Technical Manual

AIR TOOLS (Cont'd.)

1500 - 7/8" Cut washers
100 - 1" Cut washers
50 - 1-1/4" Cut washers
2 - 1-1/2" Globe valves
30 - 1/4 x 4 Nipples
30 - 3/8 x 4 Nipples
20 - 1/2 x 3 Nipples
40 - 1/2 x 4 Nipples
6 - 1/2 x 6 Nipples
12 - 3/8" Close Nipples
2 - 1-1/2" Close Nipples
20 - 3/4 x 4 Nipples
1 - 1-1/2" Union Elbow
2 - 1-1/2" Union
6 - 1/4" Elbows
2 - 1-1/2" Elbows
6 - 1/2" Elbows
2 - 1-1/2 x 6 Nipples
50 - 1/2 to 3/8 Bushing
4 - 2 to 1-1/2 Reducing Bush
4 - 1-1/2 Coupling
40 - 1/2 to 3/4 Reducing Coupling
40 - 1/2" Coupling
15 - 3/4" Coupling
1 - 1-1/2 x 1-1/2 x 1/2" Tee
24 - 1/2 to 3/8 Reducing Coupling
100 - Feet 1-1/2" Pipe
1 - Manifold 4" pipe 4'-0" long
2 - 4" Pipe Cap
19 - 1/2" Globe Valve
1 - 3/8" Pipe Plug
2 - 1/4" Globe Valve
24 - 3/8 to 1/4 Reducing Valve
12 - 3/4 to 1/2 Reducing Bushings
12 - Feet #2 Annealed Wire

ELECTRICAL TOOLS

2 - 4" Screw Drivers
2 - 8" Screw Drivers
2 - 8" Pliers (side cutting)
1 - 6" Long Nosed Pliers
2 - 10" Gas Pliers
1 - 8" Mill File
1 - 12" Mill File
1 - 12" Double Cut File
1 - 12 Half Round File
1 - 8" Round File
5 - File Handles

View No. 2 shows the walking shoe partially pivoted out of the normal position. This may be caused by the shoe being pressed against ground of sufficient unevenness to force the roller toward one of the high sides of the cam (14) thus compressing the spring (11). The energy thus stored in the spring will return the shoe to the normal position when it is lifted from the ground for the next step. The direction and amount of swiveling depends on the direction and magnitude of ground slope or unevenness, the maximum position being when the roller (13) is stopped by the cam end plate (15).

The spring (11) requires an initial compression of 5-1/4 inches (equal to 24 turns of the adjusting screw (10) for proper functioning of the swivel return mechanism. This adjustment must be made with the shoes off the ground (if the shoes are mounted on the machine), and the roller (13) centered on the cam (14). If the shoes are mounted on the machine, back off the adjusting screw till the spring is just free (or if the shoes are being assembled, tighten the adjusting screw till the spring just ceases being free) then tighten the adjusting screw exactly 24 full turns. A paint spot or a punch mark on the adjusting screw head will aid in counting the full turns of the adjusting screw. Never tighten the spring more than shown above, since the shoe must be capable of swiveling to the limit of the cam end plate (13) without any interference within the return mechanism.

When propelling the machine, the operator must be sure that the ground over which the machine is to travel is fairly level and that the shoes or tub do not rest on any sharp obstructions. The machine should not be propelled along the side of a steep hill where there is considerable danger of slipping. If possible, ground over which the machine is walking should be such that both shoes make contact with the ground at approximately the same time. When the machine reaches its digging position, the operator must be certain that the machine does not set on top of a small knoll, as this will cause the machine to rock while digging. It is very desirable that the shoes when making contact with the ground have bearing their entire length in order to prevent excessive strains. When the ground is extremely uneven a dozer may be required to push large rocks out of the way, and level the ground. Filling may be done by dumping some of the spoil in the line of travel and leveling with the dozer.

SWING LOCK BRAKE (CI-582)

The swing lock brake used for Marion 7400 Electric Dragline is spring set, air released, and electrically controlled through a magnet valve.

Caution: This brake is intended only to hold the machine when not operating and should not be used to stop the machine when rotating. The brake must be released before the machine is operated.

PROPEL BRAKE (CI-587)

The propel brake is the band type and is spring set, air released, and with electric control using a magnet valve. The operation and adjustments are fully explained in CI-587.

incline. When moving the "Hoist-Drag" ram controller to the middle position to engage both drums, the operator must be very careful not to engage the other drum while the bucket is coming in fast.

SWINGING

When it is desired to operate the swing motion, the "Swing Brake" selector switch must be turned to the "Off" position, thereby releasing the swing brake. The swing lock brake is used only to hold the machine from swinging while the machine is not operating or when the shoes are on the ground. (The swing brake is automatically set when the shoes are on the ground).

The swing motion is controlled by means of the "Swing" master switch located to the left of the operator. This master switch provides four points of graduated control in each direction. Each successive point of the master switch gives increased power. The "Swing" master switch is so connected that when the master switch handle is moved forward the machine will swing to the right, and when the handle is moved backward the machine will swing to the left.

When swinging the machine the operator must be certain that the bucket has been raised to clear all obstructions. The master switch handle should be moved gradually to the end of its travel. To stop the swing motion the master switch handle should be brought to the neutral position and then moved slowly to apply power for swinging in the opposite direction. This procedure of applying reverse power to the swing motor to bring the machine to a stop is known as "Plugging". When the machine comes to rest, the master switch handle should be brought immediately to the neutral position or the machine will start to swing in the opposite direction.

