# MAINTENANCE

AND

# OPERATING MANUAL

CRANE

CLAMSHELL

DRAGLINE

SHOVEL

TRENCHOE

UNIT CRANE & SHOVEL CORP.

MILWAUKEE 14, WISCONSIN

# TO THE OPERATOR

The operating life of any machine is largely determined by the operator and the care that he gives it. The time spent in caring for the machine in the proper manner will be reflected in its life and performance. The better care, naturally, the better performance and longer life. This reputation has been maintained throughout the years and can be upheld by proper care.

By following the instructions, the operator will be informed of the methods of lubrication, adjustments, removal and operation of attachments. It is advisable to make minor repairs and adjustments at once before they become major problems.

Any questions regarding the upkeep and care of this machine that are not included in the instructions, should be taken up with the factory where an efficient Service Department is maintained to take care of you at all times.

UNIT CRANE & SHOVEL CORP.

# GENERAL INSTRUCTIONS

Read carefully all of the instructions that are provided with the machine. Be sure that the engine radiator is filled with water for summer operation and with suitable anti-freeze for winter.

The simplicity of UNIT construction and it's self lubricating main machinery, eases the problems of lubrication for the operator. Follow the lubrication instructions so that all the external bearings are lubricated. Give the machine a thorough inspection at least once a week.

Watch the brake and clutch linings and adjust them when needed. Do not permit worn parts to work a hardship on associated parts, always replace them at once. Do a small repair job when it is required so that it will not develop into a major overhauling.

Keep your machine clean and free from grease and oil. It should never be left in mud or water over night, especially in the winter. If this is done, the machine will freeze in and it will probably result in external damage when it is moved.

# INDEX

# SPECIFICATIONS

CAPACITIES (for all models)

| | | |
|---|---|---|
| AIR CLEANER | | 3 Pints |
| FUEL TANK | | 40 Gallons |
| COOLING SYSTEM | Chrysler Engine | 7 Gallons |
| | 3 cyl. Diesel | 6 1/2 Gallons |
| | 2 cyl. Diesel | 4 Gallons |

GEAR CASE:

| | |
|---|---|
| Lower Chamber | 45 Lbs. |
| Side Chamber | 35 Lbs. |

POWER TAKE-OFF HOUSING:

| | | |
|---|---|---|
| Worm Drive | | 4 Lbs. |
| For model 357 only | Transmission | 35 Lbs. |
| | Bevel Gear Housing | 15 Lbs. |
| | Differential | 16 Lbs. |

(Refer to Lubrication Chart for type of Lubricant)

BATTERIES: Distilled water is required for maintenance. The level of electrolyte (liquid) should be approx. 3/8" above the plates and should be inspected frequently.

COOLING SYSTEM: Keep water slightly below top of radiator overflow pipe. Use clean water only. Do not pour cold water in an empty or partly empty cooling system when the engine is hot. Clean out the system at intervals, using soda and water. When using anti-freeze solutions, check to maintain the proper mixture.

# OPERATING LEVERS

The illustrations on page 3 shows all of the controls from the operators viewpoint. The diagrams represent a top view of the levers in operating position. Refer to the diagrams in connection with all the following instructions.

The three hand levers 1,2 and 3 control the operating clutches. Lever 4 engages the engine clutch. Lever 5 and 6 are used for swing, travel and boom hoist. Lever 7 is the steering lever. Foot pedals 8 and 9 are used to control the front and rear drum brakes. Lever 10 operates the swing lock.

TO START MACHINE: (Gasoline Engine) Pull out the ignition switch and accelerator control rod. Then press the starter button. These controls are mounted on the instrument panel.
(For Diesel Engine) Open the hand throttle and press the starter button. However, in cold weather it will be necessary to open the hand throttle and also the fuel valve. Then apply a few rapid strokes to the air heater as the starter is being engaged. This will allow the large air pump to distribute a flame around the cylinder walls to preheat the engine for easy starting.

