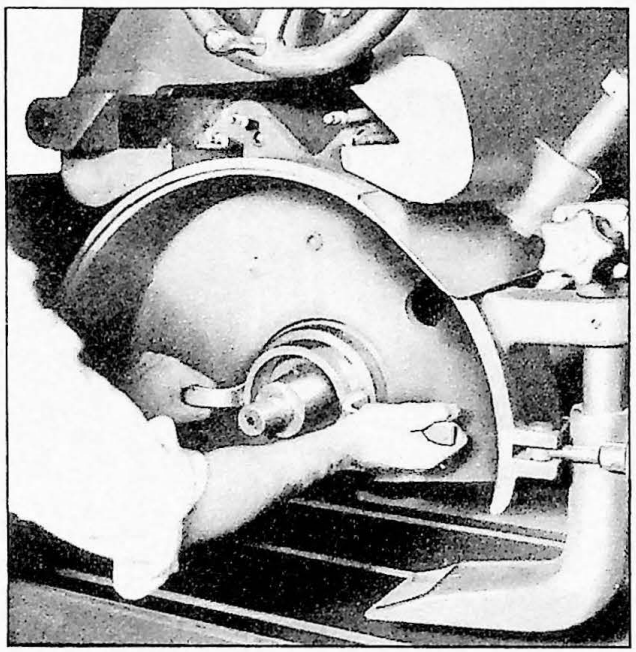
4. After bearing has been taken up the desired amount, (best results are obtained with .002" to .003" clearance) the nuts on the four wedge bolts on R. H. side of housing should be tightened and locked.

5. Next the large nut on bearing should be backed off several revolutions until resistance is met and lightly locked in this position. Occasionally it is a good idea to pull the spindle and lightly spot scrape the bearing, being careful to remove all chips before replacing spindle.

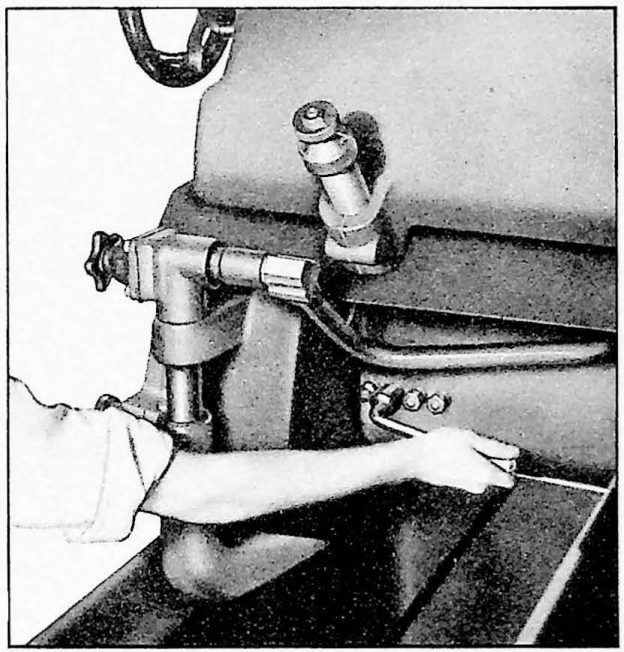
6. Wheel sleeve may now be replaced and machine is ready for use.



Slide Showing Wheel Sleeve Removed



Bearing Nut Adjustment



Wedge Bolt Adjustment

INSTRUCTIONS FOR OPERATION AND ADJUSTMENT OF OILGEAR VARIABLE DISPLACEMENT HYDRAULIC PUMP AND EQUIPMENT ON MATTISON HYDRAULIC SURFACE GRINDER

1. HYDRAULIC PRINCIPLE AND CIRCUIT: The table and cross-travel are actuated by means of hydraulic pressure supplied by a pump, controlled by a suitable valve to cylinders under what is called a four-way, non-differential closed circuit.

2. HYDRAULIC PUMP: The pump which is located on pedestal at right rear of Grinder furnishes oil, under sufficient pressure, to operate the grinder table longitudinally and the grinding wheel head transversely.

The hydraulic pump consists of a variable delivery pressure pump for high pressure circuit which actuates the grinder table, and a gear pump for pilot circuit which furnishes power for the cross-travel mechanism, pressure for the table reverse pilot valve, and super-charging effect on the high pressure. This pump is driven direct-coupled to 1200 R.P.M. motor. Small size machines Vee belt driven from 1800 R.P.M. motor.

Direction of rotation of drive shaft is clockwise when facing shaft, and is denoted by directional arrow located over shaft.

Oil volume adjustment hand wheel which controls speed of grinder table is located in front of machine to the right of operator, and is regulated by turning pump handwheel counterclockwise to increase oil volume and speed of table, and clockwise to reduce oil volume and speed of table. Directional arrows are installed above handwheel to denote direction for increase and decrease of oil volume.

3. TABLE CYLINDER: Two single-acting cylinders for the table are installed in base of machine directly under table. A ram from each cylinder is attached to a bracket at either end of table. One cylinder moves table in one direction, and the other cylinder moves table in reverse direction.

As there is pressure in one direction only on each cylinder of this type, the ram does not require a piston and rings fitting in the bore of the cylinder, but is provided with a suitable rider or head to support the end of the ram inside the cylinder. This construction eliminates all possiblility of loss of pressure or slippage inside of cylinder. Packing, located in end of cylinder for sealing around the ram, is a "V" Type Self-Sealing Packing. To tighten packing, move the table to extreme opposite stroke, remove table end bracket, which will make packing gland easily accessible.

A 1/4" Oilgear petcock is installed in end of each cylinder for removing air bubbles. In the event that oil in reserve tank runs low, the hydraulic pump will pump air into system and cause table to move with a jerky motion. To remove air from cylinders, run table slowly and while in operation place can under petcock and open petcock until solid stream of oil, minus air bubbles, come from petcock. This petcock can be removed and pressure gauge installed to obtain pressure to

cylinder. Cylinder ram should "float" in table end bracket to permit self alignment during stroke. When tightening two lock nuts on end of ram, leave .003" clearance between bracket and lock nuts. DO NOT GET THE NUTS UP TIGHT.

4. CROSS-TRAVEL CYLINDER: Cross-travel cylinder is mounted in vertical slide and is direct connected to wheel slide. Piston rod should "float" in bracket on rear of wheel slide and should have .003" end play between bracket and nut.

5. HYDRAULIC CONTROL VALVES: Unit consists of the following:

A. Table control valve.
B. Cross feed valve.
C. Wheel dressing valve.
D. Wheel dressing speed control valve.

Table control valve controls starting, stopping, inching and reversing. It is located on right front of base under push button control panel.

Cross feed valve controls intermittent feed and reverse of wheel slide, and is located in center of base under reverse lever.

Wheel dressing valve and wheel dressing speed control valve operate in conjunction to furnish a continuous, smooth, variable speed movement to wheel slide. Both valves are located near cross feed valve.

6. ADJUSTING COMBINATION VALVE TO CONTROL SPEED OF REVERSAL OF TABLE:

Acceleration and deceleration chokes are located on top of valve unit, two at each end.

The acceleration chokes should be adjusted first. These chokes control the speed at which table starts reverse stroke immediately after table has reached its extreme travel.

The deceleration chokes control the speed of table from time reverse lever has been tripped until table reaches its extreme travel.

Adjust acceleration choke first and deceleration choke last. The correct adjustment of both chokes will cause the grinder table to reverse smoothly with a minimum of overtravel and no appreciable change in speed of table either before, during, or after reversal.

"Overtravel" means distance table travels or "coasts" after reverse lever has been tripped.

7. WHEEL SLIDE CROSS FEED is adjusted from 1/4" per cycle up to the width of the wheel. The small knurled knob on right hand side of control panel varies the stroke. Clockwise rotation decreases stroke and counterclockwise increases stroke.

8. HAND FEEDING OF WHEEL SLIDE is possible with hand wheel on front of vertical slide. It is engaged by swinging ball knob lever 180° to the right. When engaged for hand feeding, power is automatically disconnected.

9. HYDRAULIC OIL TANK: Reserve oil tank for hydraulic pump is located directly beneath pump.

Oil specification plate for recommended grade of oil is attached to outside of pump and motor unit cover. Extreme care should be exercised in filling reserve tank, that only clean oil is used. A screen filter is installed in opening to tank and should always be used in filling tank.

Oil gauge is provided on side of reserve tank, and oil should show on gauge at all times.

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OILGEAR EQUIPMENT IS FURNISHED BY US SUBJECT TO THE STANDARD GUARANTEE OF THE MANUFACTURER.

ATTENTION TO HYDRAULIC EQUIPMENT.

Inspect all connections at frequent intervals to locate any leaks and tighten connections if necessary. After a period of service the ram packing at ends of hydraulic cylinders will wear and need replacing. To replace, run table to extreme of travel, take off unit on end of ram outside of bracket attached to table and remove bracket from table to provide accessibility. In replacing ram unit, do not set up tight. The ram must float in the bracket to prevent any cramping that might throw the table out of alignment. Be sure the system is always freely charge with oil of the type specified on Oilgear plate attached to pump.

Replace oil filter cartridge as soon as indicated by filter gauge.

MATTISON MACHINE WORKS
ROCKFORD, ILLINOIS
U.S.A.

5/54

LIST OF DISTRIBUTORS
of WHITE & BAGLEY UNIVERSAL SPINDLE OIL
Recommended for use in Lubricating Front Bronze Bearing
on MATTISON SURFACE GRINDERS

Los Angeles Oil & Grease Co., 1333 Willow St., Los Angeles, Calif.

Moore Machinery Co., 1699 Van Ness Ave., San Francisco, California

Mine & Smelter Supply Co., Denver, Colorado

The N. T. Bushnell Co., 289 State St., New Haven, Conn.

Samuel Harris & Co., 114 No. Clinton St., Chicago, Illinois

The E. A. Kinsey Co., 725 No. Capitol Ave., Indianapolis, Indiana

Oliver H. Van Horn Co., Inc., 522 Camp St., New Orleans, Louisiana

Oliver H. Van Horn Co., Inc., 311 Market St., Shreveport, Louisiana

The White & Bagley Co., 1448 Wabash Ave., Detroit, Michigan

F. E. Satterlee Company, Minneapolis, Minnesota

Richards & Conover Hardware Co., Box 889, Kansas City, Missouri

Mill Supply & Machinery Co., 528 No. Vandevonter Ave.,
St. Louis, Missouri

Oliver Abrasive & Tool Co., Inc., 60 Pearl St., Buffalo, New York

Syracuse Supply Company, 314 West Fayette St., Syracuse, New York

A. V. Wiggin & Co., 326 West Fayette St., Syracuse, New York

LeValley-McLeod-Kinkaid Company, Inc., Elmira, New York

The Cleveland Tool & Supply Co., 1427 West Sixth St., Cleveland, Ohio

The E. A. Kinsey Company, 331 West Fourth Street, Cincinnati, Ohio

Somers, Fitler & Todd Co., 327 Water St., Pittsburgh, Pennsylvania

William K. Toole Company, Pawtucket, Rhode Island

Frank H. Logan, 46 Franklin St., Providence, Rhode Island

Oliver H. Van Horn Co., Inc. of Texas, Franklin Ave. Cor. Austin,
Houston, Texas

INSTRUCTIONS

OILGEAR TYPE "DS" ONE-WAY VARIABLE DELIVERY PUMPS WITH HANDWHEEL CONTROLS

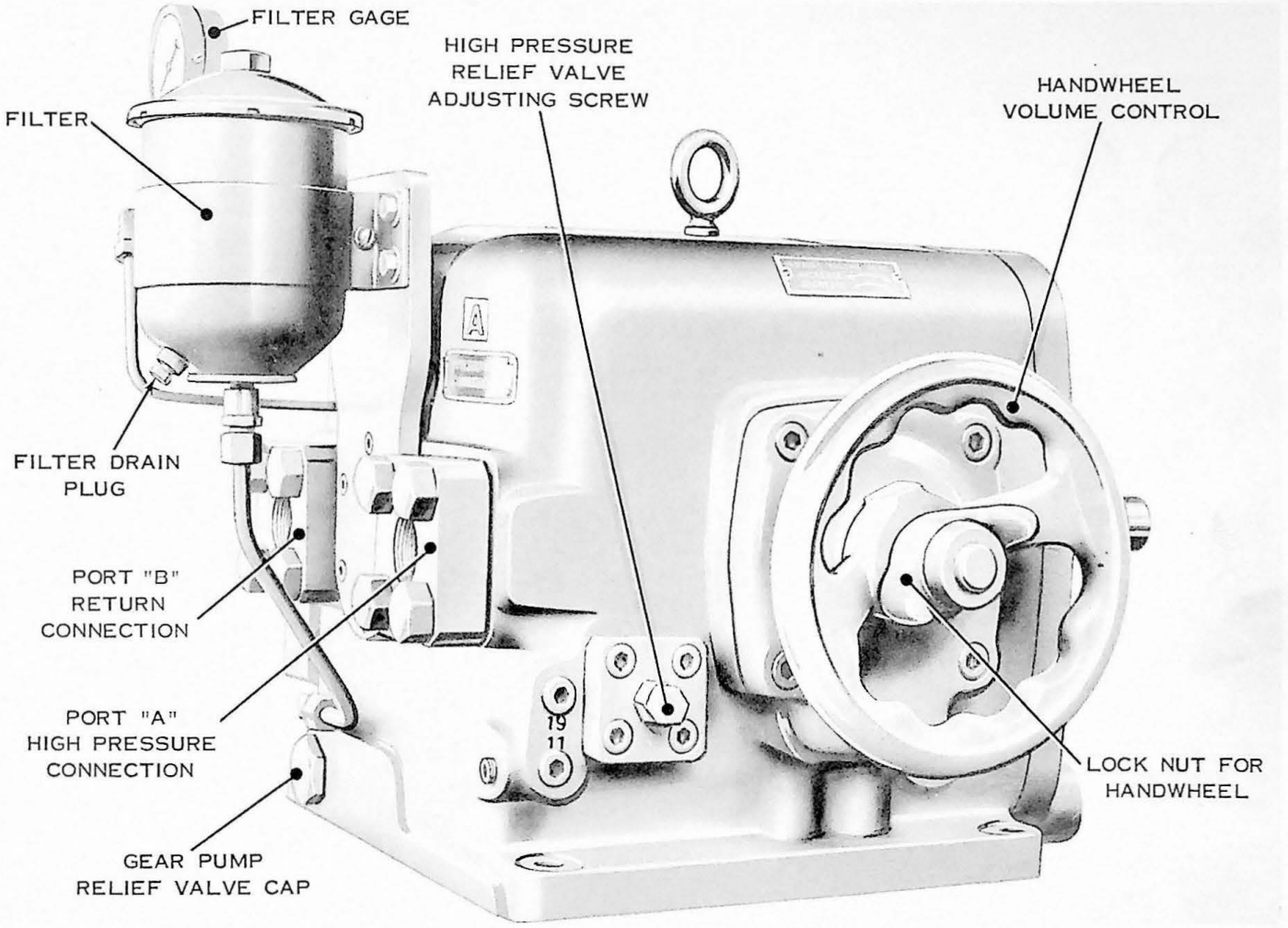


Figure 1. Type "DS" Pump-Control Side (53263).

TO THE USER AND OPERATOR OF OILGEAR TYPE "DS" VARIABLE DELIVERY PUMPS

The purpose of these instructions is to both simplify and minimize your work of installing, operating and maintaining Oilgear Type "DS" Pumps. Your acquaintance with the detail construction, principle of operation, recommended application and inherent characteristics of these units will assure satisfactory performance, reduce shut-downs and increase the life expectancy.

For publication convenience, instructions covering the "Type "S" Handwheel Controls", "Case and Radial Piston Units", "Gear Pumps", "Suction Valves", "High Pressure Relief Valves" and "Gear Pump Relief Valves" are issued in separate bulletins (see back cover).

We feel confident, that if these instructions are adhered to, the Oilgear will operate to your satisfaction.

THE OILGEAR COMPANY

ISSUED FEBRUARY 1954 MILWAUKEE 4, WISCONSIN, U. S. A. BULLETIN 947100

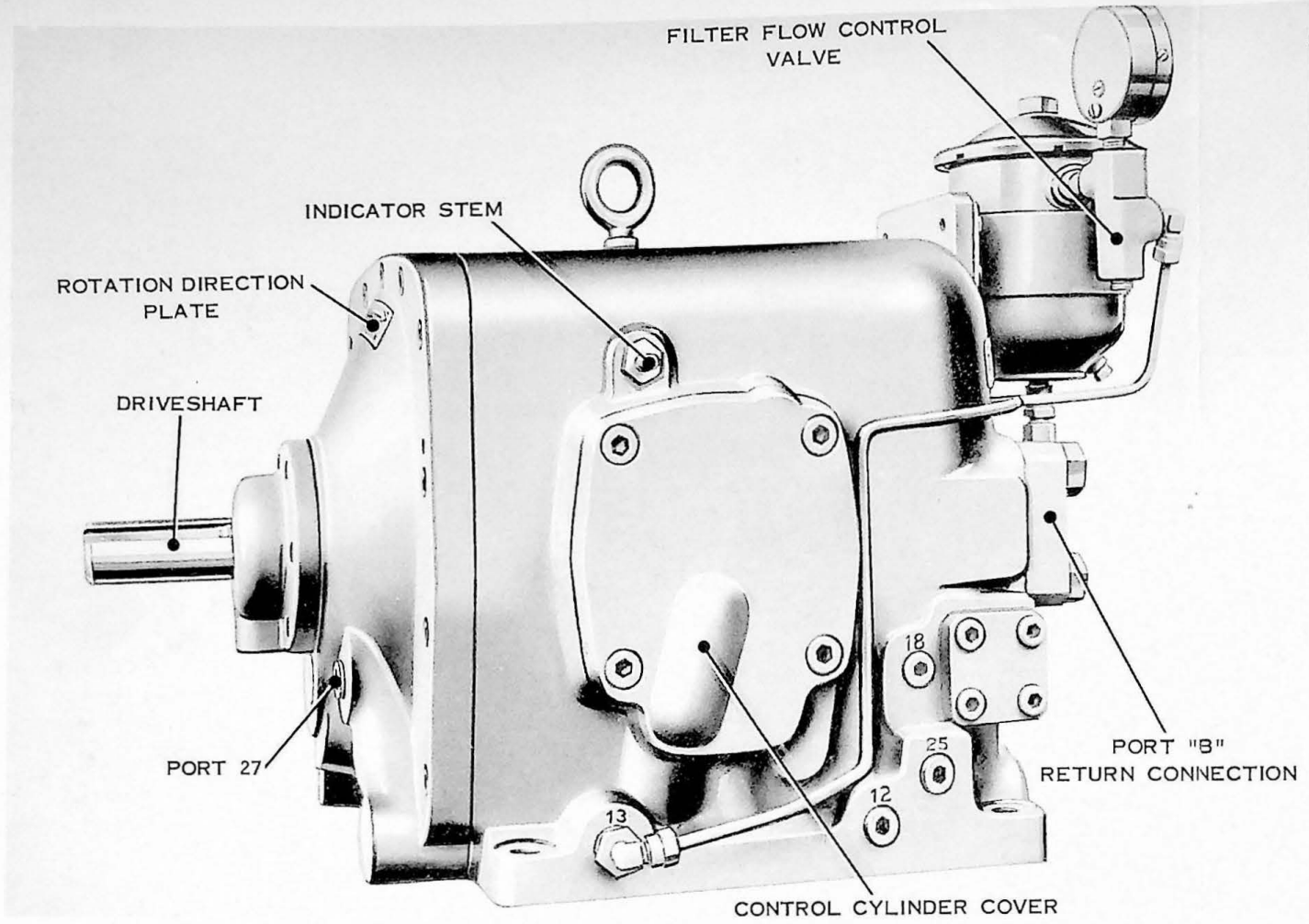


Figure 2. Type "DS" Pump - Opposite Control Side (53264).

Some pumps have no ports 50 and 51. On these units port 8, instead of port 26, is connected to port 22.

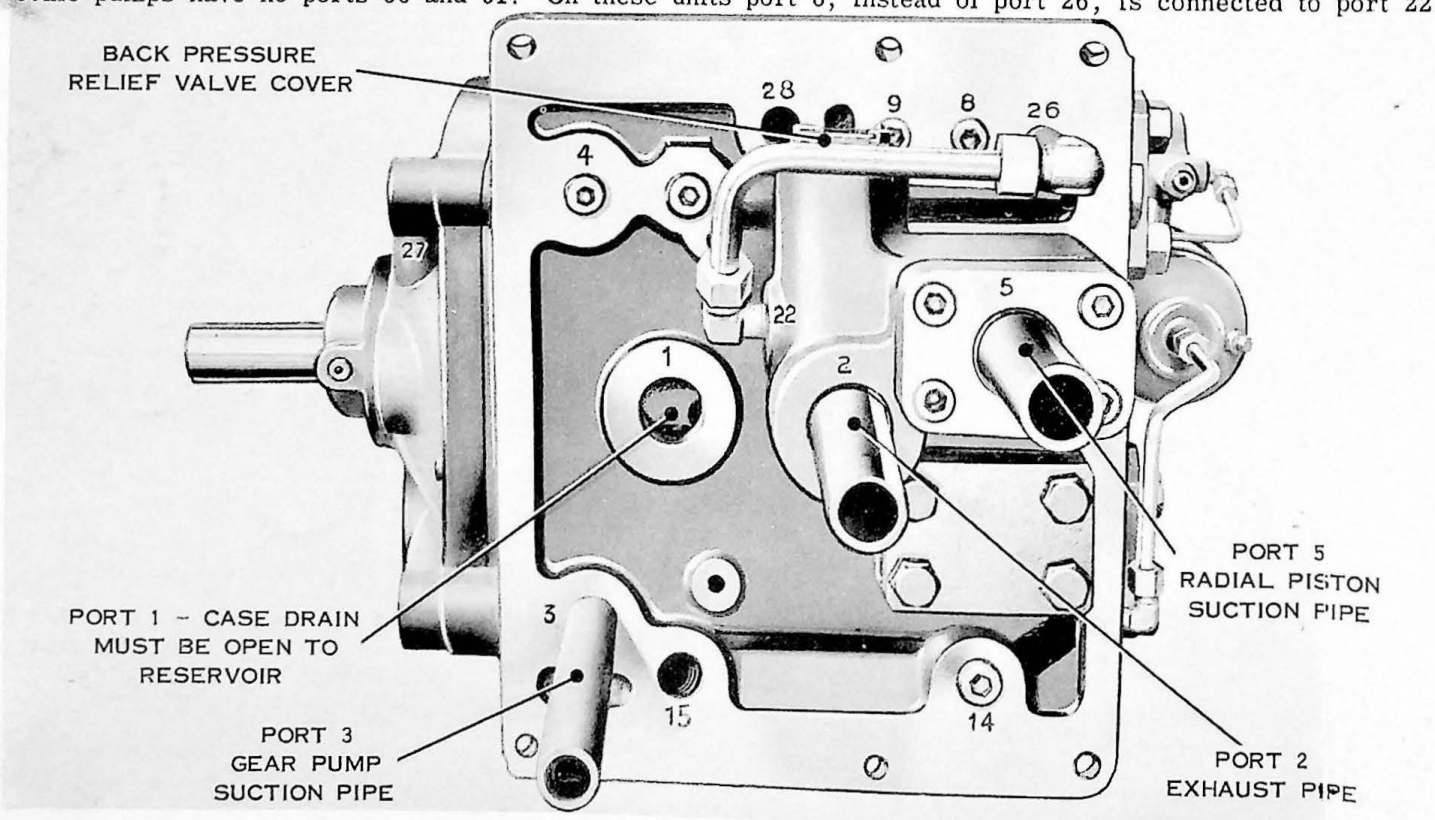
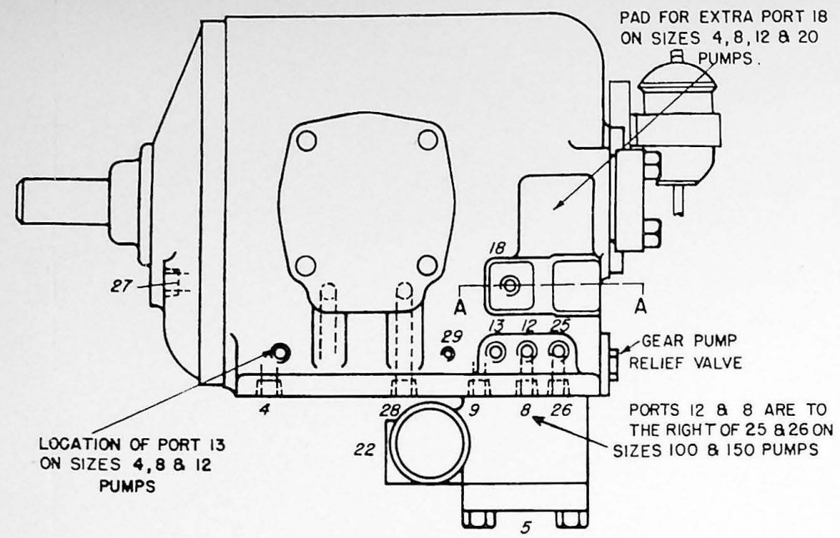
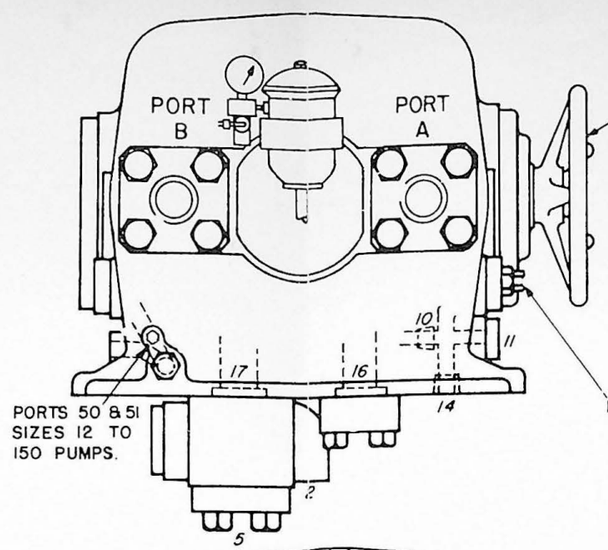
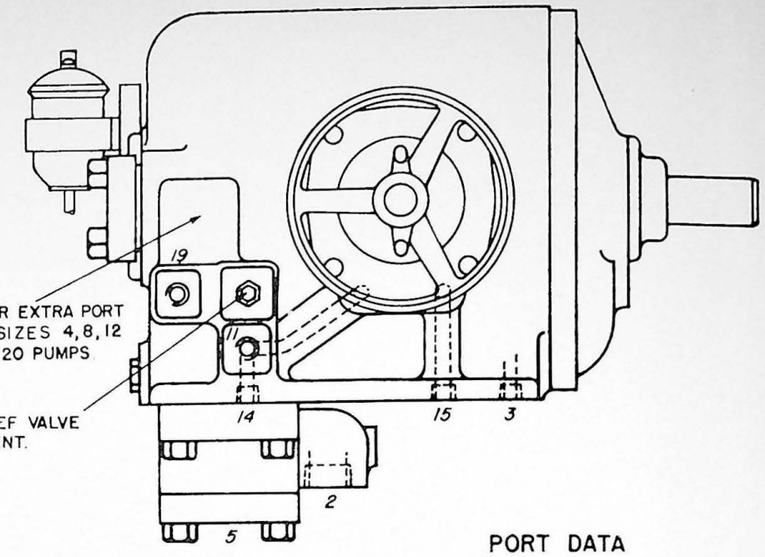
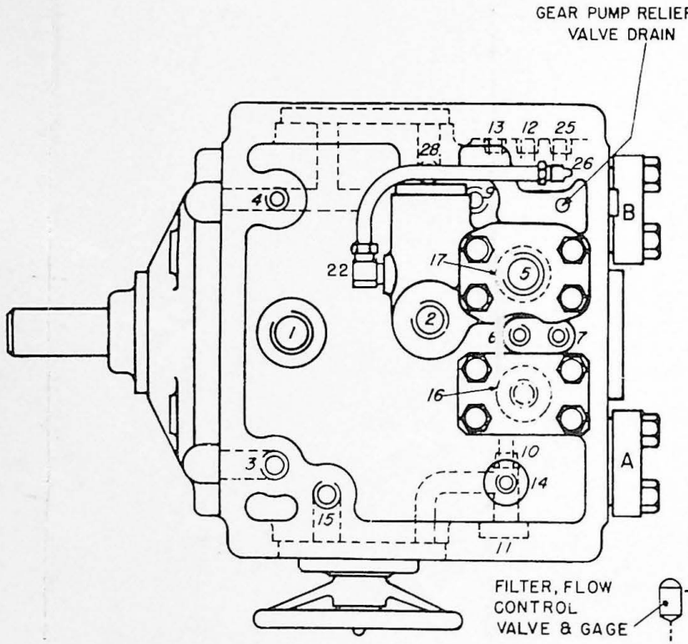


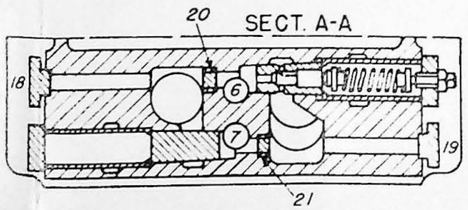
Figure 3. Type "DS" Pump - Bottom View (53269)

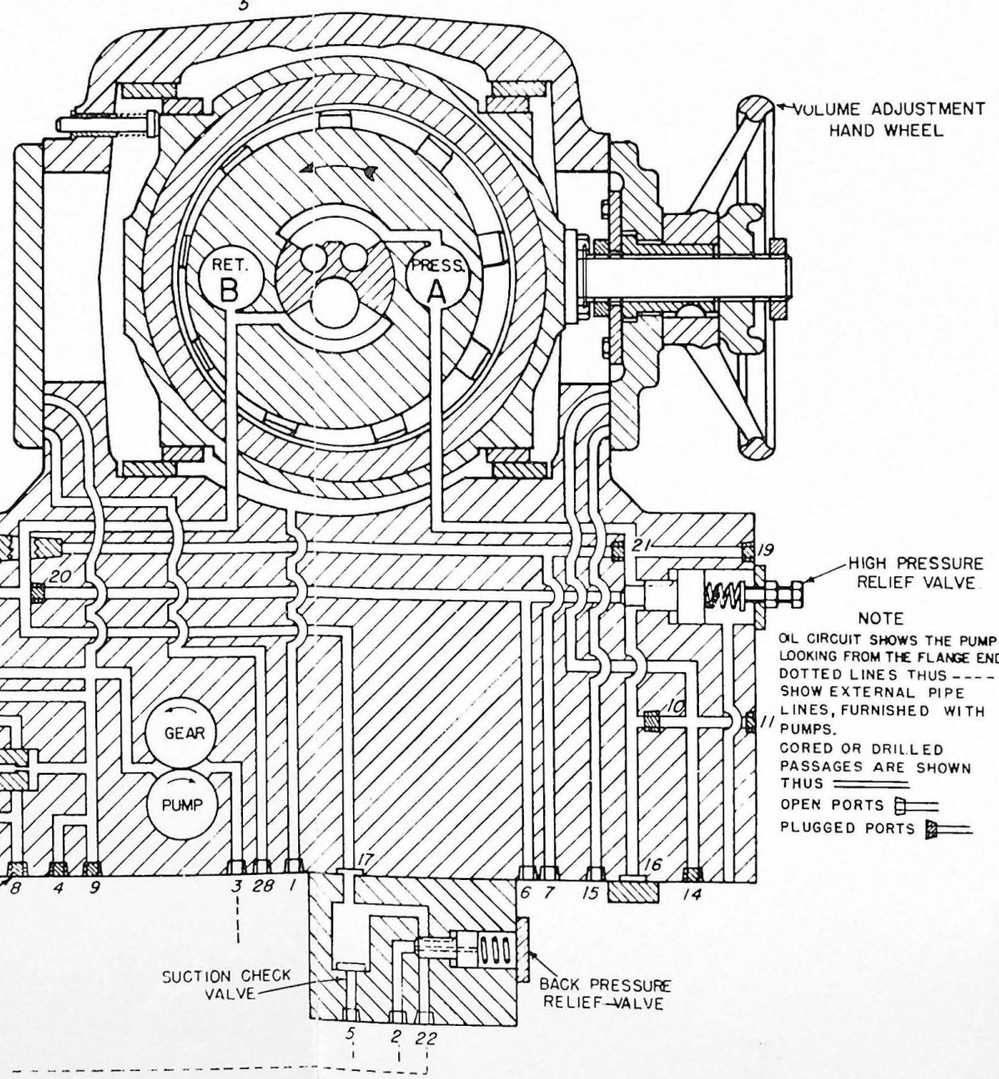












NOTE

OIL CIRCUIT SHOWS THE PUMP LOOKING FROM THE FLANGE END. DOTTED LINES THUS ---- SHOW EXTERNAL PIPE LINES, FURNISHED WITH PUMPS.
CORED OR DRILLED PASSAGES ARE SHOWN THUS
OPEN PORTS
PLUGGED PORTS

COOLER INSTALLATION DRAWING DS-47905
COOLER OIL CIRCUIT DS-947905
COOLERS ARE NOT FURNISHED WITH PUMPS.

PORT DATA

PORT NO.	PUMP SIZE	4	8	12	20	35	60	100	150
	PORT DESCRIPTION	PIPE TAP SIZE							
A	HIGH PRESSURE CONN.	3/4	1	1 1/4	1 1/2	2	2 1/2	2 1/2	2 1/2
B	RETURN CONN.	3/4	1	1 1/4	1 1/2	2	2 1/2	2 1/2	2 1/2
1	CASE DRAIN	3/4	1	1	1 1/4	1 1/2	2	2	2
2	EXCESS RETURN EXHAUST	3/8	1/2	3/4	1 1/2	2	2	2	2
3	GEAR PUMP SUCTION	3/4	1	1	1	1 1/4	1 1/4	1 1/4	1 1/2
4	GEAR PUMP PRESSURE	1/2	1/2	3/8	1/2	3/4	3/4	3/4	3/4
5	PUMP SUCTION	3/4	1	1 1/4	1 1/2	2	3	3	3
6	'A' RELIEF VALVE EXHAUST	3/8	1/4	1/4	3/4	1	1 1/4	1 1/4	1 1/4
7	'B' RELIEF VALVE EXHAUST	3/8	1/4	1/4	3/4	1	1 1/4	1 1/4	1 1/4
8	GEAR PUMP REL. VLV. EXH.	1/2	1/2	1/2	1/2	3/4	3/4	3/4	3/4
9	GEAR PUMP PRESSURE	-	-	-	1/2	3/4	1	1	1
10	'A' CORE TO CONTROL CONN.	1/4	1/4	1/4	1/2	1/2	3/4	3/4	3/4
11	'A' SIDE CONTROL CONN.	3/8	3/8	3/8	3/4	*	*	*	*
12	GEAR PUMP REL. VLV. EXH.	1/2	1/2	1/2	1/2	3/4	3/4	3/4	3/4
13	GEAR PUMP PRESSURE	1/2	1/2	1/2	1/2	3/4	3/4	3/4	3/4
14	'A' SIDE CONTROL CONN.	1/4	1/4	3/8	3/4	3/4	3/4	1	1
15	'A' SIDE CONTROL EXHAUST	3/8	3/8	1/2	3/4	1	1 1/4	1 1/4	1 1/4
16	'A' CORE SIZE	7/8	1 1/8	1 3/8	1 5/8	2 1/4	3	3	3
17	'B' CORE SIZE	7/8	1 1/8	1 3/8	1 5/8	2 1/4	3	3	3
18	'B' CORE CONNECTION	3/8	3/8	3/8	1/2	*	*	*	*
19	'A' CORE CONNECTION	3/8	3/8	3/8	1/2	*	*	*	*
20	'A' REL. VLV CROSS CONN.	1/4	1/4	1/4	3/8	1/2	3/4	3/4	3/4
21	'B' REL. VLV. CROSS CONN.	1/4	1/4	1/4	3/8	1/2	3/4	3/4	3/4
22	STANDARD SUPERCHARGE	3/8	3/8	3/8	1/2	3/4	3/4	3/4	3/4
25	AUXILIARY CONN.	1/2	1/2	1/2	1/2	3/4	3/4	3/4	3/4
26	AUXILIARY CONN.	3/8	1/2	1/2	1/2	3/4	3/4	3/4	3/4
27	GEAR PUMP PRESSURE	1/2	1/2	1/2	1/2	3/4	3/4	3/4	1
28	'B' SIDE CONTROL EXHAUST	3/8	1/4	1/2	3/4	1	1 1/4	1 1/4	1 1/4
29	OIL FILTER DRAIN	-	-	-	-	-	1/8	1/4	1/4
50	G.P.R.V. EXHAUST	-	-	3/8	3/8	1/2	1/2	1/2	1/2
51	ACCESS. PORT TO PORT 50	-	-	1/2	1/2	3/4	3/4	3/4	3/4

* BLANK FLANGE UNLESS OTHERWISE SPECIFIED.

Figure 4. Oil Circuit and Port Location Diagram for Type "DS" Pumps (DS-947120-A) (53946-A).

1. PUMPS WITH RESERVOIRS.

These units are usually fully equipped and ready for installation.

2. PUMPS WITHOUT RESERVOIRS.

These units are shipped with or without suction and discharge tubes in place. When shipped WITH tubes in place, clean external surfaces of pump thoroughly . . . especially the bottom surface which mounts on reservoir. IMPORTANT, remove pipe tap protector from case drain port 1. This port must be open to reservoir . . . no tube is required. When shipped WITHOUT tubes in place, clean external surfaces of pump thoroughly . . . especially the bottom surface which mounts on reservoir. Remove all pipe tap protectors under pump case. Screw tubes securely into proper ports under pump. Numbers corresponding with proper ports in case are stamped or printed on the tubes furnished by The Oilgear Company. Use pipe compounds sparingly. Screw tubes securely in place to prevent air being drawn into the systems. Suction and discharge tubes should reach to within one or two times the diameter of tube from bottom of reservoir. IMPORTANT, port 1 must be open to reservoir . . . no tube is required.

3. MOUNTING.

Bolt lower flange of pump and gasket to machine reservoir or bolt standard reservoir to machine or floor. Mount reservoir at least six inches above floor level to facilitate draining of oil. Avoid undue jarring and abuse in handling to protect tubes and pump mechanism.

4. PIPING AND FITTINGS.

See Oilgear bulletin on "Piping Recommendations".

5. POWER REQUIREMENTS.

Power is required in proportion to volume and pressure used. Motor size recommendations for specific applications can be obtained from The Oilgear Company. Standard low starting torque motors are suitable for most applications.

6. DRIVE.

Pump drive shaft must always rotate clockwise when facing end of pump shaft. (Special pumps available for counterclockwise rotation). See name plate on gear pump housing. Use either direct, belt, texrope, silent chain or gear drive. Provide an easy slip fit for coupling, pulley, sheave, sprocket or gear and fasten with set screw. Do not use a drive fit.

7. OIL RECOMMENDATIONS.

Refer to red oil instruction plate on pump case or reservoir or Oilgear bulletin on "Oil Recommendations". Set pump handwheel to about zero stroke. Turn drive shaft a few revolutions by hand to be sure all working parts are free. Switch electric control off and on several times before allowing pump to reach full speed. Turn handwheel control to full stroke, or a fraction thereof, to fill system with oil. AVOID STARTING OR STOPPING OF PUMP UNDER LOAD. Pump passages, piping and cylinder or hydraulic motor are filled by running pump. When cylinders are used, operate machine idle and at full stroke of cylinders to enable all air to be forced out of the system and replaced by a solid column of oil. Add oil to the pump reservoir as system is being filled. Be sure the oil level in reservoir never drops below the low oil level marker.

8. OIL FILTER.

Approximately 30 gph of the gear pump oil flows through the filter flow control valve and filter. Replace element when filter pressure gage pointer reaches "Change Filter Element" area at normal oil temperature. Remove top cover of filter case, lift out element and open drain plug to drain out oil. Wipe filter case clean, close drain plug, insert a new element and fasten cover in place. If filter gage pointer remains at "0", remove plug in bottom of flow control valve and clean out passage and plunger groove.

9. AIR BREATHER.

On most installations, an air breather is screwed into top of oil reservoir. Keep breather case filled to the oil level mark with oil. About once every six months, remove wing nut and cover from breather and clean screen with solvent. Install screen and fill to mark with clean oil.

PARTS LIST

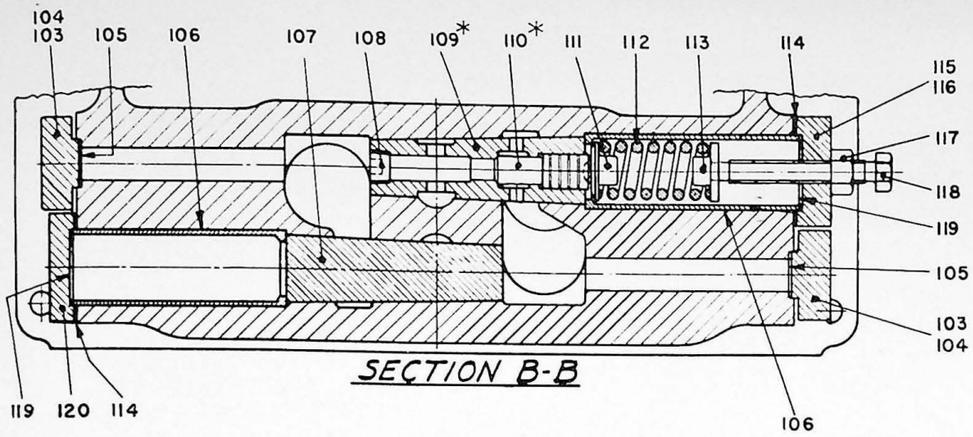
OILGEAR TYPE "DS" PUMPS (SIZES 2 TO 60)

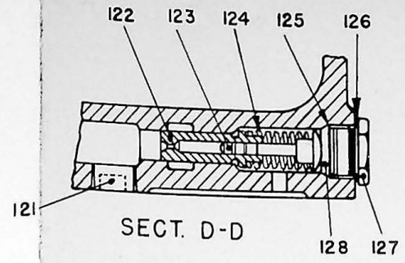
NO.	PARTS
1.	Flange, Suction Valve
2.	Screw, Flange
3.	Seat, Check Valve
4.	Disc, Check Valve
5.	Cage, Check Valve
6.	Gasket, Suction Valve
7.	Body, Suction Valve
8.	Gasket, Oil Reservoir
9.	Case, Pump
10.	Gasket, Control Cylinder Cover
11.	Cover, Control Cylinder
12.	Screw, Cover
13.	Stem, Indicator
14.	Bushing, Indicator
15.	Spring, Indicator
16.	Dowel, Slide Block Liner
17.	Dowel, Case Liner
18.	Rotor
19.	Eyebolt
20.	Piston
21.	Cylinder*
22.	Slide Block
23.	Nameplate, Control
24.	Screw, Drive
25.	Screw, Cap
26.	Wire, Lock
27.	Collar, Stop
28.	Pin, Taper
29.	Plate, Control Nut
30.	Nut, Control Adj.
31.	Nut, Lock
32.	Collar, Stop
33.	Screw, Control
34.	Screw, Retaining
35.	Key, Woodruff
36.	Screw, Retaining Plate
37.	Wire, Lock
38.	Cover, Control
39.	Screw, Cover
40.	Handwheel
41.	Gasket, Control Cover
42.	Bushing, Cylinder*
43.	Shim, Slide Block Liner
44.	Liner, Slide Block
45.	Liner, Case
46.	Spacer, Flange
47.	Gasket, Spacer
48.	Flange, Blind
49.	Screw, Flange
50.	Gasket, Suction Flange
51.	Gasket, Pintle Cover
52.	Cover, Pintle
53.	Screw, Pintle Cover
54.	Screw, Flange
55.	Flange, Connection
56.	Gasket, Flange
57.	Filter, Oil
58.	Valve, Flow Control
59.	Gage, Filter
60.	Pintle
61.	Key, Pintle
62.	Shim, Rear Rotor Bearing
63.	Bearing, Rear Rotor
64.	Plug, Pipe
65.	Spacer, Thrust Ring
66.	Ring, Thrust
67.	Nameplate
68.	Screw, Rotor Cover
69.	Wire, Lock
70.	Screw, Slide Block Cover
71.	Wire, Lock
72.	Housing, Gear Pump
73.	Screw, Housing
74.	Cover, Slide Block
75.	Cover, Rotor
76.	Plate, Rotation Direction
77.	Ring, Slide Block Spacer
78.	Shim, Slide Block Spacer
79.	Screw, Gear Pump Cover
80.	Gasket, Screw
81.	Housing, Oil Seal
82.	Seal, Drive Shaft Oil
83.	Nut, Bearing Lock
84.	Washer, Lock
85.	Shaft, Drive
86.	Key, G.P. Driver
87.	Spacer, Coupling
88.	Shim, Front Shaft Bearing
89.	Bearing, Front Shaft
90.	Gear, G.P. Driver
91.	Gasket, Housing
92.	Gear, G.P. Driven
93.	Bearing, G.P. Roller
94.	Shaft, Stub
95.	Shim, Front Rotor Bearing
96.	Bearing, Front Rotor
97.	Cover, Gear Pump
98.	Gasket, G.P. Housing
99.	Flange, Coupling
100.	Ring, Coupling
101.	Roller, Coupling
102.	Bearing, Rear Shaft
103.	Flange, Blind
104.	Screw, Flange
105.	Gasket, Flange
106.	Retainer, Bushing
107.	Plug, Dummy
108.	Plug, Pipe
109.	Bushing, H.P.R.V.*
110.	Plunger, H.P.R.V.*
111.	Seat, H.P.R.V. Spring
112.	Spring, H.P.R.V.
113.	Guide, H.P.R.V. Spring
114.	Gasket, Cap
115.	Cap, H.P.R.V.
116.	Screw, Cap
117.	Nut, Lock
118.	Screw, H.P.R.V. Adjusting
119.	Shim, Bushing Retainer
120.	Cap, Blind
121.	Plug, Pipe
122.	Plunger, G.P.R.V.
123.	Plunger, G.P.R.V. Dashpot
124.	Spring, G.P.R.V.
125.	Shim, G.P.R.V.
126.	Gasket, G.P.R.V. Cap
127.	Cap, G.P.R.V.
128.	Spacer, G.P.R.V.
129.	Screw, B.P.R.V. Cap
130.	Wire, Lock
131.	Cap, B.P.R.V.
132.	Gasket, Cap
133.	Spring, B.P.R.V.
134.	Plunger, B.P.R.V.
135.	Shim, B.P.R.V.