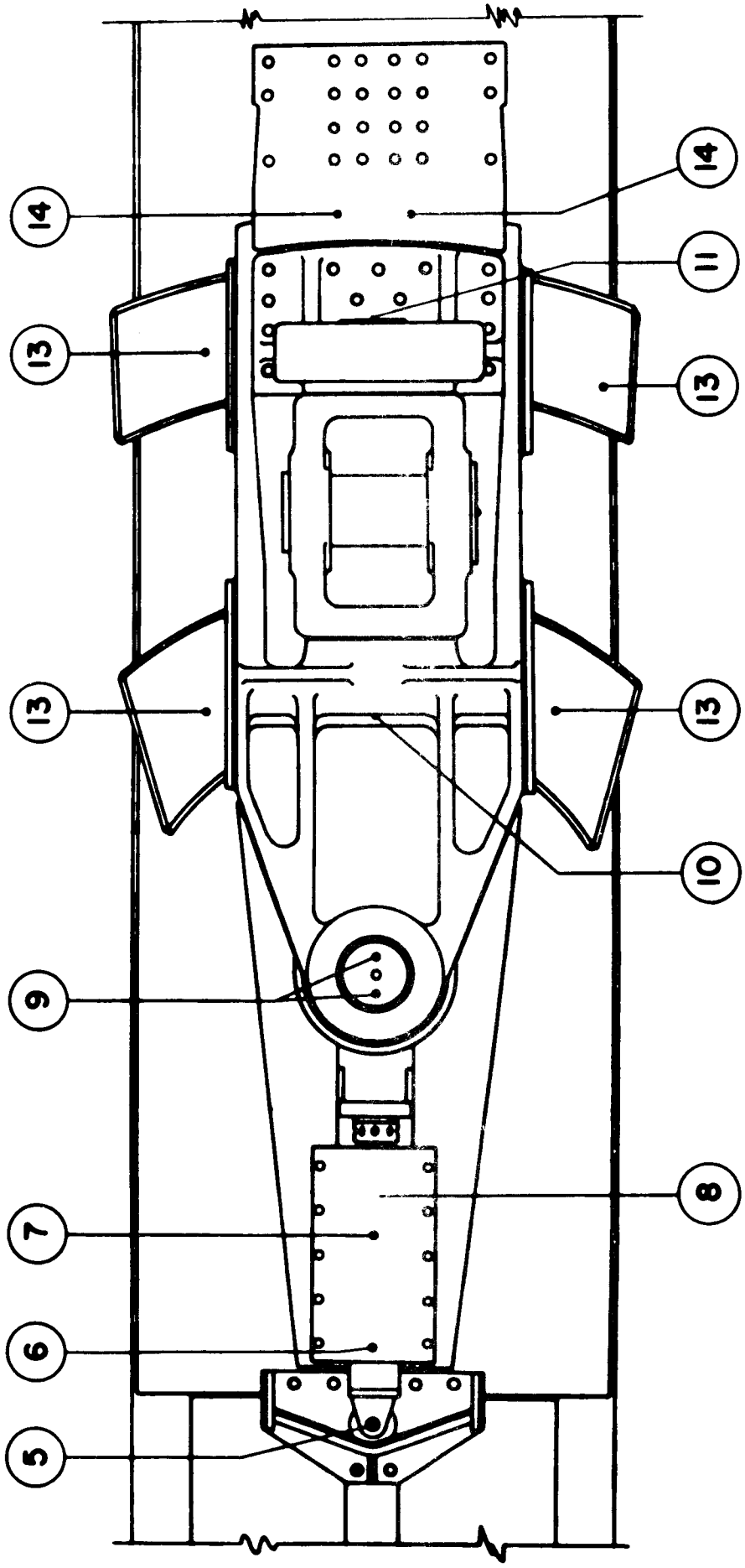
Intermediate swing speeds can be obtained by moving the "Swing" master switch handle to the intermediate points.

The operator should start swinging the machine in the direction of the place where he is to dump as soon as the bucket has cleared the ground and at the same time continue hoisting and paying out on the drag cable as described previously. Dragging the bucket through the ground after it is filled is a waste of power and time.

On a dragline, it is essential that the operator start swinging and stop swinging smoothly so that the bucket will not swing like a pendulum. This is very important especially when it is necessary to dump the bucket into cars or trucks. When dumping on to a spoil bank, a certain amount of swing in the bucket can be tolerated. After the bucket is emptied, the operator should begin to lower the bucket by releasing the hoist foot brake at the same time he swings to return to the digging position provided that no obstructions lie between the dumping position and the digging position.