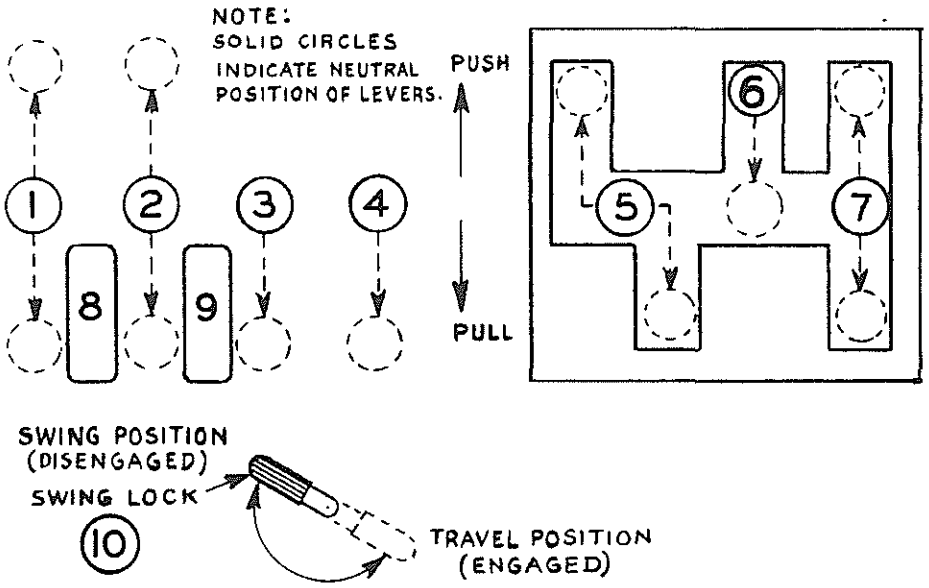
TO SWING THE MACHINE: With the engine started, pull back engine clutch lever 4. Push lever 5 forward from neutral to engage the swing clutch. Now move lever 10 to swing position. To swing the machine right, push lever 1 forward. To swing left, pull lever 1 back. To stop the right swing, pull lever 1 back or to stop the left swing, push lever 1 forward past neutral position until stop is made. Practice of these two operations, will give the operator the feel of the swing motion.

TRAVEL and STEERING: (for models 514 and 1020) Pull lever 5 from neutral position to its engaged position as shown in diagram on page 3. Move the swing lock lever 10 to travel position. For forward travel, pull lever 1. For reverse travel, push lever 1. To steer to the right, lever 7 is pulled back from neutral position. To steer left, lever 7 is pushed forward. Apply a slight pressure to lever 7 for full clutch engagement. Also slip operating lever 1 if necessary.
IMPORTANT: In forward travel, the drive chain sprockets should always be at the rear of the machine.

TRAVEL and STEERING: (for model 357) With lever 1 in neutral position, pull lever 5 from neutral position to its engaged position as shown in diagram page 3. Now move the swing lock lever 10 to travel position and release the air brake by pulling lever 11 back. Then move the shift lever 12 into low or high gear as required. For low gear pull lever 12 back and for high gear, push lever 12 forward. For forward travel push lever 1. For reverse travel, pull lever 1. To steer to the right, pull lever 7 upward and to steer to the left, push lever 7 downward. To stop the machine and put it in braking position, lever 1 should be moved into neutral position and lever 11 pushed forward.

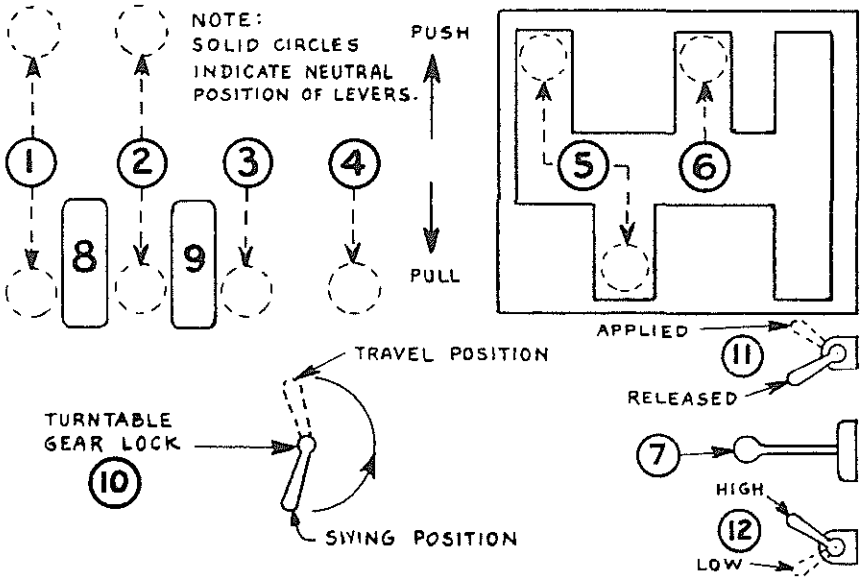
TO RAISE and LOWER THE BOOM: Move lever 5 in neutral position and pull lever 6 into boom hoist engagement. To raise the boom, pull lever 1 from neutral position. To lower the boom push lever 1 from neutral position. Note: On models 357 & 514 the boom hoist lever 6 is pushed into engagement instead of pulled as on model 1020. A spring loaded brake in the boom hoist mechanism, eliminates manual control.