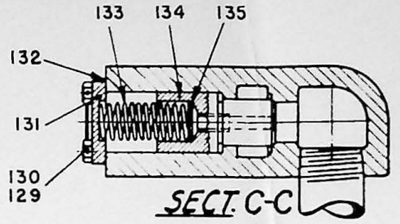
*Parts 21 and 42, or 109 and 110 are furnished only as complete assemblies

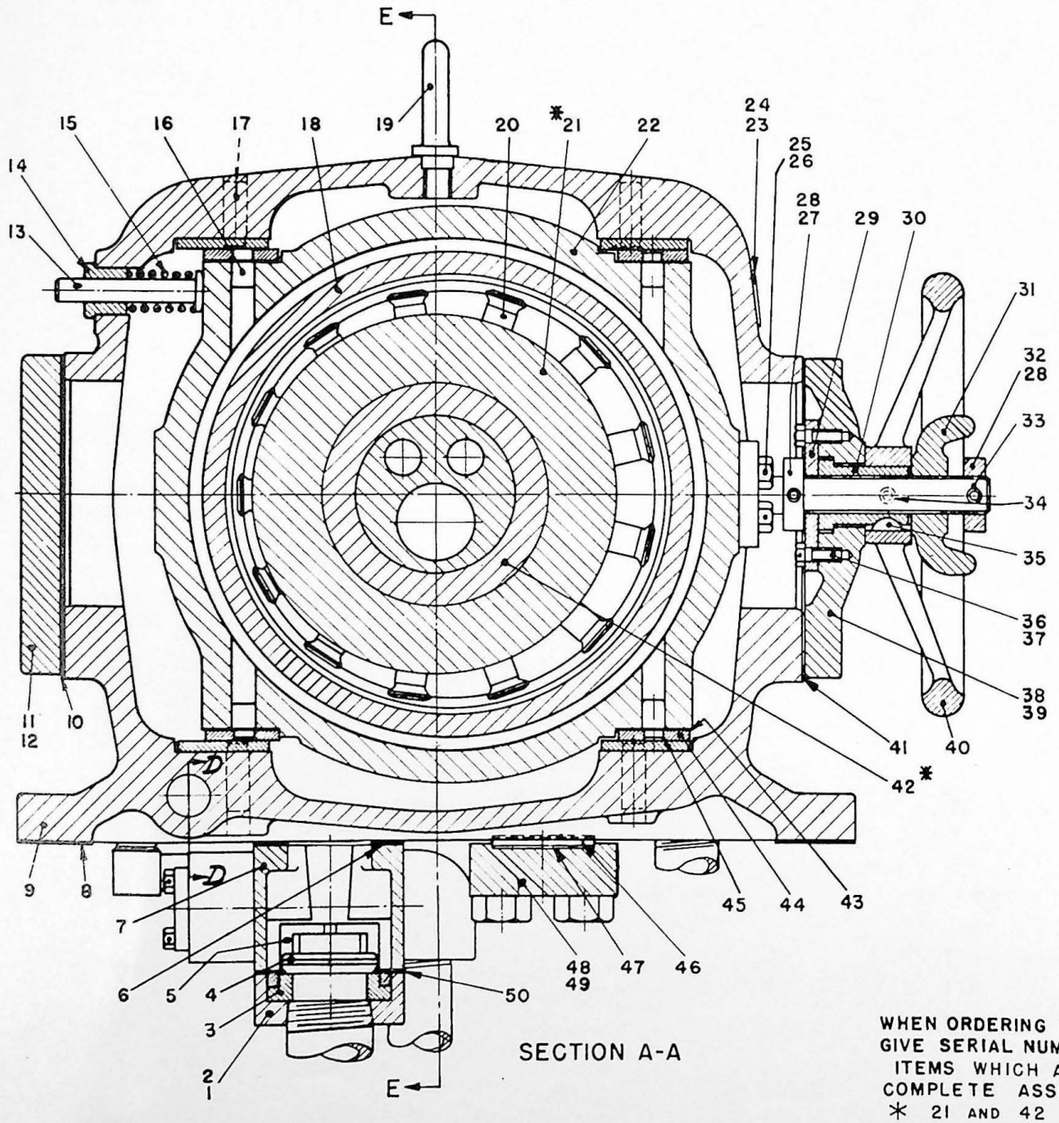
NOTE

When ordering parts be sure to give serial number of pump.









WHEN ORDERING PARTS BE SURE TO GIVE SERIAL NUMBER OF PUMP.
ITEMS WHICH ARE FURNISHED AS COMPLETE ASSEMBLIES:

* 21 AND 42

* 109 AND 110

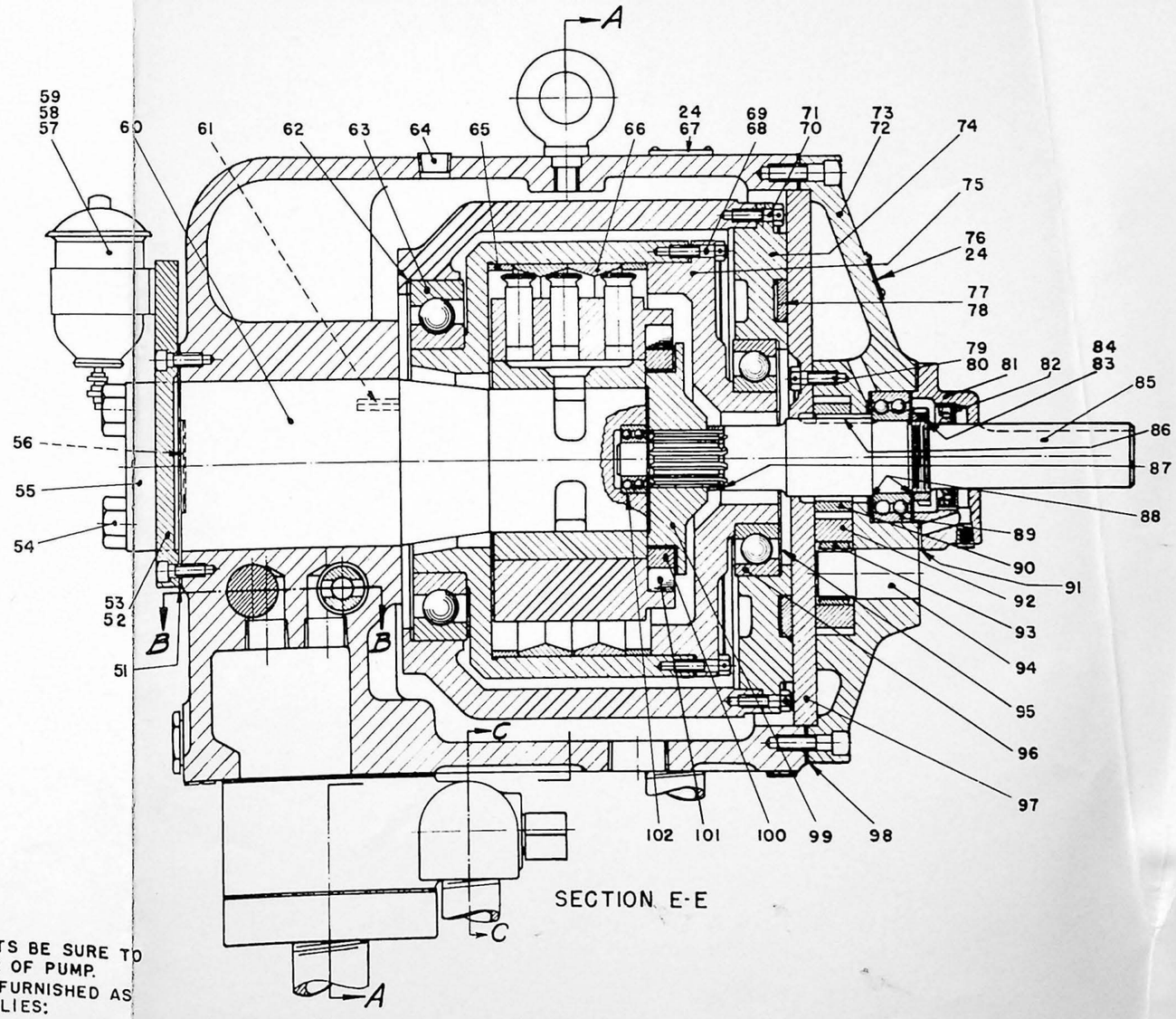
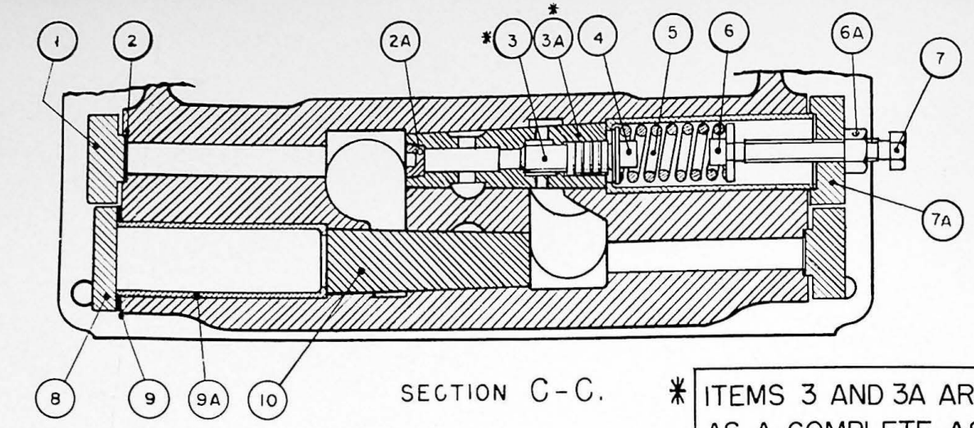
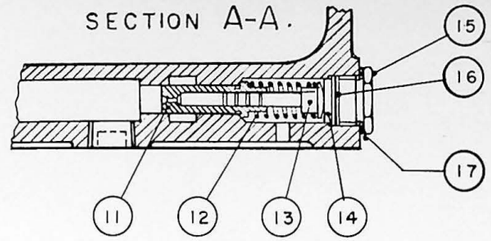


Figure 5. Parts Drawing for Type "DS" Pumps (Sizes 2 to 60) (DS-947100-C) (51719-C).

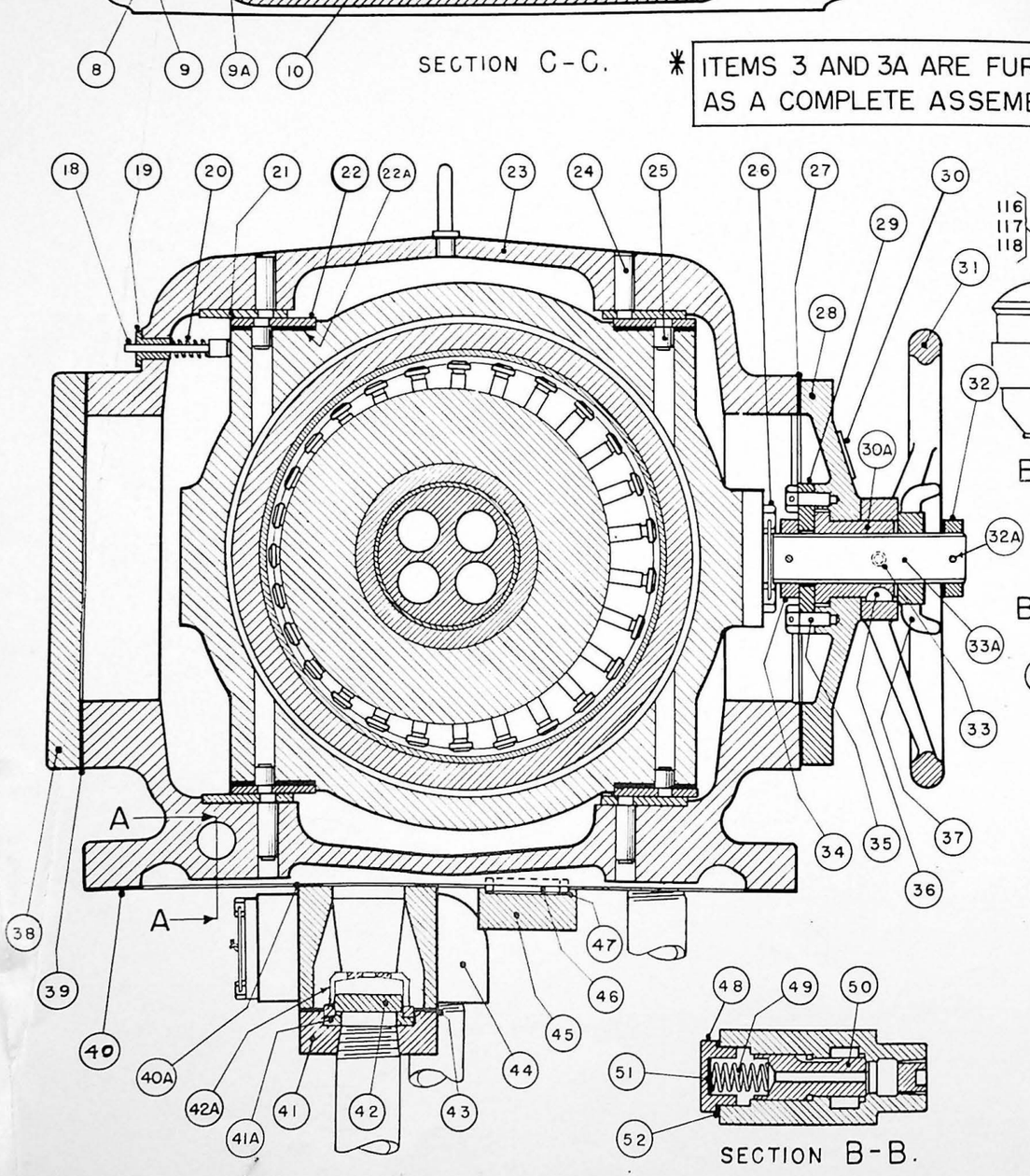


SECTION C-C.

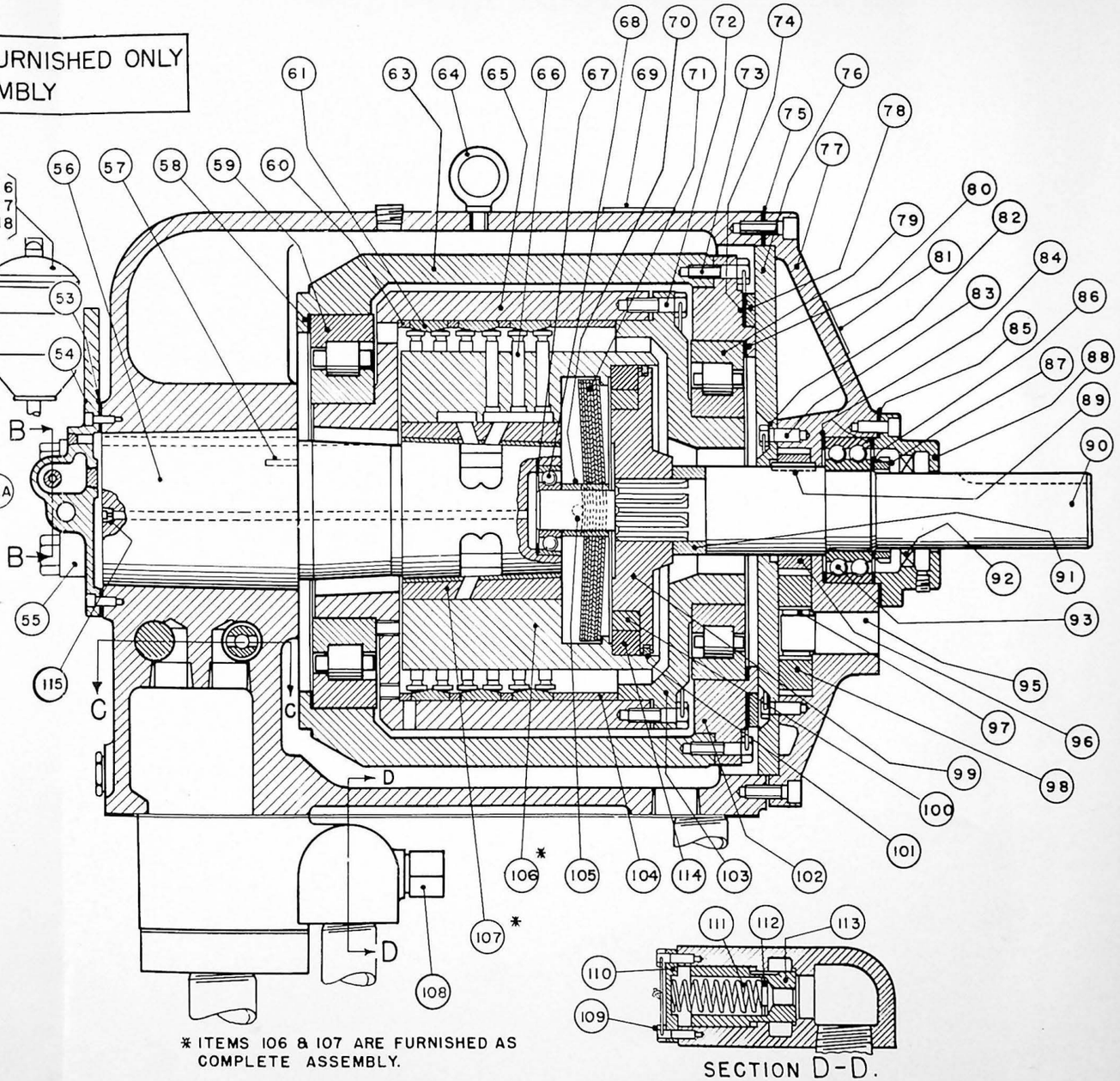
* ITEMS 3 AND 3A ARE FURNISHED ONLY AS A COMPLETE ASSEMBLY



NOTE=
WHEN ORDERING PARTS BE SURE TO GIVE SERIAL NUMBER OF PUMP.



SECTION B-B.



* ITEMS 106 & 107 ARE FURNISHED AS COMPLETE ASSEMBLY.

SECTION D-D.

Figure 6. Parts Drawing for Type "DS" Pumps (Sizes 100 and 150) (DS-947101-B) (54085-B).

PARTS LIST

OILGEAR TYPE "DS" PUMPS (SIZES 100 AND 150)

NO.	PARTS
1.	Flange, Auxiliary
2.	Gasket, Flange
2A.	Plug, Pipe
3.	Plunger, H.P.R.V.*
3A.	Bushing, H.P.R.V.*
4.	Seat, H.P.R.V. Spring
5.	Spring, H.P.R.V.
6.	Guide, H.P.R.V. Spring
6A.	Nut, Lock
7.	Screw, H.P.R.V. Adjusting
7A.	Cap, H.P.R.V.
8.	Flange, Blind
9.	Gasket, Cap
9A.	Retainer, Bushing
10.	Plug, R.V. Dummy
11.	Bushing, G.P.R.V.
12.	Spring, G.P.R.V.
13.	Plunger, G.P.R.V.
14.	Spacer, G.P.R.V.
15.	Cap, G.P.R.V.
16.	Shim, G.P.R.V.
17.	Gasket, G.P.R.V. Cap
18.	Stem, Indicator
19.	Bushing, Indicator
20.	Spring, Indicator
21.	Liner, Case
22.	Liner, Slide Block
22A.	Shim, Slide Block Liner
23.	Case, Pump
24.	Dowel, Case Liner
25.	Dowel, Slide Block Liner
26.	Screw, Cap
27.	Gasket, Control
28.	Housing, Control
29.	Plate, Retaining
30.	Nameplate, Control
30A.	Nut, Control Adjusting
31.	Handwheel, Control
32.	Collar, Stop
32A.	Pin, Taper
33.	Screw, Retaining
33A.	Screw, Control
34.	Collar, Stop
35.	Screw, Cap
36.	Key, Woodruff
37.	Nut, Lock
38.	Cover, Control Cylinder
39.	Gasket, Cover
40.	Gasket, Reservoir
40A.	Gasket, Suction Valve
41.	Flange, Suction
41A.	Seat, Check Valve
42.	Disc, Check Valve
42A.	Cage, Check Valve
43.	Gasket, Suction Flange
44.	Body, Suction Valve
45.	Flange, Blind
46.	Spacer, Flange
47.	Gasket, Spacer
48.	Cap, Pintle Cover R.V.
49.	Spring, Pintle Cover R.V.
50.	Plunger, Pintle Cover R.V.
51.	Shim, Pintle Cover R.V.
52.	Gasket, Cap
53.	Gasket, Pintle Cover
54.	Cover, Pintle
55.	Flange, Pump
56.	Pintle
57.	Key, Pintle
58.	Shim, Rear Rotor Bearing
59.	Bearing, Rear Rotor
60.	Spacer, Thrust Ring
61.	Ring, Thrust
62.	
63.	Slide Block
64.	Eyebolt
65.	Rotor
66.	Piston
67.	Shim, Rear Shaft Bearing
68.	Bearing, Rear Shaft
69.	Nameplate
70.	Yoke, Flat Spring
71.	Spring, Flat
72.	Screw, Rotor Cover
73	Screw, Slide Block Cover
74.	Shim, Slide Block Spacer
75.	Gasket, Gear Pump
76.	Cover, Gear Pump
77.	Housing, Gear Pump
78.	Ring, Slide Block Spacer
79.	Bearing, Front Rotor
80.	Shim, Front Rotor Bearing
81.	Plate, Rotation Direction
82.	Gasket, G.P. Cover Screw
83.	Screw, G.P. Cover
84.	Shim, Front Shaft Bearing
85.	Gasket, Shaft Seal
86.	Washer, Bearing Lock
87.	Nut, Bearing Lock
88.	Housing, Shaft Seal
89.	Key, G.P. Drive
90.	Shaft, Drive
91.	Spacer, Coupling
92.	Seal, Shaft Oil
93.	Bearing, Front Shaft
94.	
95.	Shaft, G.P. Stub
96.	Gear, G.P. Driver
97.	Bearing, G.P. Needle
98.	Gear, G.P. Driven
99.	Flange, Coupling
100.	Ring, Coupling
101.	Ring, Coupling Flange
102.	Cover, Slide Block
103.	Cover, Rotor
104.	Spacer, Thrust Ring
105.	Ball, Flat Spring
106.	Cylinder*
107.	Bushing, Cylinder*
108.	Fitting, B.P. Tube
109.	Screw, B.P.R.V. Cap
110.	Cap, B.P.R.V.
111.	Spring, B.P.R.V.
112.	Shim, B.P.R.V.
113.	Plunger, B.P.R.V.
114.	Roller, Coupling
115.	Plug, Pintle Orifice
116.	Filter, Oil
117.	Valve, Flow Control
118.	Gage, Filter

*Parts 3 and 3A, or 106 and 107 are furnished only as complete assemblies

NOTE

When ordering parts be sure to give serial number of pump.

MALFUNCTIONS AND CAUSES

A. Irregular or unsteady operation.

1. Oil level in reservoir is low (see paragraph 7).
2. Air in the fluid power system (see paragraph 7 and instruction bulletin on "Suction Valves").
3. Insufficient back pressure (see instruction bulletin on "Suction Valves").
4. Insufficient gear pump pressure (see instruction bulletin on "Gear Pumps").
5. Sticking pistons or worn radial piston unit (see instruction bulletin on "Case and Radial Piston Units").
6. Faulty hydraulic motor, cylinder or valve.

B. Unresponsive control.

1. Worn control nut or screw.
2. Control screw loose from slide block.
3. Control screw not operating from stop to stop.
4. Handwheel not secured to control nut. (See instruction bulletin on "Type "S" Handwheel Controls").

C. Control works hard.

1. Worn or dirty threads in control nut or screw (see instruction bulletin on "Type "S" Handwheel Controls").

2. Binding or sticking slide block (see instruction bulletin on "Case and Radial Piston Units").

D. Loss of pressure or volume.

1. Foreign sediment under high pressure relief valve, sticking H.P.R.V. plunger or defective H.P.R.V. spring (see instruction bulletin on "High Pressure Relief Valves").
2. Worn radial piston unit (see instruction bulletin on "Case and Radial Piston Units").
3. Faulty suction check valve (see instruction bulletin on "Suction Valves").
4. Obstructed suction passages in case or pintle (see instruction bulletin on "Case and Radial Piston Units").
5. Bushing turned in cylinder (see instruction bulletin on "Case and Radial Piston Units").

E. Overheating.

1. Worn radial piston unit (see instruction bulletin on "Case and Radial Piston Units").
2. Leakage past high pressure relief valve (see instruction bulletin on "High Pressure Relief Valves").
3. Insufficient cylinder running clearances (see instruction bulletin on "Case and Radial Piston Units").
4. Low oil level in reservoir (see paragraph 7).
5. Excessive gear pump pressure or worn gear pump (see instruction bulletin on "Gear Pumps").
6. Continuous operation at excessive pressure.

F. Excessive noise.

1. Worn bearings or radial piston unit (see instruction bulletin on "Case and Radial Piston Units").
2. Air in the fluid power system (see paragraph 7 or instruction bulletin on "Suction Valves").
3. Incorrect clearances in radial piston unit (see instruction bulletin on "Case and Radial Piston Units").

STANDARD TYPE "DS" PUMP INSTRUCTION BULLETINS

Type "S" Handwheel Controls	947101
Gear Pump Relief Valves	947910-A
High Pressure Relief Valves	947911-A
Gear Pumps	947912
One-Way Pump Suction and Return Valves	947913
Case and Radial Piston Units (Sizes 2 to 60)	947916
Case and Radial Piston Units (Sizes 100 and 150)	947917

SPECIAL TYPE "DS" PUMP INSTRUCTION BULLETINS

Pumps for closed circuits may be equipped with "Suction Valves (Check Valve Types)" and two-way pumps are usually equipped with "Suction Valves (Three-Way Plunger Types)" covered by instruction bulletins 947915 and 947914 respectively.

GENERAL INSTRUCTION BULLETINS

Oil Recommendations	90000-G
Oil Selection and Maintenance Recommendations	90002
Piping Recommendations	90011-A

OILGEAR REPLACEMENT SERVICE

STANDARD REPLACEMENT PUMPS ARE AVAILABLE TO USERS OF OILGEAR EQUIPMENT WHERE COMPARABLE UNITS WILL BE RETURNED FOR REBUILD. THESE REBUILT AND TESTED REPLACEMENTS ARE USUALLY CARRIED IN STOCK FOR QUICK DELIVERY, SUBJECT TO PRIOR REQUESTS. WHEN STANDARD REPLACEMENTS MUST BE MODIFIED TO REPLACE UNITS WHICH ARE SPECIAL, DELIVERY WILL DEPEND ON AVAILABILITY OF PARTS AND ASSEMBLY AND TEST TIME NECESSARY.

TO OBTAIN THIS SERVICE, PLACE AN ORDER FOR A REPLACEMENT FOR REPAIR OF THE WORN UNIT (GIVE SERIAL NUMBER AND TYPE DESIGNATION). THE REPLACEMENT WILL BE SHIPPED F. O. B. MILWAUKEE, WISCONSIN. USER RETAINS THE REPLACEMENT AND RETURNS THE WORN UNIT PREPAID TO THE OILGEAR COMPANY FOR RECONDITIONING AND TEST. WHEN THE UNIT IS RECONDITIONED AND STOCKED, THE USER IS BILLED THE COST OF RECONDITIONING.

LITHO IN U.S.A.

TYPE "DS" PUMPS

ONE-WAY VARIABLE DISPLACEMENT HAND-WHEEL CONTROL

These pumps are available in conventional sizes having normal capacities from 2 to 150 horsepower and peak capacities up to 190 horsepower. In addition, each size is available with one. two or three pumps having normal working pressure ratings of 1100, 1700 and 2500 pounds per square inch and peak pressure ratings up to 3000 pounds per square inch. See tabulations below for pressure ratings and specifications on standard pumps.

For each fluid power application there is a pump having the volumetric displacement and working pressure rating especially suited to meet the exact requirements. For example, there are three size 20 (approximate H.P. output) units having the same mounting dimensions and rated speed but with different volumetric displacements and different working pressure ratings. Thus, the user can select a size 2011, 2017 or 2025 pump for the application.

Standard reservoirs or motor bases are available for each size unit. For additional compactness the user can build oil reservoir in the machine and mount pump as an integral part.

PRESSURE RATINGS
IN POUNDS PER SQUARE INCH

PRESSURE SERIES	DUTY		
	CONTINUOUS 100%	INTERMITTENT 50%	PEAK 10%
1100	1100	1225	1350
1700	1700	1850	2050
2500	2500	2750	3000

SPECIFICATIONS:

CAPACITY IN CUBIC INCHES AND GALLONS FLOW PER MINUTE AT RATED SPEED

SIZE	PRESSURE SERIES						RATED SPEED R.P.M.
	1100		1700		2500		
	CUBIC INCHES	GALLONS	CUBIC INCHES	GALLONS	CUBIC INCHES	GALLONS	
2	850	3.7			380	1.7	1140
4	1550	6.7			700	3.	1140
8	3100	13.4	2000	8.7	1300	5.6	1140
12	5300	22.9	3500	15.2	2200	9.5	1140
20	8000	34.6	5400	23.4	3400	14.7	1140
35	13000	56.3	8500	36.8	5500	23.8	860
60	24000	104.	15500	67.	10300	44.6	860
100			25000	108.	16500	71.4	860
150					25000	108.	860

Printed in U. S. A.

BULLETIN 47100

TYPE "DS" VARIABLE DISPLACEMENT One-Way With

With the large, convenient hand wheel connected direct to the variable stroke pump unit through a work nut and screw, the fluid power delivered by Type "DS" Pumps is accurately and promptly controlled. Any volume from zero to maximum is obtained with two and one-half to five and one-quarter turns of the hand wheel, depending on the size of pump. Both the hand wheel and screw are locked in position with a thumb nut. For convenience, the control can be mounted on either side of the pump case.

Type "DS" Pumps deliver the fluid power in one direction only. Reversal of oil flow to cylinder or motor is obtained by a single or combination piston type control valve located in any convenient position to suit the application.

Oil from the built-in gear pump can be used for auxiliary purposes, such as operating pilot valves, clamps, and the like.

When used in combination with Oilgear cylinders and control valves the Type "DS" Pumps are especially suited for operating grinding, shaping, planing and honing machines, pull and push broaching machines and blanking presses.

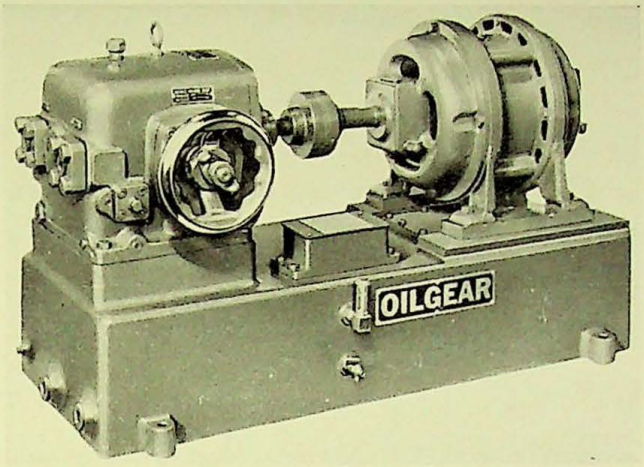
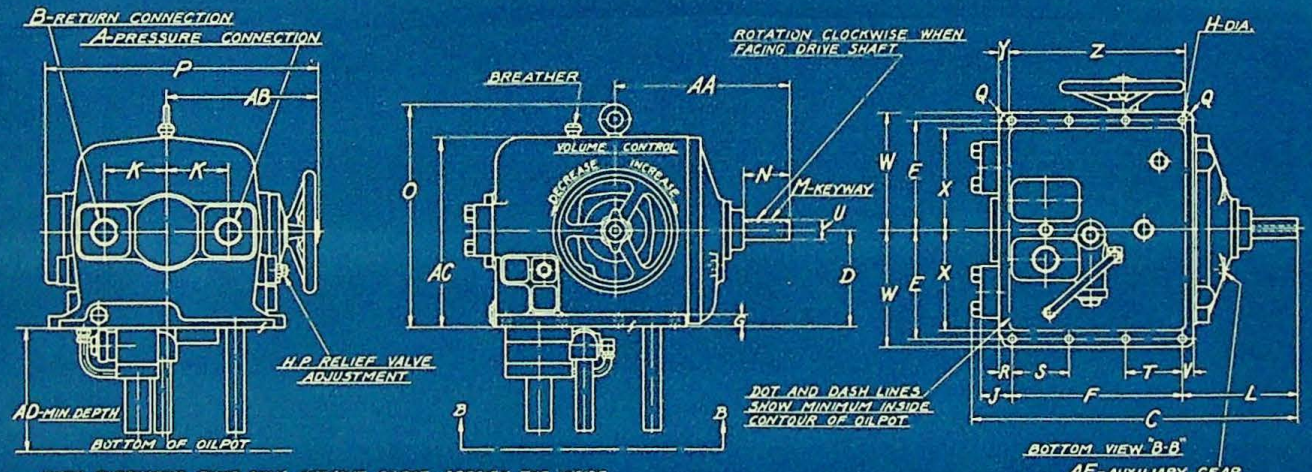


Fig. 16—Type "DS" Pump with Large Motor Base.

When used in combination with Oilgear Motors they constitute ideal variable speed transmissions for driving conveyors and machines in rubber tire manufacturing plants, driving paper machines and pipe conveyors and for reciprocating long grinding machine tables.



PUMP SIZE	DIMENSIONS IN INCHES																														SPEED R.P.M.	NET WEIGHT IN LBS.	SHIP WEIGHT IN LBS.
	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE			
2	1/2	1/2	17 1/16	5	4 1/4	8 1/16	11/16	9/16	1 1/8	3	7 1/4	1/4 x 1/8	2 1/2	11 3/8	15 5/16	3/8	5/8	—	—	1.0625 / 1.0620	1/2	5 1/4	4 1/2	1/2	8 5/16	10 1/4	9 5/16	9 5/16	9	1/2	1140	230	265
4	3/4	3/4	18 3/16	5 1/2	5 1/16	8 3/8	11/16	9/16	1 1/16	3 1/2	7 1/2	1/4 x 1/8	2 1/2	13 3/8	16 5/16	3/8	13/16	—	—	1.0625 / 1.0620	1/2	6	4 5/8	5/16	9 5/16	10 1/4	10 1/16	10 3/8	10	1/2	1140	300	350
8	1	1	20 3/4	6	6	9 1/4	7/8	9/16	1 5/16	3 1/4	8 1/16	1/4 x 1/8	3	14 1/4	19 5/16	1/2	7/8	—	—	1.2500 / 1.2495	5/8	6 5/8	5 1/2	5/16	10 3/8	11 5/16	11 5/16	11 3/8	11 1/2	1/2	1140	400	460
12	1 1/4	1 1/4	22	6 3/4	6 15/16	10 1/4	1	9/16	2	4 1/4	8 5/8	3/8 x 1/8	3 1/4	15 1/4	20 5/16	1/2	7/8	—	—	1.4375 / 1.4370	11/16	7 1/2	6 1/16	5/16	11 5/16	12 5/16	11 5/16	13 5/16	12 1/4	1/2	1140	500	570
20	1 1/2	1 1/2	26 1/4	7 1/4	8 1/4	13 1/4	1	9/16	2 5/16	4 3/8	9 1/2	3/8 x 1/16	3 1/4	17 1/4	22	5/8	13/16	6 1/2	—	1.625 / 1.624	5/8	8 1/8	7 1/2	5/8	13 5/16	14 5/16	12 1/4	14 5/16	14 1/4	1/2	1140	750	850
35	2	2	31 1/16	9 3/8	10 5/8	16 3/8	1 1/4	11/16	3	6	11 1/2	1/2 x 1/4	4 1/8	21 1/4	26 3/8	3/4	1 1/4	8 1/16	—	2.000 / 1.999	1	11 3/8	10	7/8	16 3/8	16 7/16	15 5/8	18 5/16	15	3/4	860	1335	1550
60	2 1/2	2 1/2	37 1/8	11	12 1/4	19 7/16	1 1/4	11/16	3 5/8	7 1/8	12 5/8	5/8 x 5/16	5 1/4	25	31 5/8	3/4	1 3/8	6 1/2	6 1/2	2.625 / 2.624	1	13	11 5/8	7/8	20 5/16	19 7/16	18	21 5/8	15 3/8	3/4	860	2600	2870
100	2 1/2	2 1/2	44 1/2	12 1/8	12 1/8	25 5/8	1 1/2	11/16	3 1/8	8	14 1/2	5/8 x 5/16	6	27 1/4	34 5/16	3/4	1 3/8	—	—	3.000 / 2.999	1	13 1/2	12	1 1/4	25 5/8	26 1/2	19 5/16	24	16 1/2	3/4	860	3600	3950
150	2 1/2	2 1/2	45 5/16	13 1/2	13 3/8	25 3/4	1 3/8	11/16	3 1/8	8	15 1/16	5/8 x 5/16	6 1/4	29 1/8	37 5/16	3/4	1 3/8	—	—	3.375 / 3.374	1	14 5/8	12 5/8	1 1/4	25 5/8	26	20 5/16	26 5/8	18	3/4	860	4100	4500

Fig. 17—Dimensions of Type "DS" Pumps. (Write The Oilgear Company for certified prints.)

PARTS DRAWING
TYPE "DS" PUMPS

DR. MEE.	CH. MEE.	APPR. W.
TR. MEE.		

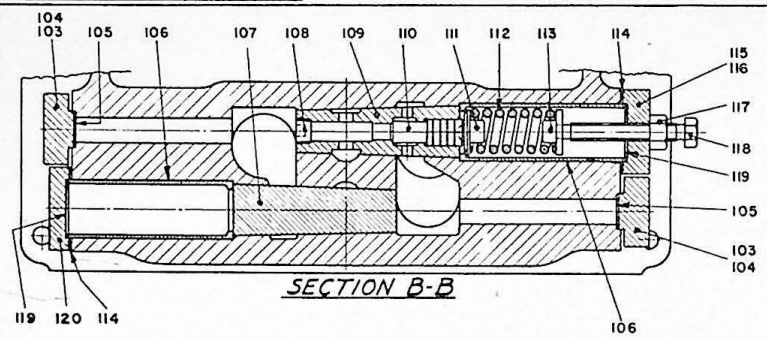
51719-C

REISSUED JAN. 8, 1951

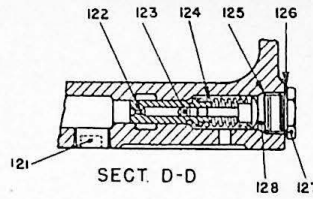
THE OILGEAR COMPANY
MILWAUKEE 4, WISCONSIN, U.S.A.

DS-947100-C

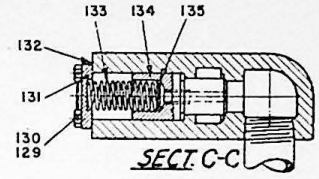
TYPE "DS" PUMPS



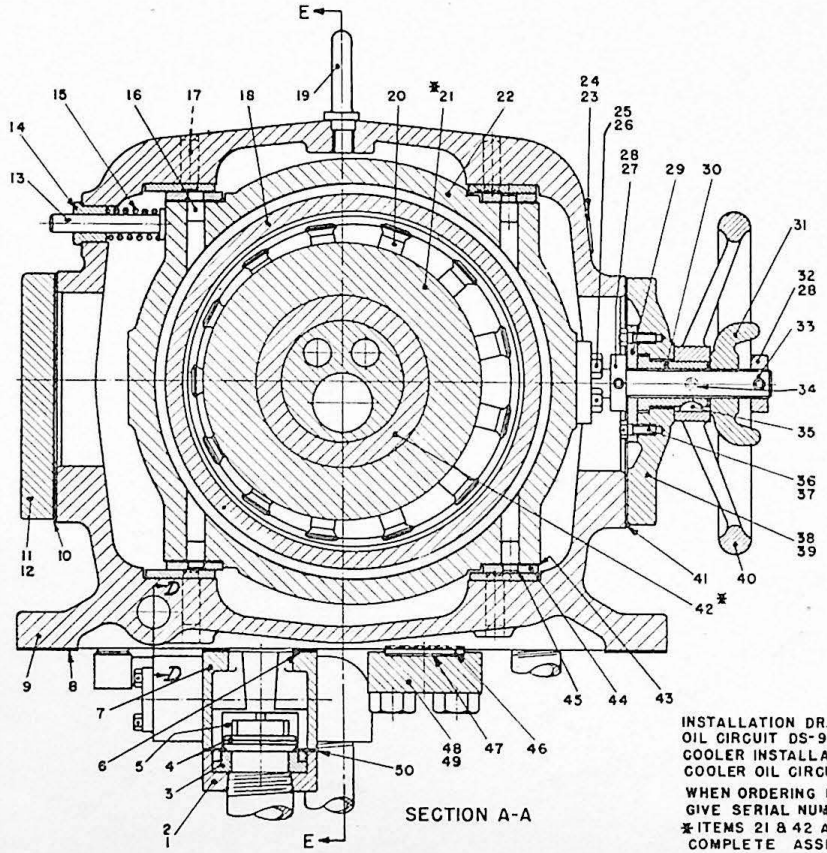
SECTION B-B



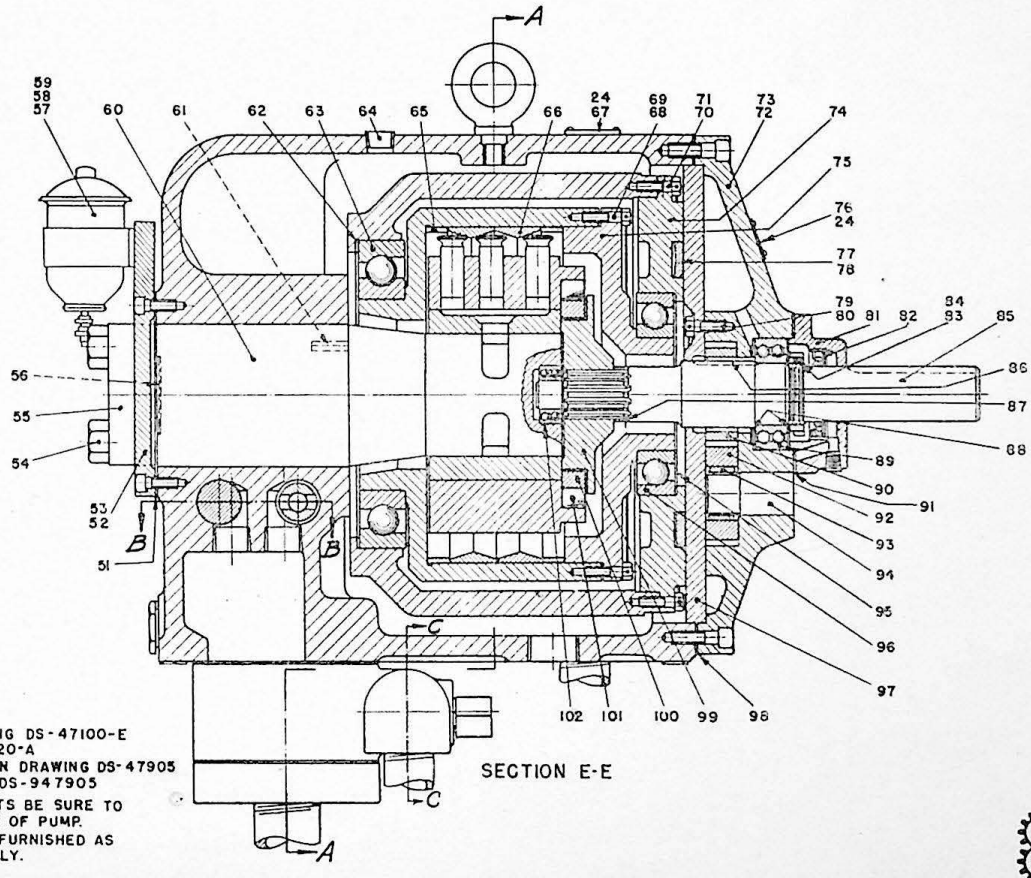
SECT. D-D



SECT. C-C



SECTION A-A



SECTION E-E

INSTALLATION DRAWING DS-47100-E
OIL CIRCUIT DS-947120-A
COOLER INSTALLATION DRAWING DS-47905
COOLER OIL CIRCUIT DS-947905

WHEN ORDERING PARTS BE SURE TO GIVE SERIAL NUMBER OF PUMP.

*ITEMS 21 & 42 ARE FURNISHED AS COMPLETE ASSEMBLY.