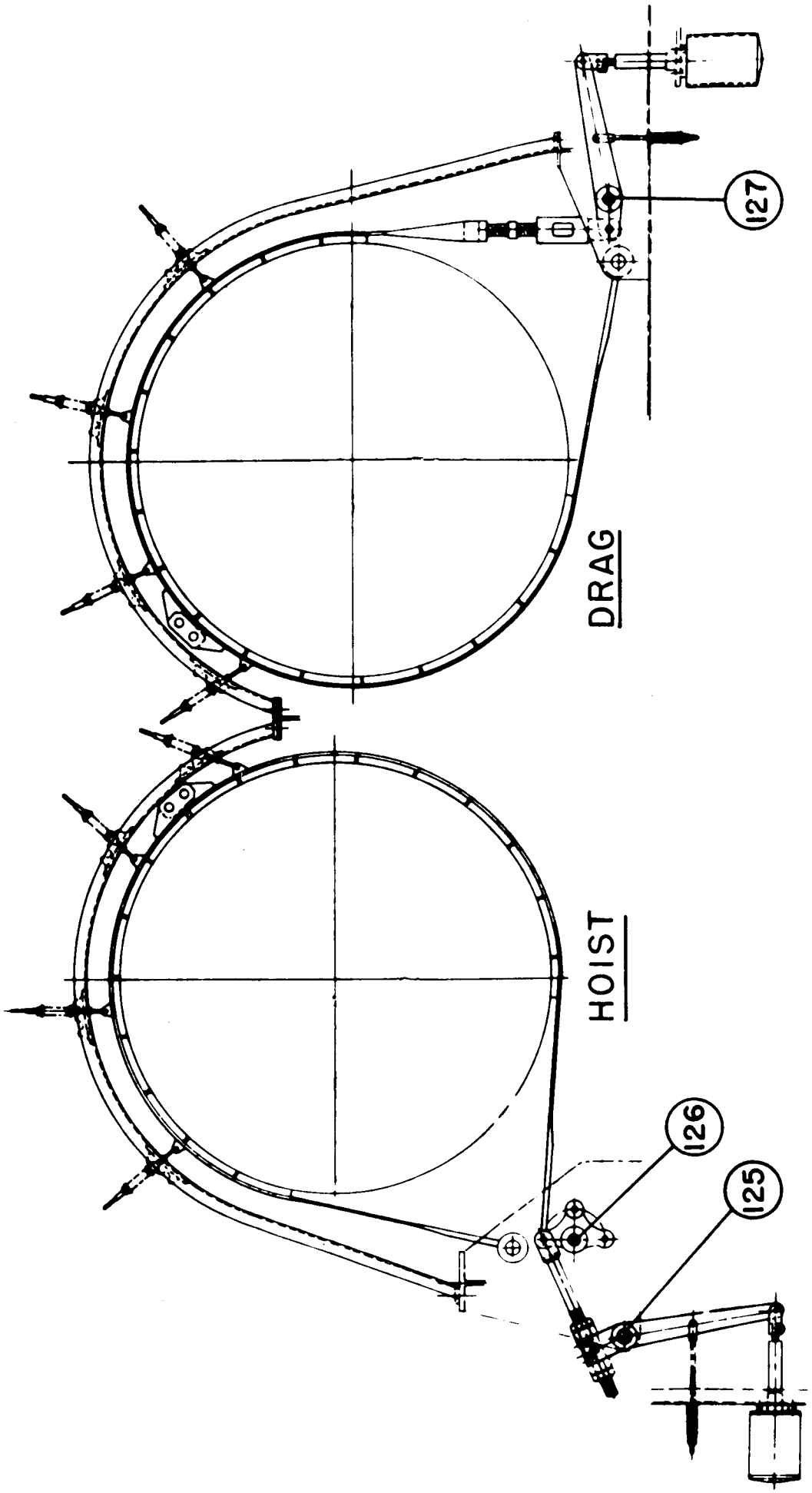
PROPELLING

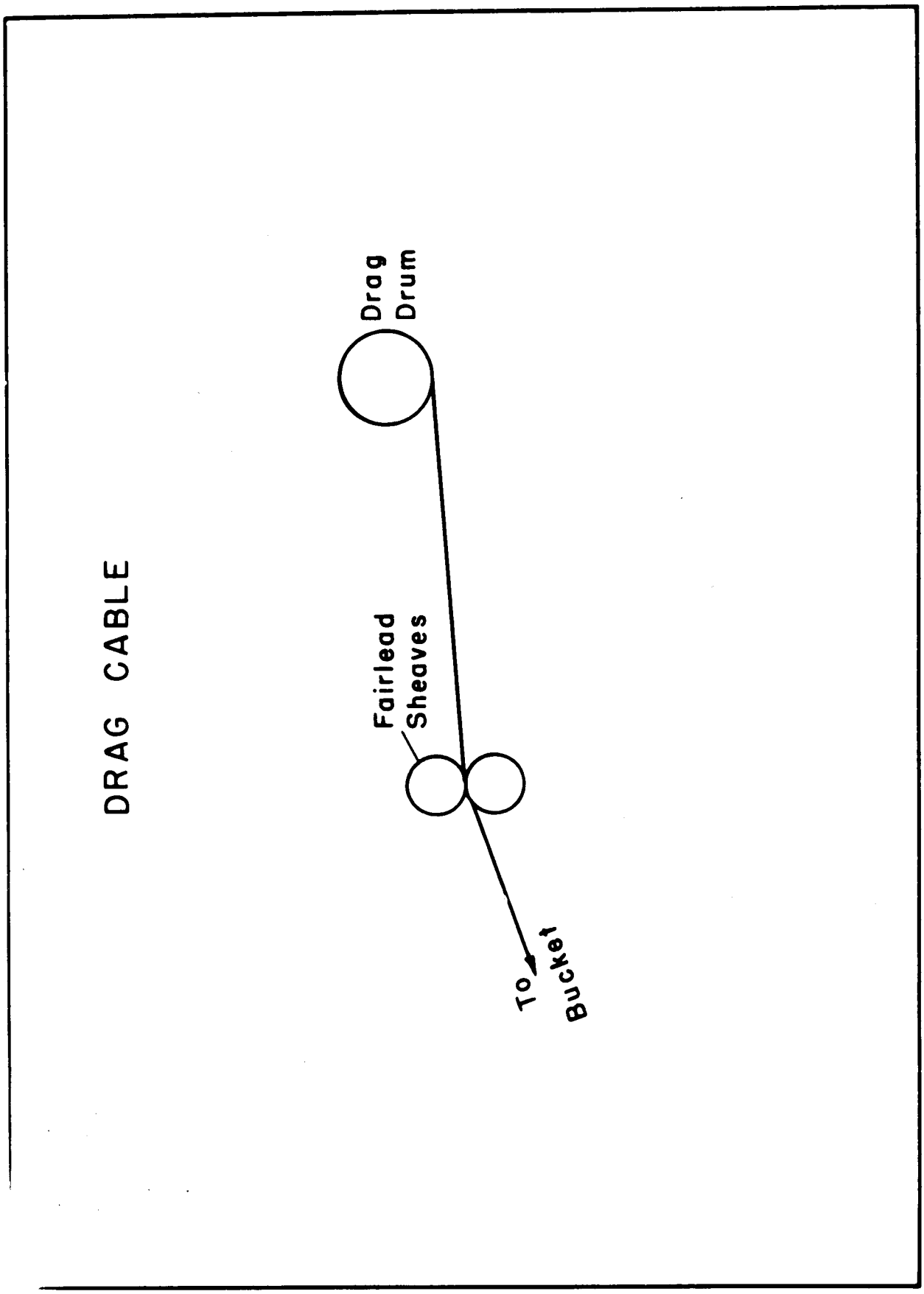
The propelling on a walking dragline is accomplished by a series of "Steps". Each step represents a complete revolution of the main propel shaft which runs across the machine. On each end of this shaft there is attached the walking mechanism.