## OPERATING LEVERS FOR MODELS 514-1020




1. SWING, TRAVEL & BOOM HOIST LEVER.
2. CROWD & RACK for shovel operation. FRONT HOIST DRUM for crane, clamshell & dragline operation.
3. REAR HOIST DRUM for shovel, clamshell & dragline operation.
4. ENGINE CLUTCH LEVER.
5. SWING & TRAVEL ENGAGING LEVER.
6. BOOM HOIST ENGAGING LEVER.
7. CRAWLER STEERING LEVER.
8. FRONT HOIST DRUM FOOT BRAKE.
9. REAR HOIST DRUM FOOT BRAKE.
10. TURNTABLE GEAR LOCKING LEVER.

## OPERATING LEVERS FOR MODEL - 357

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9. REAR HOIST DRUM FOOT BRAKE.
10. TURNTABLE GEAR LOCKING LEVER.
11. AIR BRAKE LEVER.
12. TRANSMISSION SHIFT LEVER.

# OPERATING INSTRUCTIONS

TO OPERATE THE CRANE: Use levers 1, 2, 5 and 6 also brake pedal 8. First the swing lock lever 10 must be moved in the swing position. To raise the load from the ground, pull back on lever 2 and at the same time release brake pedal 8. When the load is raised to the proper height, lever 2 is moved to neutral position and brake pedal 8 is pressed down at the same time to hold the load. Proper handling of operating lever and brake pedal between lifting and holding the load will eliminate excess tension on the hoist cable. Lower the load by slightly releasing the pressure on the brake pedal. If rear drum is used for hoisting, use lever 3 instead of lever 2 and brake pedal 9 instead of brake pedal 8.

TO OPERATE THE DRAGLINE: Use levers 1, 2, and 3 also brake pedals 8 and 9. With the bucket in proper digging position on the ground, start the digging operation by pulling back on lever 2 and at the same time releasing the pressure on brake pedal 9 to allow slack on the hoist cable. When bucket is filled, press brake pedal 8 to hold the load and move lever 2 to neutral position. Pull back lever 3 to raise the load to the necessary height. While bucket is being raised, ease up on brake pedal 8 to allow slack in the drag cable. Keep just enough drag on this cable to prevent dumping the load. With the swing lock lever 10 in the swing position, engage swing lever 1 and swing load to dumping location. When the desired height and position for dumping is reached, release the pressure on brake pedal 8 and the load will be dumped. To return to digging position, use swing lever 1, then lower the bucket by releasing brake pedal 9 slightly so the bucket does not drop too fast.

CASTING THE BUCKET: To cast straight ahead, first bring the bucket back to the boom by engaging lever 2, then release brake pedal 8. This will release the bucket and it will swing forward and ahead of the boom. Care must be taken at this point to keep a slight tension on the brake pedal 8 to prevent the front drum from over-riding the cable when it slacks. When it has reached the farthest distance ahead of the boom, release the brake pedal 9 and the bucket will drop to the ground.

CASTING ON THE SWING: This is done by throwing the bucket out to the digging position. The swing action of the turntable throws the bucket out beyond the boom. When in line with the digging position, the bucket is dropped by releasing the pressure on brake pedal 9. Skill, judgement and practice is necessary for efficient dragline operation.