PARTS LIST
OILGEAR "DS" PUMPS

NO.	PARTS
1.	Flange, Suction Valve
2.	Screw, Flange
3.	Seat, Check Valve
4.	Disc, Check Valve
5.	Cage, Check Valve
6.	Gasket, Suction Valve
7.	Body, Suction Valve
8.	Gasket, Oil Reservoir
9.	Case, Pump
10.	Gasket, Control Cylinder Cover
11.	Cover, Control Cylinder
12.	Screw, Cover
13.	Stem, Indicator
14.	Bushing, Indicator
15.	Spring, Indicator
16.	Dowel, Slide Block Liner
17.	Dowel, Case Liner
18.	Rotor
19.	Eyebolt
20.	Piston
21.	Cylinder*
22.	Slide Block
23.	Nameplate, Control
24.	Screw, Drive
25.	Screw, Cap
26.	Wire, Lock
27.	Collar, Stop
28.	Pin, Taper
29.	Plate, Control Nut
30.	Nut, Control Adj.
31.	Nut, Lock
32.	Collar, Stop
33.	Screw, Control
34.	Screw, Retaining
35.	Key, Woodruff
36.	Screw, Retaining Plate
37.	Wire, Lock
38.	Cover, Control
39.	Screw, Cover
40.	Handwheel
41.	Gasket, Control Cover
42.	Bushing, Cylinder*
43.	Shim, Slide Block Liner
44.	Liner, Slide Block
45.	Liner, Case
46.	Spacer, Flange
47.	Gasket, Spacer
48.	Flange, Blind
49.	Screw, Flange
50.	Gasket, Suction Flange
51.	Gasket, Pintle Cover
52.	Cover, Pintle
53.	Screw, Pintle Cover
54.	Screw, Flange
55.	Flange, Connection
56.	Gasket, Flange
57.	Filter, Oil
58.	Valve, Flow Control
59.	Gage, Change Indicator
60.	Pintle
61.	Key, Pintle
62.	Shim, Rear Rotor Bearing
63.	Bearing, Rear Rotor
64.	Plug, Pipe
65.	Spacer, Thrust Ring
66.	Ring, Thrust
67.	Nameplate
68.	Screw, Rotor Cover
69.	Wire, Lock
70.	Screw, Slide Block Cover
71.	Wire, Lock
72.	Housing, Gear Pump
73.	Screw, Housing
74.	Cover, Slide Block
75.	Cover, Rotor
76.	Plate, Rotation Direction
77.	Ring, Slide Block Spacer
78.	Shim, Slide Block Spacer
79.	Screw, Gear Pump Cover
80.	Gasket, Screw
81.	Housing, Oil Seal
82.	Seal, Drive Shaft Oil
83.	Nut, Bearing Lock
84.	Washer, Lock
85.	Shaft, Drive
86.	Key, G.P. Driver
87.	Spacer, Coupling
88.	Shim, Front Shaft Bearing
89.	Bearing, Front Shaft
90.	Gear, G.P. Driver
91.	Gasket, Housing
92.	Gear, G.P. Driven
93.	Bearing, G.P. Roller
94.	Shaft, Stub
95.	Shim, Front Rotor Bearing
96.	Bearing, Front Rotor
97.	Cover, Gear Pump
98.	Gasket, G.P. Housing
99.	Flange, Coupling
100.	Ring, Coupling
101.	Roller, Coupling
102.	Bearing, Rear Shaft
103.	Flange, Blind
104.	Screw, Flange
105.	Gasket, Flange
106.	Retainer, Bushing
107.	Plug, Dummy
108.	Plug, Pipe
109.	Bushing, H.P.R.V.
110.	Plunger, H.P.R.V.
111.	Seat, H.P.R.V. Spring
112.	Spring, H.P.R.V.
113.	Guide, H.P.R.V. Spring
114.	Gasket, Cap
115.	Cap, H.P.R.V.
116.	Screw, Cap
117.	Nut, Lock
118.	Screw, H.P.R.V. Adjusting
119.	Shim, Bushing Retainer
120.	Cap, Blind
121.	Plug, Pipe
122.	Plunger, G.P.R.V.
123.	Plunger, G.P.R.V. Dashpot
124.	Spring, G.P.R.V.
125.	Shim, G.P.R.V.
126.	Gasket, G.P.R.V. Cap
127.	Cap, G.P.R.V.
128.	Spacer, G.P.R.V.
129.	Screw, B.P.R.V. Cap
130.	Wire, Lock
131.	Cap, B.P.R.V.
132.	Gasket, Cap
133.	Spring, B.P.R.V.
134.	Plunger, B.P.R.V.
135.	Shim, B.P.R.V.

*Parts 21 and 42 furnished only as a complete assembly.

NOTE: When ordering parts be sure to give serial number of pump.

INSTRUCTIONS

TYPE "S" HANDWHEEL CONTROLS

OILGEAR TYPE "D" PUMPS AND "DC" TRANSMISSIONS

1. FUNCTION.

The type "S" handwheel control consists of a large handwheel, a control adjusting nut, a control screw, two stop collars, a lock nut and a control housing. The handwheel is keyed to the internally threaded control nut so that when the handwheel is rotated, the control screw which passes through the threaded control nut moves in or out. The control screw is bolted to the slide block and has stop collars pinned near its inner and outer ends to limit the distance through which the slide block can be moved. In operation, any volume from zero to maximum is obtained with two and one-tenth to six and three-eighths turns of the handwheel, depending on the size of the unit. The lock nut on the control screw locks the handwheel to the control screw to prevent creeping.

2. SPECIFICATIONS.

Size	Maximum Eccentricity	Turns of Handwheel Neutral to Full
2	.150	2.1
4	.198	2.77
8	.187	2.6
12	.250	3.5
20	.250	3.5
35	.375	5.25
60	.375	4.5
100	.406	4.875
150	.531	6.375

3. MALFUNCTIONS AND CAUSES.

A. Unresponsive control.

1. Worn control adjusting nut or screw.

2. Control screw loose from slide block.

3. Control screw not operating from stop to stop.

4. Handwheel not secured to control nut.

B. Control works hard.

1. Worn or dirty threads in control nut or screw.

2. Binding or sticking slide block (see bulletin on "Case and Radial Piston Units").

4. TESTING.

A. Pump with pressure at port "A".

With handwheel turned counterclockwise, all the way, the outer stop collar should be flush against the lock nut and the indicator stem should be at "0" (zero ecc.). With handwheel turned clockwise, all the way, the indicator stem should be at "F" (full ecc.).

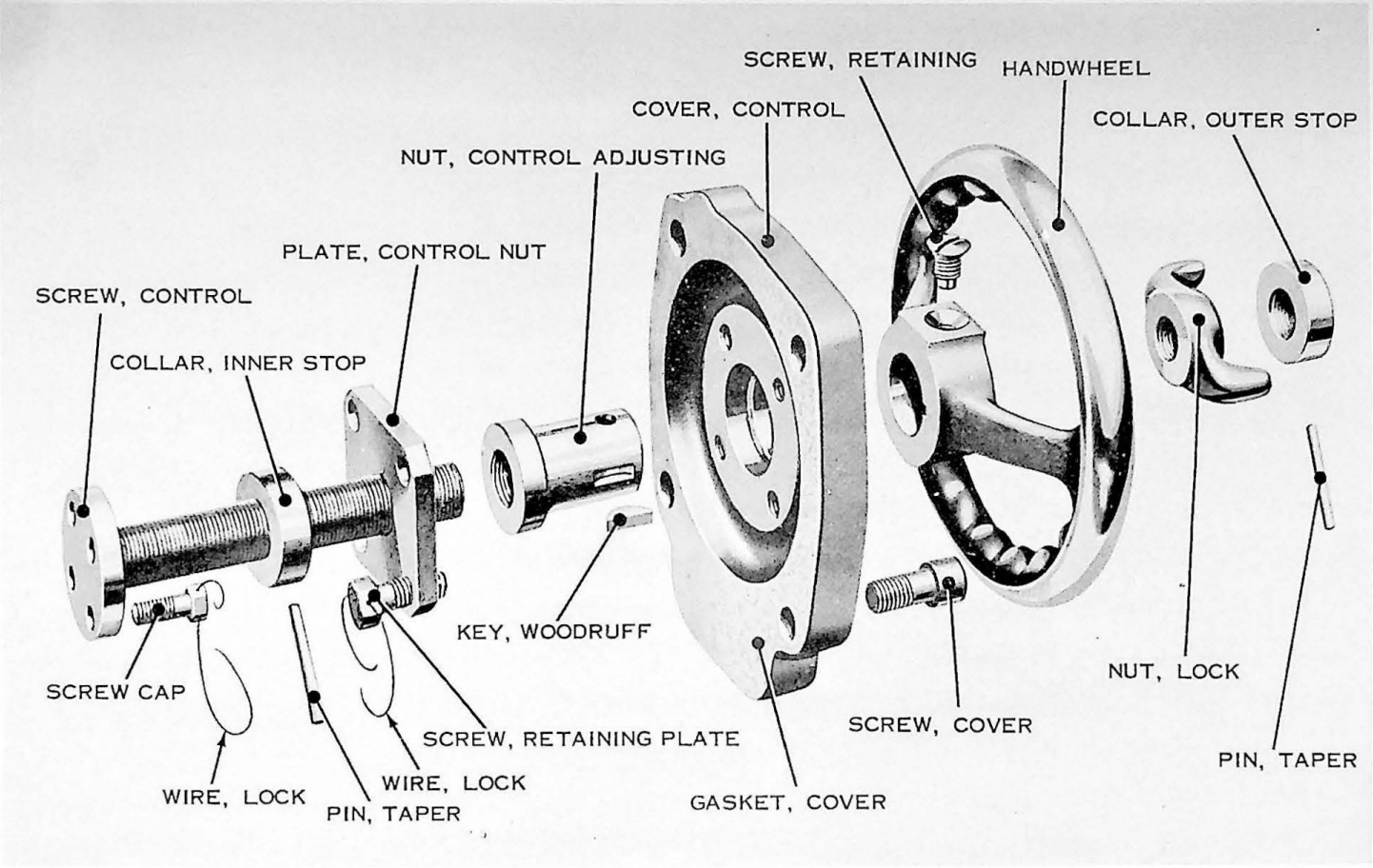
B. Pump with pressure at port "B".

With handwheel turned clockwise, all the way, the indicator stem should be at "0" (zero ecc.). With handwheel turned counterclockwise, all the way, the outer stop collar should be flush against the lock nut and the indicator stem should be at "F" (full ecc.).

If control is mounted on left side of pump, when facing flanges, the above control functions will be reversed.

ISSUED FEBRUARY 1954

THE OILGEAR COMPANY
MILWAUKEE 4, WISCONSIN, U. S. A.



Type "S" Handwheel Control - Exploded View (53251).

5. DISASSEMBLY AND INSPECTION.

Tap out the tapered pin in outer stop collar and unscrew stop collar and lock nut from control screw. Remove socket head cap screws holding control housing to pump case and turn control assembly counter-clockwise until control housing and handwheel are free from control screw. Loosen handwheel retaining screw and remove handwheel from control adjusting nut. Clip locking wire and unscrew retaining plate screws. Remove control nut plate and control nut from the inside of control housing. Clip locking wire and remove cap screws holding control screw to slide block. Tap out taper pin from inner stop collar and unscrew stop collar from control screw. Inspect all components of control, especially control adjusting nut and control screw. Replace if worn.

6. ASSEMBLY.

Thread inner stop collar on control screw and pin in position with a taper pin. Bolt control screw to slide block and secure with new, soft iron locking wire.

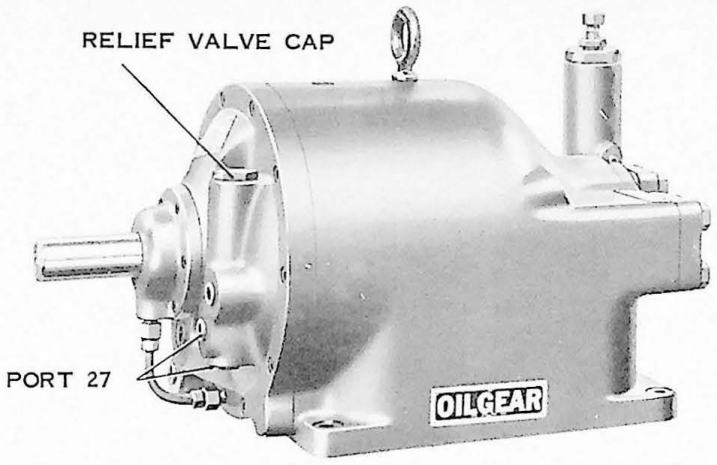
If a new control screw is being installed it will be necessary to drill holes in it to position the stop collars correctly. Bolt the control screw to the slide block and position the slide block at "F" on the indicator stem. Thread the inner stop collar on control screw so that its outer face extends beyond control housing flange on pump case the thickness of compressed control housing gasket. Remove control screw from slide block and drill through control screw using collar for a guide. Ream for taper pin and pin collar in position. Insert control nut in control housing and fasten control nut plate over it with retaining plate screws. Secure screws with new, soft iron locking wire. Install Woodruff key in control nut and slip handwheel on control nut. Secure the handwheel with retaining screw. Install control assembly and gasket by turning the assembly clockwise against the control screw. Fasten control housing and gasket to pump case with socket head cap screws. Thread lock nut and outer stop collar on control screw and pin stop collar in position. If new control screw was installed, outer stop collar will have to be positioned on the control screw. With pump at neutral ("0" on indicator stem), lock nut should be tight against the handwheel and the outer stop collar should be tight against lock nut. Drill and ream a hole through control screw and pin stop collar in position with tapered pin. Check on indicator stem to make sure that handwheel operates slide block through correct travel.

NOTE: When ordering parts be sure to include the serial number of pump or transmission.

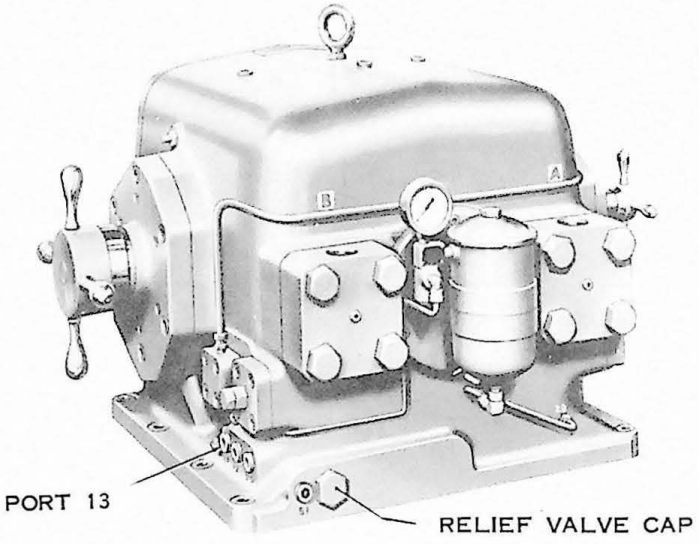
INSTRUCTIONS

GEAR PUMP RELIEF VALVE

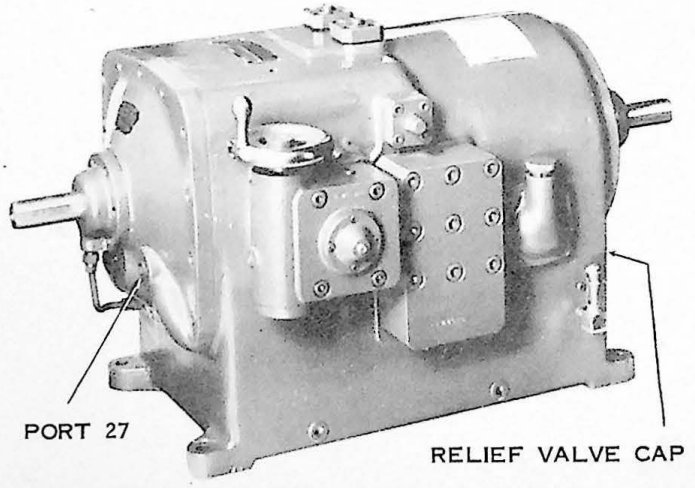
OILGEAR TYPES "CG" AND "D" PUMPS AND "DC" TRANSMISSIONS



Type "CG" Pump (51850).



Type "D" Pump (52377).



Type "DC" Transmission (52213).

1. FUNCTION.

The gear pump relief valve limits the pressure of the gear pump. This valve is built into the flange end of Type "D" pumps, the input drive shaft (gear pump) housing of Type "CG" pumps and the output end of Type "DC" transmission cases. The gear pump is built into the drive shaft (gear pump) housing. It supercharges and lubricates the radial piston unit, actuates pump control pistons and slide block, delivers oil through the filter, provides oil for cooling purposes and supplies oil for operating auxiliary equipment.

2. SPECIFICATIONS.

A. Gear Pump Volume in cipm at zero pressure. (Some size 8, 12 and 20 pumps have larger gear pumps delivering 2500 cipm. Some size 100 and 150 pumps have smaller gear pumps delivering 3600 and 5200 cipm respectively).

B. Relief valve settings in psi for type DH, DHP, DR, DX and DXP pumps and DHC, DRC and DXC transmissions.

C. Relief valve settings in psi for type CG, DS, DE, DF and DP pumps.

D. Relief valve settings in psi for type DSC, DEC, DFC and DPC transmissions.

E. Maximum gear pump pressure in psi when using the standard spring. Special springs are available for recommended maximum pressure up to 300 psi.

Size	A	B	C	D	E
2	1000	130	85	35	190
4	1000	130	85	35	190
8	1700	130	85	35	190
12	1700	150	85	35	190
20	1700	130	85	35	190
35	2100	150	85		160
60	2800	130	85		160
100	5500	150	85		160
150	7000	150	85		160

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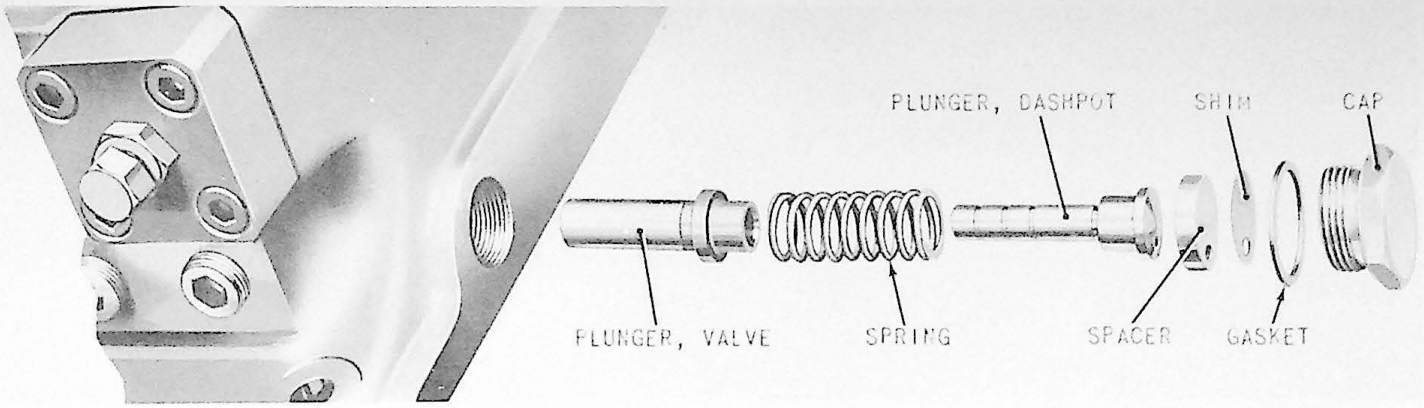


Gear Pump Relief Valve Assembly, Exploded View (51796).

3. ADJUSTING AND TESTING.

Remove cap and gasket. Insert additional shims to increase pressure or remove shims to decrease pressure. Each 1/32 inch thick shim will change pressure about 12 psi in sizes 4 through 20 and 5 psi in sizes 35 and up. CAUTION: Do not shim for pressures higher than those in Column E above or the spring will be compressed solid. Special springs are available for recommended maximum pressures up to 300 psi. To check pressure, connect a low pressure gage to pump port 13 or 27 in Type "D" pumps, or port 27 in drive shaft (gear pump) housing of Type "CG" pumps and Type "DC" transmissions. Note: The gear pump pressure may be higher when the oil is cold. Do not make adjustments until oil is warm.

4. MALFUNCTIONS AND CAUSES.

Unresponsive hydraulic controls, sluggish hydraulic controls or insufficient maximum volume may be caused by low gear pump pressure or volume. Excessive heating may be caused by high gear pump pressure. Valve chatter may be caused by insufficient dashpot action due to worn parts. Replace both plungers if either is worn. High peak pressures may be caused by plugged hole in valve plunger or binding fit of valve plunger or dashpot plunger.

5. REMOVAL.

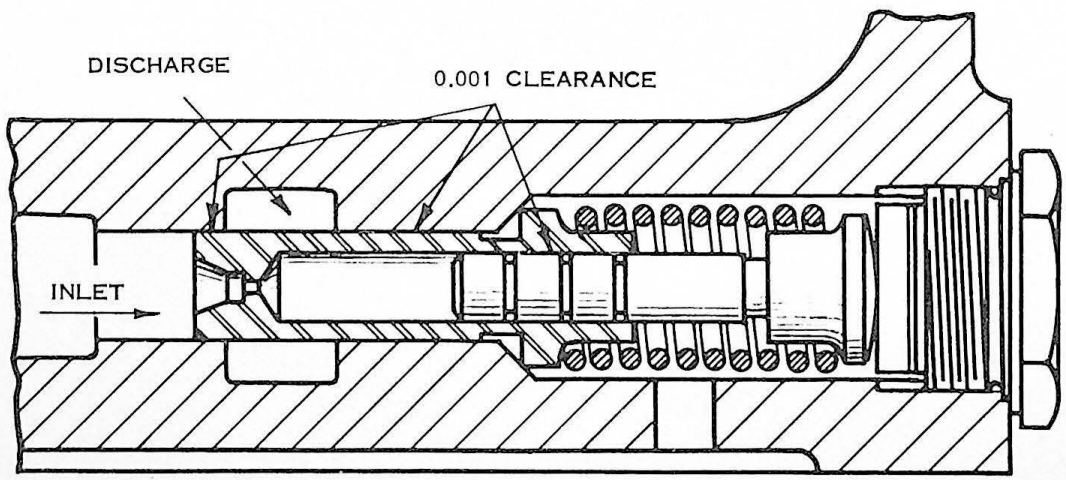
Relief valve can be removed without draining system or removing pump from reservoir. Unscrew cap and remove gasket, shims, spacer, dashpot plunger, spring and valve plunger. Avoid marring highly finished surfaces on dashpot plunger and valve plunger.

6. INSPECTION.

Wash parts thoroughly. Clean foreign matter from grooves in dashpot plunger and small hole in end of valve plunger. Check valve plunger seat for scoring or foreign matter. Polish or lap sticking plungers. Clearance between dashpot plunger and valve plunger and between valve plunger and unit case or housing should be approximately 0.001 inch.

7. ASSEMBLY.

Reassemble clean parts in reverse order to that used for disassembly. Be sure gasket is in place on shoulder of cap before tightening cap in place. Anneal gasket, if necessary. Recheck pressure.



Gear Pump Relief Valve Assembly, Plan View (2V-8374-L).

Dashpot plunger and valve plunger are furnished only as a complete assembly. When ordering parts be sure to give serial number of pump or transmission.

INSTRUCTIONS

HIGH PRESSURE SAFETY RELIEF VALVES

OILGEAR TYPES "D" PUMPS AND "DC" TRANSMISSIONS

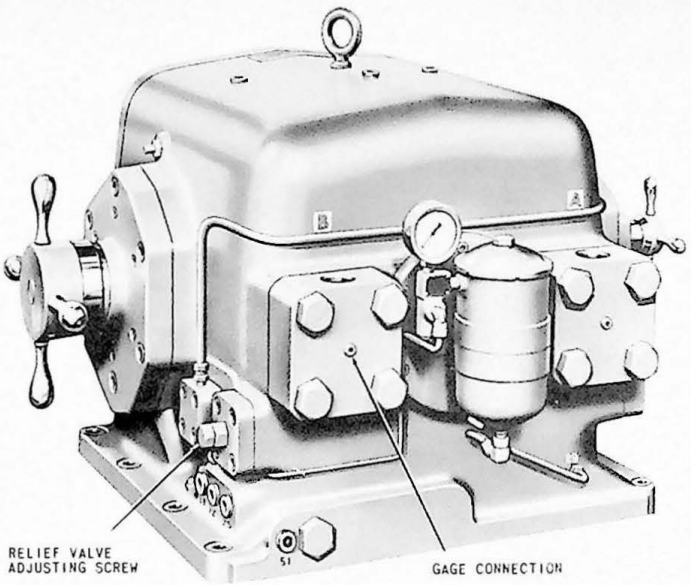


Figure 1. Type "D" Pump (52377).

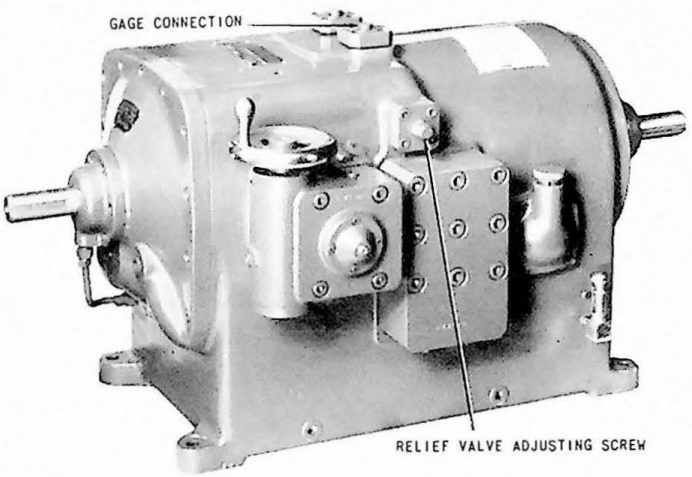


Figure 2. Type "DC" Transmission (50873).

1. FUNCTION.

One or two adjustable high pressure, safety relief valves are built into each pump and transmission case. These reverse flow type relief valves limit the peak pressure of the pump and protect input and driven equipment against overload.

2. LOCATION.

See figures 1, 2, 4 and 5. A dummy plug, retainer and blank cap are installed in hole on opposite side of one-way pumps and sizes 44 thru 1212 transmissions.

3. SPECIFICATIONS.

A. Pumps for general straight-line service applications. Nominal pressure rating is 1100, 1700 and 2500 psi as indicated by the figures 11, 17 or 25 in the body of the type designation. Normal relief valve setting is 1475, 2100 and 3000 psi respectively when pump is blowing 1/2 volume.

B. Pumps and transmissions for rotary drive applications. Nominal pressure rating of 1100 series pumps and sizes 44 thru 1212 transmissions is 1100 psi. Normal relief valve setting of these units is 1700 psi when pump or input unit of transmission is blowing 1/2 volume. Normal relief valve setting of 1700 series pumps and size 2020 transmissions is 2500 psi when blowing 1/2 volume.

4. ADJUSTING AND TESTING.

To check pressure in pump port "A", connect a gage to port "A" flange or port 19. To check pressure in pump port "B", connect a gage to port "B" flange or port 18. To check pressure in transmission when output shaft rotation is clockwise (facing output shaft), connect a gage to left flange on top of case. When output shaft rotation is counterclockwise, connect a gage to right flange on top of case. Set control for approximately 1/2 volume. Check setting on indicator stem. Stall ram or output shaft. Loosen lock nut and turn adjusting screw inward to increase pressure or outward to decrease pressure. Only discharge oil past relief valve long enough to check setting and make adjustment or excessive heating or damage may result. Make adjustments when oil is warm. Lock screw in place with nut.

5. MALFUNCTIONS AND CAUSES.

A. Excessive heating may be caused by operating unit above nominal or peak pressures recommended. The safety valve is your protection against overload. If used indiscriminately excessive heating, wear or damage may result.

B. Low pump volume or transmission output speed at normal load may be caused by valve plunger binding in open position, a worn or dirty valve seat, a loose valve bushing or a loose dummy plug.

C. High peak pressures may be due to a binding plunger, obstructed axial groove on plunger or spring screwed down solid.

D. Excessive chatter may be due to a loose fit between small end of plunger and bushing or too deep an axial groove in plunger.

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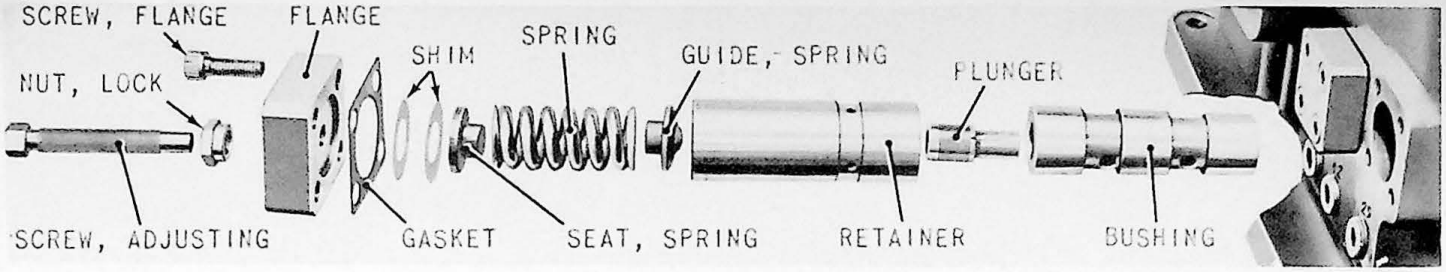

Figure 3. High Pressure Safety Relief Valve, Exploded View (51797).

6. REMOVAL.

Normally, the relief valves can be removed without draining system. However if pump or transmission is lower than other large volume components in system, equipment above pump or transmission should be drained. Measure and record the distance adjusting screw extends out of flange. Loosen lock nut and turn screw outward until spring resistance is released. Remove four screws, flange, gasket, shims, spring seat, spring, spring guide, retainer and plunger. If plunger is stuck in bushing, turn a screw (size "Y") into plunger to pull it out. Avoid marring highly finished surfaces on plunger. Tapered bushing is pressed into case. Remove it only when replacement is necessary. To remove bushing, remove pipe plug (flange on some pumps) directly opposite bushing hole and unscrew plug "A" (transmissions and some pumps used in non-differential circuits have cross-piped relief valves and plug "A" is omitted). Tap bushing out toward spring side with a rod slightly smaller than drilled hole.

7. INSPECTION.

Wash parts thoroughly. Clean foreign matter from grooves in plunger. Check seat in bushing for scoring or foreign matter. Relap plunger on seat, if necessary. When lapping seat retain close fit between smaller plunger diameter and bushing.

8. ASSEMBLY.

Reassemble clean parts in reverse order to that used for disassembly. In reassembling bushing, press it lightly in place to dimension "X" in table. Be sure plunger is free in bushing. Insert sufficient shims to hold retainer tight against bushing and to prevent oil leakage at gasket. Turn screw in to previous position. Tighten lock nut. Check pressure.

NOTE: Relief valve plunger and bushing are furnished only as a complete assembly.

SIZE, hp		2	4	8	12	20	35	60	100	150
"X", inch	Pump	3-1/8	3-1/4	3-11/16	4-5/16	4-3/16	5-5/8	6-1/16	6-1/16	6-1/16
	Trans.	3-1/4	3-1/4	3-1/4	3-11/16	4-3/16				
"Y", NC-2 Tap		1/4-20	1/4-20	1/4-20	1/4-20	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16

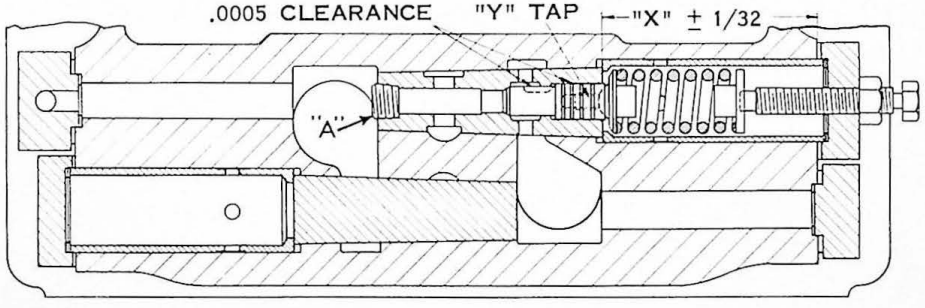

Figure 4. Relief Valve in Type "D" One-Way Pumps and Sizes 44 thru 1212 Transmission, Plan View.

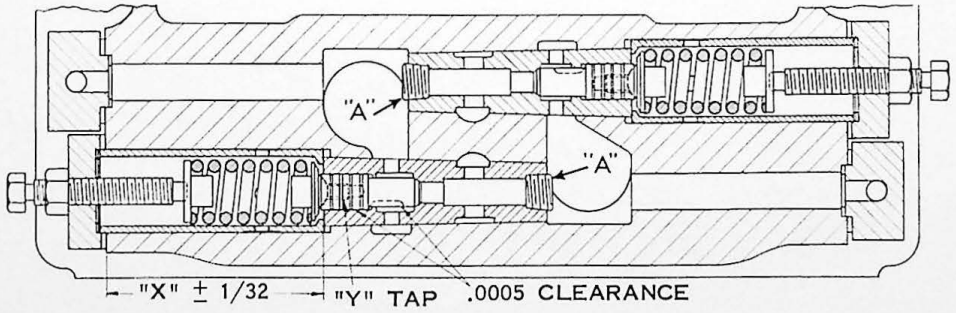

Figure 5. Relief Valves in Type "D" Two-Way Pumps and Size 2020 Transmission, Plan View (3V-8385-L).

INSTRUCTIONS

GEAR PUMP

OILGEAR TYPES "CG" AND "D" PUMPS AND "DC" TRANSMISSIONS

1. FUNCTION.

The gear pump is built into the drive shaft (gear pump) housing. It is used to supercharge and lubricate the radial piston pumping unit, actuate pump control pistons and slide block, deliver oil through the filter, provide oil for cooling purposes and supply oil for operating auxiliary equipment in the hydraulic circuit.

2. SPECIFICATIONS.

A. Gear Pump Volume in cipm at zero pressure (Some size 8, 12 and 20 pumps have larger gear pumps delivering 2500 cipm. Some size 100 and 150 pumps have smaller gear pumps delivering 3600 and 5200 cipm respectively).

B. Relief valve settings in psi for type DH, DHP, DR, DX and DXP pumps and DHC, DRC and DXC transmissions.

C. Relief valve settings in psi for type CG, DS, DE, DF and DP pumps.

D. Relief valve settings in psi for type DSC, DEC, DFC and DPC transmissions.

E. Maximum gear pump pressure in psi when using the standard spring. Special springs are available for recommended maximum pressure up to 300 psi.

Size	A	B	C	D	E
2	1000	130	85	35	190
4	1000	130	85	35	190
8	1700	130	85	35	190
12	1700	150	85	35	190
20	1700	130	85	35	190
35	2100	150	85		160
60	2800	130	85		160
100	5500	150	85		160
150	7000	150	85		160

3. MALFUNCTIONS AND CAUSES.

Unresponsive or sluggish control, pump slide block not going to full stroke or a noisy pump (due to lack of supercharge (back) pressure) may be caused by low gear pump pressure or volume. Excessive heating may be caused by excessive gear pump pressure. If shaft will not turn, gear pump gears may be frozen.

4. TESTING OF GEAR PUMP.

If malfunction in unit indicates gear pump difficulties insert a low pressure gage in pump ports 13 or 27 in type "D" pumps, or port 27 in drive shaft (gear pump) housing of type "CG" pumps and type "DC" transmissions. If pressure is low add shims to gear pump relief valve to raise pressure to rated pressure per specifications. If additional shims fail to increase pressure disassemble gear pump relief valve and inspect and clean. Reassemble and recheck pressure. If the pressure is still insufficient remove pipe plug from port 13 or 27 and install a globe or needle resistance valve with piping to suitable container to catch gear pump oil. Start pump. Open globe or resistance valve and measure gear pump volume. Limit discharge to prevent dropping reservoir oil below low oil level. Check all components in hydraulic circuit supplied by gear pump to insure gear pump oil is not bypassed or leaking somewhere in the circuit.

5. REMOVAL OF GEAR PUMP ASSEMBLY.

Rest pump on flange end. Remove gear pump housing screws, fasten a clamp to drive shaft or screw hook bolts into taps in outer rim of gear pump housing and lift entire gear pump assembly upward with a crane. Raise assembly carefully to prevent damage to the shaft, bearing or coupling flange.

6. DISASSEMBLY.

A. Gear Removal.

Remove lock wire and gear pump cover screws and gaskets. Lift off cover and gears.

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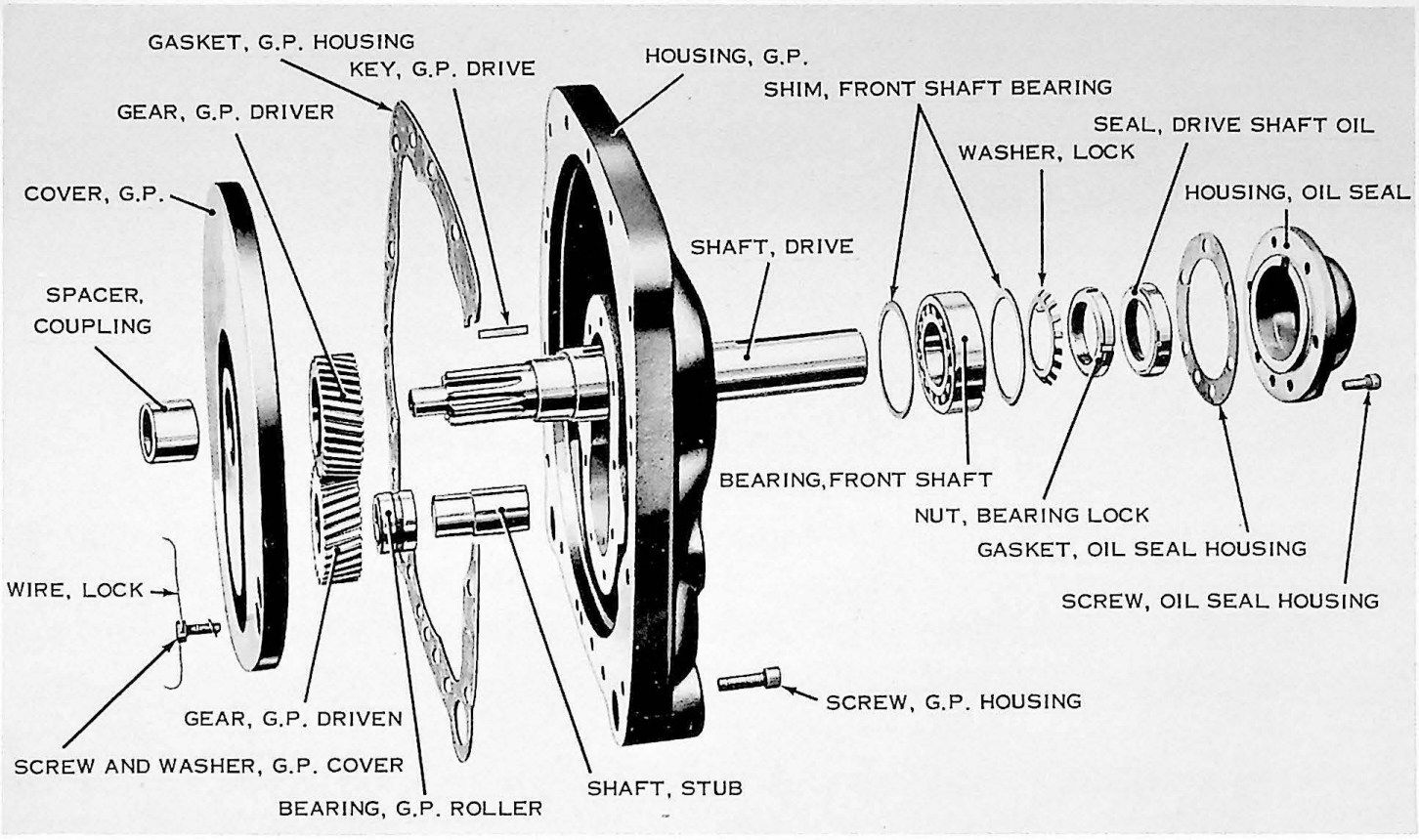


Gear Pump Assembly - Exploded View (51659)

B. Shaft Removal.

Shaft need not be removed unless inspection of shaft seal and front shaft bearing is necessary. Unscrew shaft seal housing screws, file burrs on keyway and carefully slide seal housing and seal off shaft. Place shim stock over keyway to prevent cutting oil seal. Lift shaft and bearing assembly out of gear pump housing.

CAUTION

Keep shims in front and rear of front bearing separate to insure correct reassembly.

7. INSPECTION.

A. Gear Pump Assembly.

Inspect gear teeth for wear. Check stub shaft and roller bearing. Inspect wear surfaces in gear housing and cover. Check depth of driving and driven gear pockets with depth gage and add amount of wear in cover. Normal running clearance is .001 to .0035 inch for units up to and including 20 hp and .003 to .005 inch for the larger units. Normal clearance over outside diameter of gear is .001 to .003 inch for units up to and including 20 hp and .003 to .005 inch for the larger units.

B. Shaft Seal and Front Bearing.

Inspect shaft seal for cracks, cuts and hardening or deterioration of seal material. If seal needs replacement tap out old seal and tap new seal into position carefully to prevent distorting seal.

8. ASSEMBLY.

Replace parts in reverse order to that of disassembly. Check all parts for cleanliness before assembly and be sure that drive shaft turns freely before housing is bolted back onto pump case. Lock gear pump cover screws with soft iron wire. If same shaft is reassembled, be sure that the front bearing shims are installed exactly as on the original assembly. When installing a new drive shaft, front shaft bearing position must be reshimmed to provide correct cylinder end play. For these instructions, see bulletin on "Case and Radial Piston Unit". When mounting oil seal housing on gear pump housing make certain that holes in gasket match holes in both housings to prevent blocking oil passage.

NOTE: When ordering parts be sure to give the serial number of the pump or transmission.

INSTRUCTIONS

ONE-WAY PUMP SUCTION AND RETURN VALVES

OILGEAR TYPES "CG" AND "D" PUMPS

1. FUNCTION.

The one-way pump suction and return valve, bolted to the bottom of the pump case, consists of two basic components each of which serves a separate function. The back-pressure relief valve (B.P.R.V.) prevents excessive supercharge and return pressure on the suction side of the pump. The suction check valve retains the supercharge oil in the suction valve and pump, yet allows the pump to suck oil from the reservoir if the supercharge volume is insufficient.

2. SPECIFICATIONS.

Back pressure relief valves are normally set at approximately 35 psi on all one-way pump suction and return valves.

3. MALFUNCTIONS AND CAUSES.

Excessive noise in pump is usually caused by air entering the system, either at the suction valve gasket or the suction pipes. Low back pressure is usually caused by a sticky B.P.R.V. plunger or a faulty suction check valve.

4. TESTING AND ADJUSTING.

To check back pressure relief valve setting in Type "D" pumps, insert a low pressure gage in port 12 and run the pump at neutral. If port 12 is being used, and when checking Type "CG" pumps, insert the gage in the return port of the pump. Gage reading will be back pressure. (Check any connections from the return port to the circuit to be sure supercharge oil is not being bypassed somewhere in the circuit).

To adjust back pressure, remove inspection cover on side of reservoir (it may be necessary to drain some oil first). If reservoir base does not have an inspection cover it will be necessary to disconnect the pump from the circuit and drive motor and raise it in order to shim the B.P.R.V.

Remove cover (cap or pipe plug) over B.P.R.V. and add shims to increase pressure or remove shims to decrease pressure. See "A" in table below for approximate pressure variation for each 1/16 inch thick shim and "B" for maximum total thickness of all shims permitted.

PUMP SIZE	"A"	"B"
2, 4, 8, 12	5 psi	5/16
20	1-1/2 psi	7/16
35	2 psi	7/16
60, 100, 150	1-1/4 psi	13/16

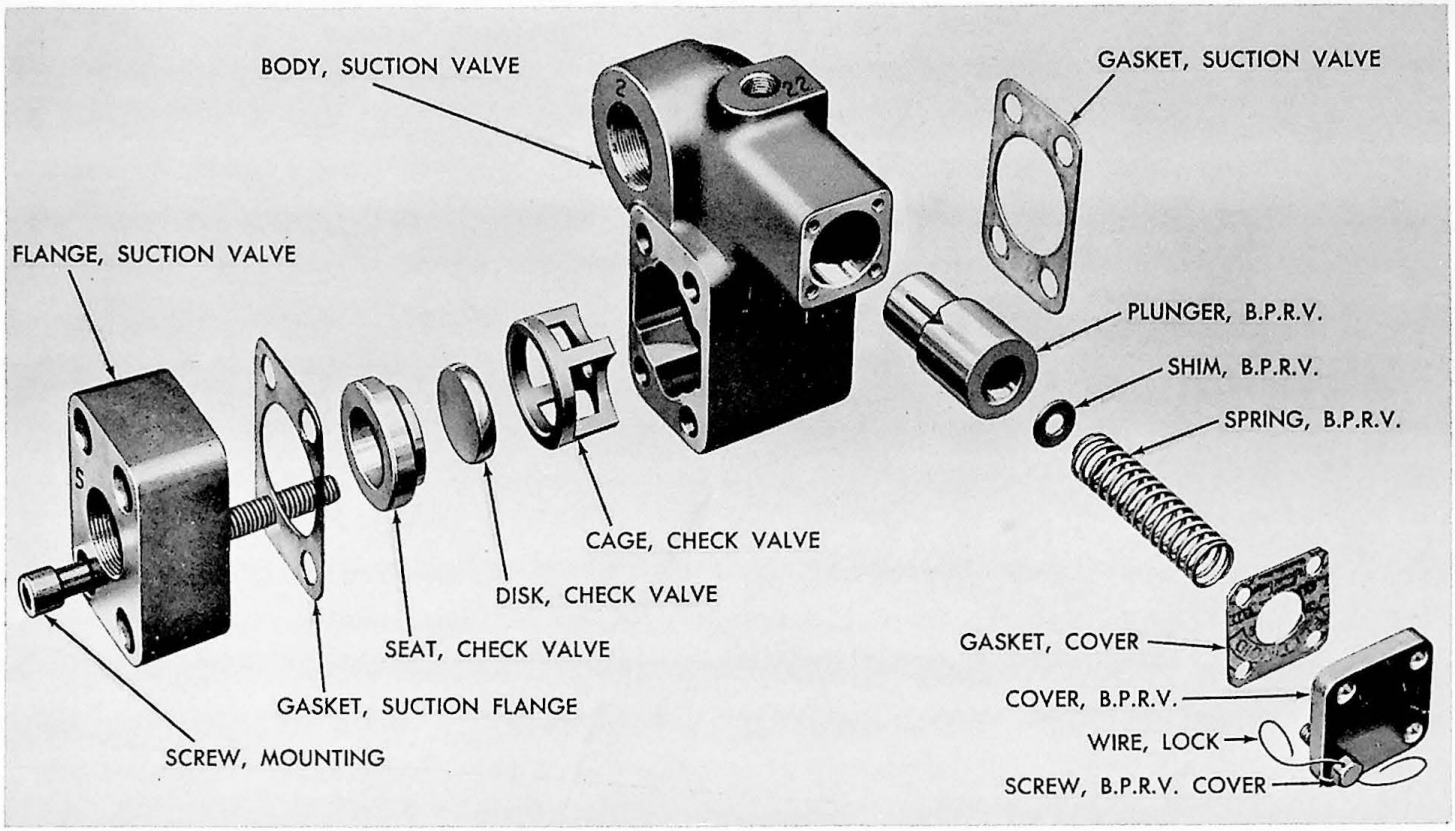
If B.P.R.V. uses a cap or plug, install shims between cap or plug and spring. If a flange type B.P.R.V. retaining cover is used, install hollow shims or washers between plunger and spring.