WALKING SHOE SWIVEL MECHANISM

HOIST and DRAG CHECK BAND LEVERS




DRAG CABLE
Drag Drum
Fairlead Sheaves
To Bucket

S1A, S2A S3A - Swing Accelerating Contactors. Short resistance in series with swing generator fields to increase speed or torque.

SMF - Swing Motor Field Contactor. Shorts resistance to increase motor field strength.

SMFR - Swing Motor Field Relay. Opens contactor SMF to increase maximum motor speed. Set to pickup with 410 volts on coil and resistor B.

SF, SR - Swing reversing Contactors. Energize swing separately excited field.

MAGNET VALVES

DRAG RAM - When valve is energized, drag drum is disengaged from hoist motor.

HOIST RAM - When valve is energized, hoist drum is disengaged from hoist motor.

PROPEL CLUTCH - When valve is energized, hoist motor is clutched to propel shaft.

PROPEL BRAKE - When valve is energized, propel brake is released.

SWING BRAKE - When valve is energized, swing brake is released.

LIMIT SWITCHES

1LS - Actuated by propel clutch. Prevents release of propel brake until propel clutch is engaged.

2LS - Actuated by cams on propel shaft in parts of propel cycle when pon-shoes or tub are being lowered. Contact (H11-Y) allows RCR relay to reduce propelling speed during parts of cycle mentioned above.

3LS - Actuated by propel shaft. Lights indicating light and prevents operation of swing while shoes are down.

SELECTOR & CONTROL SWITCHES

HOIST-PROPEL - Two position, multi-contact switch. In hoist position shorts relay RCR Contact, energizes contactor HSF to close hoist generator self field circuit and also allows full swing speed. In propel position disengages hoist and drag rams, picks up contactor DMF to strengthen hoist motor field, energizes propel clutch, picks up contactor P, makes relay RCR operative and sets up circuit to energize propel brake magnet valve when propelling.

26. Stop the M. G. set and make the jumpers on resistors permanent, remove the shunts in the field circuits and attach the leads to the terminals permanently. This completes the hoist generator stall current and no-load voltage tests.

HOIST MOTOR FIELD VOLTS ADJUSTED

Adjust the hoist motor field volts to the recommended values specified in the attached test sheet by the following procedure:

27. With the hoist armature circuit still open, close the hoist motor field.

28. Start the M. G. set and press the Emergency "Start" button to energize LE contactor.

29. With the controller in neutral, adjust the neutral voltage to the required value by shorting out resistance between HM6 and HM4.

30. Move the controller one point in the hoist direction and with the HMF contactor closed, adjust the hoist motor field volts to the recommended value for hoisting by moving lead HM4 to the proper tap on the resistor.

31. With the hoist-drag controller in the neutral position, move the Ram Magnet Valve Controller to the "drag" position and thus close the DMF contactor at the same time ram magnet valve is energized.

32. With DMF closed, adjust the drag motor field volts to the recommended value for dragging and propelling by moving the lead HM2 to the proper tap on the resistor.

SWING ADJUSTMENTS

The swing circuit consists of two swing generators connected in series with two swing motors. It will be found that there will be a slight difference in the self and separate field current values and in no-load voltage values between the two swing generators. The adjustments should be set as close as possible to test sheet values and the values recorded for each unit.

STALL CURRENT ADJUSTMENT

Adjust the swing generators to the recommended stall current and no-load voltage value by the following procedure which are similar to that used for hoist adjustment, with the following exceptions.

1. Stall current and no-load values are different from the hoist because of different size swing and hoist generators.

2. Resistor terminal markings are different.

TUTHILL MODEL CL PUMP INSTRUCTIONS

A. REMOVAL OF SEAL

TO REMOVE THE SEAL ASSEMBLY, OCL13, CLAMP THE PUMP IN A VISE SO THAT ONE JAW GRIPS ACROSS THE TWO PARTS. DO NOT SQUEEZE TOO TIGHTLY OR THE CASTING WILL BE DEFORMED. REMOVE THE CAP, OCL37, WITH THE SPECIAL SPANNER WRENCH, OL506. REMOVE THE SPRING RETAINER, OCL41 AND THE SPRING OCL73. THE THREE PIECES OF RING PACKING, OCL94, MAY THEN BE REMOVED.

B. INSTALLATION OF SEAL

PLACE THE SPRING, OCL73, ON THE SPRING RETAINER, OCL41 AND SLIDE THEM OVER THE SHAFT 1L24 UNTIL THEY TOUCH THE BUSHING OL71. INSERT THE PACKING OCL94 INTO THE HOUSING PLUG. BE SURE THAT THE CUTS IN THE PACKING RINGS ARE 180° APART. (NEW PACKING SHOULD BE SOAKED IN OIL FOR AT LEAST AN HOUR BEFORE INSTALLING.) PLACE THE GASKET OL82 OVER THE OUTSIDE OF THE HOUSING PLUG OCL11. SLIDE THE ASSEMBLY OCL13 OVER THE SHAFT AND MOVE SLOWLY INTO POSITION TO START THE THREADS. TIGHTEN THE HOUSING INTO PLACE WITH THE SPECIAL SPANNER WRENCH OL506.

DETERMINE THE PROPER TAPPED HOLE IN HOUSING PLUG OCL37 FOR THE GREASE FITTING. PLUG THE OTHER TWO HOLES WITH PIPE PLUGS. INSERT THE PUMP IN THE MOTOR END BELL AND BOLT INTO POSITION. THEN INSERT A 1/8" x 4" LONG NIPPLE INTO THE SELECTED HOLE AND ADD COUPLING AND GREASE FITTING TO THE END OF THE NIPPLE. FILL WITH SOFT CUP GREASE.

C. MAINTENANCE

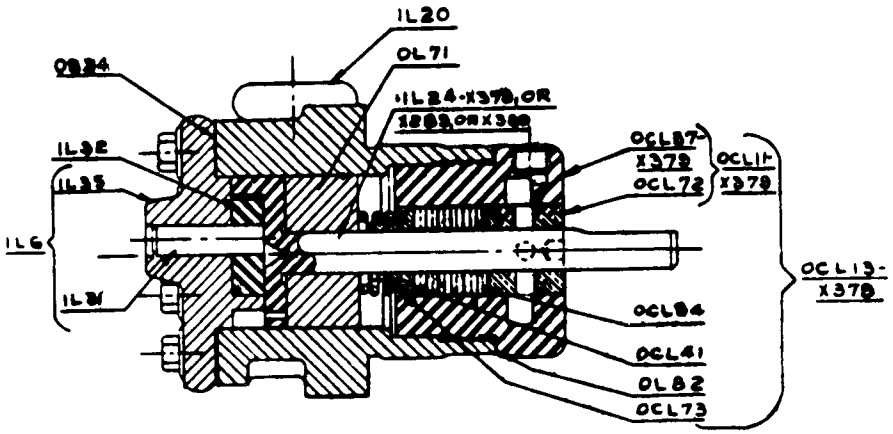
BE SURE THAT THE HOUSING PLUG, OCL37 IS KEPT FILLED WITH SOFT CUP GREASE.

DROP-OFF IN CAPACITY MAY BE CAUSED BY SLIGHT ABRASIVE ACTION OF THE FOREIGN MATERIAL IN THE OIL, CAUSING END-PLAY OF THE ROTOR. THIS CAN BE TAKEN UP BY INSTALLING A THINNER GASKET, 0834. GASKETS .003 THROUGH .009 THICK CAN BE FURNISHED.

CAUTION: ALWAYS PUT THE PIPE COMPOUNDS ON THE MALE FITTINGS--NEVER IN THE FEMALE THREADS.

D. REPLACEMENT PARTS

ORDER PARTS BY THE NUMBER GIVEN ON THE DRAWING AND GIVE THE PUMP MODEL NUMBER (SUCH AS 10CLX-379).



MARION
POWER SHOVEL COMPANY
MARION OHIO

R.L.5464

Shaft Nom. Diam.	Shaft O.D.	Running Clearance	Shaft Nom. Diam.	Shaft O.D.	Running Clearance
9	9.000 8.997	.016 .026	13	13.000 12.997	.020 .033
9-1/4	9.250 9.247	.016 .026	13-1/4	13.250 13.247	.020 .033
9-1/2	9.500 9.497	.016 .027	13-1/2	13.500 13.497	.020 .033
9-3/4	9.750 9.747	.016 .027	13-3/4	13.750 13.747	.021 .034
10	10.000 9.997	.016 .027	14	14.000 13.997	.022 .035
10-1/4	10.250 10.247	.016 .027	14-1/4	14.250 14.247	.022 .035
10-1/2	10.500 10.497	.016 .027	14-1/2	14.500 14.497	.022 .035
10-3/4	10.750 10.747	.016 .027	14-3/4	14.750 14.747	.023 .036
11	11.000 10.997	.017 .028	15	15.000 14.997	.024 .036
11-1/4	11.250 11.247	.017 .028	15-1/4	15.250 15.247	.024 .036
11-1/2	11.500 11.497	.017 .028	15-1/2	15.500 15.497	.024 .036
11-3/4	11.750 11.747	.017 .028	15-3/4	15.750 15.747	.024 .036
12	12.000 11.997	.017 .028	16	16.000 15.997	.026 .039
12-1/4	12.250 12.247	.017 .028	16-1/4	16.250 16.246	.026 .040
12-1/2	12.500 12.497	.017 .028	16-1/2	16.500 16.496	.026 .040
12-3/4	12.750 12.747	.019 .030	16-3/4	16.750 16.746	.026 .040
17	17.000 16.996	.027 .041	21	21.000 20.996	.031 .045

DESCRIPTION OF OIL AND GREASE CLASSIFICATION

CODE	NAME	DESCRIPTION
MPG (Formerly CG and WB)	Multipurpose Grease	A well manufactured E. P. grease having good resistance to both heat and water, possessing good mechanical stability and oxidation resistance. It must be suitable for use in Farval, Lincoln and Trabon automatic dispensing systems. It shall be free of corrosive and deleterious foreign matter of any kind. Special products not meeting the requirements of the Engineering Standard may be required for operation at sub-zero ambient temperatures. MPS Co. should be consulted regarding products intended for service at low ambient temperatures. USES - Anti-friction bearings both packed and gun lubricated, chassis and plain bearings and central lubricating systems.
RGL	Regular Gear Lubricant	Semi-fluid greases having just enough body to retain them in a semi-enclosed case. It must have good adhesive, load carrying and non-channeling properties. USES - Semi-enclosed gear cases.
OGL (Formerly GC)	Open Gear Lubricants	Either of two types of product may be specified. They are intended for use on open gearing where retention is a problem. Both must be adhesive in nature and resist dripping from or flinging off the exposed gearing either idle or in motion. They must be water and corrosion resistant and have E. P. properties.