CAUTION

Do not install solid shims between plunger and spring.

5. REMOVAL.

To remove suction valve from pump, lift pump from reservoir and unscrew suction pipe from port 5, exhaust pipe from port 2 and disconnect piping to port 22. Remove mounting screws and the suction valve is free to be removed. Observe the position of all gaskets very carefully while suction valve is being removed since some units may vary slightly from the illustration.



One-Way Pump Suction and Return Valve - Exploded View (51818)

6. DISASSEMBLY.

A. Suction check valve. The check valve assembly will be freed from the valve body when the mounting screws are removed. The check valve cage has a .002 press fit in the suction flange. Complete disassembly of flange and cage is usually not necessary for inspection and cleaning.

B. Back pressure relief valve. Remove cover (cap or pipe plug). The spring, shims and plunger are then free to be removed. Plunger is tapped so a threaded rod can be inserted to withdraw the plunger.

7. INSPECTION.

A. Suction check valve. Check for dirt on the check valve seat or disk and examine surfaces for scratches or grooves. Check for cracked seat.

B. Back pressure relief valve. Check valve plunger seat for scoring or foreign matter. Clean foreign matter from V-slot in plunger. Polish or lap sticky plunger. Clearance between plunger and valve body should be approximately .001 at both diameters. Be sure hole thru plunger is not blocked. Anneal all copper gaskets.

8. ASSEMBLY.

Clean all parts thoroughly. If B.P.R.V. plunger was lapped, make certain that all compound has been removed. Insert plunger, shims, spring and cover.* Install lock wire in hex head cap screws. If removed, insert suction check valve seat and disk and press cage into the suction flange. Mount suction flange assembly with gasket on valve body and bolt the entire suction valve in place on bottom of pump. Draw suction valve mounting bolts up evenly and very tightly as all seals here must be air tight. Install suction pipes using a minimum of compound. Suction pipe in port 5 must be turned in very tightly to prevent the pump from sucking air. Connect piping to port 22 and remount pump on reservoir.

*If B.P.R.V. has cap or pipe plug, install shims between spring and cap or pipe plug.

NOTE

When ordering parts be sure to include the serial number of pump.

INSTRUCTIONS

CASE AND RADIAL PISTON UNITS

OILGEAR TYPE "D" PUMPS (SIZES 2 TO 60)

1. CONSTRUCTION.

The type "D" pump case and radial piston unit consists essentially of a case, a tapered pintle, a cylinder and bushing with closely fitted pistons, a rotor, a rotor cover, a slide block, a slide block cover, a drive coupling and anti-friction bearings. The case encloses and supports the radial piston unit, accomodates the built-in high pressure and gear pump relief valves, provides flange mounting for a suction valve and one or two controls, contains the indicator stem assembly and has many drilled and cored oil passages. The pintle, pressed into the case, serves as a bearing for the cylinder assembly and as a valve to direct oil to and from the radial pistons. The rotor and rotor cover assembly is free to rotate on anti-friction bearings. It encloses the thrust rings which force the radial pistons inward during the pumping stroke. The slide block and slide block cover assembly supports the rotor assembly. It is mounted on flat, horizontal liners in the pump case so that the control can move it to the right or left of the centerline of the cylinder and pintle. The floating drive coupling absorbs any minute misalignment between the drive shaft and cylinder and allows the cylinder a small amount of end play on the pintle.

2. PRINCIPLE OF OPERATION.

Torque, applied to the drive shaft is transmitted through the splined floating drive coupling to the cylinder assembly, causing it to rotate about the pintle. As the cylinder assembly rotates, centrifugal force combined with pressure in the system, keeps the beveled end of the pistons against the beveled surfaces of the thrust rings at all times. Through contact of the pistons, the rotor, rotor cover and thrust ring assembly rotates with the cylinder and drive shaft in anti-friction bearings in the slide block and slide block cover assembly. As the slide block is moved to one side or the other of the case, on the flat horizontal ways, an eccentricity is created between the cylinder center and the rotor center. Consequently, with the cylinder rotating about the pintle and the pistons following the thrust rings in the rotor, reciprocating motion is imparted to the pistons so that those moving out of the cylinder are filling with oil from one pintle port while those moving into the cylinder are delivering oil to the other pintle port. The change in radii from the center of the cylinder to the point of contact of each piston with the thrust ring causes each piston to move faster or slower than its point of contact. This difference in speed causes a slow partial rotation of each piston in its cylinder bore, in one direction during one-half revolution of the cylinder and in the other direction during the other half revolution. The pistons thus reciprocate and partially rotate at a uniformly accelerated and decelerated rate while oil flows to and from them through passages in the pump case, pintle, bushing and cylinder. Drilled and cored passages in the case carry oil to and from the built-in relief valves, the suction valve and pump controls.

3. DATA.

A. Maximum eccentricity.
B. Slide block vertical clearance in ways and slide block end play.
C. Rotor end play within slide block.
D. Cylinder should begin to get tight when pintle projects ± 1/16 inch.
E. Approximate force in tons to press out pintle.
F. Approximate force in tons to press in pintle.

SIZE	A	B	C	D	E	F
211	.150	.004 to .007	.010	1/4	10	5
225	.150	.004 to .007	.010	1/4	10	5
411	.198	.004 to .007	.010	9/64	12	8
425	.198	.004 to .007	.010	1/8	12	8
811	.187	.005 to .008	.015	5/32	15	10
817	.187	.005 to .008	.015	9/64	15	10
825	.187	.005 to .008	.015	9/64	15	10
1211	.250	.005 to .008	.015	1/4	30	20
1217	.250	.005 to .008	.015	7/32	30	20
1225	.250	.005 to .008	.015	7/32	30	20
2011	.250	.005 to .008	.020	7/16	40	35
2017	.250	.005 to .008	.020	5/16	40	35
2025	.250	.005 to .008	.020	5/16	40	35

(Tabulation continued on page 2)

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SIZE	A	B	C	D	E	F
2511	.375	.006 to .010	.031	19/32	50	30
3517	.375	.006 to .010	.031	13/32	50	30
3525	.375	.006 to .010	.031	3/8	50	30
6011	.375	.008 to .012	.031	11/16	50	30
6017	.375	.008 to .012	.031	7/16	50	30
6025	.375	.008 to .012	.031	7/16	50	30

4. MALFUNCTIONS AND CAUSES.

A. Insufficient volume.

1. Slide block not going to full eccentricity due to sticking or binding liners.
2. Worn pumping unit.
3. Obstructed suction passages in case or pintle.
4. Bushing turned in cylinder.
5. Faulty gear pump, control, gear pump relief valve, high pressure relief valve or suction valve (see separate instruction bulletins on these assemblies).

B. Excessive noise.

1. Worn or pitted bearings.
2. Incorrect rotor or slide block clearances.
3. Pitted or galled thrust rings.
4. Worn pumping unit.
5. Air entering system past large end of pintle.
6. Lack of back pressure (see instruction bulletin on "Suction Valve").

C. Excessive heating.

1. Worn pumping unit.
2. Insufficient cylinder running clearance.
3. Excessive discharge past relief valves, high gear pump pressure, restriction in piping or valves, and insufficient oil.

5. TESTING.

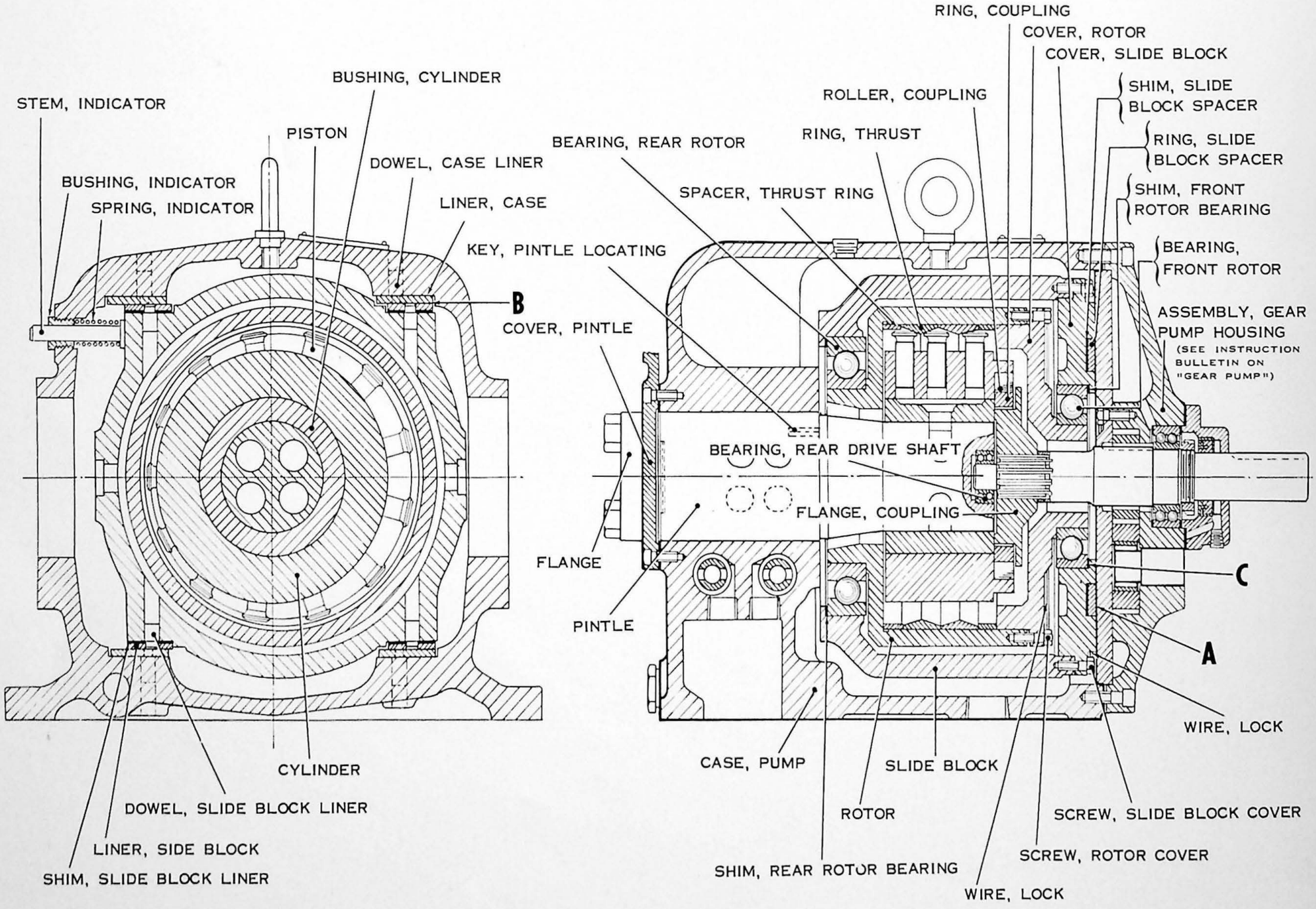
To check for worn radial piston unit, insert a high pressure gage in a pressure port of the pump. Block all high pressure lines to the circuit. Set the slide block control at neutral and start the drive motor. Slowly increase the slide block eccentricity until gage reads 1000 psi. Check the slide block indicator stem with a scale or depth gage to see what per cent of eccentricity is required to raise the pressure. A new radial piston unit requires approximately 5% eccentricity to raise 1000 psi. Additional eccentricity indicates wear. Only if the slip eccentricity is excessive for the particular application, is repair necessary.

6. DISASSEMBLY.

Disconnect pump from circuit and drive motor. Remove "A" and "B" flanges, pintle cover and pump mounting bolts. Lift pump from reservoir with a crane and set pump on flange end. If necessary, block pump to hold it securely in this position. Observe position of all gaskets and shims during disassembly. Remove gear pump housing and drive shaft assembly (see instruction bulletin on "Gear Pumps"). Lift off slide block spacer ring and shims. Remove lock wire and slide block cover screws. Screw three square head set screws into taps in rim of cover and jack cover from slide block. Turn each screw a little at a time to avoid cocking cover. Lift cover out by hand or use hook bolts and crane. Remove lock wire and rotor cover screws. Jack cover from rotor with square head set screws. Lift cover and bearing out by hand or use hook bolts and crane. Lift out flange coupling, coupling rollers and coupling ring. Screw hook bolts into taps in end of cylinder and very carefully lift the cylinder, bushing and piston assembly off the pintle. Do not cock unit and scratch inside of bushing when removing the assembly. Screw hook bolts into end of rotor and lift rotor assembly out of slide block. Remove rear rotor bearing shims. Should it be necessary to inspect and clean siide block and inside of case, remove the control (see instruction bulletin on specific "Pump Control"). To remove indicator, unscrew indicator bushing and pull out indicator stem assembly. Screw hook bolts into slide block and lift slide block out of case. Case liners are doweled to the pump case and slide block liners are dowled to the slide block. If liners are removed, be sure to mark each liner and shim to be sure that each is returned to its same position on slide block or in case. If pintle is to be replaced or reground set pump case, with open end down, in a press. Insert a piece of wood or other soft material under inside end of pintle so when it is pressed from case it will not be damaged. Apply pressure to case end of pintle (see 3 E for approximate force required). Pintle has .005 per inch taper so after pintle is pressed down a short distance it will drop the rest of the way. If cylinder is frozen to pintle, press pintle out of case before attempting to separate the cylinder bushing and pintle. If it is necessary to remove thrust rings from rotor, first break the inner spacer ring by striking a rod inserted in one or more of the radial holes in rotor directly behind the spacer ring. Then drive out the thrust rings and outer spacer by striking a brass bar inserted in the axial holes in bearing end of rotor.

7. INSPECTION.

Clean all parts thoroughly and make certain that all chips, grit and foreign matter have been removed. Inspect all bearings for pitting, galling and binding. Inspect working surfaces on pintle, bushing, piston holes in cylinder, pistons and thrust rings. Inspect slide block and case liners for grooves or scratches. Check scratch mark on upper face of cylinder and bushing to make certain that bushing has not turned in cylinder. Replace any parts which appear worn or damaged.



Assembly Drawing of Type "D" Pump Case and Radial Piston Units (Including Gear Pump) - 58745

8. ASSEMBLY.

PINTLE. If pintle was removed, set pump case, with drive shaft end facing upward, in a press (see 3 F for approximate force required). Apply a thin coat of white lead to the large tapered surface of pintle, and insert pintle into case locating it with the key. Slip a sleeve over the small end of pintle so that the sleeve rests against the shoulder of large diameter. Press on sleeve and shoulder instead of on the small end of pintle.* Press in pintle until the shoulder on large diameter is flush with the boss in the pump case.

SLIDE BLOCK. If slide block was removed, replace by inserting the case liners in the same positions from which they were removed. Install the shims and slide block liners on the slide block in the same positions from which they were removed. Lower slide block into case and check liner clearance with a feeler gage to see if it is within tolerances (3 B). On all pumps, hold slide block central with pintle within .005. Reshim slide block if necessary. Slip spring on indicator stem, insert stem in threaded end of bushing and screw bushing into case.

CYLINDER. Both cylinder bushing and pintle have .005 taper on diameter per inch of length. Check for proper running clearance by suspending cylinder and bushing in a small crane with large end of bushing bore downward. Clean pintle and bushing surfaces thoroughly. Gradually lower cylinder and bushing over pintle taking care not to scrape or scuff the bushing against the edges or ports of the pintle. Stop when cylinder begins to become tight on pintle. At this point the pintle should project the amount shown in 3 D. Do not let the entire weight of cylinder rest on the taper of the pintle as the cylinder will become too tight and damage to the bushing might result. Remove cylinder and bushing from pintle.

ROTOR. If a new rear rotor bearing is being used make certain that the thrust side of bearing faces the flange end of pump case. Squirt some oil on the rear rotor bearing for initial lubrication. Replace rotor assembly and check to make sure that bearing turns freely. If spacer and thrust rings were removed, replace by pressing rings in evenly.

CYLINDER. Lubricate working surfaces of the pintle and cylinder bushing, and lower cylinder assembly with all pistons in place over the pintle, being very careful not to scratch the bushing against the edges of the pintle. Be sure cylinder turns freely on the pintle. With cylinder resting against the rear of the rotor the pintle should project 1/32 beyond the face of the cylinder except for size 2 and size 60 units. On the size 2 unit the pintle should project 5/32 inch beyond the face of the cylinder and on the size 60 unit the cylinder should extend 1/16 inch beyond the end of the pintle when cylinder is resting against rear of rotor. Add or remove shims between the slide block and rear rotor bearing to obtain correct dimension. If a new rear drive shaft bearing is used make certain that the thrust side of bearing faces the flange end of the case.

ROTOR COVER. Lubricate rear drive shaft bearing in end of pintle, insert coupling ring, coupling rollers, coupling flange and rotor cover. Force rotor cover down uniformly with screws to hold spacers and thrust rings firmly in place. Avoid cocking rotor cover. There should be approximately 1/16 clearance between rotor and cover. Secure screws with new, soft iron locking wire. If a new front rotor bearing is used make certain that the thrust side of bearing faces the open end of the pump case.

SLIDE BLOCK COVER. To adjust for correct rotor end play, bolt slide block cover tightly in place and measure the clearance between the front rotor bearing and counterbore in cover with a feeler gage. Add shims between rotor bearing and slide block cover until dimension in 3 C is obtained. When end play is correct, secure slide block cover screws with soft iron locking wire. To adjust for correct slide block end play, place slide block shims and slide block spacer ring on slide block cover. Measure distance from face of spacer to the face of pump case. Also measure distance from face of gear pump cover to face of gear pump housing gasket with gasket tight against housing. Gasket is normally .016 thick when free and .008 thick when compressed so deduct accordingly. Add or remove shims under slide block spacer ring to obtain clearance shown in 3 B.

DRIVE SHAFT. Remove drive shaft before assembling gear pump housing assembly to case (see instruction bulletin on "Gear Pumps"). Fasten gear pump housing assembly and gasket to case. To adjust for proper cylinder end play of 1/32 inch, remove front bearing from drive shaft and slide shaft with coupling spacer and key in place, through gear pump housing assembly and coupling flange into rear drive shaft bearing. While shaft, spacer, coupling and cylinder rest on rotor, measure distance from upper face of gear pump housing to shoulder on drive shaft which contacts the inner race of front drive shaft bearing. Then insert shims into counterbore of housing until they are higher than the shoulder on shaft by 1/32. Also measure the distance from face of gear pump housing to end of drive shaft before and after bearing is fitted in place to be sure that the drive shaft rises the 1/32 inch to provide proper cylinder end play. Thread bearing, lockwasher and nut on drive shaft. Tighten bearing against shoulder on drive shaft and bend one prong of the lockwasher to lock nut in place. Insert sufficient shims between outer race of front drive shaft bearing and oil seal housing to eliminate drive shaft end play and leakage at seal housing gasket, (see instruction bulletin on "Gear Pumps").

MOUNTING. Bolt pump and case gasket to reservoir. Turn pump shaft over by hand several revolutions to make certain no parts are binding. Couple pump to drive motor and reinstall piping to circuit.

*Early model pumps and size 2 units have no shoulder on large diameter. Press these pintles in with a bar in rear drive shaft bearing counterbore until pintle is flush with rear of case.

NOTE: When ordering parts be sure to include the serial number of pump.

INSTRUCTIONS

OILGEAR COMBINATION VALVES

WITH "FOUR" WAY REVERSING PLUNGERS FOR RECIPROCATING DRIVES

4 WAY

OILGEAR TRADE MARK Reg. U. S. Pat. Off.

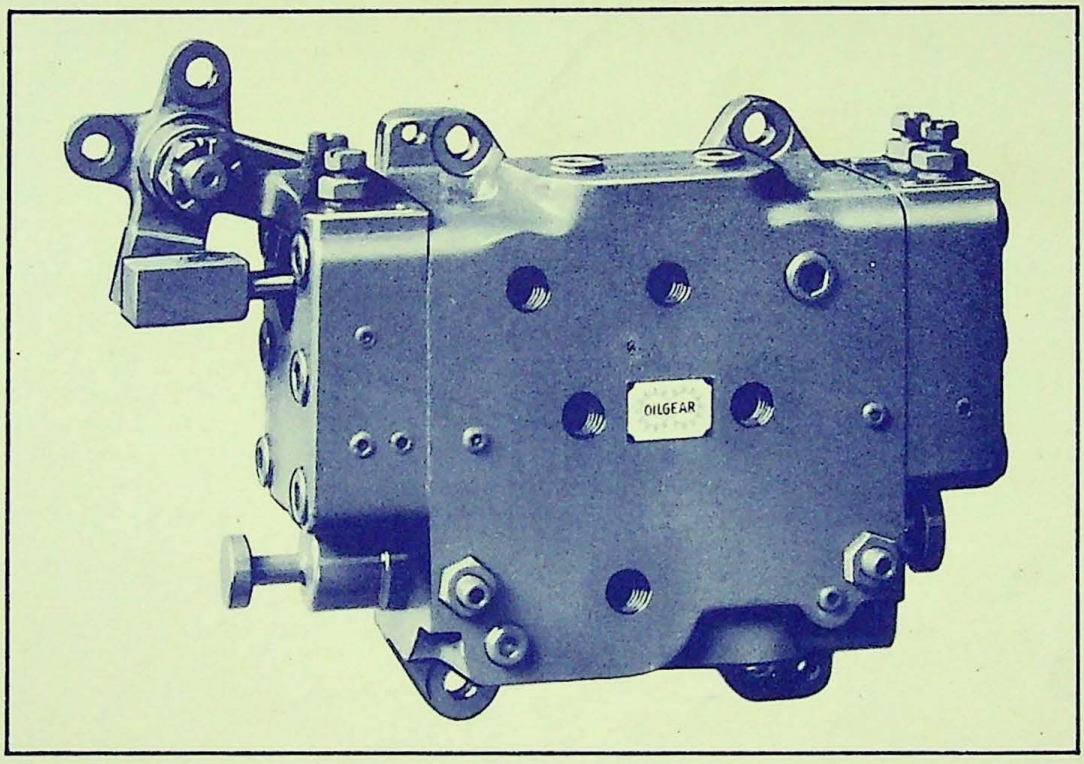


Fig. 1. Front View of Oilgear Size 1 Combination Valve.

APPLICATION OF OILGEAR COMBINATION VALVES

Oilgear Combination Valves with "FOUR" way reversing plungers provide controlled, cushioned reversal of high speed fluid power operated reciprocating drives. They are used extensively with Oilgear Variable Displacement Pumps and Non-Differential Double Acting Cylinders, Twin Single Acting Cylinders or Constant Displacement Motors on a wide variety of grinding machines, honing machines and the like where high speed reciprocation and controlled reversal without shock or delay are essential.

These self-contained valves combine the pilot, reversing and inching (start and stop) plungers into one compact unit to greatly simplify the installation and reduce the amount of piping to a minimum. Accelerating and decelerating speeds of table at each reversal are independently adjustable and thermostatically controlled. Table can be started, inched, reversed or stopped at the will of operator. Reciprocation is automatic and continuous.

Only a simple cam, dog or electric mechanism is required to actuate the pilot plunger and a simple hand or foot operated lever to move the start, stop and inching plunger. Reversing plunger is operated automatically by oil from pilot plunger. Alternative pipe taps for ports 1, 2, 3, 4 and 5 are available on the back of the valve, if requested, to further simplify the installation of piping.

The oil circuit diagram, parts drawing and recommendations given in this bulletin will better enable you to understand the many features of Oilgear Combination Valves. We invite your careful study of same.

THE OILGEAR COMPANY
Milwaukee, Wisconsin, U. S. A.

Litho in U. S. of A. (M441)

BULLETIN 981051

INSTALLATION—OPERATION—MAINTENANCE
OILGEAR COMBINATION VALVES

INSTALLATION:

Bolt and dowel valve to a rigid frame. Mount plungers in a horizontal position and above the high oil level in reservoir for gravity drains from valve stems. For your convenience, pipe connections for ports 1, 2, 3, 4 and 5 are also available, if requested, on the back of valve. Avoid excessive strain on pipe connections. Only use Oilgear approved oil circuit systems.

Connect control mechanism to pilot plunger lever and stop and go plunger knob. Provide stops in mechanism to prevent pilot plunger from striking valve end heads. For your convenience, pilot plunger lever and stop and go plunger knob can be furnished on R.H. or L.H. side of valve.

Use a high quality oil of the TURBINE or CIRCULATING oil class in the system.

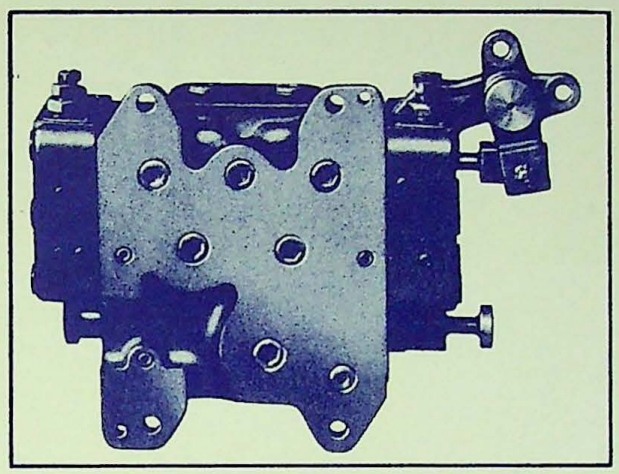


Fig. 2. Rear View of Oilgear Size 1 Combination Valve.

OPERATION:

LOW PRESSURE oil (normally 50 to 125# per sq. in.) flows in port (1) to the pilot plunger and is used to operate the reversing plunger. A limited volume is also directed to port (7) when pilot lever is in position "B" and to port (8) when pilot lever is in position "A" for operating auxiliary equipment. Low pressure return oil flows out port (2).

HIGH PRESSURE oil (maximum 1500# per sq. in.) flows in port (5) and out port (6) when stop plunger is in stop position. Moving stop plunger to go position directs high pressure oil to port (4) when pilot lever is in position "A" and high pressure oil to port (3) when pilot lever is in position "B". High pressure return oil flows out port (6).

TO START cycle move stop plunger to GO position.

TO STOP cycle move stop plunger to STOP position.

TO INCH table move stop plunger slowly toward GO position.

TO ACCELERATE or DECELERATE table reversal adjust the two choke needles (17) in each end head. Screw chokes inward slightly to retard reversal and outward slightly to quicken reversal. For sequence of adjustments see name plates on valve or oil circuit diagram. Make all adjustments with machine running.

MAINTENANCE:

EXCESSIVE TABLE OVERTRAVEL is usually due to insufficient low pressure in line to port (1), insufficient resistance on oil leaving ports (7) and (8), variation in low pressure volume and pressure at moment of reversal, or an excessive increase in mass reciprocated. Choke needles may be screwed in too far. Also check for foreign sediment under chokes.

SHOCK AT REVERSAL may occur if chokes are screwed out too far or if foreign sediment lodges under the ball checks.

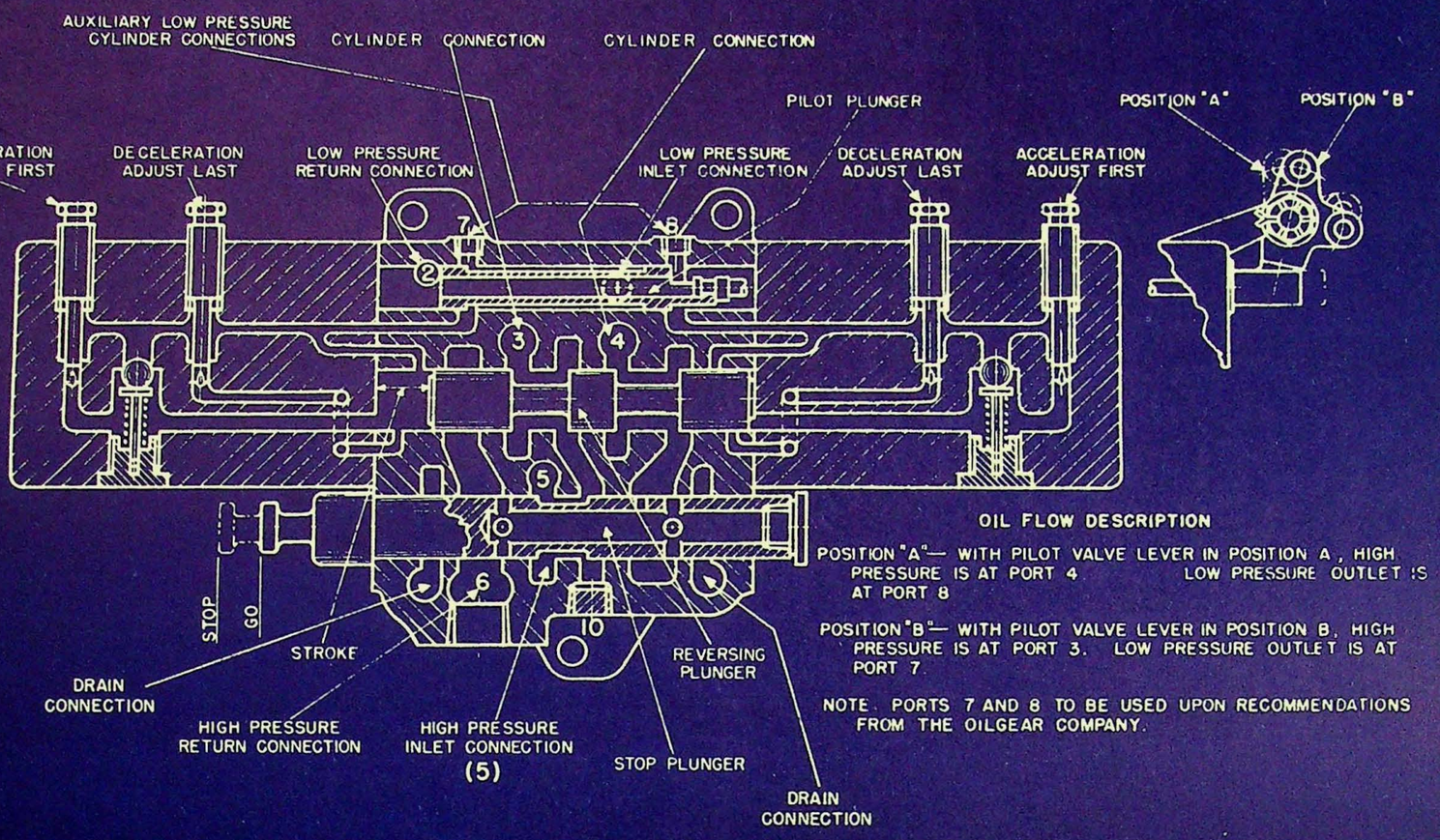
REBOUND OF PILOT PLUNGER may be eliminated by adjusting nut and spring washers on shaft (13) for additional tension. Plunger must stop in position "A" or "B".

LEAKAGE at pilot valve stem or stop plunger requires adjustment of screws above packings (8). Connect 1/8" and 3/8" pipe connections near stop plunger packing screws to atmospheric drain.

When ordering spare parts or writing The Oilgear Company, Milwaukee, Wisconsin, for more detailed information on Oilgear Combination Valves, specify the "L" list number stamped on the valve body.

(SEE VALVE OIL CIRCUIT AND PARTS DRAWING INSIDE)

OIL CIRCUIT & PARTS DRAWING
FOR
OILGEAR COMBINATION VALVES
(WITH "FOUR" WAY REVERSING PLUNGER)

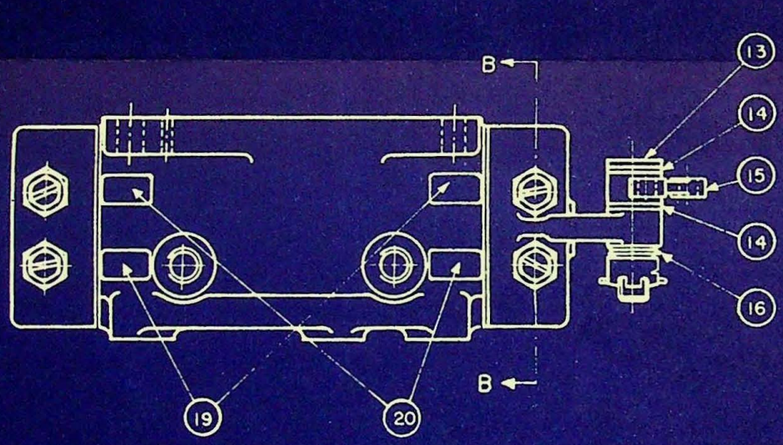


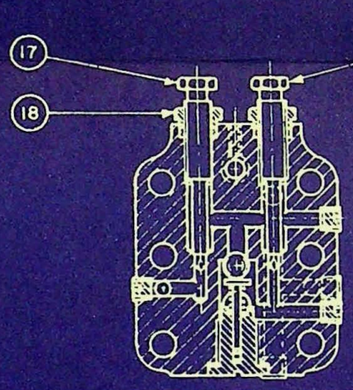
OIL FLOW DESCRIPTION

POSITION "A"— WITH PILOT VALVE LEVER IN POSITION A, HIGH PRESSURE IS AT PORT 4 LOW PRESSURE OUTLET IS AT PORT 8

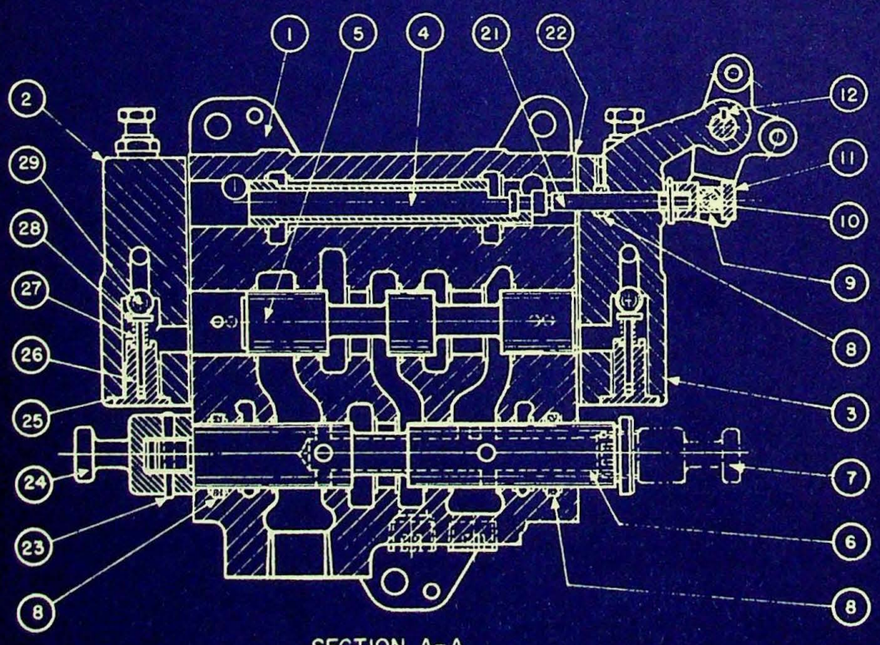
POSITION "B"— WITH PILOT VALVE LEVER IN POSITION B, HIGH PRESSURE IS AT PORT 3. LOW PRESSURE OUTLET IS AT PORT 7

NOTE. PORTS 7 AND 8 TO BE USED UPON RECOMMENDATIONS FROM THE OILGEAR COMPANY.

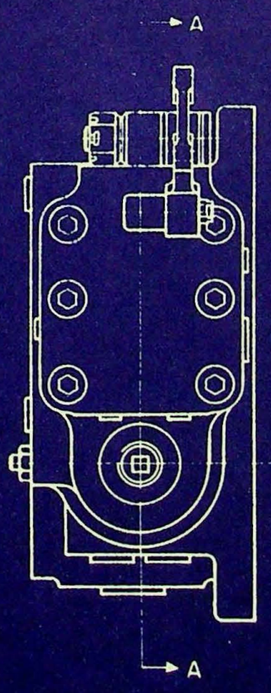




SECTION B-B



SECTION A-A

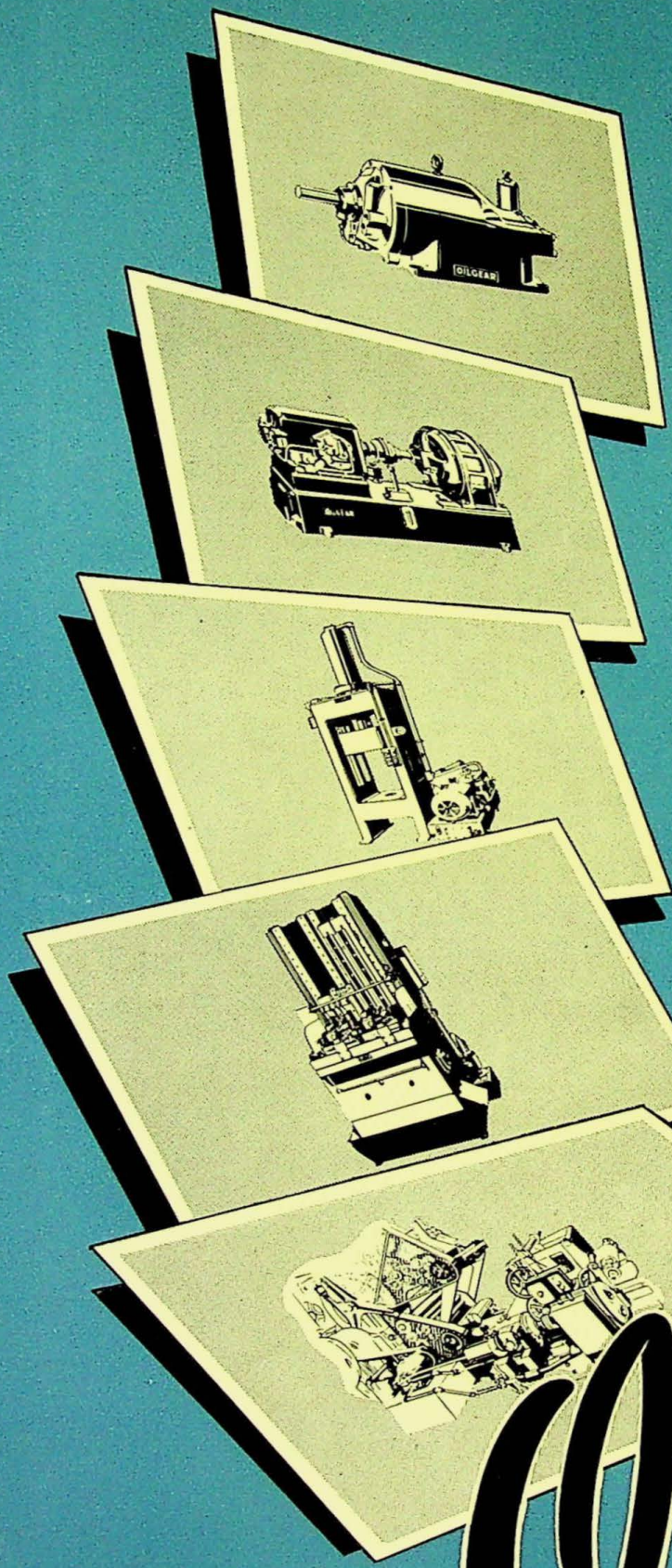


PARTS LIST

1	BODY
2	END HEAD
3	END HEAD & BRACKET
4	PILOT PLUNGER
5	REVERSING PLUNGER
6	STOP PLUNGER
7	STOP PLUNGER KNOB
8	PACKING
9	BLOCK
10	PIN
11	YOKE
12	WOODRUFF KEY
13	SHAFT
14	FIBRE WASHER
15	LEVER
16	SPRING WASHER
17	CHOKE NEEDLE
18	CHOKE NUT
19	ACCEL. NAME PLATE
20	DECEL. NAME PLATE
21	PILOT VALVE STEM
22	GASKET
23	TAPER PIN
24	STOP
25	CHECK VALVE GASKET
26	SHOULDER SCREW
27	SPRING
28	SPRING GUIDE
29	STEEL BALL

WHEN ORDERING REPAIR PARTS SPECIFY VALVE LIST NUMBER.

Fig. 3. Oil Circuit Diagram and Parts Drawing of Oilgear Combination Valve with "Four" Way Reversing Plunger.

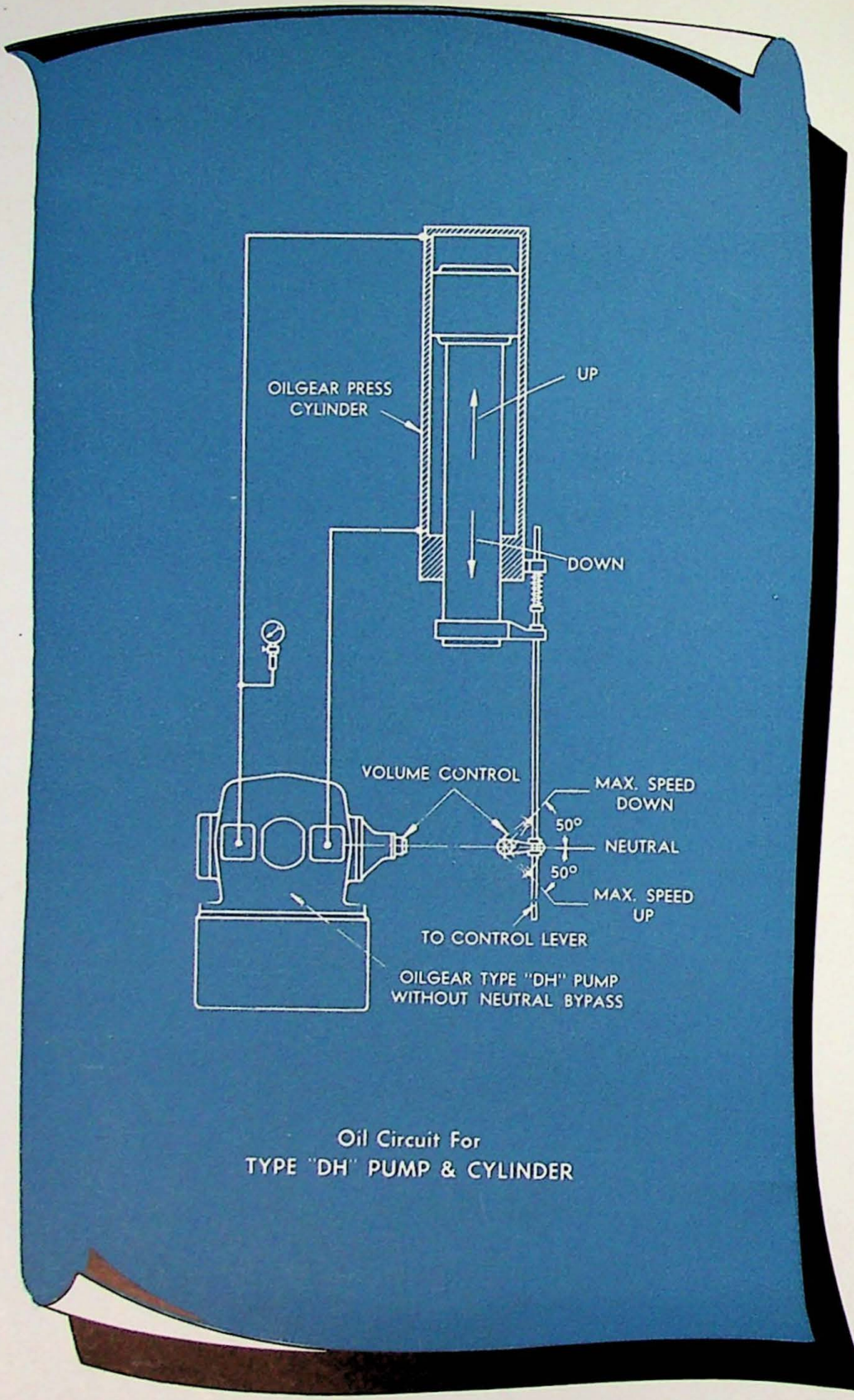


OIL SELECTION and MAINTENANCE RECOMMENDATIONS

OILGEAR

Oilgear

FLUID POWER SYSTEMS



Oil Circuit For
TYPE "DH" PUMP & CYLINDER

OIL SELECTION

NEED FOR HIGH QUALITY MINERAL OIL

High quality oil is used as the hydraulic medium in all Oilgear Fluid Power Systems. The grade of oil employed is the most important single factor influencing system performance, freedom from frequent servicing, low maintenance cost and long life. It should furthermore be of the type which has been especially refined for service in hydraulic systems. The average engine or bearing oil will usually not perform with complete satisfaction when used as the hydraulic fluid.