LUBRICATION OF GANTRY & FRONT END

NO.	NAME OF PART	TYPE	NO. OF POINTS	LOCATION	LUB. SYM.	METHOD & FREQUENCY (HRS.)
68.	Boom Hoist Sheave Gantry	Bushing	6	In End of Shaft	MPG	Manual 24 Hrs.
69.	Boom Safety Sheave Gantry	Bushing	4	In End of Shaft	MPG	Manual 24 Hrs.
70.	Sheave in House	Bushing	1	In End of Shaft	MPG	Manual 24 Hrs.
71.	Boom Hoist Sheave Point	Bushing	4	In End of Shaft	MPG	Manual 24 Hrs.
72.	Boom Safety Sheave Point	Bushing	4	In End of Shaft	MPG	Manual 24 Hrs.
73.	Bridle Sheaves	Bushing	4	In End of Pin	MPG	Manual 24 Hrs.
74.	Bridle Clevis	Bushing	4	In Side of Clevis	MPG	Manual 24 Hrs.
75.	Boom Point Sheave	Anti-Friction	2	On Each Side of Hub	MPG	Manual 500 Hrs.
76.	Swivel Bearing (Cradle)	Bushing	2	In Top of Bearing	MPG	Manual 24 Hrs.
77.	Deflector Sheave	Bushing	2	In Hub of Sheave	MPG	Manual 24 Hrs.

Remove the cylinder head bolts and take off the head. Remove the cap screw from the center of the piston and lift off the packing retainer plate. Remove some of the shims from under the retainer plate. If removing shims from the piston does not tighten the packing sufficiently, the "V" type packing ring must be replaced. Always use a new full set of packing. Coat the inside of the cylinder with a small amount of MPG.

If the hoist or drag clutch or the hoist or drag brake cylinders leak air, the piston cup should be replaced. Lubricate the inside of the cylinder with a small amount of MPG.

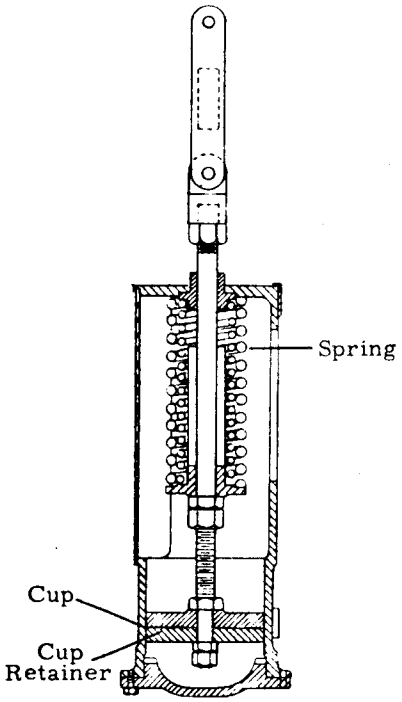


Fig. 7

HOIST OR DRAG BRAKE CYLINDER

Remove electric motor and brake assembly. Attach fixture to hold rotating shaft and gear in place. Remove holddown bolts. Attach sling to lifting holes provided in gear case cover and lift gear case straight up until the main rotating shaft clears the deck.

Place the gear case on suitable cribbing and remove the main rotating shaft from the bottom of the case. Remove gear case cover. The lower intermediate anti-friction bearing must be removed from the bottom of the case. Remove bearing retainer and lock plate and use puller to remove bearing.

To assemble the gear case, reverse the procedure. After the intermediate shaft is in place and the top bearing is installed, draw up the bottom retainer plate, without shims, until the retainer and bearing is snug with a noticeable drag when turned by hand. Measure the space between the retainer plate and the bearing boss. Add shim to this dimension, plus .003. The shim is laminated in increments of .003. Separate the lamination with a sharp knife until the correct thickness is obtained. Be sure all gaskets are in good condition. When assembling the main rotating shaft gear, be sure the oil seal is in good condition, with the lip turned up. Use care not to damage the seals when lowering the gear in place. Use paper gasket under the gear case cover.

ROTATING BRAKE

A rotating brake is located on the top of each of the two rotating motors. The brake is an external shoe type brake that acts on a friction housing keyed to the rotating motor armature shaft. The brake is spring set and air released.

The rotating brake is a holding brake. Not intended to stop or retard the rotation of the machine. Do not apply the brake while the machine is in motion except in case of emergency. Stop the swing by "plugging" the electric motor.

The brake is set by moving the two operating links together, toward toggle position. Adjust the position of the toggle by turning the adjusting bolt between the end casting of the in-

Adjust the band lifter to support the band in release position evenly all around the band. The band must not drag on the friction housing. The small nut on the band lifter rod adjusts the length of the band lifter rod, the large nut adjusts the spring compression. Do not tighten the spring to the point where the spring bottoms in set position. Allow for lining wear.

Adjust the bottom band support roller with about 3/8" to 1/2" clearance in set position. Keep the band lifter support channel aligned with the housing to insure even wear of the lining and housing.

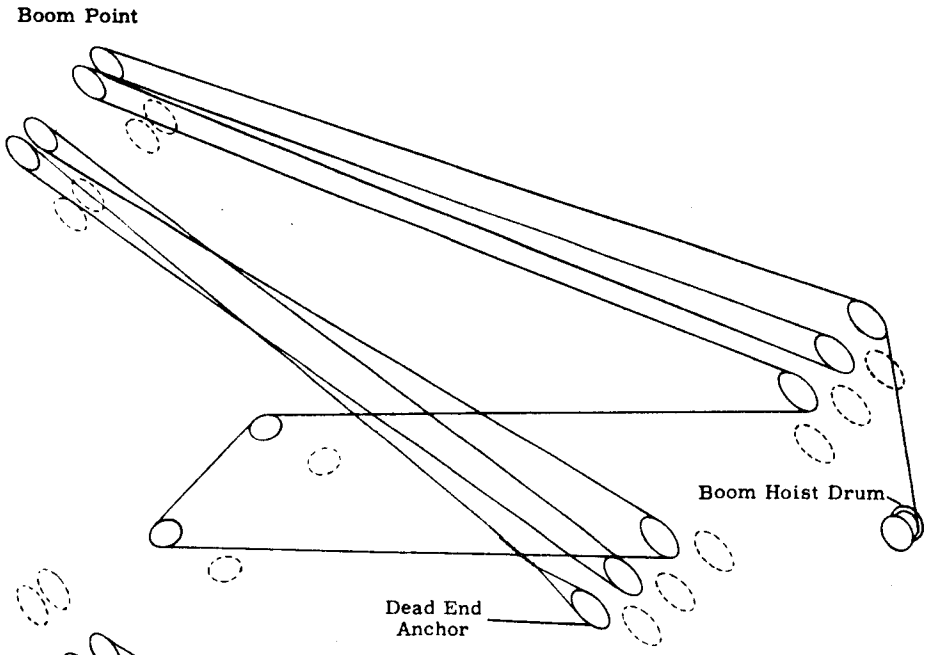


Fig. 21
BOOMHOIST ROPE

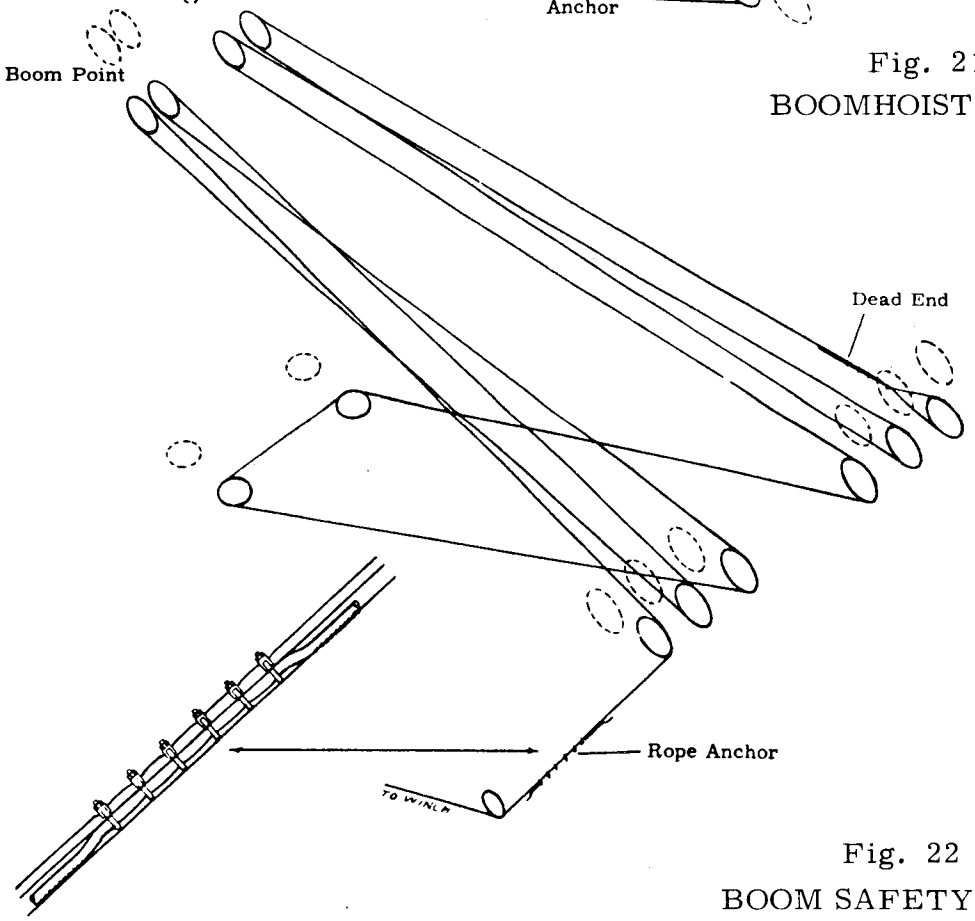


Fig. 22
BOOM SAFETY ROPE

moving the master switch handle to various points. To propel at full power, move master switch to full "On" position. The control is so arranged that lowering the tub in the walking cycle is retarded regeneratively, allowing the machine to set down gently. To set the tub down more slowly than automatic control permits, move the control back to neutral, set the propel brake and allow tub to drift down with brake engaged. Use the procedure only when absolutely necessary for it will cause propel brake to wear rapidly.

When the shoes start to move toward the ground a red warning light, mounted on top of the control box to operator's right, will light. This light remains on during the walking cycle except when the shoes are in the raised position, normal for digging.

The walking cycle is accomplished in four steps, each representing 90 degress rotation of the propel shaft. As shown in the sketches, "A" lowers the shoes, "B" raises one edge of the tub, "C" lowers the tub and "D" raises the shoes.

The edge of the tub will follow an arc shown in sketch "A". This cycle will be repeated until the machine has traveled or stepped as far as necessary.

The speed of lowering the machine is controlled by a reverse current relay, as described in the Electrical Section.

To continue digging, be certain the shoes are in their raised position, as indicated by signal light which is out only in this position. If the shoes have traveled beyond this point, bring them back to the proper position by moving "Hoist-Drag" master switch handle in the "hoist" direction, this allows only minimum power for moving the shoes in reverse and not sufficient to raise the tub. After taking the final step for a move up, be careful in bringing the shoes to the normal raised position to avoid reversing.

RCRX - Auxiliary Reverse Current Relay. Operated by RCR.

S1A, S2A, S3A - Swing Accelerating Contactors. Short resistance in series with swing generator fields to increase speed or torque.

SMF - Swing Motor Field Contactor. Shorts resistance to increase motor field strength.

SMFR - Swing Motor Field Relay. Opens contactor SMF to increase maximum motor speed. Set to pickup with 410 volts on coil and resistor B.

SF, SR - Swing Reversing Contactors. Energize swing separately excited field.

MAGNET VALVES

DRAG RAM - When valve is energized, drag drum is disengaged from hoist motor.

HOIST RAM - When valve is energized, hoist drum is disengaged from hoist motor.

PROPEL CLUTCH - When valve is energized, hoist motor is clutched to propel shaft.

PROPEL BRAKE - When valve is energized, propel brake is released.

SWING BRAKE - When valve is energized, swing brake is released.

LIMIT SWITCHES

1LS - Actuated by propel clutch. Prevents release of propel brake until propel clutch is engaged.