Oilgear Fluid Power Equipment is designed for the use of mineral oil only as the medium for transmitting power. Water or mixtures of oil and water are usually unsuitable for this purpose and should be strictly avoided. Damage from scoring and rusting may occur very quickly if they are employed. Animal or vegetable oils are also unsatisfactory because they lack certain physical and performance qualities necessary for efficient operation. Of all the fluids which have been tried as the pressure medium none have been found to compare with correctly selected mineral oil of the hydraulic type.

WHAT THE OIL MUST DO

In most machines oil has but a single job to do, namely that of providing lubrication to surfaces in moving contact, in other words points of wear. In contrast hydraulic service imposes two distinct and different duties, i.e., lubrication and transmission of power. To be fully satisfactory the oil must be dual purpose and competently satisfy both requirements. Those qualities alone which promote good lubrication do not necessarily assure efficient power transmission or vice versa.

The next point to examine is the element of time. Considerations of both a practical and economic nature make it essential that the oil be able to perform both functions for long periods of continuous use without serious impairment of initial properties. Oils which do not stand up dependably are a likely source of operating difficulties. Although oil changes are a normal part of good maintenance practice the interval between changes should necessarily be of reasonable duration. For further information in this connection see "Need for Oil Changes" page 9.

A final consideration is the temperature range through which the oil may be called upon to operate. The conditions which influence and limit this range are (1) surrounding air temperature (2) service and load factors (3) facilities for cooling and warming the oil. Variation in these conditions will, of course, depend upon the particular installation. In the case of systems exposed to the atmosphere considerable variation is normally to be expected. When the equipment is started after extended shut-down the oil temperature will closely approximate that of the surrounding air (unless regulated in advance). For that reason the latter in cold weather may be the deciding factor in determining correct oil viscosity. All mineral oil thins down with increase in temperature and thickens as the temperature falls but the viscosity characteristics of an hydraulic oil must enable it to perform satisfactorily through the entire range over which the equipment is designed to operate.

WHAT THE OIL MUST NOT DO

As a corollary to the statement in preceding section that the oil must both lubricate and transmit hydraulic power we would point out that the fluid medium must neither permit a high rate of wear nor allow an excessive amount of slippage, i.e., the escape of oil from the high pressure to the low pressure side of the system. Wear and slippage will penalize efficient performance of the hydraulic circuits causing both increased power consumption and higher maintenance costs.

Other performance qualities essential in a satisfactory hydraulic oil and indicative of what the oil must not do, are:

(1) It must not permit rusting of internal surfaces.

(2) It must not emulsify with any water which may gain entrance and must separate quickly upon standing.

(3) It must not generate an excessive amount of foam caused by the entrainment of air.

(4) It must not oxidize or deteriorate chemically producing a marked loss in original properties.

(5) It must not form sludge or deposits in the system. These materials clog the filter, cause cycle malfunctioning and retard normal flow of the hydraulic medium resulting in a loss of operating efficiency.

PHYSICAL TESTS

Selecting hydraulic oil solely on the basis of physical tests or specifications may prove misleading. Such readings apply only to the physical characteristics of new oils. Inferior products lack the chemical stability required to resist deterioration and thereby retain their original characteristics, within reasonable limits, during prolonged exposure to the deteriorating influences of operating conditions. Such deterioration produces increased viscosity and the formation of gummy or sludge-like products of oil oxidation. While Oilgear pumps are designed so as not to be highly sensitive to variations in oil viscosity or oil thickening due to sludge-like materials, various other parts of the system such as control valves, operating cylinders, etc., may be adversely affected by the products of oil oxidation which are deposited on the operating surfaces. Oils specially designed for use in hydraulic systems are made so as to have the high chemical stability necessary for good performance. This property, although not evidenced by physical readings, enables them to retain original characteristics during prolonged periods of service and thereby to minimize the troubles which result from excessive or rapid oil deterioration.

Two properties are useful in establishing suitability for service in Oilgear Fluid Power Systems, namely viscosity and pour point. Both of these qualities are discussed at further length in sections which follow. Other commonly quoted characteristics such as flash point, fire point, specific gravity, carbon residue, color, demulsibility, etc. have only a minor bearing upon selection of hydraulic oil.

SAE NUMBERS

Because of their widespread use in designating the body of motor oils, SAE numbers are often employed when specifying hydraulic oil. We caution against this practice, first because the broad permissible viscosity ranges of SAE grades do not assure accurate selection of hydraulic oils, and second because it encourages the introduction of motor oils which are not, in the average case, suitable for hydraulic duty. *Motor oils of the detergent type are particularly questionable because they are apt to foam and emulsify quite badly.*

VISCOSITY REQUIREMENTS

Oilgear Fluid Power Systems are designed for the use of hydraulic oil within certain maximum and minimum operating viscosity limits depending upon type of unit and horsepower rating. For all units the maximum is 4000 seconds S.U. at operating temperature. Minimum figures are specified in seventh column on the chart which follows. *Users are cautioned to observe these recommended limits because operating difficulties and even damage may be caused if they are disregarded.*

First Type Letter of Oilgear Pump	Approx. H.P. Rating	For Average Conditions		For Lower Temperatures		*Maximum Viscosity Range in S.S.U.
		*Maximum Temperature Range	Oil to Use	*Maximum Temperature Range	Oil to Use	
A,B,C,D,H,J, M,Q,R or W	Up to 60	40°F. to 160°F.	Medium (Med.)	25°F. to 135°F.	Light (Lt.)	4000 to 70
C or D	100 or 150	55°F. to 140°F.	Heavy (Hvy.)	40°F. to 140°F.	Medium (Med.)	4000 to 100
F	Up to 10	55°F. to 170°F.	Heavy (Hvy.)	40°F. to 170°F.	Medium (Med.)	4000 to 65

*Ranges based on conditions at pump intake.

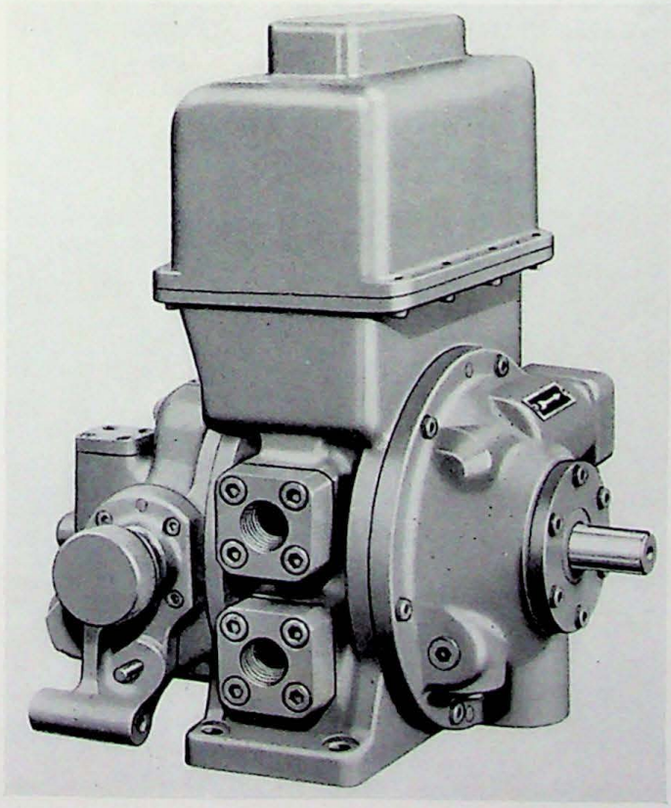
Note:
Type designations are published in Oilgear bulletins and stamped on the name plate attached to each hydraulic unit. Horsepower ratings are presented in similar manner. When two or more Oilgear units are connected to a common reservoir, ordinarily follow the oil recommendations given for the unit having the greatest horsepower rating.

Viscosity of mineral oils is synonymous with body and represents a measurement of resistance to flow. In this country, the standard reading is seconds Saybolt Universal which denotes the time required for a given quantity to flow through an orifice of stated size under specified conditions. The viscosity of all mineral oils varies with temperature decreasing or thinning down when heated and thickening when chilled. For this reason a viscosity reading is without value unless the temperature at which it is taken is specified.

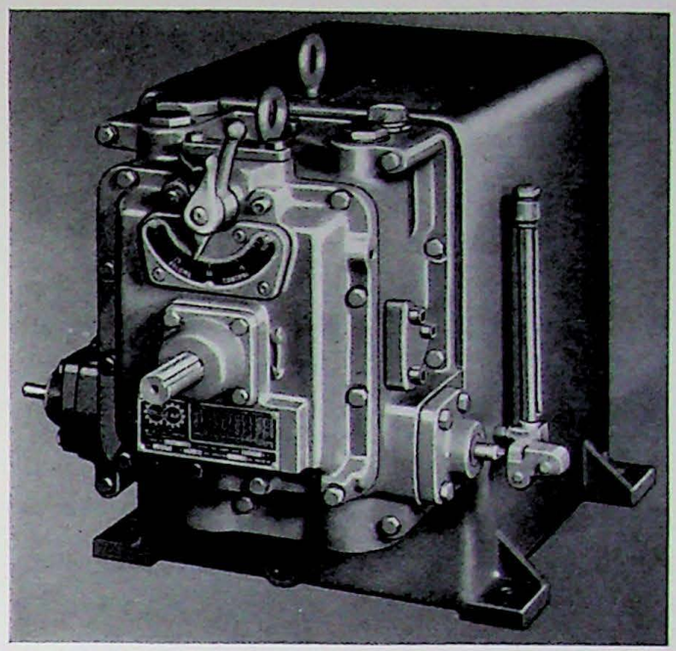
Operating temperature is an important consideration when selecting hydraulic oil because of its influence upon viscosity. The types of oil (trade designation) ordinarily used for average installations or service are listed in fourth column of chart. When lower operating temperatures are encountered, lighter grades are required as indicated. The lowest starting temperatures and the highest operating temperatures (at pump intake) of most installations will usually be within the temperature ranges listed in the third column for average conditions and in the fifth column for lower temperatures.

POUR POINT

As the name implies the pour point may be defined as the temperature at which the oil congeals and ceases to pour. When equipment is operated in heated buildings, the pour point is rarely a factor because all well made hydraulic oils have readings considerably below the lowest temperature likely to be encountered. On the other hand if the system is exposed to continuously low temperature as in the case of out-door operation during winter the pour point will have distinct influence upon ease of starting and time required for warm up. The pour point should be at least five degrees below the coldest temperature at starting and preferably more to assure the desired fluidity. See section on out-door operation, page 11, for further instructions when equipment is to be started at temperatures under the low limits in chart.



Type "JK" Feed Pump

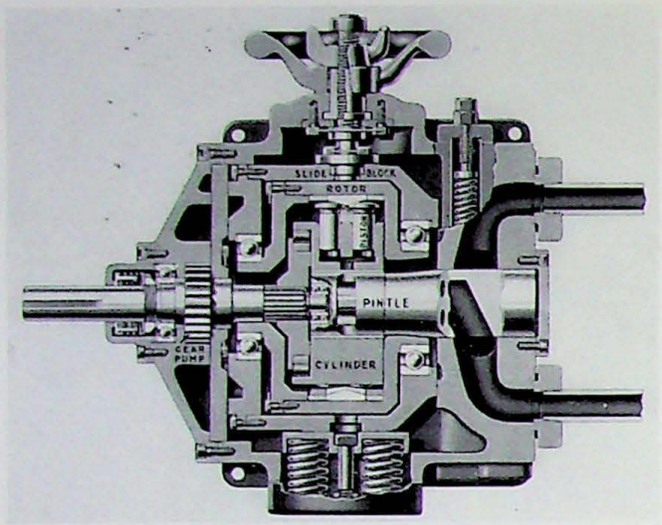


Type "F" Feed Pump

EXPLANATION OF ADDITIVES

Additives are most simply defined as materials added to the base oil for the purpose of enhancing natural performance qualities. Most oils today which are manufactured for hydraulic service contain additives of one type or another. Usually a considerable amount of research work is represented in the choosing of ingredients which permit the optimum in service value. Generally speaking additive type oils will show superior results although the fact that a particular brand contains additives does not necessarily assure this outcome. Much depends upon the knowledge, skill and experience of the refiner.

Oilgear Fluid Power Systems do not require additive-type oils for efficient, trouble-free performance. However, properly compounded and properly selected grades have been used with satisfactory results. The



Plan view of section Type "D" Variable Delivery Unit

benefits claimed are reduced wear, cleaner systems, longer oil life, freedom from sludge, deposits, rusting, foaming, etc.

Additive materials or inhibitors as they are sometimes called may serve one or more than one definite purpose. For example an ingredient may be added to increase oxidation resistance which at the same time improves film strength and wear preventing qualities. Hydraulic oils of the additive type as now sold are usually either single or double inhibited. The first class contains a single additive to improve oxidation resistance with an increase in wear preventing qualities a supplementary feature in some instances. The second class is treated additionally to prevent rusting of internal surfaces, i.e., both rust and oxidation inhibited. Still other types of additives may be employed such as those designed to suppress foaming, lower the pour point, etc.

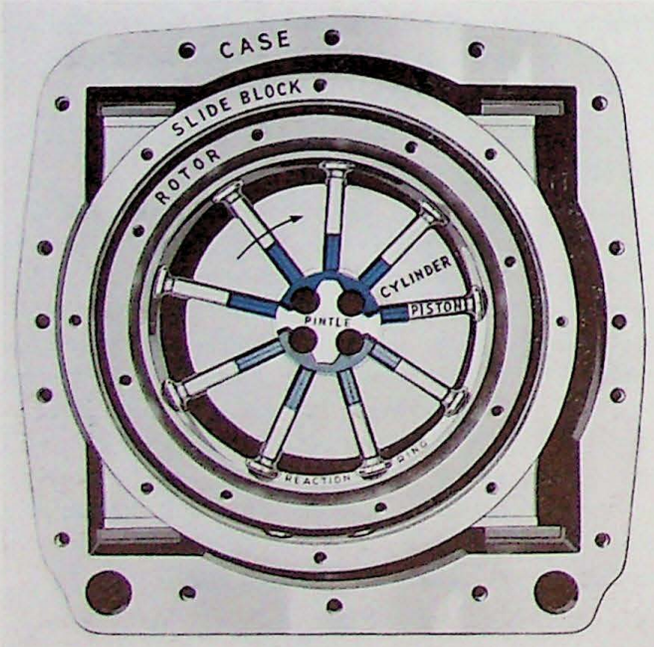
OIL RECOMMENDATIONS

As a convenience and general guidance to users of Oilgear Fluid Power Systems, we are listing the following Gargoyle D.T.E. Oils made by the Socony-Vacuum Oil Co. which correspond as indicated with trade designations appearing in chart on page 4. They also satisfy viscosity requirements specified therein. We do not wish to imply that lubricants of other manufacture will be unsatisfactory but if other grades are employed they should be of the hydraulic oil class and of similar high quality.

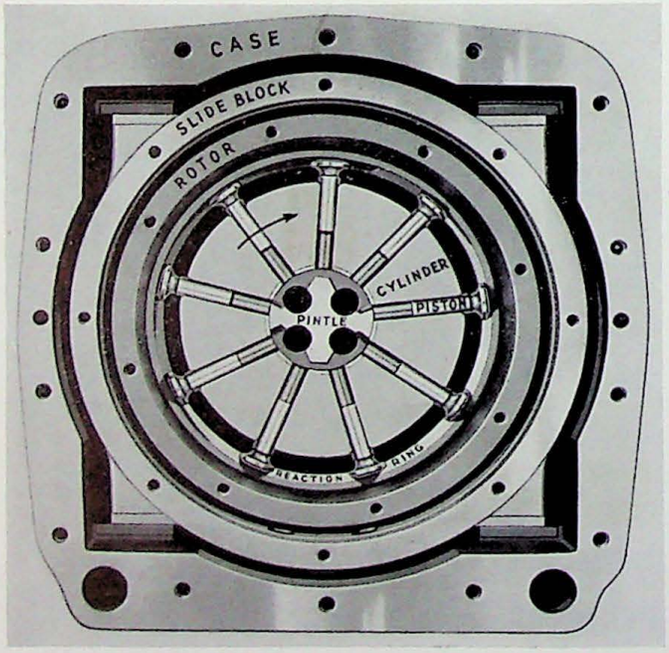
Light (Lt.) — Gargoyle D.T.E. Oil Light.
Medium (Med.) — Gargoyle D.T.E. Oil Heavy Medium.
Heavy (Hvy.) — Gargoyle D.T.E. Oil Extra Heavy.

The brands listed are high viscosity index oils having a 95 minimum V.I. They are both rust and oxidation inhibited. Viscosity readings are as follows:

Brand	Visc. at 100° F. Seconds S.U.
Gg. DTE Oil Light	145/155
Gg. DTE Oil Hvy. Medium	290/300
Gg. DTE Oil Ex. Hvy.	590/610



Shows slide block, rotor and reaction ring unit with its centerline moved to left of cylinder, pintle and drive shaft centerline. Oil is delivered through upper port.



Shows slide block, rotor and reaction ring with its centerline concentric with cylinder, pintle and drive shaft centerline. Neutral—no oil is delivered.

Oil under high pressure (Pump Discharge)

MAINTENANCE RECOMMENDATIONS

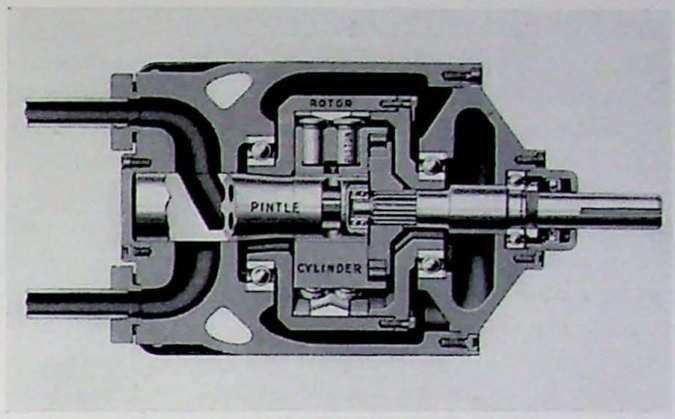
OIL LEVEL.

Maintaining the right oil level is an important need and one so obvious that it is frequently overlooked. Unless leaks develop not much oil will disappear during the course of normal operation. However to protect against possible irregularities it is advisable to inspect the level at least once daily with the pump idle and add make-up if needed.

While the correct level as indicated on gauge allows some leeway or factor of safety too low a level may permit the pump intake to become uncovered and cause the pump to draw in air. As air is compressible and oil is virtually non-compressible this condition will produce irregular action of the system. It may also permit increased wear in the pump due to less oil reaching the areas of severe rubbing pressure.

On the other hand too high a level offers no benefits and if carried too far may cause actual harm. Difficulties which may occur when the head of oil is carried higher than recommended are:

1. Pump heating
2. Power loss
3. Leakage at Pump Shaft Seal
4. Foam
5. Leakage from air breather, filler plug, etc.

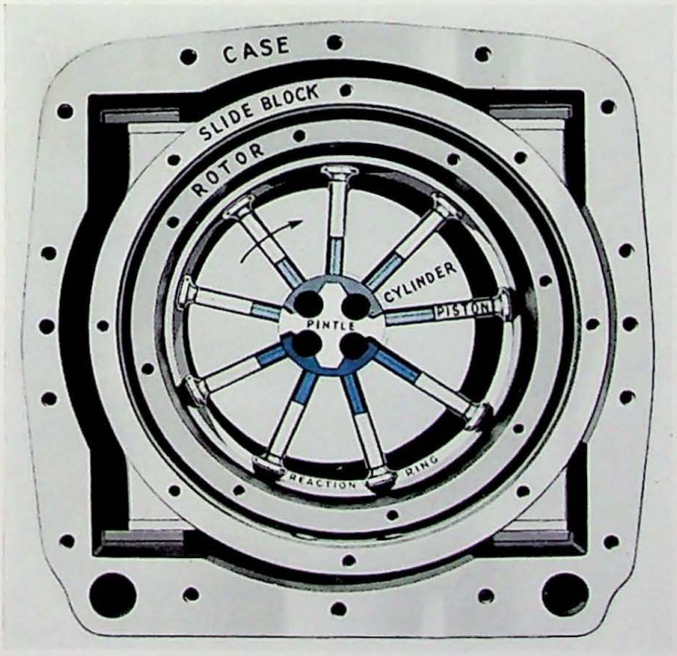


Plan view section of Type "C" Constant Delivery Unit

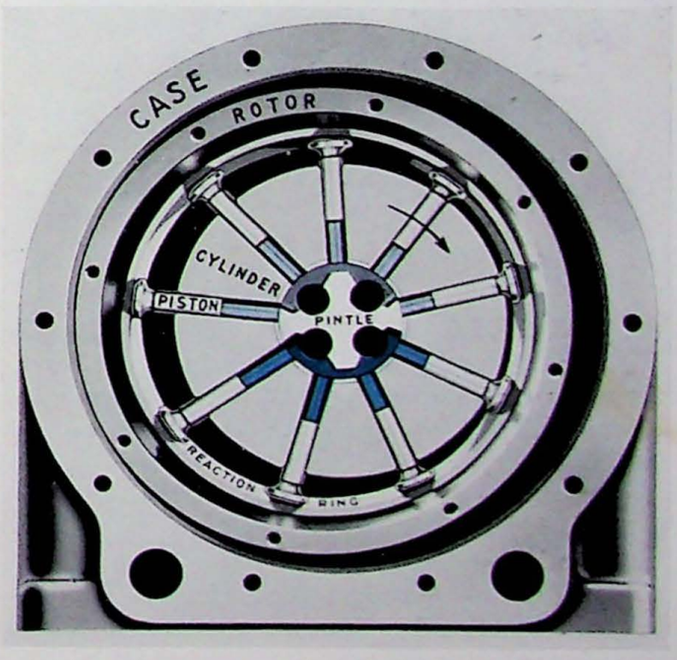
OIL PRESSURE

Oilgear Fluid Power Systems are designed to operate at oil pressures not exceeding specified maximum limits. This statement applies both to feeding pressure and rapid traverse pressure. While relief valves are placed in the circuit to prevent the pressure from exceeding these limits, continuous discharge past relief valves should be avoided since it causes excessive heating, power loss and wear on equipment and oil.

Failure to develop the required oil pressure will be reflected in the system's inability to do its normal work. Loss of pressure can usually be traced to trouble in the controls. However wear in the pump or cylinder may also prove a contributing factor. Suitable correction must be made to avoid continuing power loss and lowered performance level.



Shows slide block, rotor and reaction ring unit with its centerline moved to right of cylinder, pintle and driveshaft centerline. Oil is delivered through lower port.



Shows rotor and reaction ring unit with its centerline at a fixed eccentricity to left of cylinder pintle and driveshaft centerline.

Oil under low pressure (Pump Intake)

CONTROL OF OIL TEMPERATURE

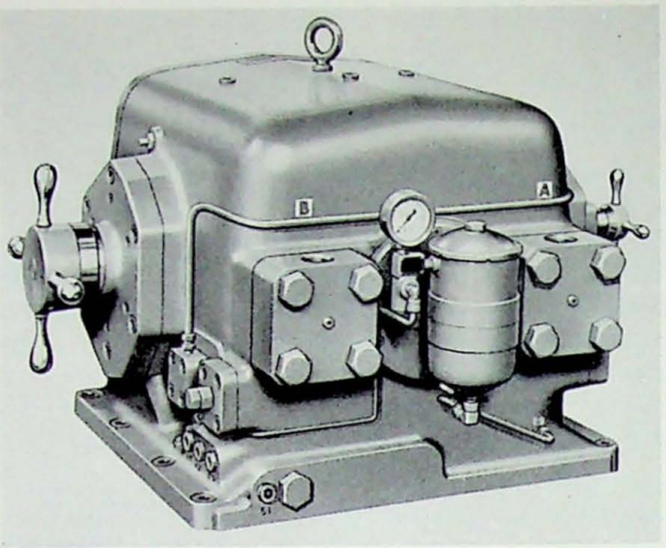
On most applications, the operating temperature seldom exceeds the maximum recommended because the units, reservoir and oil provide sufficient radiation. However, where components are operating at maximum capacity or overload, reservoirs are limited in capacity or abnormal restrictions prevail, the operating temperature of the hydraulic system can be suitably controlled through cooling to prevent an advance above safe limits. While we do not consider it advisable to specify a maximum because of variation in operating conditions it is in general desirable to stay below 160°F. A temperature around 120°F. will help to assure best all round efficiency. Excessive heat generation is usually due to conditions within the system which permit a high rate of mechanical friction or slippage.

Temperature rise thins down the hydraulic oil and accelerates oxidation. To illustrate the latter point, an increase of 18°F will in the average instance double the rate of oxidation. Therefore it is necessary to change the oil more often when temperature is elevated particularly if this remains for any length of time above 120°F.

Mounting and Piping of Oil Cooler to Standard Type "D" Pump and Reservoir

CARE OF OIL FILTER

In recent years, most Oilgear pumps and transmissions are equipped with oil filters as standard equipment. The oil filter performs a most important function in removing the finest contamination and even removes discoloring matter to retain the original oil color. It operates on the by-pass principle and continuously purifies at the rate of approximately 30 gal. per hour. A pressure gauge is installed at the filter and is marked to indicate when filter has become clogged and requires replacement of the element. Stoppage in the filter or flow control valve does not affect normal operation of the system although it

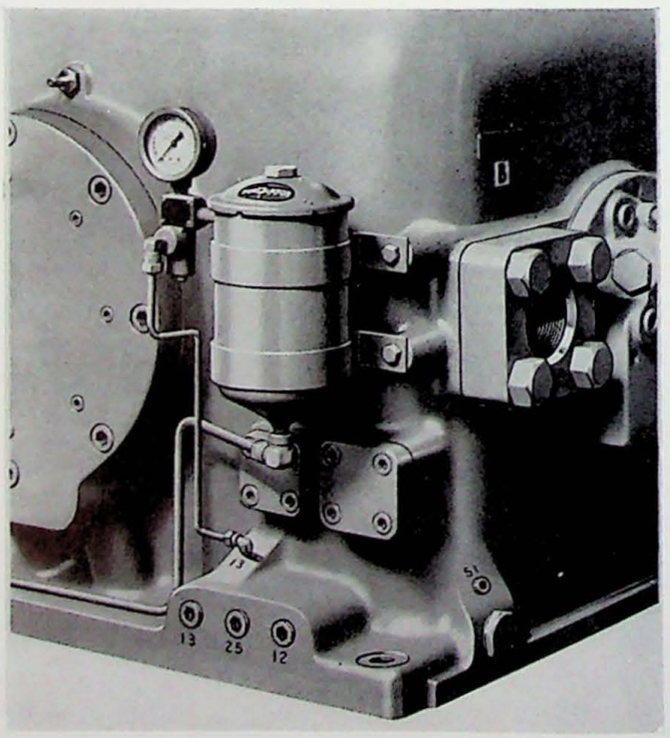


Mounting of Oil Filter on Type "D" Pumps up to 60 hp.

is always advisable to renew the element promptly when gauge reading tokens the need for so doing. In fact we urge that gauge be inspected daily so that functioning of filter is kept under continuous observation.

ELIMINATION OF FOAM

Foaming of the hydraulic oil is caused by entrainment of air and is generally the result of conditions within the system which tend to aerate the oil. It is likely to produce irregular operation due to the fact



Mounting of Oil filter on Type "D" 100 hp. and 150 hp. Pumps

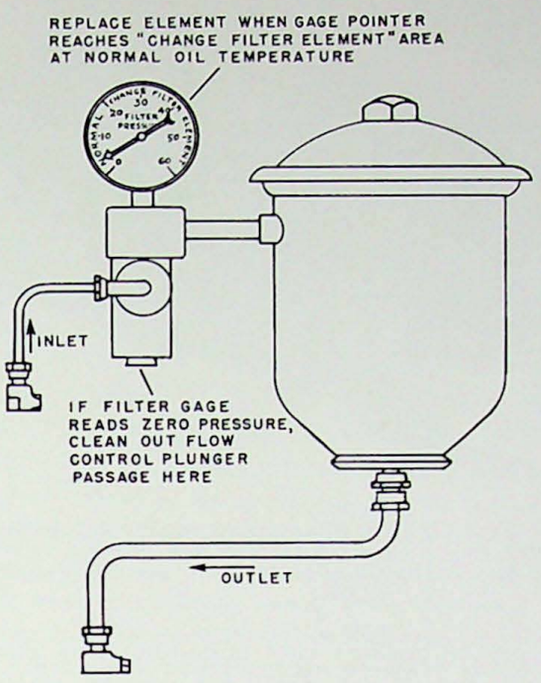


Diagram of Standard Oil Filter Application to Oilgear Variable Delivery Pumps

that foam changes the oil from a non-compressible to a compressible medium. Wear of pump parts may increase because a reduced amount of oil is received at points of heavy rubbing pressure. Leakage of oil from the breather on the reservoir is a possibility due to the expansion created by foam.

Elimination of foam is largely a matter of controlling conditions which produce aeration. Air drain cocks are usually used to eliminate air when filling system with oil. On fine feed applications, automatic air drain valves free the system of minute quantities of air each cycle. Too low an oil level permitting pump intake to become uncovered, leaks in the suction line, improperly adjusted relief valves, turbulence in the reservoir caused by excessively high velocity of oil returning to or circulating in the reservoir, etc., are possible factors. If foam continues after eliminating these potential causes it is in all likelihood attributable to either poor quality or poor condition of the hydraulic oil. In this event the only remedy is to completely drain the system and install new oil of the right type.

NEED FOR OIL CHANGES

Periodic changes of the hydraulic oil will help to assure effective lubrication of the pump and to keep the system free of objectionable deposits. Some deterioration in original properties is a natural result of time and use, the rate being determined by quality of the oil and service conditions, particularly operating temperature. If contaminants should reach the oil another consideration will be the ability of the filter to thoroughly remove these impurities.

If the equipment is used for continuous service, drain the oil approximately every SIX months. If it is used for light service, drain the oil approximately every TWELVE months. If the fluid system is automatically filtered and periodically tested, the oil may sometimes be retained in service for several years, especially if the oil temperature remains below 120°F.

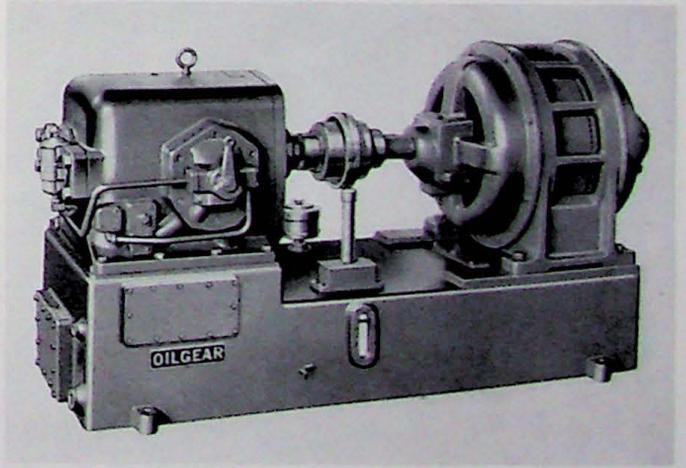
FILTERS

Micronic type oil filters are available from The Oilgear Company and their effectiveness in reducing the frequency of changing oil and in prolonging the life of the Oilgear equipment makes their use a marked economy.

DRAINING PROCEDURE

When the system is drained it is essential to get all the old oil out so that no appreciable quantity remains to reduce the purity of the new oil. The ram should be positioned at the return end of the stroke and the piping bled at low point to drain off as much as possible of the used oil. Also allow sufficient time for good draining. The clean-out covers should then be removed and the bottom of the reservoir wiped clean with lint-free rags. Do not use cotton or wool waste.

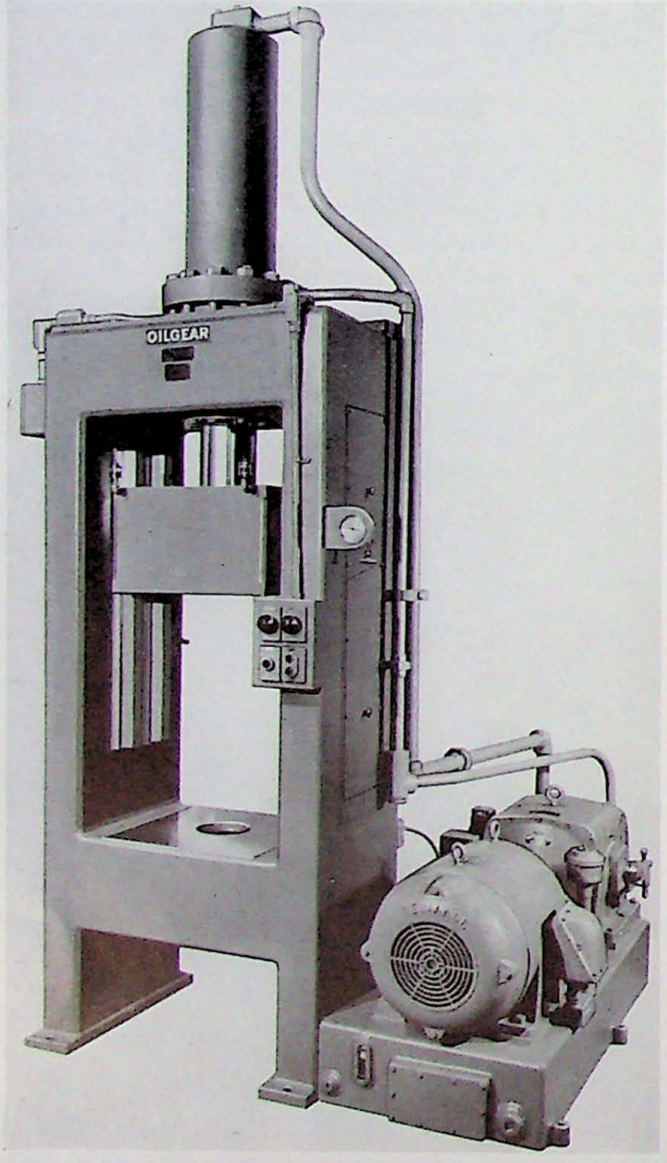
We further recommend that draining be done right after equipment has been in use and is thoroughly warmed up. By so doing impurities will be removed which may settle out if the oil is permitted to stand for a while.



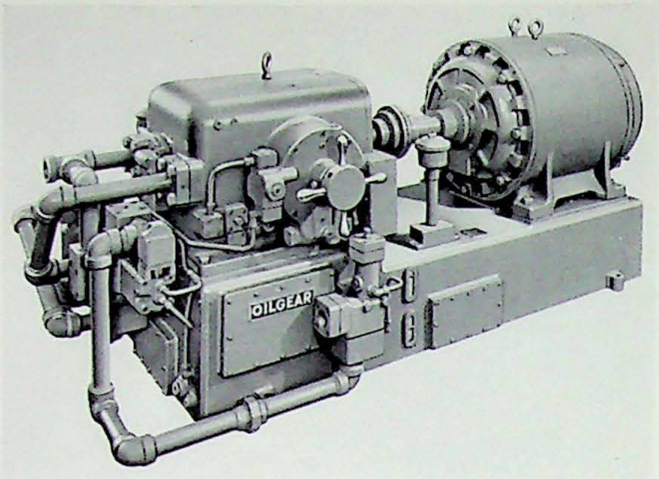
Type "DH" Oil Reservoir Base with cleanout covers on each end, showing observation covers on sides and above the oil level, large air-breather, filler pipe and strainer.

PROTECTION AGAINST DIRT AND CONTAMINANTS

Dirt or contaminants of any type are harmful to useful life of the hydraulic oil and continued efficiency of the equipment. Impurities of an abrasive or gritty nature will increase wear of pump parts. They may also act as catalytic agents to hasten oxidation of the oil. Common dirt as swept up from the floor is effective in this respect. While it is not feasible to enumerate the particular action of fluid contaminants they are without exception diluting and more or less injurious depending upon type and quantity present. Mixture with oils other than the regular hydraulic oil may nullify desired properties in the hydraulic medium.



35 Ton Two-Column Vertical Press with Type "DX" Pump



100 hp. Type "DX" Pump, large reservoir base, clean-out and inspection covers, air breather, filler pipe, strainer, control and relief valves and associate piping for billet peeler application.

To protect against contamination, good common sense and care on the part of the operator are mainly required. A likely opportunity for dirt to enter is when oil is added for refilling or make-up purposes. Receptacles for transferring oil should be clean before use and dirt wiped away from the filler cap on the oil reservoir. As an extra precaution pour oil into the system through a fine mesh metal strainer.

Modern refinery methods assure that the hydraulic oil as received in drums or cans is pure and free from foreign material. It is however entirely possible for contaminants to enter during storage unless suitable precautions are taken. First of all the oil containers should be housed in a separate room devoted to this purpose and never left out in the open on the shop floor. There are unsuspected opportunities for dirt to enter when the latter practice prevails. Drums and cans should be kept tightly closed when not in use. The same room should preferably be used for housing transfer and dispensing equipment.

The inspection covers, oil filler and breather caps on the reservoirs of Oilgear Fluid Power Systems should always be kept properly in place and never left off for any reason. Leaving the system open at these points offers a likely opportunity for dirt to enter.

The filter in the breather removes dust from the air which enters when the level in the oil reservoir falls during the operating cycle. This unit is a highly important factor in keeping the system free of dirt or grit. It is essential to clean the air filter regularly at least once every six months and more often if there is considerable dust present in the air around the breather.

OUTDOOR OPERATION OF OILGEAR UNITS

SIZES — 60 H.P. OR LESS

Oilgear drives which operate outdoors or in open buildings are usually subjected to a wide range of temperature. When operating Oilgear drives under these conditions, use an oil having a high viscosity index, i.e., a low rate of change in viscosity with change in temperature. Oil recommendations on Page 6 show products of this type.

NORMAL STARTING RANGE

Oilgear units of size 60 hp or less have an operating range of 70 seconds Saybolt to 4000 seconds Saybolt at the intake. That is, when the oil gets so hot that its viscosity is less than 70 seconds Saybolt it is too thin to insure efficient operation and effective protection against wear of rubbing parts. Since the oils recommended reach 70 seconds Saybolt viscosity at different temperatures, the operating temperature ranges vary also. Likewise, when the oil gets so cold that its viscosity is more than 4000 seconds Saybolt it is too heavy to flow freely to the pump suction at start up. Also, at such viscosities the oil moves too sluggishly throughout the system to give the free, rapid movement of control elements which is essential to efficient operation. So for normal starting of the Oilgear pump be sure the oil temperature and viscosity are within the limits shown in the chart on Page 4.

COLD STARTING RANGE

The starting period is the critical time during cold weather operation. Lack of lubrication due to the oil becoming stiff and congealed may cause the units to seize during the starting period if the drive is not started properly. When the oil is between 4000 seconds Saybolt and 20,000 seconds Saybolt and the temperature is above the pour point the unit can still be started by intermittently turning it on and off as directed following. However, considerable caution is necessary if the oil approaches the temperature at which the viscosity is 20,000 seconds Saybolt and the schedule for intermittent starting should be observed with great care. Of course, if the oil can be warmed by some other means before starting, the intermittent method need not be used.

In cases where the intermittent starting method or prior warming can not be used because of service demands it is advisable to employ a special cold weather oil which has a viscosity of less than 4000 seconds Saybolt at the lowest starting temperature encountered.

INTERMITTENT STARTING SCHEDULE

Drive the input shaft of the unit for about 5 seconds and then let it rest 20 seconds — repeat about 10 times — drive the input shaft about 20 seconds and then let it rest for 20 seconds — repeat about 5 times — run unit continuously and operate machine at light loads to warm up the oil in entire system.

CONDITIONS OF EXTREME COLD

If the oil viscosity at starting is more than 20000 seconds Saybolt or the temperature is below the pour point, the intermittent starting method should no longer be used and one or the other of two possible courses of action is advisable.

1. Warm the oil prior to starting by some auxiliary means or if this method is not convenient,
2. Change to a special grade of cold weather oil.

Although the use of a special cold weather oil will in most instances eliminate the need for intermittent starting it is well to keep in mind that extreme cold may make this practice advisable, i.e., when the viscosity becomes greater than 4000 seconds Saybolt. Mobilfluid 200 is considered an example of a good cold weather oil which will work dependably in Oilgear drives. Comparable products of other manufacture will also be suitable.

RUST INHIBITORS

Since condensation due to changes in temperature is likely to deposit water in the system, it is desirable to use rust inhibited hydraulic oil to protect internal ferrous parts against rusting. However, such oils may not entirely eliminate rusting, especially when excess condensation takes place so care must be exercised to protect the drive against the entry of moisture, damp air or rain. Occasionally, the unit should be drained to remove water, which may have accumulated.

OIL CHANGE

If the equipment is used for continuous service, drain the oil approximately every SIX months. If it is used for light service, drain the oil approximately every TWELVE months. If the fluid system is automatically filtered and periodically tested, the oil may sometimes be retained in service for several years, especially if the oil temperature remains below 120°F.

FILTERS

Micronic type oil filters are available from The Oilgear Company and their effectiveness in reducing

the frequency of changing oil and in prolonging the life of the Oilgear equipment makes their use a marked economy.

HOT WEATHER

During hot weather be sure the oil does not exceed the high temperature limit as shown in the chart. The table is based on the temperature at the pump intake. This is frequently 20°F or more above the temperature of the oil in the reservoir. If a reservoir thermometer is used proper allowance should be made for this difference. The maximum temperature of oil in reservoir should usually not exceed 160°F.

GENERAL RECOMMENDATIONS

Ordinarily, use the heavier oil listed in chart unless the weather is frequently too cold for convenient starting of drives.

RECOMMENDATIONS FOR STORAGE OF OILGEAR UNITS

INTERNAL PROTECTION

Before shutting down an Oilgear drive for an extensive storage period be sure that the unit has operated for at least several hours with a RUST PREVENTIVE HYDRAULIC OIL.

While the rust preventive additive produces its full effect after 20 minutes of submersion in the oil at the operating temperature, there are parts of the drive which are not submerged and it takes longer for the oil spray to reach these parts. Therefore, operation with a rust preventive hydraulic oil for longer periods such as several days or even a week before shutting down for the winter is sometimes beneficial.

1. Ordinary Conditions

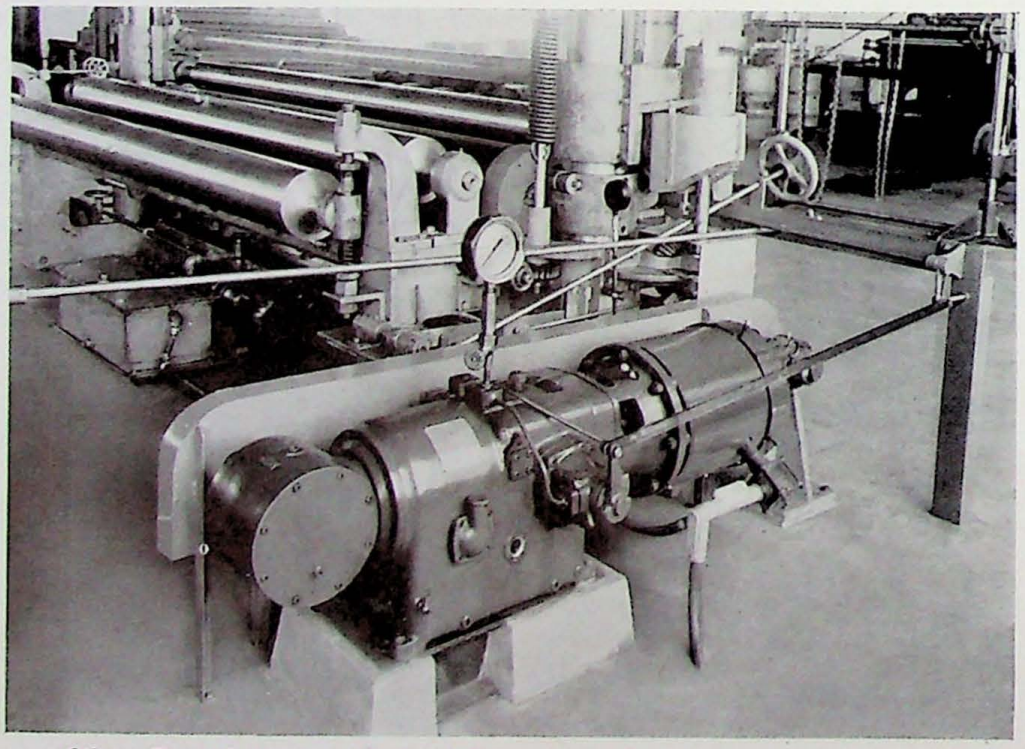
If the Oilgear drive regularly uses a hydraulic oil which contains a rust preventive additive and if the drive is reasonably well sheltered in a dry atmosphere no additional rust preventive oil is ordinarily required for internal protection.

2. Severe Conditions

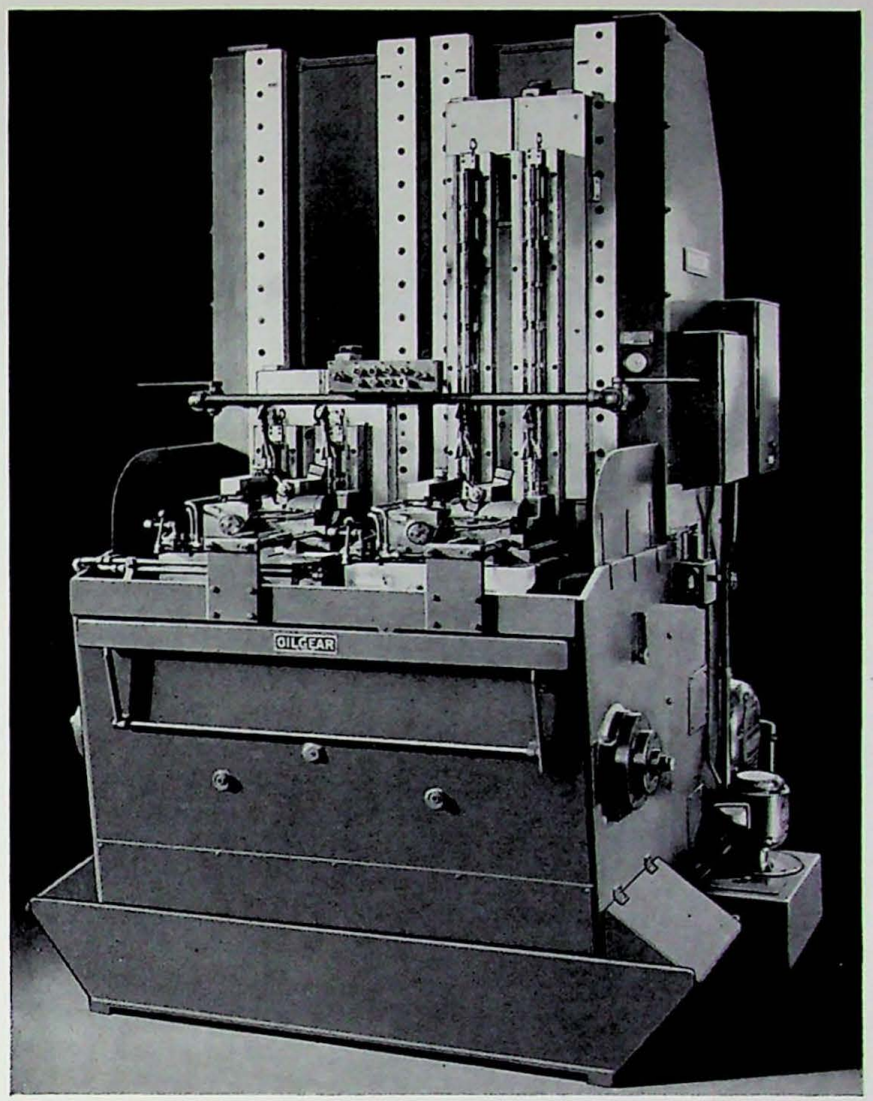
If the drive is to be stored in an exposed location or a damp atmosphere, or near the sea where salty air is prevalent, additional precautions for internal protection are desirable. Operate the unit for a period of time, as described preceding, with a hydraulic oil containing a high percentage of rust inhibitor. Leave this oil in the unit during the storage period. S/V Sova-Kote 501 and 503 are typical examples of rust preventive oils which are suitable for this purpose.

EXTERNAL PROTECTION

Be sure that chains, all bearings and couplings are well lubricated or covered with a protective grease.



Oilgear Type "DHC" Variable Speed Transmission on a Slitter and Rewinder Drive



Oilgear Double-Slide Vertical Surface Broaching Machine with Type "DX" Pump

Remove breathers if any are installed, and replace with pipe plugs. Breathers may be located on tops of units or reservoirs.

Make sure that the drive is well protected from ice, rain and snow.

RESUMING OPERATION

1. Before starting the drive after the storage period, inspect a sample of the oil for rust. If any evidence of rust is found, it is advisable to have the Oilgear units disassembled and cleaned before running.

2. If there is no evidence of water being present, operate the unit for about 20 minutes or long enough to cause a thorough agitation of the oil and drain off a small sample in a glass container and let it settle in a warm place for about 12 hours. Then look for water in the bottom of the container. If water is present drain the oil and wipe out the reservoir. If no water is present and the unit is reasonably clean internally, normal operation can be resumed.

3. If a heavily inhibited oil has been put in the unit as described previously under "severe conditions", it should be removed after about a week of operation and replaced with a conventional type of hydraulic oil. It is not necessary to drain all of the heavily inhibited oil out of the system because it mixes well with other oils and small quantities of it are often beneficial.

The S/V Sova-Kotes are not recommended by their manufacturer for continuous duty, but have been used by The Oilgear Company in many installations for periods of several thousand hours without any noticeably detrimental effects.

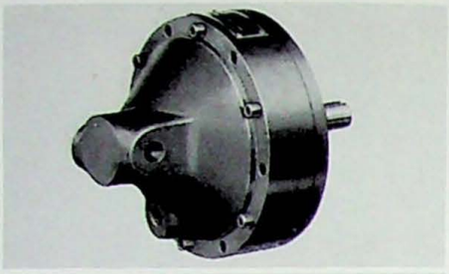
OILGEAR Fluid Power COMPONENTS

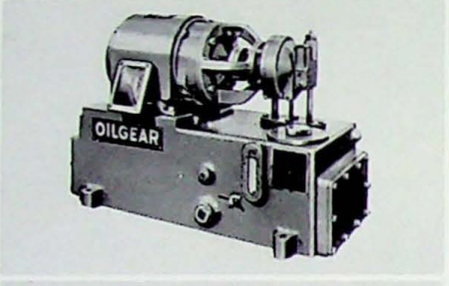
Representative current and old style Oilgear pumps, motors and transmissions, referred to in column one of chart on page 4, are shown in the following illustrations. All of the controls and other standard attachments available on the various basic models are not shown.

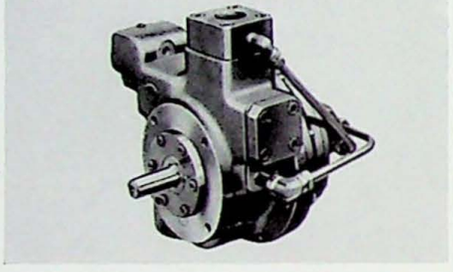
When the Oilgear filling instruction and type designation name plates are not visible, and the first letter of the type designation is not known, use these illustrations to assist you in identifying the first letters of your components. The approximate hp rating of the Oilgear component can usually be estimated from the input power drive. Where large Oilgear pumps or motors are involved the approximate hp rating should be obtained from the name plate on the unit.

TYPE "A" UNITS

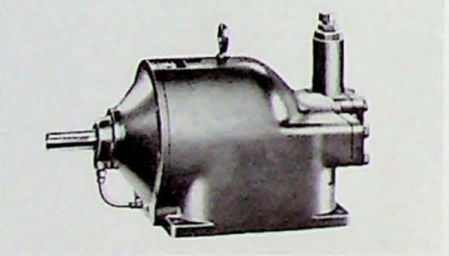
TYPE "B" UNITS

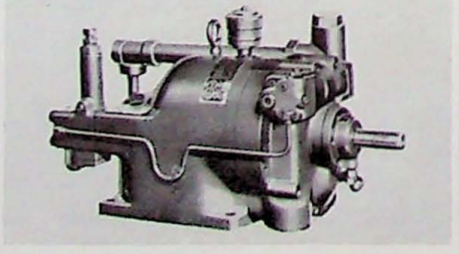


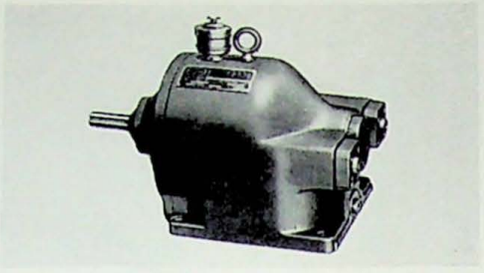




TYPE "C" UNITS







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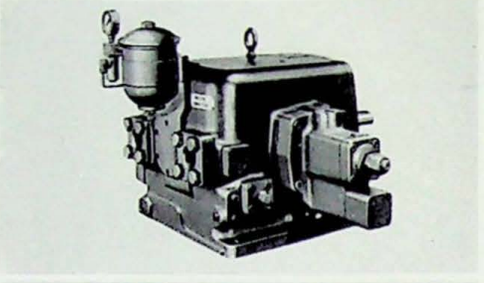
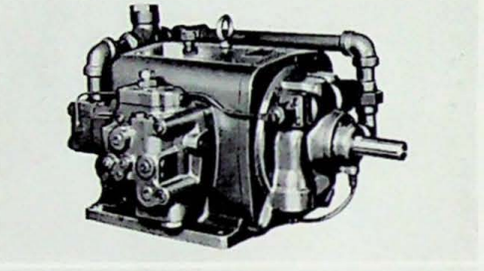
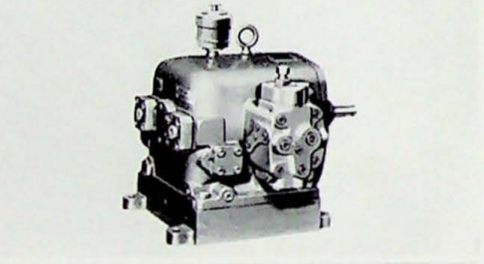
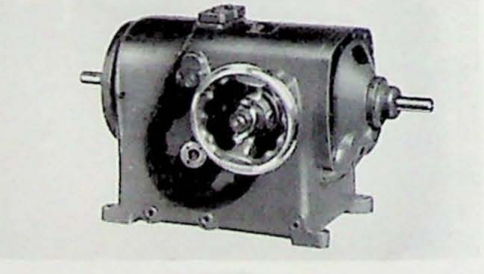
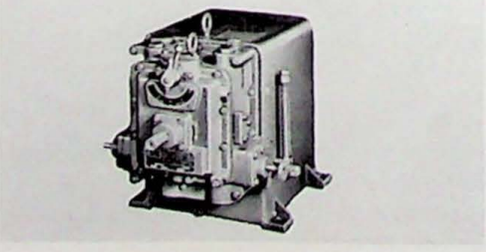




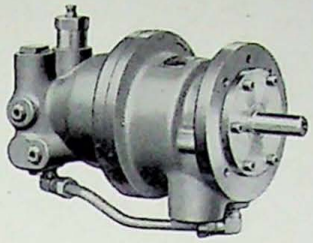




TYPE "F" UNITS



TYPE "H" UNITS



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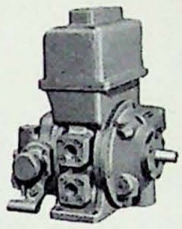

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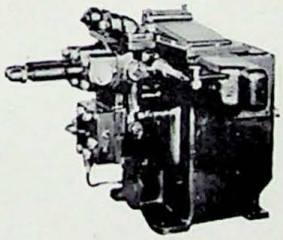

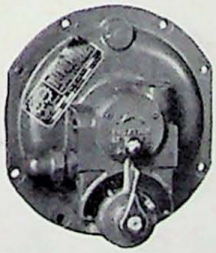

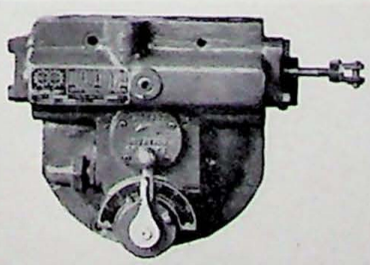

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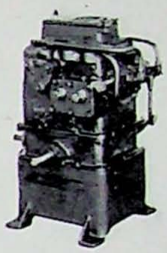

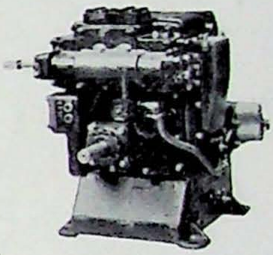

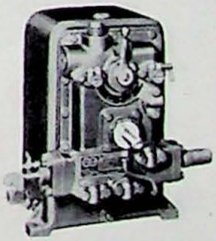

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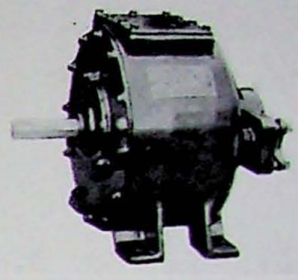
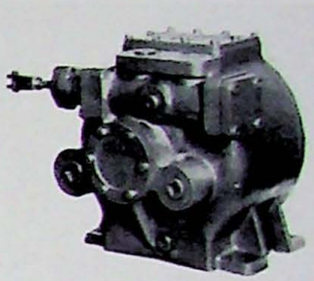
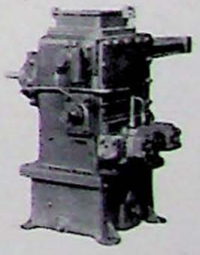




TYPE "W" UNITS

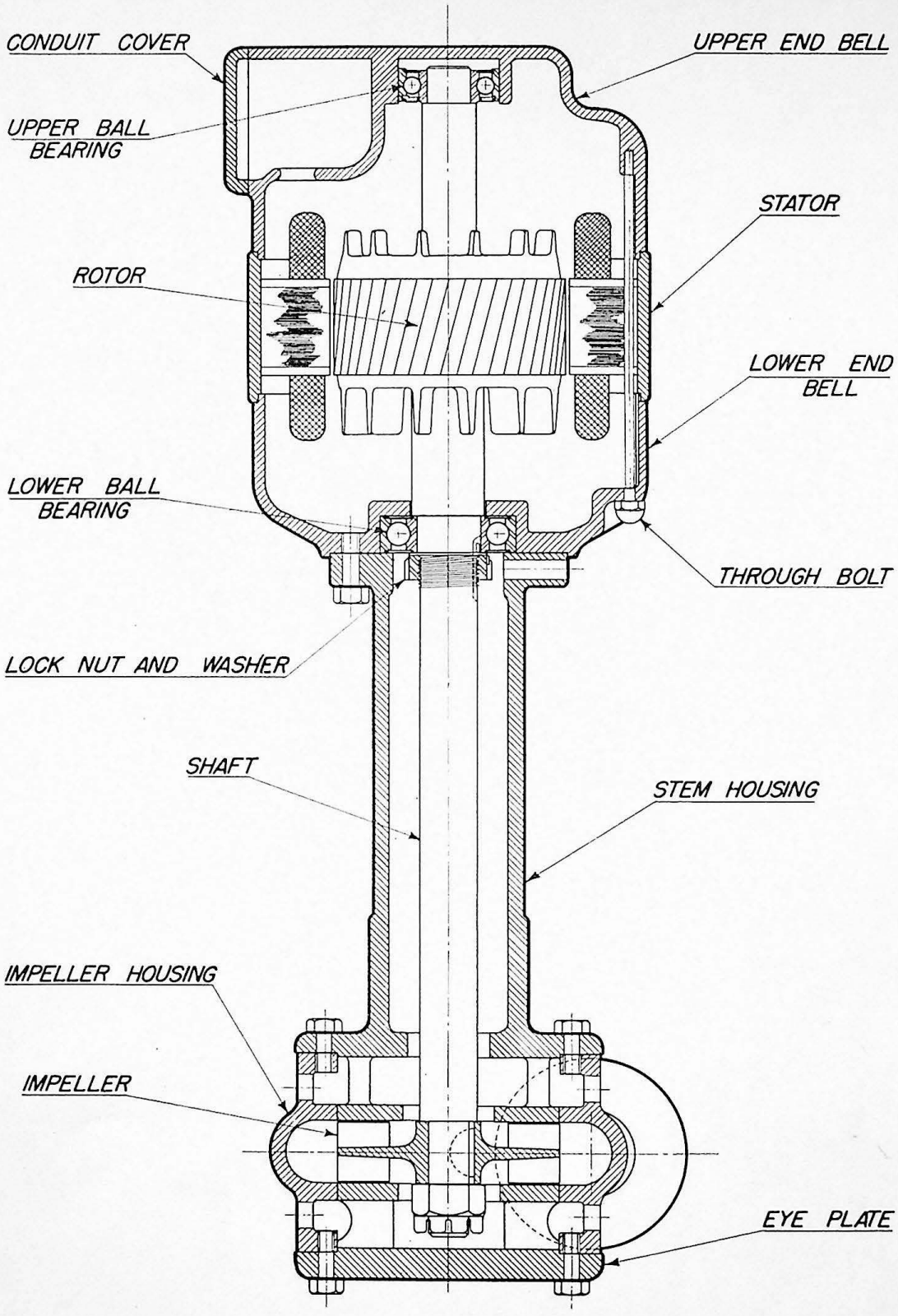


OIL SELECTION and MAINTENANCE RECOMMENDATIONS

THE OILGEAR COMPANY
1560 Pierce Street
Milwaukee 4, Wisconsin, U.S.A.

— District Field Offices —
Elizabeth, New Jersey; Cleveland, Ohio; Detroit, Michigan; Los Angeles, California; Beaverton, Oregon

31-Printed in U.S.A.



TYPICAL CROSS SECTION GUSHER COOLANT PUMP.

THE RUTHMAN MACHINERY CO.
CINCINNATI 2, OHIO.

Service Instructions

For systems with lubricators type "HIA" & "JIA"

BIJUR automatic lubricating system

Your machine is protected by a built-in Bijur central lubricating system —by CORRECT lubrication of all bearings served, it assures smooth operation of your machine for years, if properly maintained.

The Bijur system consists of three basic elements: (1) a **lubricator** (pump) which periodically forces a measured volume of oil into (2) a single **line of distribution tubing** branched to supply oil to the bearing surfaces through (3) **Meter-Units** which proportion the correct oil film to each bearing.

OIL: Use only non-compounded clean mineral oil of type and viscosity recommended by machine manufacturer.

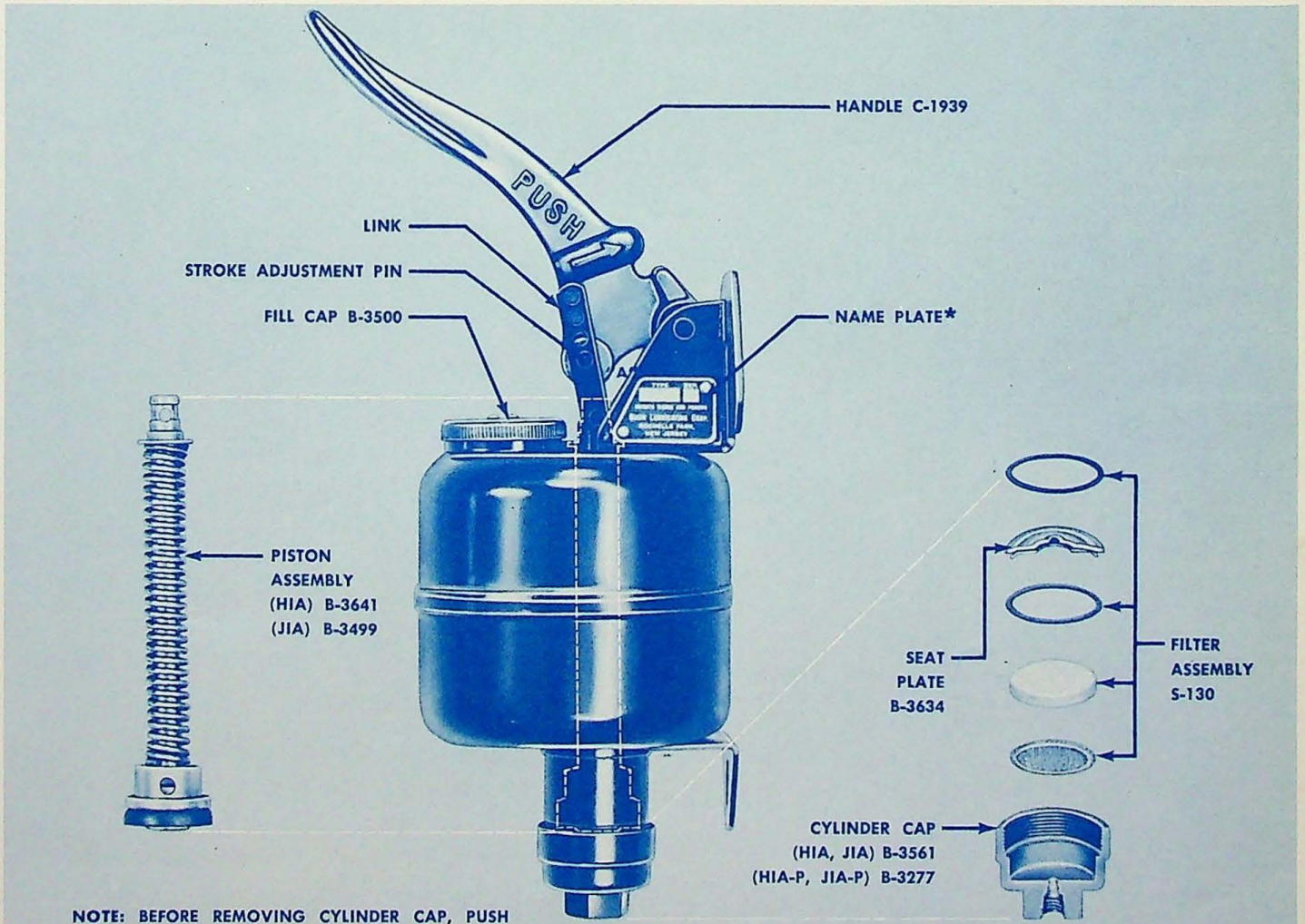
OPERATION: This One-Shot lubricating system is pre-set by the machine manufacturer for best operation. Lubricator Type HIA is a spring discharge piston pump in a 1 pint reservoir. Type JIA is similar, but with a 2 pint reservoir. Pushing up on the handle against the stop fills the cylinder with a predetermined volume of oil. Spring pressure discharges the oil into the distribution system automatically, and returns the handle to the original position. Lubricator must be operated at intervals recommended by machine manufacturer.

STARTING A NEW MACHINE: Fill reservoir; operate lubricator until oil shows freely at all bearings.

MAINTENANCE: Check oil level daily and refill reservoir when required. **Replace filter assembly annually.** Check system periodically for loose or broken tubing, worn hoses, loose fittings and connections.

SERVICE: Too little oil at all bearings — check for low oil level (handle snaps back if reservoir is empty), broken or cracked tubes, loose connections, flattened lubricator outlet tube, clogged filter, or worn piston leather. If all are satisfactory and machine is running at operating temperature, increase oil feed. Relocate stroke adjustment pin in next lower holes of links. Run machine and check all bearing points thoroughly before further adjustment. **Too much oil at all bearings** — after full run-in period of machine, reduce oil discharge by relocating stroke adjustment pin in next higher holes of links. For **too little** or **too much** oil at **one bearing,** see other side.

SERVICE PARTS: Order by **Part Number** and **Name** shown below —you **must** also specify **complete** lubricator **Type** symbol and **Serial** letters shown on Name Plate*. Example: "S-130 Filter Assembly for Lubricator Type HIA Ser. LF." If a new lubricator is required for replacement, order by **Type** symbol and **Serial** letters shown on Name Plate*. For major repairs requiring parts not numbered below, return lubricator for factory rebuilding and adjustment. Prompt shipment can be made on parts and lubricators.



IMPORTANT: REPLACE FILTER ASSEMBLY ONCE A YEAR

OC

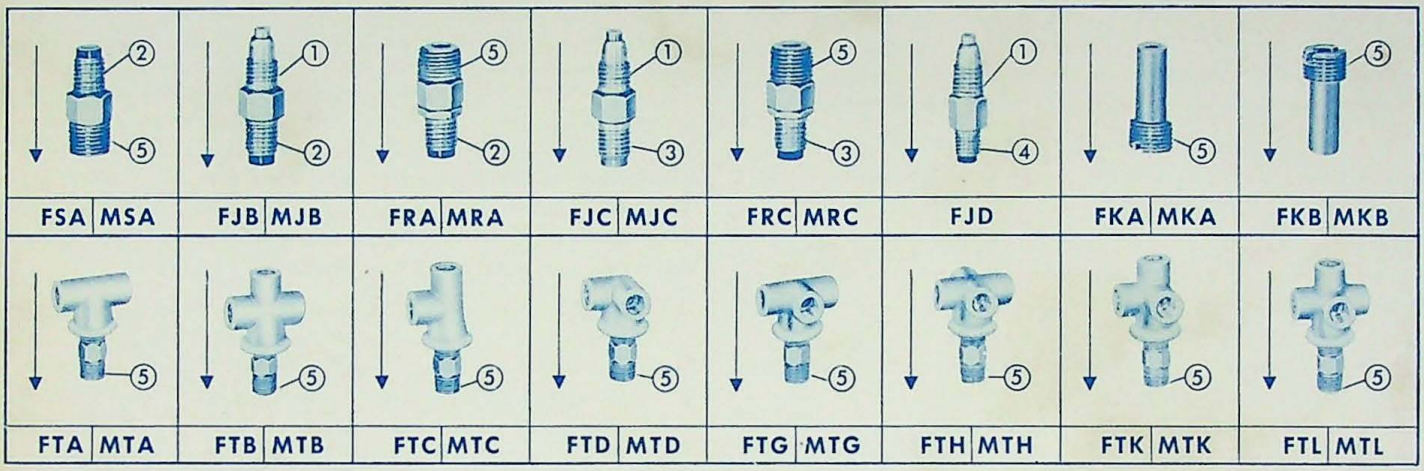
Service Instructions • BIJUR Automatic Lubricating System

SERVICE *(Meter-Units)*

If **one bearing** receives **too much oil,** remove Meter-Unit and replace with one of same type but next **lower** Flow Rate Number. For **too little oil** at **one bearing,** replace Meter-Unit with one of same Type but next **higher** Flow Rate Number. Each increase in Flow Rate Number **doubles** oil feed. Don't attempt to adjust, disassemble, blow through or drill out Meter-Units.

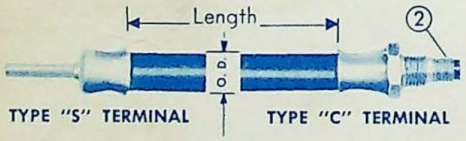
SERVICE PARTS *(Meter-Units)*

Type (FSA, MTB, etc.), Flow Rate Number (00,0,1,2,3,4 or 5) and flow direction arrow are stamped on body of Meter-Units. Before ordering, check against illustrations below. **F and M Types are not interchangeable.** (Arrows show direction of flow.) Also check threads if necessary (see "thread notes" at bottom of page). Specify fully **Name, Type** and **Flow Rate Number** required. Example: "Meter-Unit FSA-2."



SERVICE PARTS *(Distribution System)*

FLEXIBLE HOSE—Available with 5/32 tube terminals both ends (Type SS), 5/16-24 thread both ends (Type CC), or one of each (Type SC). Measure flexible length between terminals, and order from table below. Specify **Name** and **Part No.** Example: "Flexible Hose, B-4863."



LENGTH (INCHES)	Type SS		Type CC	Type SC
	5/16"O.D.	7/16"O.D.	7/16"O.D.	7/16"O.D.
4	B-4514	—	—	—
5	B-4515	B-2962	B-4873	B-4857
6	B-4516	B-3134	B-4874	B-4858
7	B-4517	B-2963	B-4875	B-4859
8	B-4518	B-3433	B-4876	B-4860
9	B-4519	B-2542	B-4877	B-4861
10	B-4520	B-3145	B-4878	B-4862
12	B-4588	B-3135	B-4879	B-4863
14	B-4589	B-3530	B-4880	B-4864
16	—	B-3531	B-4881	B-4865
18	—	B-3137	B-4882	B-4866
20	—	B-3532	B-4883	B-4867
22	—	B-3528	B-4884	B-4868
24	—	B-3508	B-4885	B-4869
27	—	B-3533	B-4886	B-4870
30	—	B-3534	B-4887	B-4871
33	—	B-3735	B-4888	B-4872

TUBING—Available in 12 foot lengths **only.** Check outside diameter, material and wall thickness. Order by **Name** and **Part No.** Example: "Tubing, 5B25."

MATERIAL	5/32" O.D.				3/32" O.D.	
	Brass	Copper	Copper	Steel	Copper	Steel
WALL	.025	.025	.055	.020	.022	.020
PART NO.	5B25	5C25	5C55	5S20	3C22	3S20

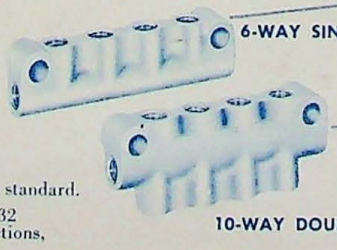
COMPRESSION FITTINGS—Check tubing O.D. and thread and hex on nuts and bushings. See "thread notes" at bottom of page. Sleeves of proper tubing size are required for all connections. Order by **Name** and **Part No.** Example: "Bushing, B-3783."

Item	Tube O.D.	Hex	Thread Note	Part No.
NUT	5/32	3/8	②	B-1095
	3/32	3/8	③	B-3312
	3/32	5/16	④	B-3610
BUSHING	5/32	3/8	②	B-1371
	5/32	5/16	②	B-3783
SLEEVE	5/32	—	—	B-1061
	3/32	—	—	B-3313

JUNCTIONS — Check number of tapped holes—identify in tables from illustrations and number of **mounting** holes (untapped). All "**One Mounting Hole**" types shown. Typical examples of "**Two Mounting Holes**" types — both "Single" and "Double" are shown. Order by **Name** and **Part No.** Example: "Junction, B-3265."

One Mounting Hole				
TYPE	2-Way	3-Way	3-Way	4-Way
PART NO.	B-3288	B-3065	B-1092	B-4231

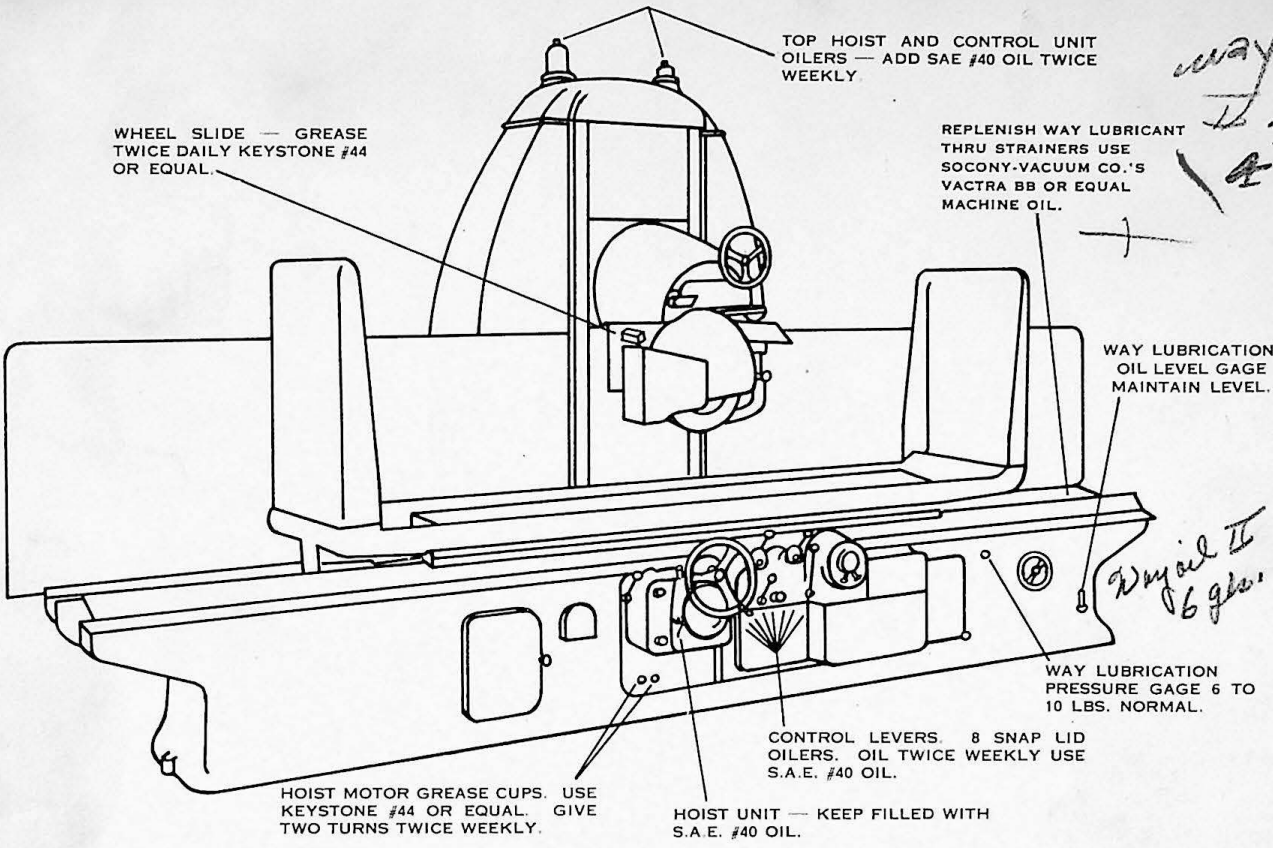
	TYPE	SINGLE	DOUBLE
Two Mounting Holes	4-Way	B-3262	—
	5-Way	B-3263	—
	6-Way	B-3264	B-3109
	7-Way	B-3289	—
	8-Way	B-3265	B-3253
	9-Way	B-4508	—
	10-Way	B-3704	B-3254
	12-Way	B-3471	B-3249
	14-Way	—	B-4020
	16-Way	—	B-4025

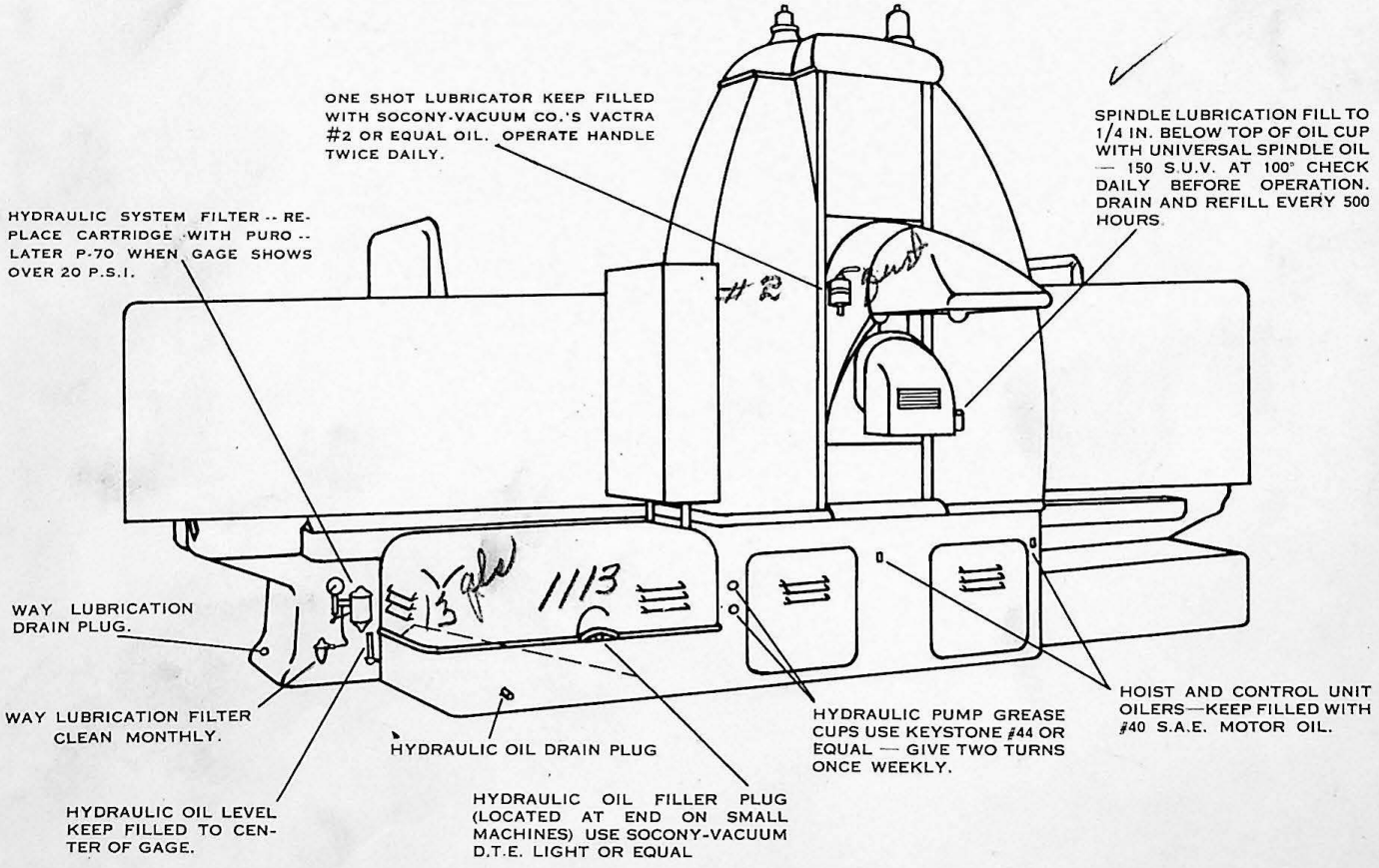


THREAD NOTES — All unnumbered tapped holes 5/16-24 Bijur standard.

① 5/16-24 for Bijur tapped holes only.
② 5/16-24 for 5/32 tubing connections.
③ 5/16-24 for 3/32 tubing connections,
④ 1/4-28 for 3/32 tubing connections,
⑤ 1/8 pipe thread.

MATTISON SURFACE GRINDER





MATTISON MACHINE WORKS, ROCKFORD, ILLINOIS, U. S. A.

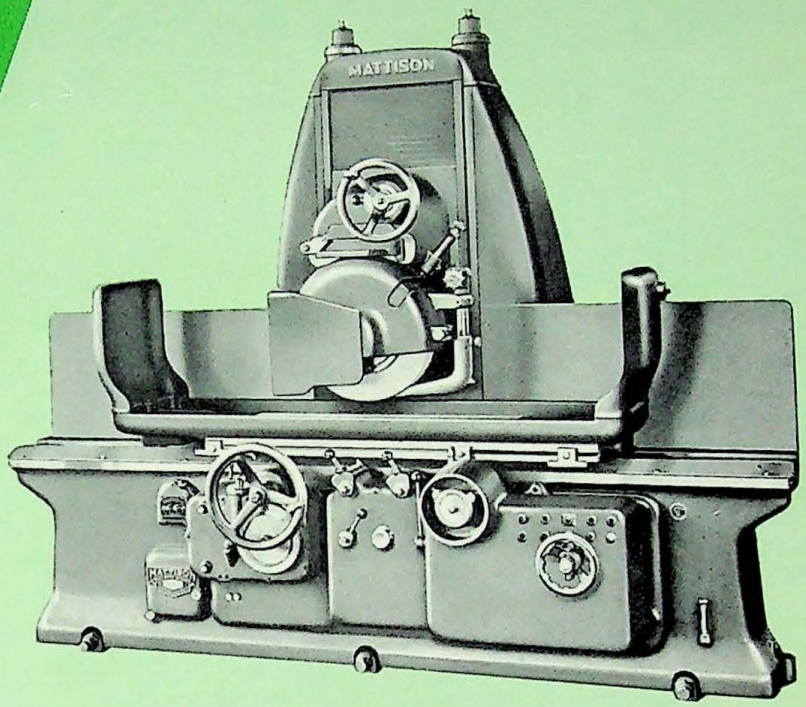
MATTISON

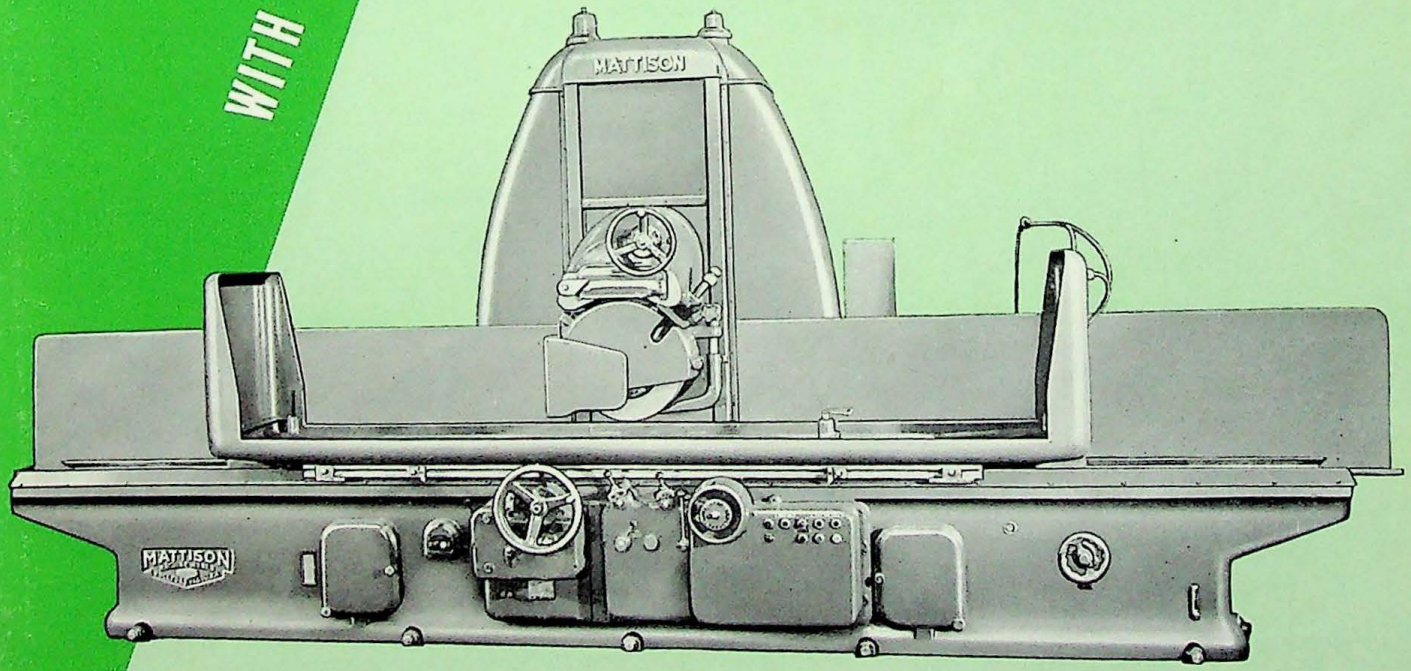
HIGH POWERED

PRECISION SURFACE GRINDERS

All Sizes

WITH Hydraulic FEEDS





MATTISON MACHINE WORKS · *Rockford, Illinois, U. S. A.*

MATTISON GRINDERS

HIGH POWERED PRECISION SURFACE GRINDERS

SINCE its innovation, the Mattison High-Powered Precision Surface Grinder has proven to be a great cost-reducing machine tool. In addition to profitably handling regular flat work, the high power, wide range, large capacity and ruggedness of construction permit handling of unusual grinding work at a great saving in time over other methods, producing a fine finish with extreme accuracy. For example: Large size castings are easily handled which allow grinding of surfaces previously hand scraped. V-type and flat ways, as well as contour work, can be ground by a wheel that has been dressed to an angle or radius. Shoulder and edge work can be easily ground because of wheel clearance and spindle construction. In many cases multiple punching dies can be resurfaced without removing leader pins. Interrupted surfaces are held to closer limits of accuracy due to rigid spindle mounting. Bronze, lead and various types of metal can also be ground.

Here is a versatile machine with advanced and practical principles of design which provide precision grinding results on a high production basis. Our confidence in being able to provide savings for you is based on performance records which are constantly being reported from actual installations.