2LS - Actuated by cams on propel shaft in parts of propel cycle when the shoes or tub are being lowered. Contact (H11-Y) allows RCR relay to reduce propelling speed during parts of cycle mentioned above.

verse direction by the opening of the normally closed interlock on H contactor. The normally closed interlock on P contactor is already open when in propel position.

36. Return the hoist-drag controller to the neutral position.

37. Move the swing controller to the full-on swing-right and swing-left position and note that the swing accelerating contactors S2A and S3A do not close in either direction. The circuit 24 of their operating coils has been opened at T8 of the transfer switch.

38. Loosen the straps of the cam under limit switch 3LS and move cam to one side.

39. Note that signal light 13 is on and swing brake is applied although the brake selector switch may be in the "Off" position.

40. Move the swing controller to the full-on swing-right and swing-left positions and note that none of the swing contactors operate because their control circuit has been opened by the S8 contact of the 3LS limit switch.

    The purpose of the cam under the 3LS limit switch is to show an indicating light in the operator's cab and to remove the power from the swing control circuit at any point of the propel cycle except when the shoes are up and in the neutral position.

41. Return the swing controller to neutral and position the cam so that the propel indicating light is out with the shoes up and in the neutral position, and secure the cam tightly to the propel shaft.

    After the control circuits for the digging and propelling positions have been checked, the hoist and swing generators are to be adjusted for stall current and no-load volts; and the motor field volts are to be adjusted to the recommended values specified on test sheet.

After the swing adjustments have been made, the machine is ready to start digging operations.

However, before it is attempted to propel, the Reverse Current Relay (RCR) that controls the speed of propel must be adjusted. The explanation of operation and the procedure of adjustment of the RCR relay is explained in the following:

REVERSE CURRENT RELAY (RCR) ADJUSTMENT

By referring to the elementary diagram on the wiring print of the subject machine, the circuit of the operating coils of the accelerating contactors should be examined carefully to see the function of the RCR relay during the propel operation. It may be noted when the propel circuit is set up, the P interlock is open, H interlock is closed, H11 contact of limit switch 2LS is closed and the RCR and RCRX contact points are open, though the voltage of 125 volts is impressed across the operating coil of RCR and its resistor.

It will be noted that if the operator desires to walk in the reverse direction, the H interlock will open and thus limit the walking power to a negligible amount, suitable for lifting the shoes only.

For machines using a set of contacts on the 2LS limit switch in parallel with a set of contacts on the RCRX relay, the following five paragraphs apply.

The accelerating contactor coils of the hoist motion during propel must be energized either through a normally open contact or RCRX relay or through a normally closed limit switch contact. The normally closed limit switch is opened by two cams on the main propel shaft. One long cam holds the limit switch open during lowering (regeneration) part of the cycle.

The short cam opens the limit switch contact for a short time just as the shoes are about to strike the ground when they are lowering. This permits the RCRX relay contact to be effective just as the shoes approach the ground. The cam is adjustable with respect to the long cam.

INDEX

TABLE 3

	RECOMMENDED BACKLASH IN NORMAL PLANE	
D.P.	MINIMUM	MAXIMUM
3/4	.030	.065
1	.030	.060
1-1/4	.025	.055
1-1/2	.020	.050
1-3/4	.020	.050
2	.015	.045
2-1/2	.015	.045
3	.010	.040
3-1/2	.010	.035

SETTING OF PINION FOR BACKLASH AND TOOTH CONTACT

Roll the gear to bring a favorable checking station (which is the one with either maximum plus (+) or maximum minus (-) rim face runout reading) to the mesh position.

PLACE THE PINION ASSEMBLY INTO POSITION

Bring the pinion shaft into approximate parallelism with the gear axis by leveling and preliminary shimming of the bearing pedestals. Next place the pinion into mesh with the gear for setting of contact and backlash. If the gearing is single helical, the bearing caps should be removed to make sure that the thrust ring is in the correct pedestal and that the free bearing is in the center of its axial float. Where locknuts are used to secure the bearing, check for tightness and make sure the lock tab on the washer is secure.

TORQUE PINION TO GEAR

Fix gear to prevent rotation and torque pinion to gear in the actual direction in which it is to operate, as illustrated in Figure 10. If a herringbone gear, make sure pinion apex centers on gear apex. This is done by barring pinion back and forth endwise to make sure it is free to float within the bearings. Anti-friction bearings should be free to float and centered in their pedestals when pinion is centered against apex of gear.

port ropes and bridge strands, do not require flexibility. The hoist, drag and crowd ropes, which undergo repeated bending without the individual wire breaking from fatigue and the internal friction within the strand, must be of flexible construction. The smaller and more numerous the wires, the more flexible the rope.

ABRASION

Resistance to abrasion is a factor which must be considered, especially for hoist and drag rope. Rope with the large outer wire is more resistant to abrasion than rope with small outer wire. Rope with lang lay construction offers greater resistance to wear than regular lay construction.

In regular lay construction the wires of each strand are twisted in the opposite direction of the strands to form the rope. The wire of the strand appear to run parallel to the center of the rope. In lang lay construction the wires are twisted the same direction as the strands and the wires appear to run across the strand or perpendicular to the center of the rope. Lang lay provides a greater area of wire to resist abrasion, also the internal friction of lang lay rope is less.

RESISTANCE TO CRUSHING OR DISTORTION

Wire rope with independent wire rope core (IWRC) offers substantially greater support to the interior of the rope and resists crushing or distortion of the rope when pulled over a sheave or drum.

The proper fit of the sheave groove and the spiral groove on the drum supports the rope and prevents the rope from assuming an elliptical shape as the rope is bent around the sheave on drum.

The final selection of the wire rope for any particular application on excavators must be a balance of several characteristics that satisfy the greatest number of requirements.

INSTALLATION

As pointed out before, a wire rope is vulnerable to abuse and mishandling. A new rope can inadvertently be permanently damaged at installation. Improper removal from the reel or coil can cause kinks. Kinks are caused by pulling