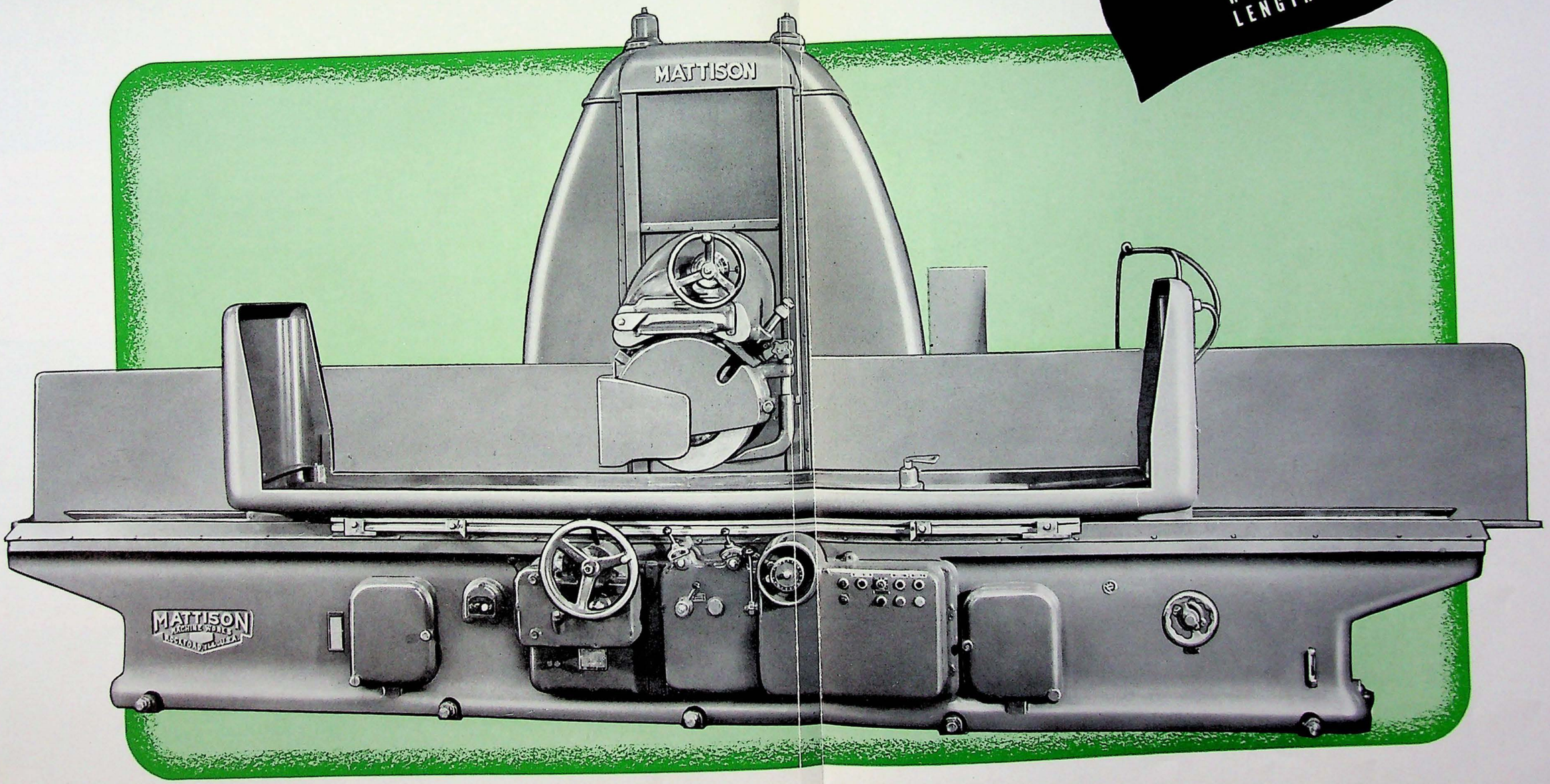
MATTISON MACHINE WORKS · *Rockford, Ill., U. S. A.*

MATTISON GRINDERS

LARGE MACHINE

Table Sizes

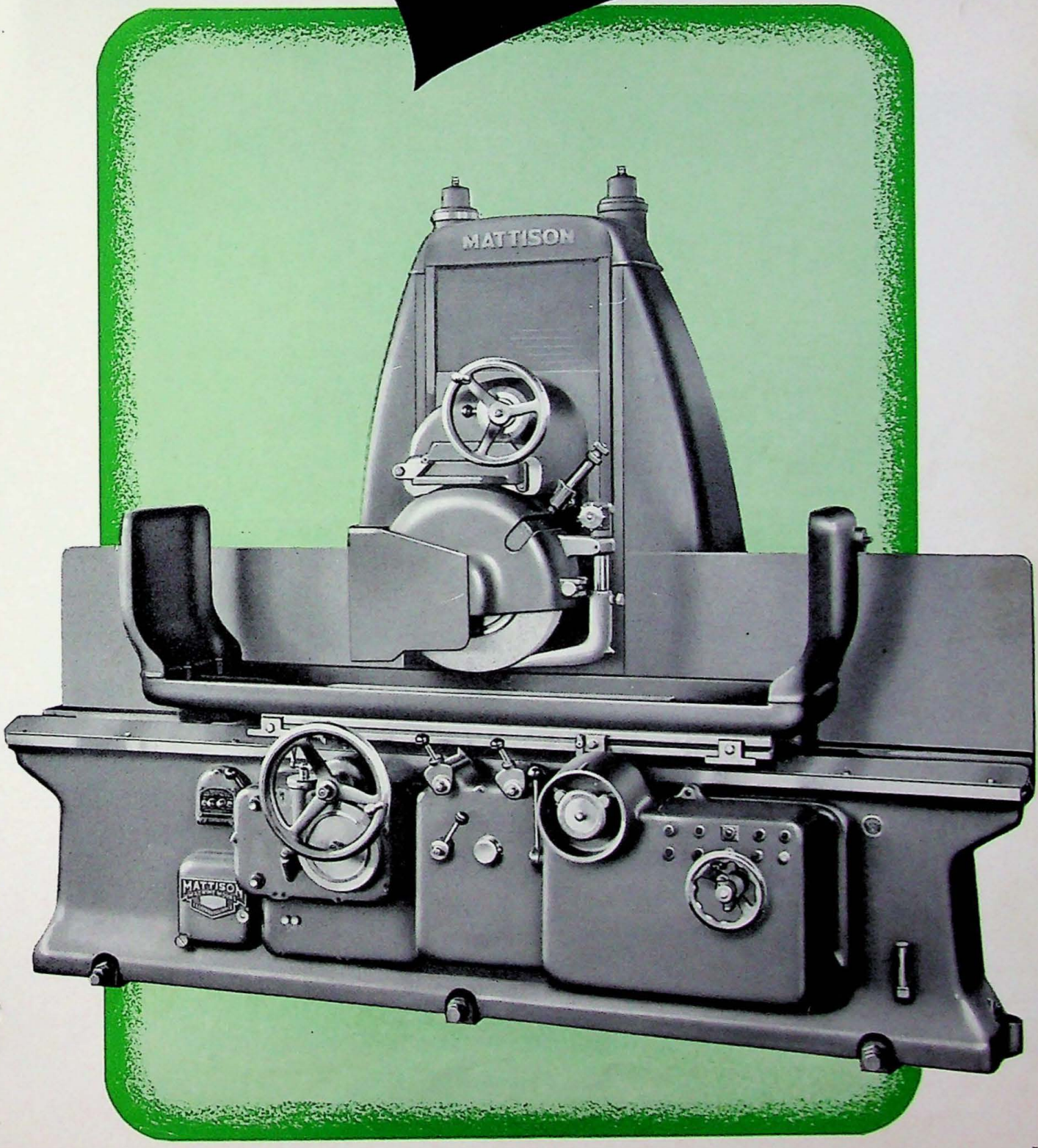
WIDTH 16" TO 36"
LENGTH 72" TO 192"



MATTISON GRINDERS

SMALL MACHINE *Table Sizes*

WIDTH 12" and 14"
LENGTH 36" to TO 72"



MATTISON GRINDERS

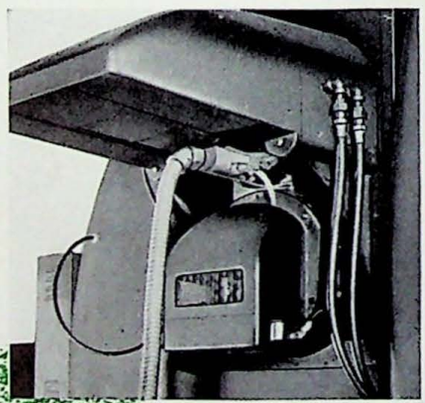
Sturdy Double Column Support AND Massive Base Construction

INSURE • • •

GREATLY increased production, together with marked savings in grinding cost, are direct results of the generous size and sturdy construction of this Mattison High-Powered Precision Surface Grinder. It is capable of hogging off stock where this is required; and, at the same time, maintaining close limits of accuracy and providing a fine finish under continuous high production.

We operate our own foundry and carefully control the metal used in castings. Alloys are employed to insure high strength, stiffness, and clean, close-grained, wear-resisting structure.

The extra heavy base is cast as a single unit, is of rigid design and is heavily braced with substantial cross girths. This provides a solid foundation free from bending and deflecting stresses and insures permanent accuracy under heavy-duty continuous-grinding service. The front part of base supports the table on a wide surface



The above picture shows the method of guarding the column ways and wheel slide ways.

MATTISON GRINDERS

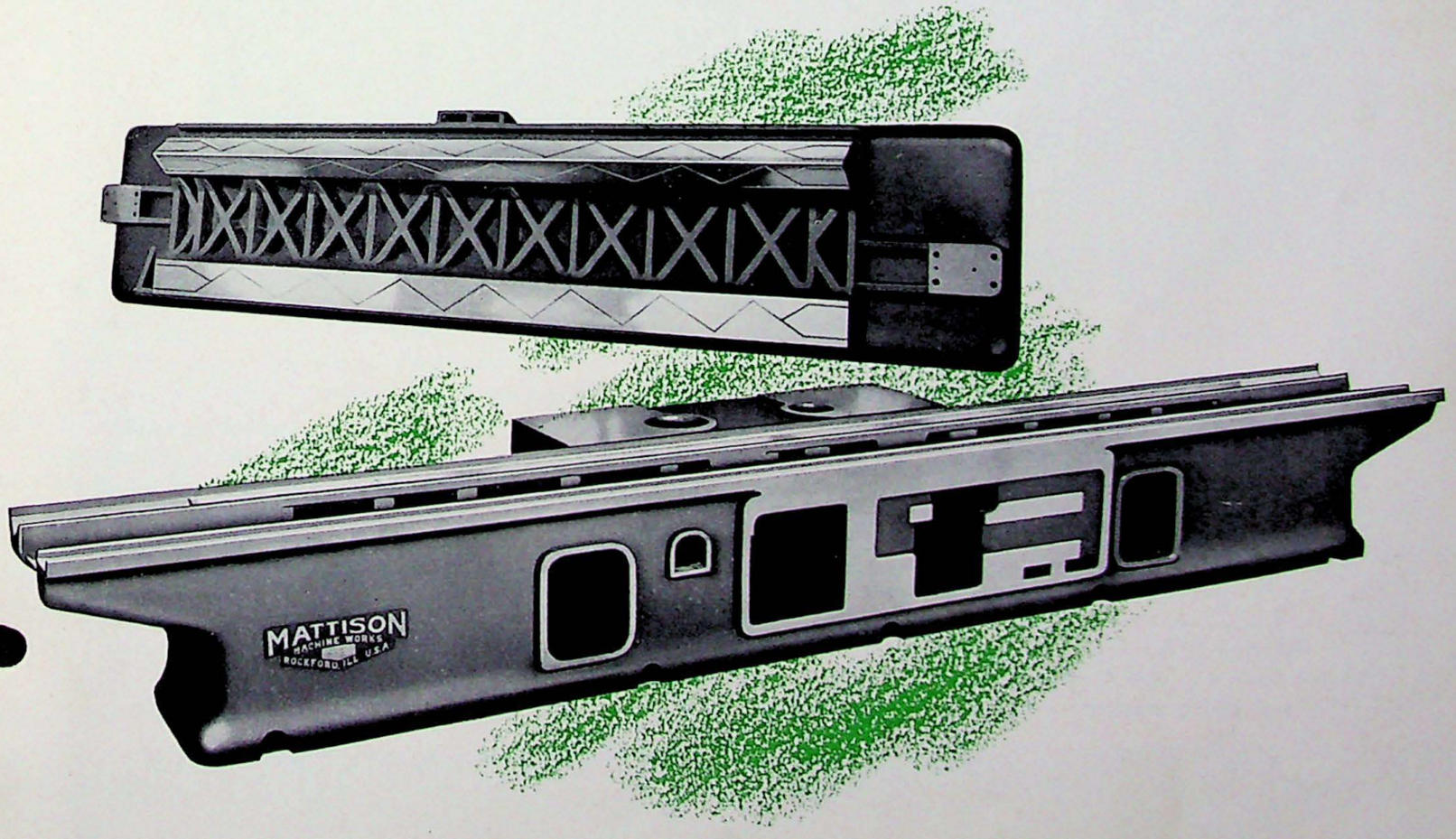
MAXIMUM RIGIDITY *for* WHEEL SLIDE ASSEMBLY RAPID STOCK REMOVAL • FINE FINISH CLOSE LIMITS *of* ACCURACY

Vee and flat way. As you will notice from the picture, the table casting is also well ribbed and of substantial construction to eliminate any chance of distortion even when handling heavy castings such as beds, slides, etc.

Mattison Grinders are well known for their sturdy, double-column support. Massive column castings rigidly bolted and doweled to the rear part of base casting and reinforced at top by heavy connecting brace make the column support unit an integral part of the base.

These columns, with wide bearing surfaces on the inside face and dovetail bearing surfaces on the front and back of each column, provide an eight-surface support for wheel slide assembly.

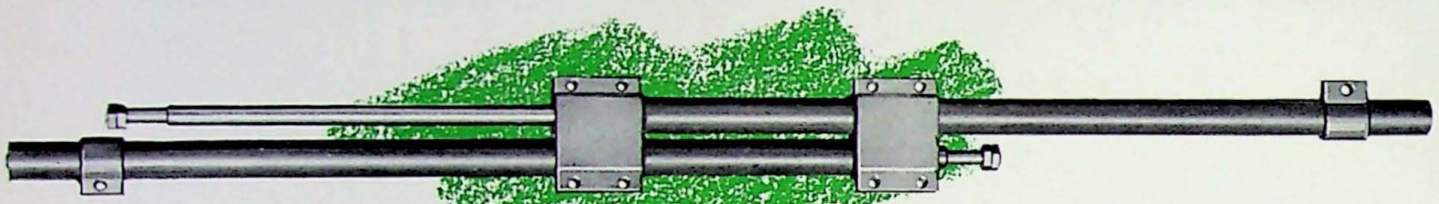
With this unusual stability so prevalent throughout the Mattison Surface Grinder, you can be certain of dependable performance, rapid stock removal, close limits of accuracy and fine finish on small, as well as large, pieces of work.



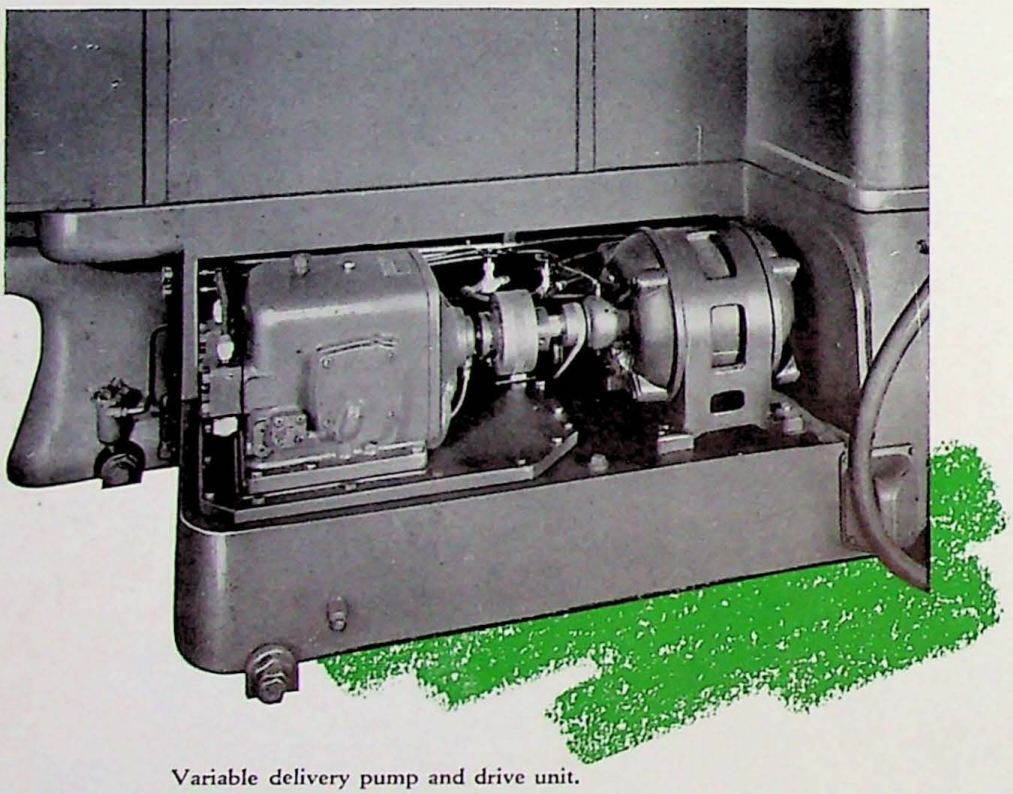
MATTISON GRINDERS

Hydraulic Drive

FOR TABLE AND WHEEL TRAVERSE



Twin cylinder provides positive longitudinal table travel and smooth, cushioned reversal.



Variable delivery pump and drive unit.

THE table on the Mattison High-Powered Precision Surface Grinder is driven by a non-differential twin cylinder hydraulic drive providing equal speed in each direction of movement, fully cushioned smooth reversal, positive longitudinal travel of table and variable table speeds up to 100 feet or more per minute.

It simplifies construction, applies power direct, and prevents chatter. It is easily controlled, exceptionally durable and highly efficient.

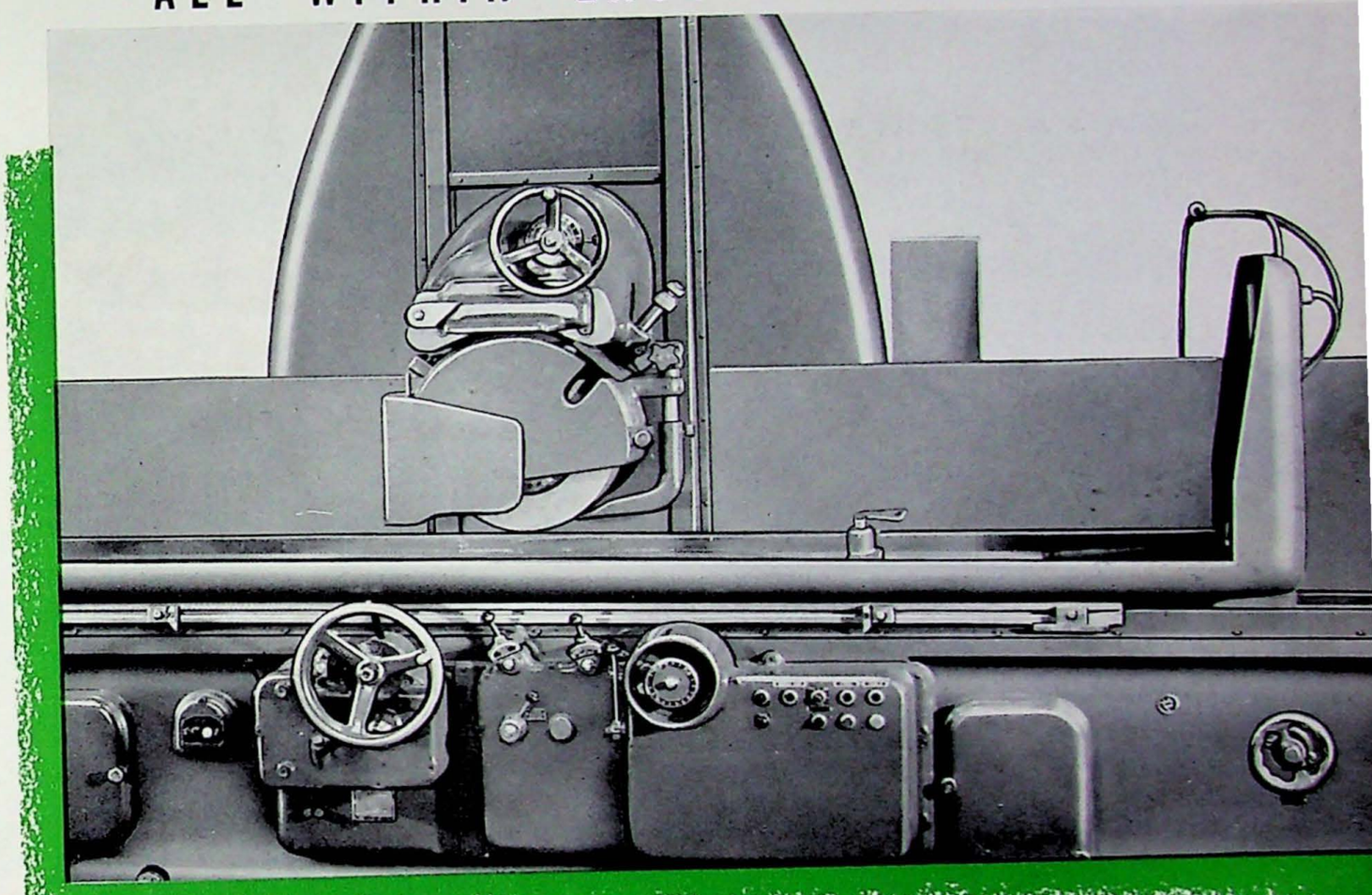
The transverse feed of the wheel is also hydraulically operated. Its movement is entirely automatic when grinding. Feed is variable up to width of wheel at each reversal of table and can be easily adjusted to any desired amount between minimum and maximum.

The many basic advantages of hydraulic drive together with substantial construction and high power of the Mattison Surface Grinder combine to reduce costs, increase production, provide accuracy, fine finish and rapid stock removal in a manner that will surprise you.

MATTISON GRINDERS

Time Saving Operating Controls

ALL WITHIN EASY REACH



OPERATING and adjusting levers, hand wheels and electric push buttons are closely concentrated on the front of the machine, all within convenient reach of the operator.

Power may be used for raising and lowering grinding wheel, with hand-wheel control for final adjustment. After the wheel has been spotted above the work, a large adjustable dial under hand wheel, graduated in thousandths, permits operator to judge stock removal on rough work where limits are not so close. Work can be ground to very close limits of accuracy by means of a small vernier dial with graduation in tenths of thousandths.

The automatic reversing of the wheel slide transverse is accomplished by two dogs on a circular disc, easily adjustable and located on front of base within easy reach of operator.

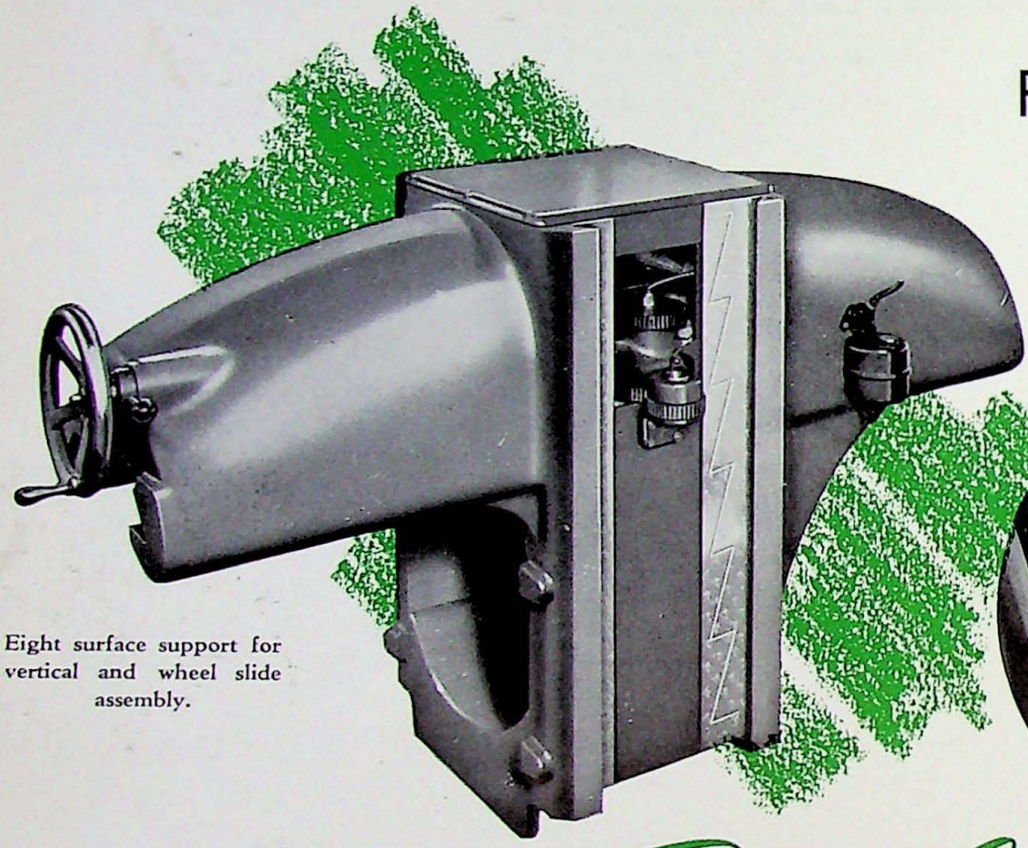
Extent of table travel is controlled by means of conveniently located, adjustable sliding dogs on front edge of table. The starting and stopping of the table is by means of lever located in front of machine within easy reach of operator. Speed which varies up to 100 feet per minute or more is controlled by hand wheel. Any reduction is accompanied by a proportionate decrease in power required for hydraulic pump.

The simplicity and convenience of these controls make it easier for your operator to run the Mattison High-Powered Precision Surface Grinder and easier for you to obtain a quick return on your investment.

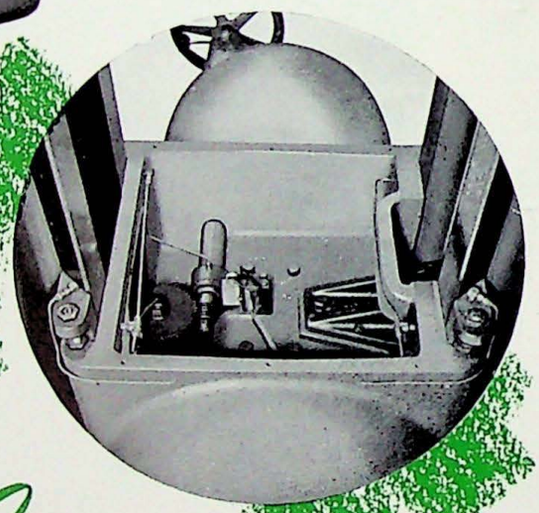
MATTISON GRINDERS

Stability AND Direct Power Drive

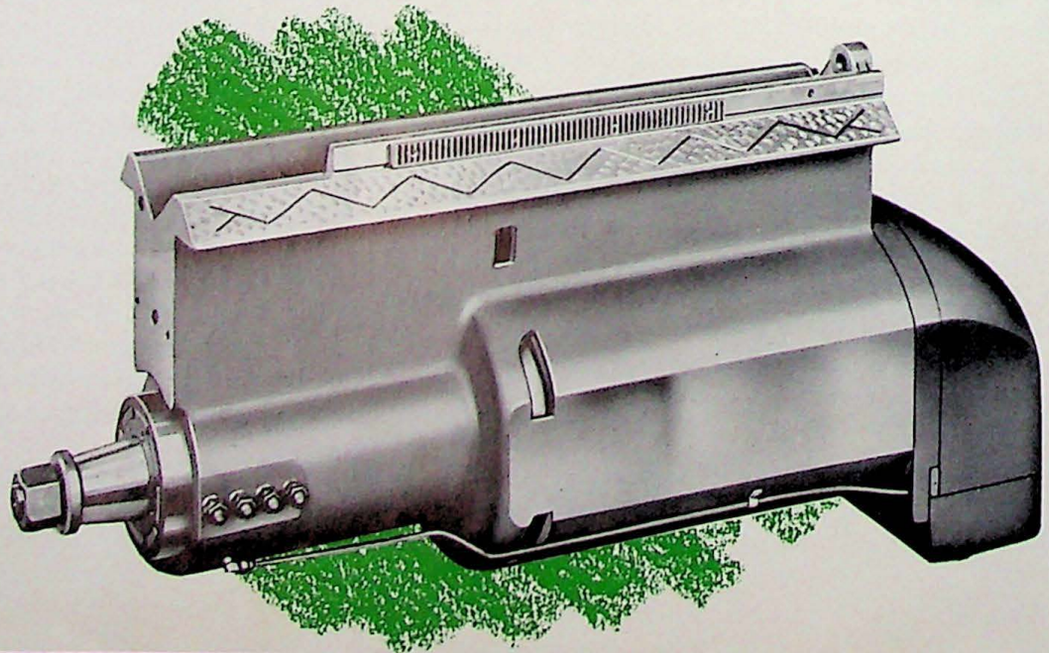
PROVIDE • • •



Eight surface support for vertical and wheel slide assembly.



Powerful, Built-In MOTOR CONSTRUCTION



Pressure lubrication system for spindle. Rotor dynamically and electrically balanced.

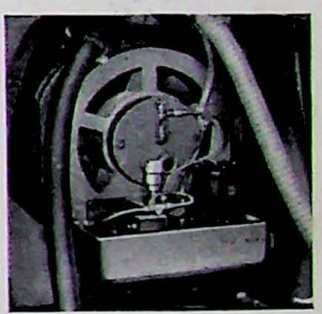
MATTISON GRINDERS

Production AND Precision

AN OUTSTANDING characteristic of the Mattison Grinder is the massive double column support for wheel slide assembly. The housing in which the grinding wheel and its motor are mounted is exceptionally heavy and is carried on large horizontal ways of the vertical slide. This assembly is in turn supported between two heavy cast columns. Wide bearing surfaces on the inside face of each column and dovetail bearing surfaces on the front and back of each column provide an eight surface support, insuring stability regardless of direction of table travel.

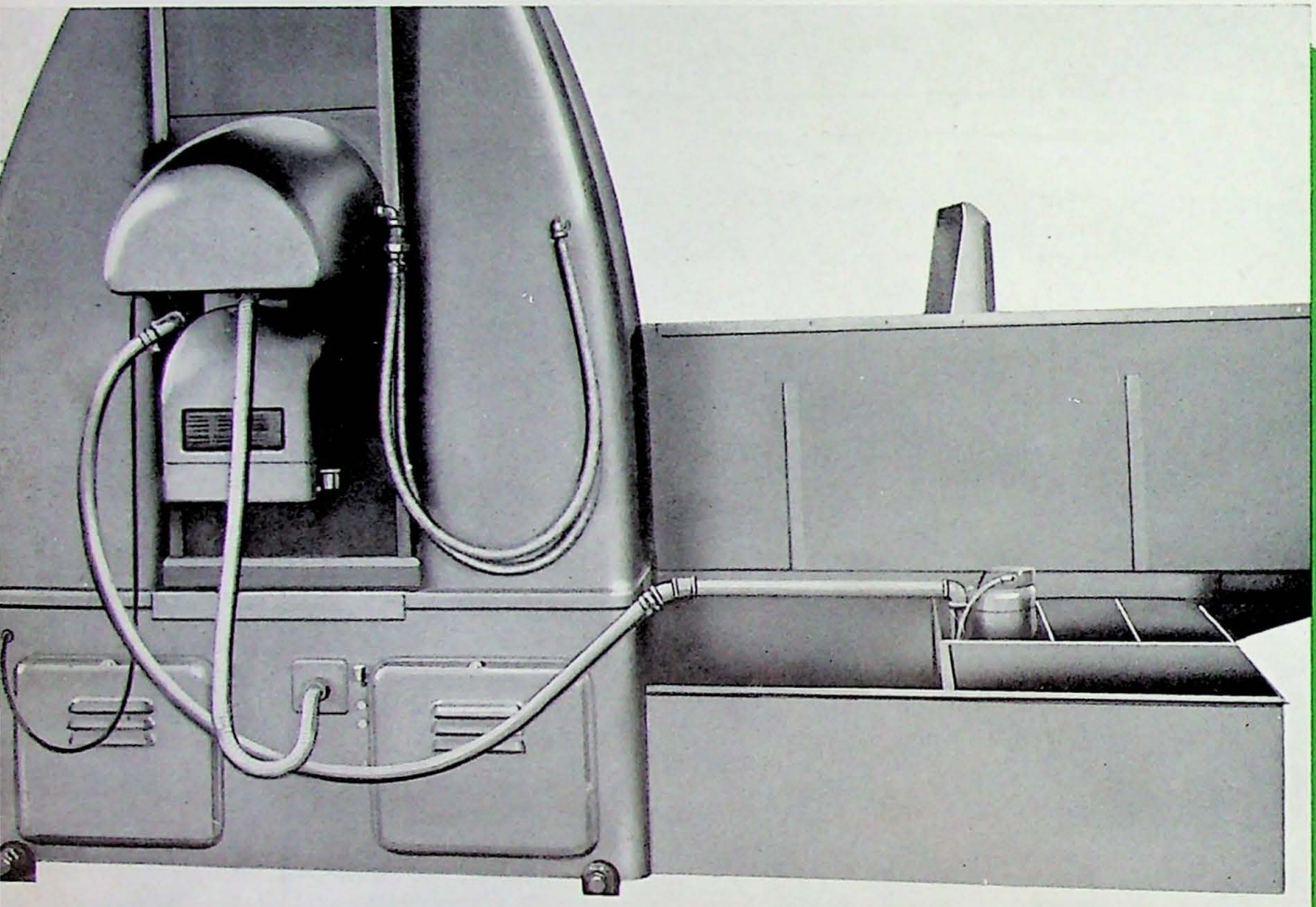
Another important characteristic of the Mattison Surface Grinder is the powerful, built-in motor construction, with the rotor being dynamically and electrically balanced and mounted directly on the wheel spindle. With this positive and direct form of drive, there is no vibration imparted to the wheel spindle. This combination of stability and direct motor drive provides users of Mattison High-Powered Surface Grinders with a machine capable of high-production and accuracy to close limits.

The Grinding Spindle lubricating system is entirely independent of the rest of the machine having its own pump, motor and oil reservoir built into rear end of housing of wheel slide. A pressure control switch provides the interlock to prevent operation of spindle without adequate lubricant pressure. The front spindle bearing is a heavy-duty, adjustable bronze, sleeve bearing oil lubricated from pressure lubrication system. The preloaded super-precision ball bearings on rear of spindle operate in a continuously circulating bath of oil also supplied by pressure system.



MATTISON GRINDERS

Coolant Pump AND Tank

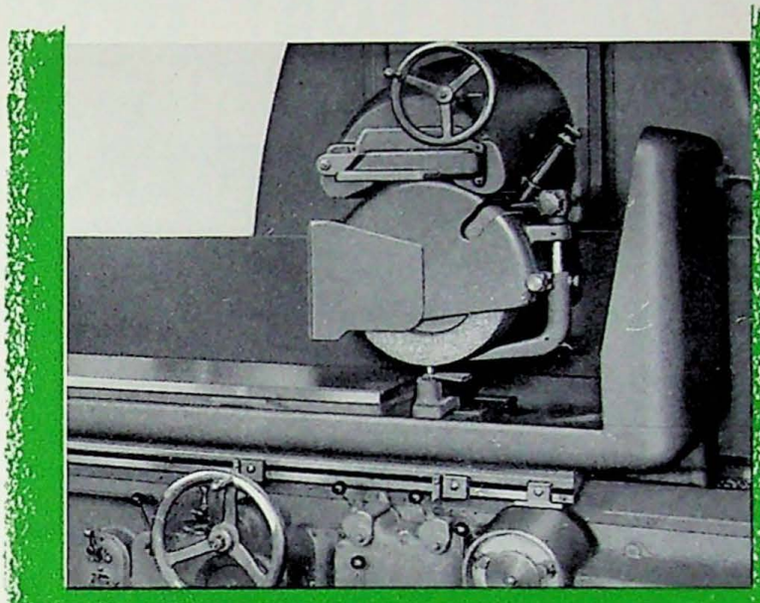


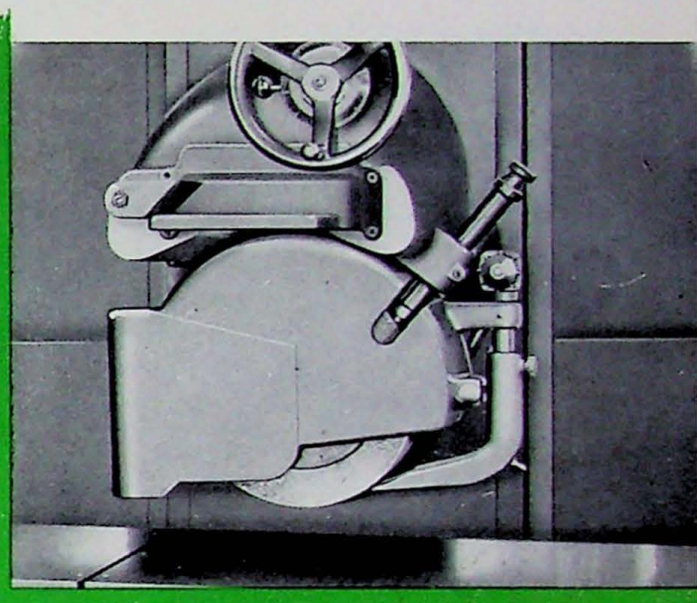
A LARGE coolant tank is furnished on the outside of the base. The pump, a heavy-duty motor-driven type supplies coolant to the point of contact, under uniform pressure and in sufficient quantity for heaviest cuts. Control of coolant flow is by means of a convenient valve located on wheel guard. A nozzle, adjustable according to the diameter of wheel, is used to direct the coolant to required position.

Coolant returns to the tank through openings in the table and base. The baffle effect of the four compartment tank serves to settle out much of the sediment carried in the coolant before reaching the pump. This provides a coolant that is relatively free from impurities which might interfere with desired grinding results.

MATTISON GRINDERS

Hydraulic Wheel Truing





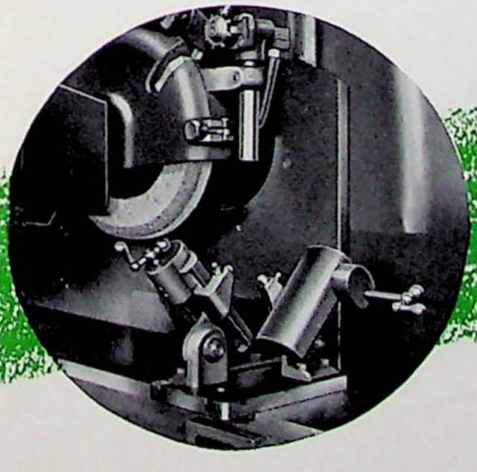
GRINDING wheels on the Mattison High-Powered Precision Surface Grinder are dressed hydraulically by movement of wheel slide. One method is shown in the illustration to the left above. Wheel can be quickly located over diamond by overtraveling reversing dog. Operation and regulation of rate of wheel cross travel can be controlled from the operator's position at front of machine. The action is smooth making it possible to obtain a fine finish and extreme accuracy.

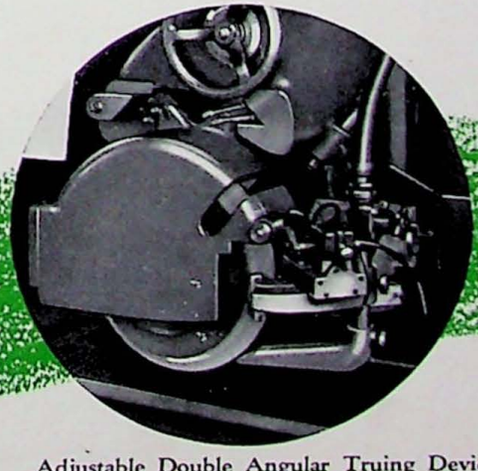
The other method, as shown in the illustration to the right above, permits quick truing of wheel regardless of position of table or work by means of truing device mounted on vertical slide.

For angle or radius work, special truing devices, as shown below, can be furnished.

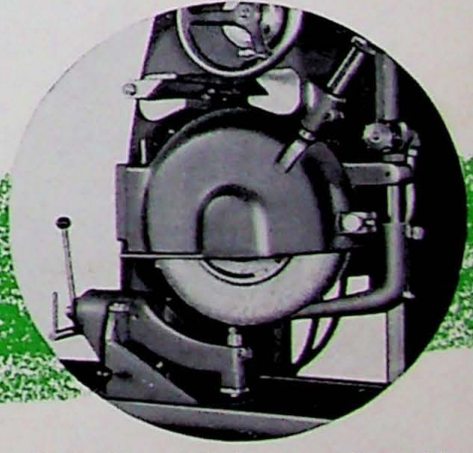
Angle AND Radius Truing Devices

Angle Truing Device mounted on table.
Adjustable to any angle.





Adjustable Double Angular Truing Device
Hydraulically Driven.

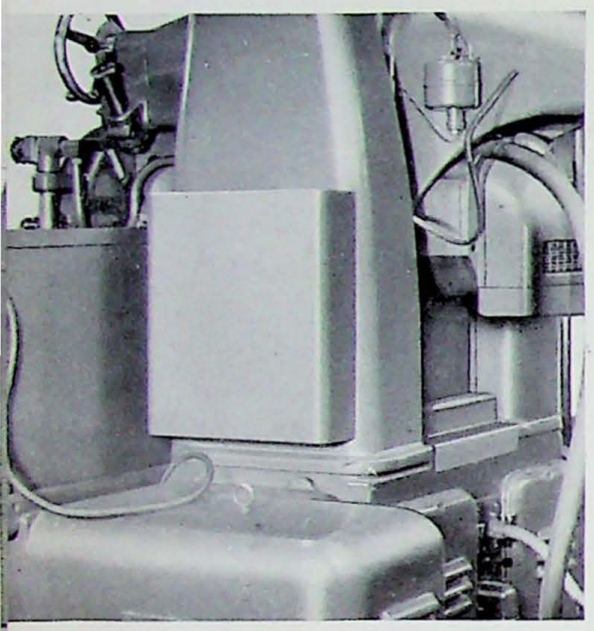


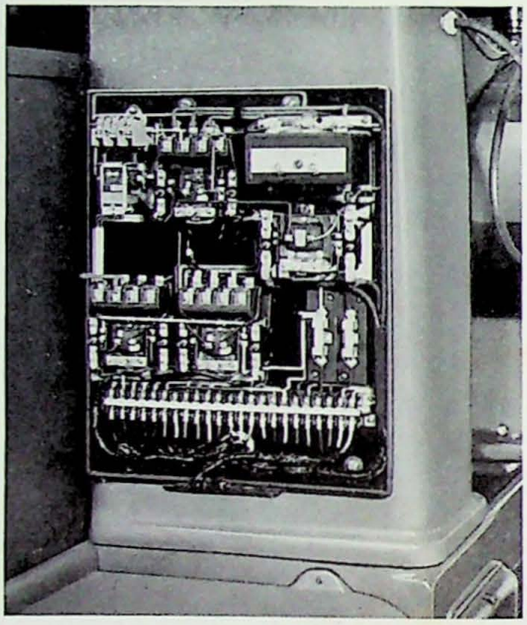
Radius Truing Device mounted on table.
Forms convex or concave wheels.

MATTISON GRINDERS

Electrical Controls

PROTECTED AND EASILY ACCESSIBLE





ELECTRICAL switches and connections are enclosed in a completely accessible cabinet affording maximum protection. Full overload and under-voltage protection is provided in the control for all motors. All internal wiring is in accordance with Standard Electrical Code, with particular emphasis on protection from water, oil and mechanical injury. Push button stations are all set into, and flush, with the base at the front of machine for accessibility and best appearance.

One-Shot

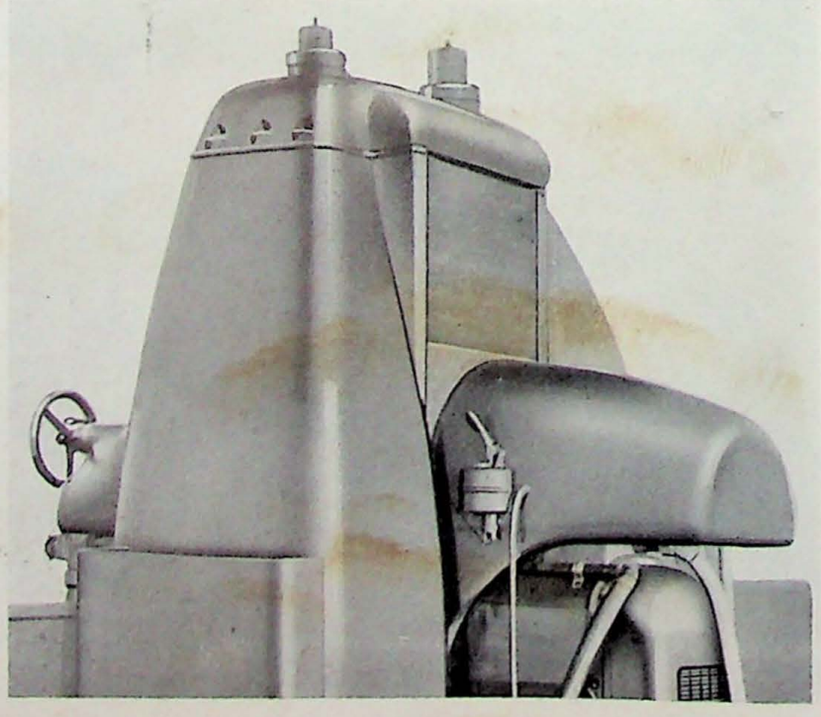
LUBRICATION SYSTEM

TO PROTECT your investment, reduce production interruptions to a minimum and maintain accuracy, the utmost care has been exercised in providing simple, yet positive, control of lubrication on the Mattison High-Powered Precision Surface Grinder.

A One-Shot System is used to lubricate the ways of vertical slide and control mechanism in the vertical slide. Table ways are automatically lubricated with filtered oil.

Thorough lubrication of hoist unit is provided by means of an oil reservoir which keeps gears continuously bathed in oil.

Entire lubrication arrangement is dependable from every standpoint. It protects your investment, maintains accuracy and insures continued smooth-working performance.



MATTISON GRINDERS

Coolant Tank Arranged WITH Magnetic Separator

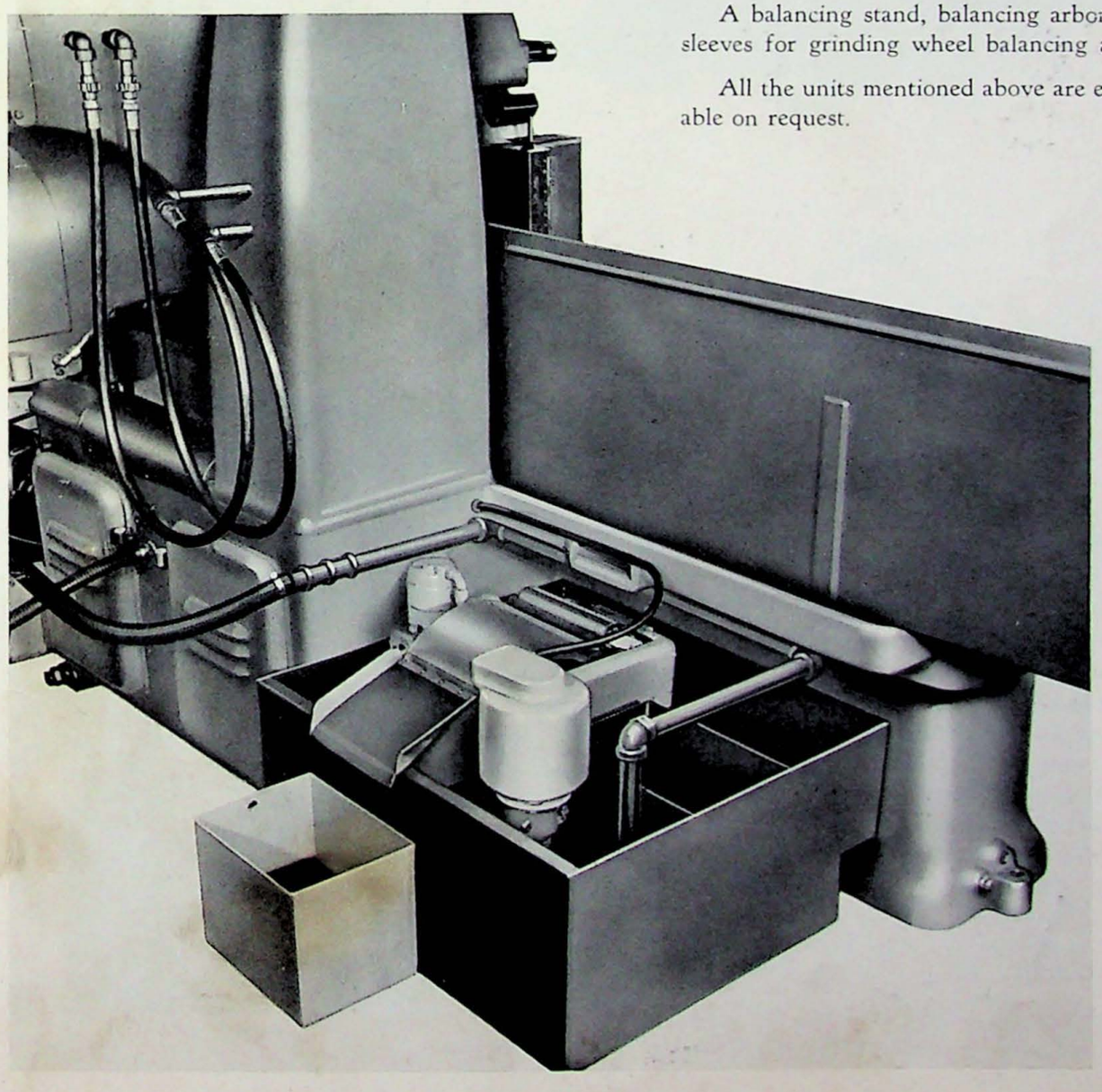
THE Mattison High-Powered Precision Surface Grinder has a coolant tank with four compartments which baffle the flow and serve as settling tanks for dirt, grit and heavy particles. Thus, the coolant is exceptionally clean when it reaches the fourth compartment from which the pump delivers it to the wheel and work.

The main compartment of each coolant tank is large enough to accommodate a magnetic separator as shown below. This is desirable where stock removal is high and the material being ground is magnetic.

When machines are used for dry grinding, a unit can be added to collect dust and grit. A powerful suction fan draws the dust from the wheel and works through a dust hood and flexible metal hose and deposits it in a container where it can be easily removed.

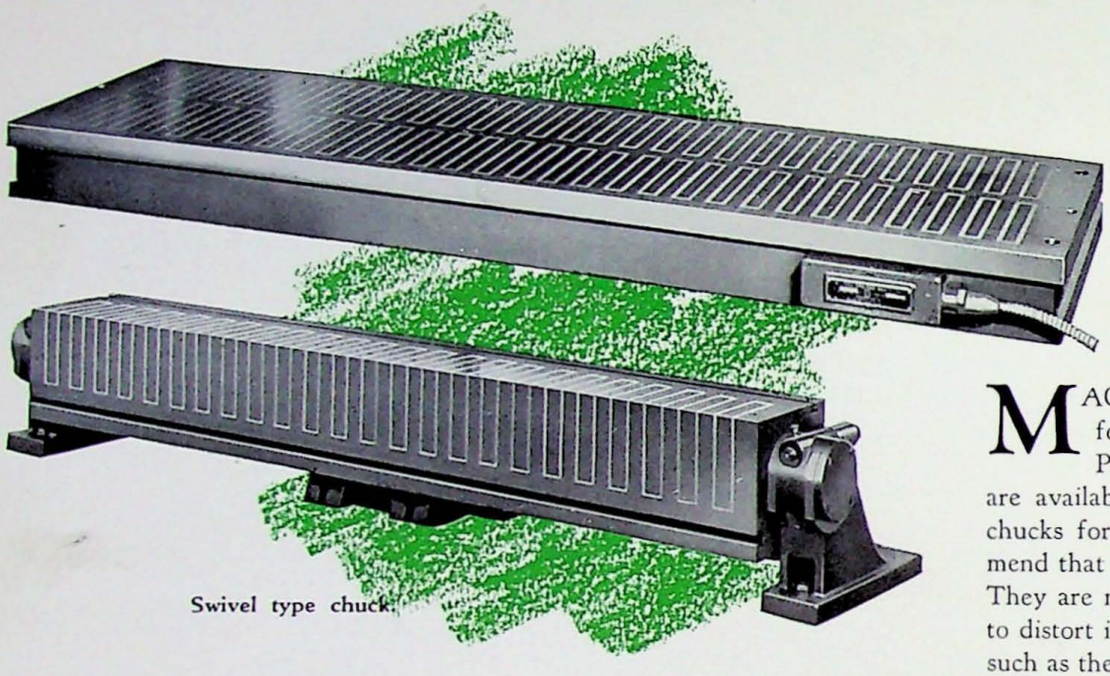
A balancing stand, balancing arbor and extra wheel sleeves for grinding wheel balancing are also available.

All the units mentioned above are extras. Price available on request.



MATTISON GRINDERS

Magnetic Chucks



Standard type Rectangular chuck.

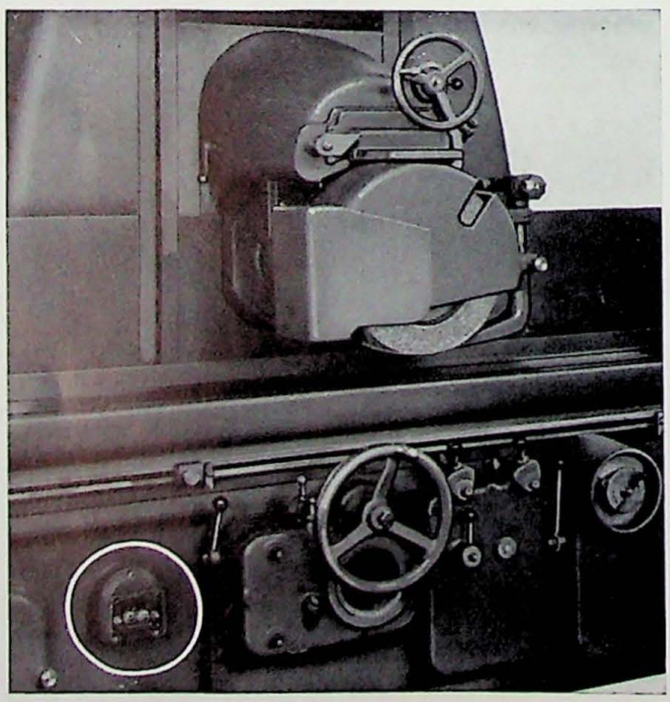
Swivel type chuck.

MAGNETIC Chucks especially adapted for use with the Mattison High-Powered Precision Surface Grinder are available for all sizes of machines. On chucks for long length machines we recommend that two or more sections be furnished. They are more easily handled and less likely to distort in service. Special types of chucks, such as the swivel type, can also be furnished.

Special Chuck

DEMAGNETIZING UNIT

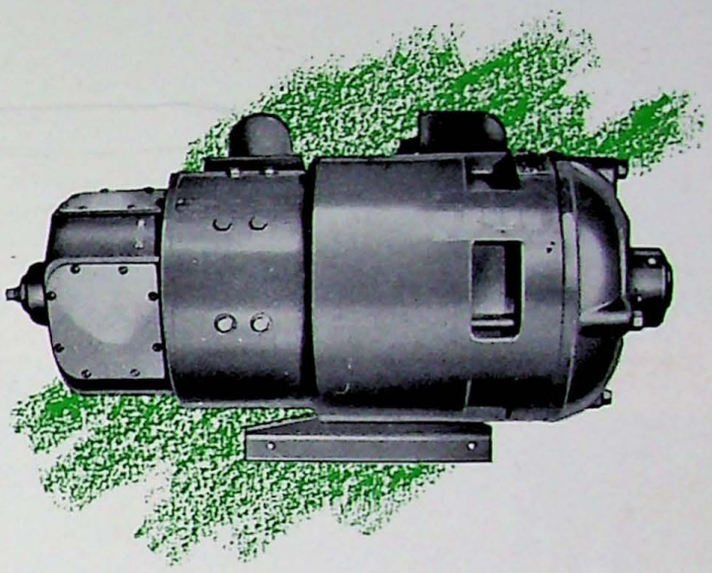
THE special demagnetizer unit control station shown in picture is particularly useful on thin, flat, highly retentive pieces which have in the past been hard to remove from chuck. It releases the work so completely that the work pieces practically float on the chuck, facilitating easy removal. High-tempered or close-grained steel maintains magnetism more readily than soft iron. In fact some of the newer steel alloys become semi-permanent magnets when energized by a magnetic chuck. The special demagnetizer is recommended where difficulty is found in removing work from chuck.



MATTISON GRINDERS

Motor Generator Set FOR CHUCK OPERATION

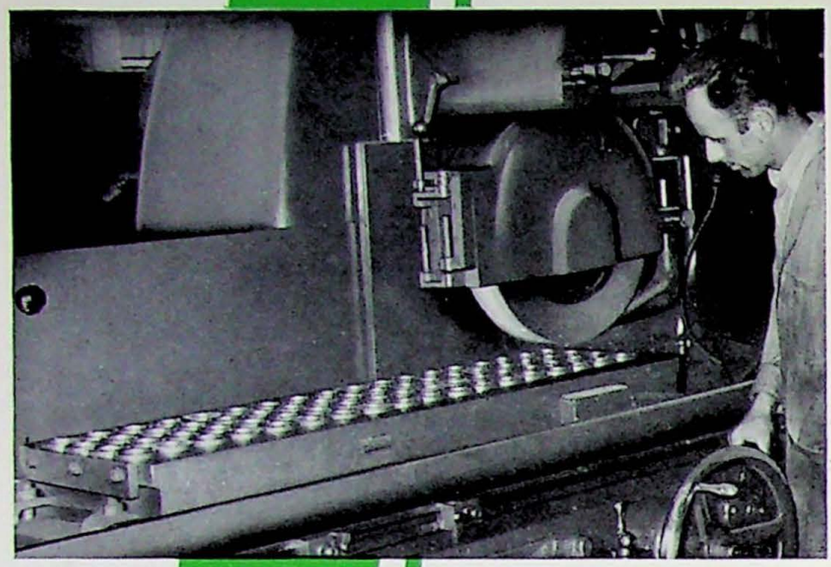
MANY manufacturing plants now have direct current available in addition to their regular alternating current power supply. Where direct current is not available, small motor-generator sets, as illustrated, can be furnished for obtaining the necessary 115 or 230 volt direct current supply for magnetic chuck operation. These are available in sizes ¾, 1, 1½, 2, 3, 5 and 7½ K.W. They consist of a close-coupled, alternating current motor and direct current generator, together with a field rheostat for adjusting the direct current voltage. They are provided with a series winding which holds the voltage constant between "No Load" and "Full Load," insuring constant holding power on the chucks. Where floor space is at a premium, such small sets can be mounted on a bracket on post or side wall.



Rectifier

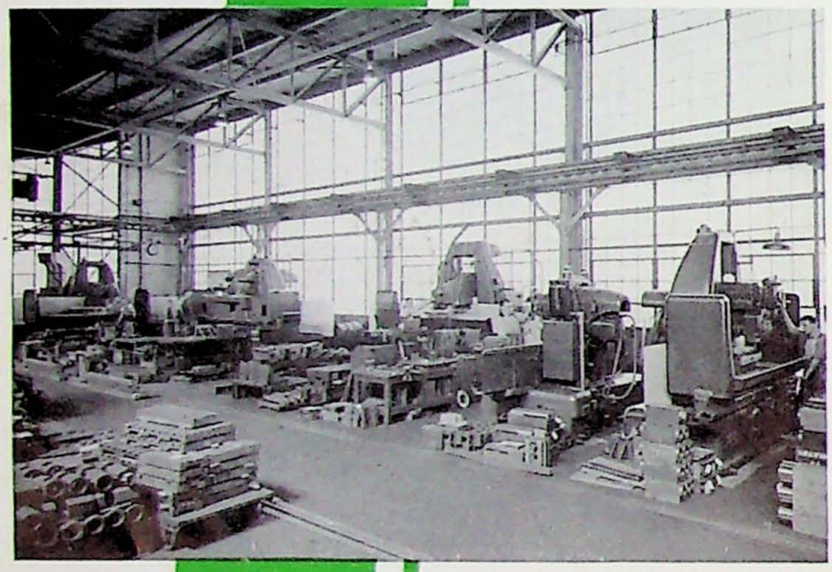
WHERE direct current is not available in most manufacturing plants, existing alternating current voltages, whether in lighting circuits or power circuits can be converted to the required 115 or 230 volt direct current supply for magnetic chuck operation by means of Tube Type Rectifiers.

Rectifiers as illustrated are efficient in operation and offer the advantages of lower cost, small size, and no moving parts to wear out or maintain. A time delay relay prevents load being thrown on the tubes until they are warmed up for proper operation. A direct current volt meter indicates the D.C. Volts available.



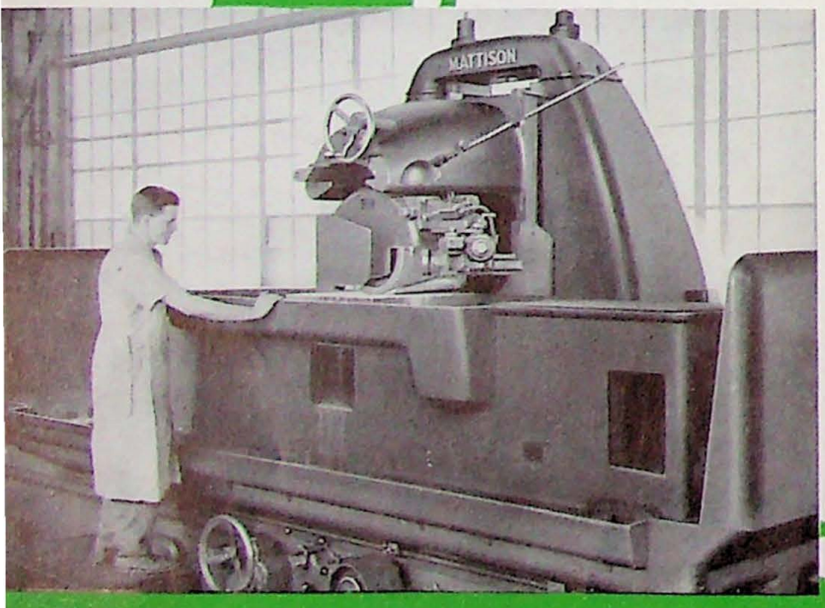
Caps previously ground few at a time on small grinder. Now Mattison Grinder handles 75 at a time. Time was reduced from 7 hours to 30 minutes.

Wide Range of Work Easily and Profitably Handled on MATTISON SURFACE GRINDER

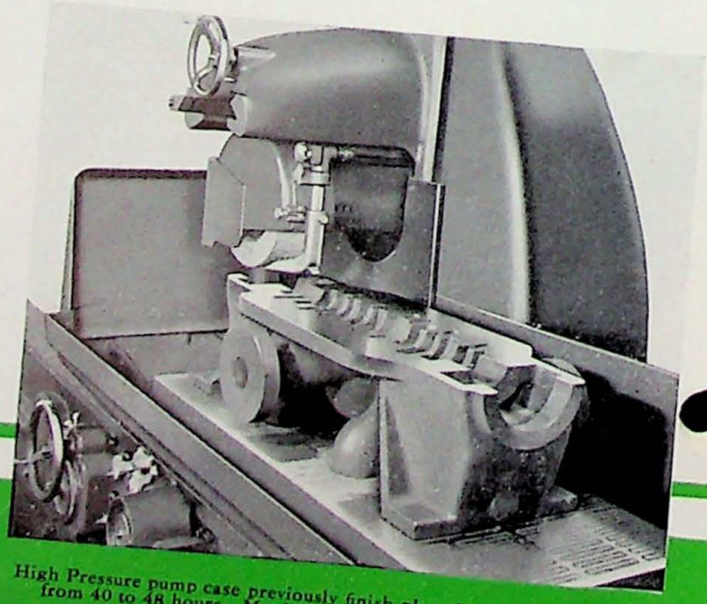


Line up of Mattison Grinders that resulted in 75% saving of man hours for prominent Detroit manufacturer. 80 out of 125 employees in scraping department were released for service elsewhere.

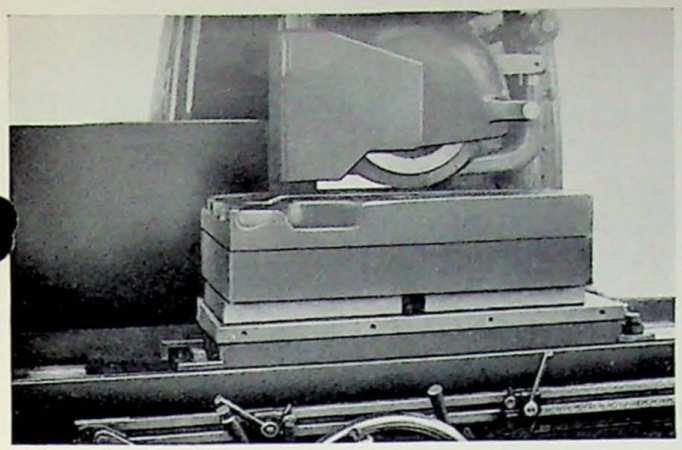
Cast Iron Frame ground top, bottom, shoulder, and inside with 75% time saving over previous method, hand scraping.



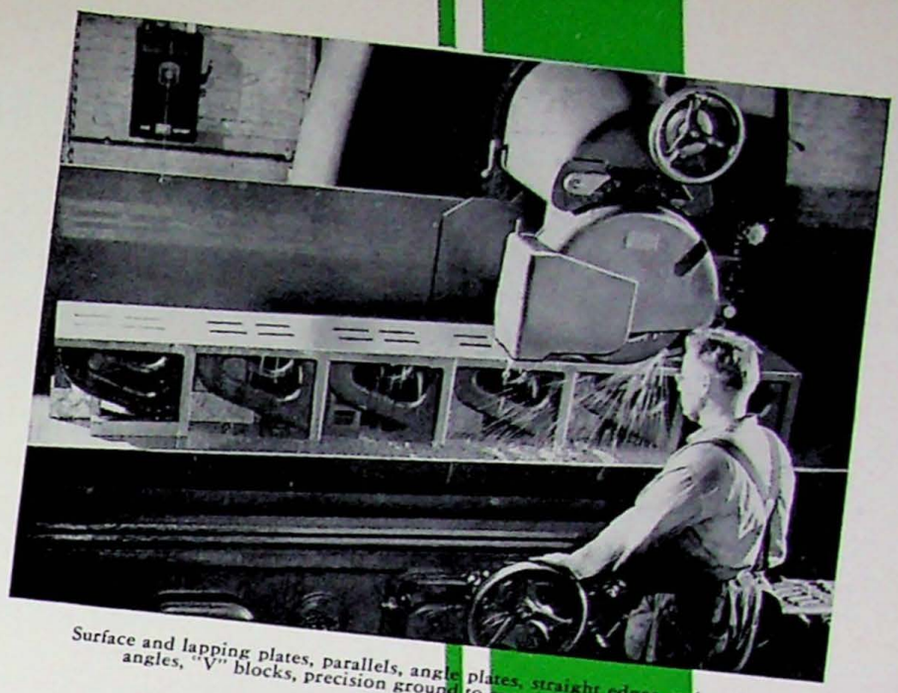
Mattison Grinder cuts time 60% on 2½ ton machine bed by eliminating hand scraping.



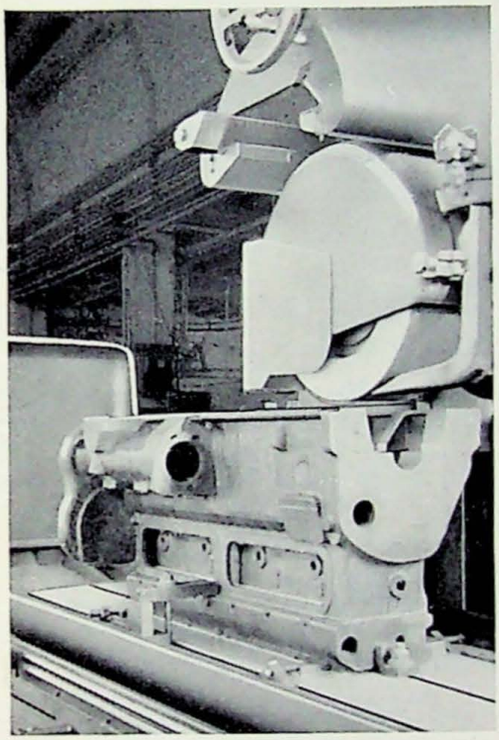
High Pressure pump case previously finish planed and hand scraped in from 40 to 48 hours. Mattison Grinder reduced time to 4 hours.



Hardtem steel forging die reconditioned in 73% less time.

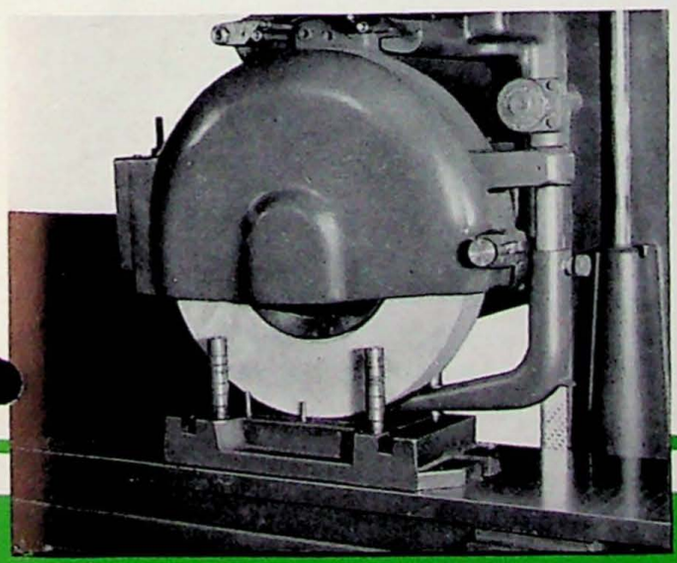


Surface and lapping plates, parallels, angle plates, straight edges, universal angles, "V" blocks, precision ground to exacting specifications.



Gasket face of Diesel cylinder block ground to absolutely smooth finish and accuracy of a few tenths. Cylinder head also ground in like fashion.

Mattison Grinder holds close limits on 3-4" high 3000 pound base casting.



Wheel and spindle clearance of Mattison Grinders is sufficient to handle dies with average height leader pins in place.

V-shaped and flat ways of lathe bed being ground to utmost accuracy and smooth finish.

Specifications MATTISON HIGH POWERED PRECISION SURFACE GRINDERS

Standard sizes of table working surfaces, wheel height adjustment, weights and code words. Wheel height adjustment based on the use of standard diameter wheel on all machines. Higher columns can be furnished for more clearance between table and wheel at extra cost.

SMALL MACHINES

CAPACITY WIDTH	CAPACITY HEIGHT	CAPACITY LENGTH	CODE WORD	APPROX. DOMESTIC SHPG. WT.	APPROX. FLOOR SPACE
12"	16"	36"	RABAB	14,700 lbs.	6' 7" x 10' 4"
12"	16"	48"	RABEC	15,200 lbs.	6' 7" x 12' 4"
12"	16"	60"	RABID	16,000 lbs.	6' 7" x 14' 4"
12"	16"	72"	RACYR	16,800 lbs.	6' 7" x 16' 4"
14"	16"	36"	RABOF	15,000 lbs.	6' 7" x 10' 4"
14"	16"	48"	RABUG	15,500 lbs.	6' 7" x 12' 4"
14"	16"	60"	RABYH	16,300 lbs.	6' 7" x 14' 4"
14"	16"	72"	RADYZ	17,200 lbs.	6' 7" x 16' 4"

LARGE MACHINES

16"	24"	72"	RACAK	31,000 lbs.	7' 6" x 19' 9"
16"	24"	96"	RACIN	33,500 lbs.	7' 6" x 22' 9"
16"	24"	120"	RACON	36,000 lbs.	7' 6" x 26' 9"
16"	24"	144"	RACUP	38,500 lbs.	7' 6" x 30' 9"
16"	24"	168"	RAHAV	42,000 lbs.	7' 6" x 35' 3"
18"	24"	72"	RAGEM	31,750 lbs.	7' 6" x 19' 9"
18"	24"	96"	RAGIP	34,250 lbs.	7' 6" x 22' 9"
18"	24"	120"	RAGOR	36,750 lbs.	7' 6" x 26' 9"
18"	24"	144"	RAGUS	39,250 lbs.	7' 6" x 30' 9"
18"	24"	168"	RAGYT	42,750 lbs.	7' 6" x 35' 3"
20"	24"	72"	RADAS	32,750 lbs.	7' 8" x 19' 9"
20"	24"	96"	RADIV	35,250 lbs.	7' 8" x 22' 9"
20"	24"	120"	RADOW	37,750 lbs.	7' 8" x 26' 9"
20"	24"	144"	RADUX	40,250 lbs.	7' 8" x 30' 9"
20"	24"	168"	RAGAL	43,750 lbs.	7' 8" x 35' 3"
24"	24"	72"	RAFAC	37,500 lbs.	8' 6" x 19' 9"
24"	24"	96"	RAFIF	40,000 lbs.	8' 6" x 22' 9"
24"	24"	120"	RAFOG	42,000 lbs.	8' 6" x 26' 9"
24"	24"	144"	RAFUH	45,000 lbs.	8' 6" x 30' 9"
24"	24"	168"	RAFYK	49,000 lbs.	8' 6" x 35' 3"
30"	24"	72"	RAHEW	39,000 lbs.	9' 5" x 19' 9"
30"	24"	96"	RAHIX	42,500 lbs.	9' 5" x 22' 9"
30"	24"	120"	RAHOZ	44,500 lbs.	9' 5" x 26' 9"
30"	24"	144"	RAHUB	49,500 lbs.	9' 5" x 30' 9"
30"	24"	168"	RAHYC	54,000 lbs.	9' 7" x 35' 3"
30"	24"	192"	RAJAD	59,000 lbs.	9' 7" x 39' 3"
36"	24"	72"	RAKEP	43,000 lbs.	10' 1" x 19' 9"
36"	24"	96"	RAKIR	45,500 lbs.	10' 1" x 22' 9"
36"	24"	120"	RAKOS	48,500 lbs.	10' 1" x 26' 9"
36"	24"	144"	RAKUT	54,500 lbs.	10' 1" x 30' 9"
36"	24"	168"	RAKYV	60,000 lbs.	10' 1" x 35' 3"
36"	24"	192"	RALAW	65,000 lbs.	10' 1" x 39' 3"

DIE BLOCK MACHINES

16"	24"	48"	RAJEE	16,500 lbs.	6' 8" x 12' 6"
16"	24"	60"	RAJIG	17,500 lbs.	6' 8" x 14' 6"
18"	24"	48"	RAJOH	17,200 lbs.	6' 9" x 12' 6"
18"	24"	60"	RAJUK	18,200 lbs.	6' 9" x 14' 6"
20"	24"	48"	RAJYL	17,900 lbs.	6' 10" x 12' 6"
20"	24"	60"	RAKAM	18,900 lbs.	6' 10" x 14' 6"
24"	24"	48"	RALEX	19,500 lbs.	7' 2" x 12' 6"
24"	24"	60"	RALIZ	21,000 lbs.	7' 2" x 14' 6"

See special circular for Vertical Spindle Way Grinder specifications.

Specifications CONTINUED • • •

TABLE DIMENSIONS

For length and width of table working surfaces and height of wheel head adjustment see opposite page. For strapping work direct to table or for applying supplementary table, special fixtures or magnetic chuck: tables on SMALL MACHINES have two 5/8" T-slots; tables on DIE BLOCK MACHINES have three 5/8" T-slots; tables on LARGE MACHINES up to 24" width have three 3/4" T-slots; tables on 30" and 36" LARGE MACHINES have four 3/4" T-slots.

TABLE FEED

Hydraulic, with variable delivery pump, up to 100′ per minute. Automatic, force-feed, filtered lubrication for table ways.

WHEEL HEAD

Has power-operated raising and lowering device, also hand-wheel control for final adjustment. Micrometer adjustment graduated to .0001".

WHEEL CROSS FEED

Hydraulic transverse wheel feeds variable up to width of wheel on all machines. Can also be operated by hand wheel for shoulder grinding.

GRINDING WHEELS

20" diameter, 3" face, standard on SMALL MACHINES; also on DIE BLOCK MACHINES.

20" diameter, 6" face, standard on LARGE MACHINES.

16" diameter wheels are furnished when machine operates on 25 cycle or 50 cycle current.

WHEEL SPINDLE and BEARINGS

The alloy steel spindle is heat-treated and ground. Tapered bronze bearing at front; one pair of matched, super precision, preloaded ball bearings with Bakelite retainers at rear. Pressure lubrication.

MOTORS

SMALL MACHINES and DIE BLOCK MACHINES. Built-in spindle motors: 15 H.P., alternating current, 220/440/550 volts, single-speed. Hydraulic and lubricating pumps are driven by 3 H.P. ball bearing motor; wheel head raising and lowering motor 1½ H.P., ball bearing; coolant pump motor, ½ H.P. ball bearing.

LARGE MACHINES. Built-in spindle motor, 30 H. P. alternating current 220/440/550 volts, single-speed. Hydraulic and lubricating pumps are driven by 7½ H.P. ball bearing motor; wheel head raising and lowering motor 1½ H.P., ball bearing; coolant pump motor, ½ H.P., ball bearing.

ALL MACHINES. Spindle motor totally enclosed, fan-cooled. Hydraulic pump motor, coolant pump motor and hoist motor in enclosed compartments, with maximum protection against oil, water and metal dust. All motors are the latest design, line-start type, push button control. Full overload and under voltage protection is provided for all motors. All internal wiring in oil-proof conduit, and in accordance with Standard Electrical Code, with particular attention to protection from water, oil and mechanical injury.

STANDARD EQUIPMENT SMALL MACHINES & DIE BLOCK MACHINES

15 H. P. Spindle Motor.
3 H. P. Hydraulic Pump Motor.
1½ H. P. Hoist Motor.
½ H.P. Coolant Pump Motor.

With control equipment, one grinding wheel, wheel sleeve, wheel guard, splash guard, wrenches, base-supporting wedges, and diamond tool holder, without diamond.

STANDARD EQUIPMENT LARGE MACHINES

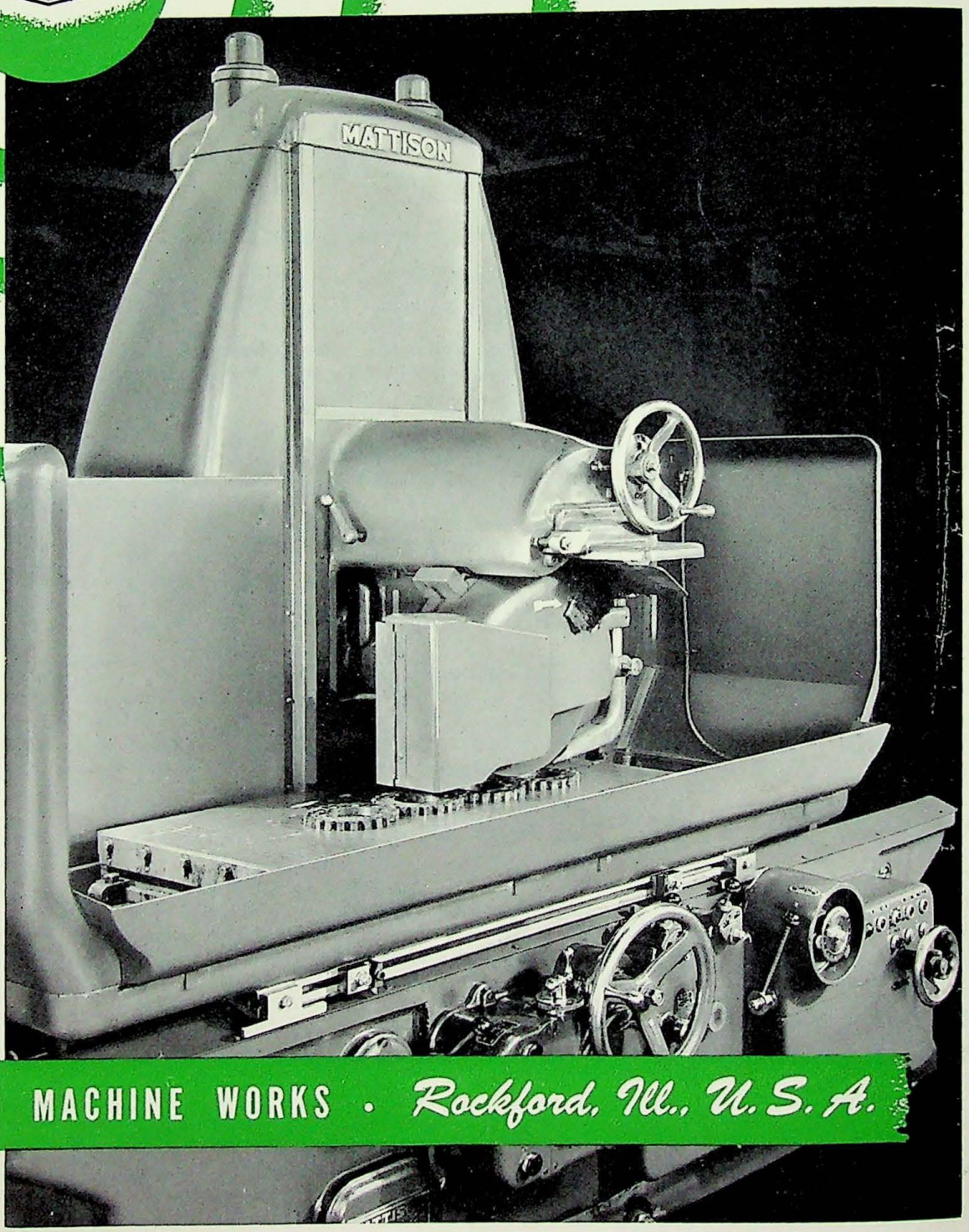
30 H. P. Spindle Motor.
7½ H. P. Hydraulic Pump Motor.
1½ H. P. Hoist Motor.
¼ H. P. Coolant Pump Motor.
½ H.P. Coolant Pump Motor.

With control equipment, one grinding wheel, wheel sleeve, wheel guard, splash guards, wrenches, base-supporting wedges and diamond tool holder, without diamond.

GUARDED VERTICAL and WHEEL SLIDE WAYS

Vertical and Wheel Slide Ways are guarded to keep out dust and grit.

MATTISON GRINDERS



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5M w-h 11-53

HELPFUL SUGGESTIONS FOR MAINTENANCE AND OPERATION OF MATTISON HIGH POWERED PRECISION SURFACE GRINDERS

SOME THINGS TO LOOK FOR WHEN:

A. WHEEL EDGE LINES APPEAR IN FINISH.

1. Same as for inaccurate grinding (Front to rear of table)
2. Grinding wheel too hard.
3. Production wheel dresser, located in wheel housing dresses face of wheel according to horizontal alignment of wheel slide. When wheel slide is loose or slightly out of line the production wheel dresser can dress wheel on slight taper or slightly larger in diameter in front than in rear or vice versa. When dressing from the over-head diamond holder make sure the center screw in the diamond holder is tight so it does not back off or vibrate out of position during dressing operation. (Wheel dresser located on table dresses wheel on same plane as bottom surfaces of cross slide ways and should be used for highest finish and accuracy.)
4. Relieve hard shell edges of grinding wheel
5. Check level of machine.
6. Vertical gibs at rear of columns loose allowing vertical slide casting to rock.

B. WORK SHOWS CHATTER.

1. Check wheel for balance.
2. Check wheel for proper hardness.
3. Check diamond to see that it is not flat.
4. Check wheel slide for grease, a dry slide will result in jerky movement when dressing wheel.
5. Check rear ball bearing.
6. Check front bearing for proper clearance (.002" - .003") on pressure lubricated spindle.

7. Wheel might be dressed too fine.

8. Check for electrical power irregularities.

9. Investigate for vibrations from adjacent machines.

C. INACCURATE GRINDING LENGTHWISE OF MAGNETIC CHUCK.

1. Check double lock nuts on either hydraulic table ram located outside of table end brackets. Hydraulic ram must be free to float in table end brackets.

2. Check level of machine.

3. For extreme accuracy remove magnetic chucks. Regrind top of table pad. Place chucks, buttom up, on table pad. Block so they will not slide and grind while "floating" on table pad. Remove chuck, thoroughly clean and install chuck. To allow for contraction and expansion of chuck one end may be tightly clamped to table pad and opposite end should be clamped lightly. Coating of white lead and oil should be placed between the bottom chuck and table pad. Chuck should be ground with magnet in the "on" position and then only after machine has thoroughly warmed up.

4. Check ram packing glands on table cylinders to make sure that packing is not too tight and that gland is drawn down evenly to avoid binding.

D. INACCURATE GRINDING FROM FRONT TO REAR OF TABLE.

1. Horizontal gib loose. Must be set snug.

2. Vertical gibs loose and slight rock in vertical slide casting on columns. To set vertical slide correctly force vertical gibs down tight as possible to align vertical slide ways with column ways. Then remove one gib and reset it lightly by hand pressure. Do the same to second gib.

3. Check level of machine.

4. Check oil flow to table ways. Must be same on both ways.

E. WHEEL SLIDE WILL NOT REVERSE ITSELF FROM EXTREME FRONT OR BACK POSITION.

1. Be sure that dial holding reversing dogs is centered. To set properly, use hand cross feed wheel to set center of wheel to center of table front to back. Place reversing dogs to extreme positions next to limit pin. Loosen elastic stop nut in center of dial and tap lightly to loosen dial on tapered shaft. Move dial so that "0" is pointing straight up and tighten in this position.
2. Remove guard under operators station at front of machine. Adjust lower fork on linkage to manual forward and reverse lever so that dogs are contacted equally in each direction under power. (Usually one turn in either direction will suffice.)

F. WHEEL SLIDE WILL NOT INDEX.

1. Check that the cross feed switch is ON.
2. Check that the hand cross feed lever (behind cross feed handwheel) is over to the left position.
3. If the wheel dressing valve will operate and not the index timer or jump feed. Check the Micro-Switch that is actuated by the table reversing lever linkage. It may be shortened or have become loosened and backed away from the contact roller. (Contact roller should depress Micro-Switch button at least 1/8")
4. Check the tube in the timer, or replace it with a new one for testing.
5. Carefully check all wires leading to and away from timer

and relay on panel for broken or loose wires or bad connections.

6. Check points and shading coil on relay beside timer.

7. If the wheel dressing valve will not operate, check items 1 and 2 first, then 4, 5, and 6. If these are operating properly then remove guard under operators station and check for loose or broken wire to solenoid on rear end of cross feed valve. (Caution, be sure power is off when making this check.) Also check for broken solenoid armature guides holding fiber block.

8. Make sure that fiber block on spindle end of solenoid is in place and has .010 clearance between block and plunger end.

G. ERRATIC CROSSFEED ON WHEEL SLIDES.

The cross feed movement of wheel slides is hydraulic but we operate the valves electrically. If wheel slide should fail on jump feed or if it moves in a steady motion most likely it is electrical trouble. Check the following:

1. Tube in Allen-Bradley Timer.
2. Timer itself.
3. Allen-Bradley Relay.
4. Solenoid SG-F 26 in parts catalog.
5. Make sure that cross feed valve plungers work freely. (SG-F 29 and SG-F 30 in parts catalog.

H. WHEEL SLIDE INDEXES CONTINUOUSLY.

1. Check relay beside timer for sticking points, also for break in shading coil. Remove coil and check air-gap.
2. Check tube in timer or replace for test.

3. Check Micro-Switch at table reversing lever to be sure it is not stuck or burned out.

4. Check for loose or broken wires leading to or from timer.

5. Remove cover from front top of cross feed valve and inspect spring to be sure it is intact. Also, be sure that top plunger is free and snap ring on front end has not caused a burr on front of valve body.

I. HYDRAULIC CROSS FEED OF GRINDING WHEEL DOES NOT FUNCTION.

1. Check operation of solenoid. Solenoid should be energized when Table Reversal Lever is moved and also when Wheel Dresser Lever is moved to dress position. Remove lower section of front cover, over controls and check first by depressing either Micro-Switch then make sure levers depress Micro-Switches when operating machines.

2. Check operation of solenoid. If solenoid does not energize, check wire connections to solenoid. Four screws, two on lead wire and two on coil frame.

Check coil for burn-out or short

Check power from control panel

Check tube on timer unit. If tube is burned out, wheel head will travel continually.

Check for loose wires on relay and timer unit.

Sequence of Jump Feed: Cross feed switch picks up CR1 Relay holding thru timer -- energizing cross feed solenoid and timer -- timer times out, dropping out CR1 Relay -- end of jump feed.

J. WHEEL SLIDE INDEXING IS ERRATIC.

1. Check and clean points on timer. (Caution - do not use

emery or abrasive in cleaning points, clean with carbon tetrachloride.

2. Check relay at time for worn points and shading-coil break and loss of armature air-gap.

3. Check Micro-Switch at table reversing lever linkage to be sure that it is not being crowded nor too close to the contact roll. It should be depressed only about 1/8" on contact.

4. Check armature of solenoid (at rear end of cross feed valve) to be sure the armature is free in the coil.

5. Check table reversing lever to be sure it does not bounce on reversal. Too much bounce may hit the Micro-Switch a second time causing a double index. Check tension of friction spring washer at left end of table valve. This lever should operate freely but not bounce.

K. WHEEL SLIDE DIRECTION LEVER FALLS FORWARD OF ITS OWN WEIGHT.

1. Remove guard under operators station at front of machine and check that pins holding linkage to cross slide valve are in place.

2. Tighten lock nuts against friction spring on stud holding rocker at bottom of direction lever to required tension.

L. OIL LEAKS FROM WHEEL DRESSER SPEED DIAL.

1. Remove dial by taking out two (2) set screws. Remove round ring plate, tighten packing nut on valve stem and replace ring and dial knob.

M. DOWN FEED IS ERRATIC.

1. Make sure that the leveling blocks or wedges are uniformly

tight under the back corners of the columns and the front center of the base. One too tight may distort the columns enough to make the head assembly hang up.

2. Make sure the vertical ways are clean and free of gummy oil and compound. They should be oiled regularly by operating one-shot oiler and wiped clean at least once each week.

3. Check adjustment of vertical gibs. To adjust vertical gibs, attach an indicator to wheel guard and lower to contact on table. Set reading at "0", back off one gib until it is loose. Feed down .0005" at a time and keep tightening other gib until indicator does not register, now loosen gib until the head will feed .0005" each time, lock gib. Now repeat same operation on other gib, leaving previously set gib in position. Be sure you are getting oil onto ways from oiling system. This is to be done with all motors idle.

4. Remove vertical gibs, clean, rescrape them if necessary.

5. Oil gibs and slide about four times daily, using the one-shot system provided at rear of vertical slide. This oiler should be filled with Socony Vacuum Company's Vactra #2 oil or equivalent.

N. TABLE MOVES IN ONE DIRECTION ONLY.

1. Check the table cylinder packing glands located at the inside end of each cylinder. If the glands have become loosened they may bind and cause the table to stop.

2. Check the table reversing lever linkage to be sure it has not become disconnected at any place.

3. Check the adjustment of the acceleration and deceleration needle valves. (A particle of dirt at any of these points may cause a sluggish reversal or complete stoppage.

4. Remove right hand end from table valve body and check middle pilot or plunger. It must move freely and not bind in any position inside valve body.

O. TABLE IS SLUGGISH AND PUMP APPEARS TO LABOR EXCESSIVELY.

1. Check the driving belts from the motor to the hydraulic pump on small machines. If they are loose, tighten them by means of the jack screw on the front left corner of the driving motor. The belts should be tight enough to keep from slipping.

2. Check oil level of hydraulic tank under pump. It should be up to the line on the gauge (or 1/4 full in glass)

3. Bleed all air from the table cylinders. A petcock is provided at end of each cylinder.

P. TABLE MOVEMENT IS JERKY.

1. Remove the front cover containing push buttons. This provides access to the four screws and lock nuts on top of combination valve marked ACCELERATION and DECELERATION. Adjust until table is as smooth as possible with two screws. marked ACCELERATION. The proper over-travel, or cushion, of table is obtained with the DECELERATION screws.

Q. EXCESSIVE OIL ACCUMULATES IN BASE OF MACHINE.

1. Check and tighten all hydraulic connections.

2. Check table cylinders to be sure p acking and oil seal is not leaking. Replace if necessary.

3. Stop table motor while loadind and unloading work or when

machine is idel. When table is standing still and table pump motor is running, oil will accumulate on ways and when table is started rapidly, the oil will overflow the ways and run into the base and accumulate there.

4. Check the overflow catch pans under the cross feed valve and wheel dresser valve and make sure the return line to the hydraulic oil reservoir is open and clear.

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6-54