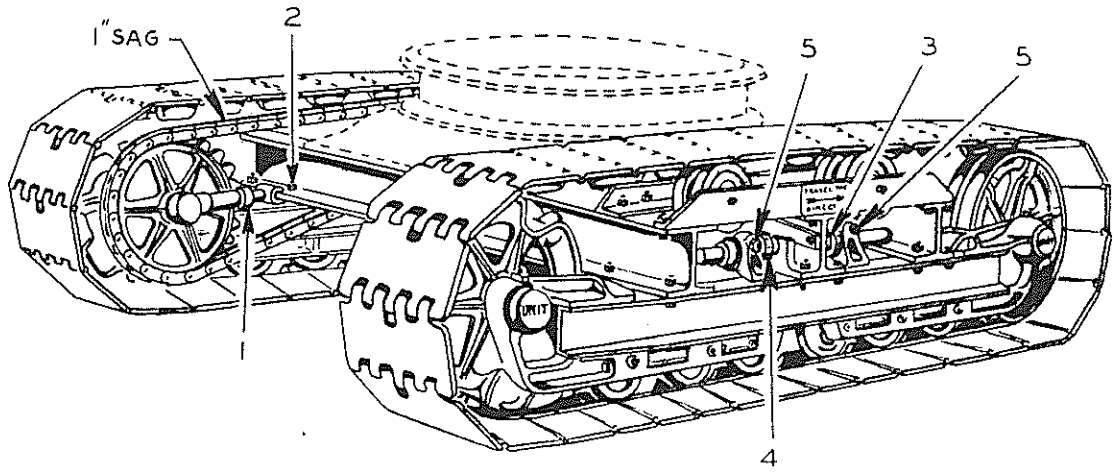
TO OPERATE THE CLAMSHELL: Use levers 1, 2 and 3 together with brake pedals 8 and 9. With the clamshell in position on top of the work, pull back on lever 2 to close the bucket. Then pull back on lever 3 to raise the bucket to the height required. Now move both levers 2 and 3 back to neutral position while at the same time applying brake pedals 8 and 9 to hold the load. With the swing lock lever 10 in swing position, swing bucket to dumping position with lever 1 and dump load by releasing brake pedal 8. Now swing the bucket back into position for another cycle of operation.

TO OPERATE THE SHOVEL: Use levers 1,2 and 3 together with brake pedals 8 and 9. The crowd and rack operations are controlled by lever 2 and brake pedal 8. The dipper trip operation is controlled by a dipper trip lever to the right of the operator.

With the bucket in digging position, pull back on lever 3 to engaged position. Now push lever 2 if it is necessary to crowd the bucket. If the bite becomes too great, pull back on lever 2 to ease the load. When the bucket is filled, push lever 3 back to neutral position and apply brake pedals 8 and 9 to hold the load. With the swing lock lever 10 in swing position, move lever 1 to swing the load into dumping position. To dump the load, push the power trip lever with the right elbow. When bringing the dipper back to digging position, care should be taken so that the bucket is not dropped to the ground too fast as this will result in damage to the cable. To eliminate this, release the brake pedal 9 slowly and rack with lever 2.

CAUTION ! Handle the levers easy - DO NOT FREEZE TO THEM. Fill the bucket completely, but work in such a way that it is filled when the end of the cut has been reached. This will eliminate unnecessary strain on the cables.

TO OPERATE THE TRENCHOE: Use levers 1,2,3 and 5 together with brake pedals 8 and 9. With the swing lock lever in swing position and the bucket on the ground ready for digging, pull back on lever 2. Apply pressure on brake pedal 9 to hold the grade with the bucket. When the bucket has been filled, set brake pedal 8. Now engage lever 3 to raise the load to the desired height and swing into position with lever 1. Release brake pedal 8 to dump the load. Proper operation of lever 3 will prevent over-shooting the load.

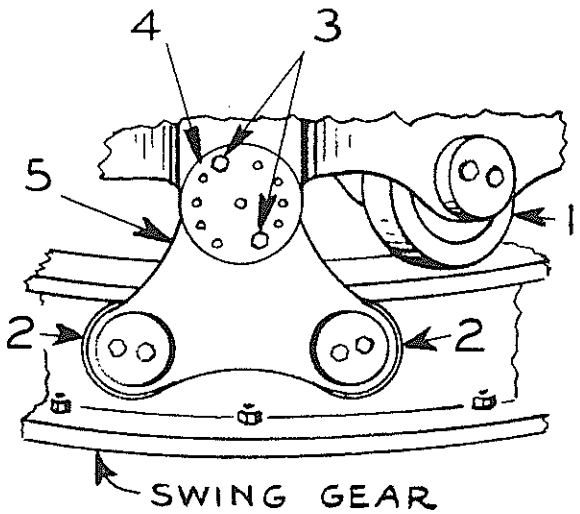


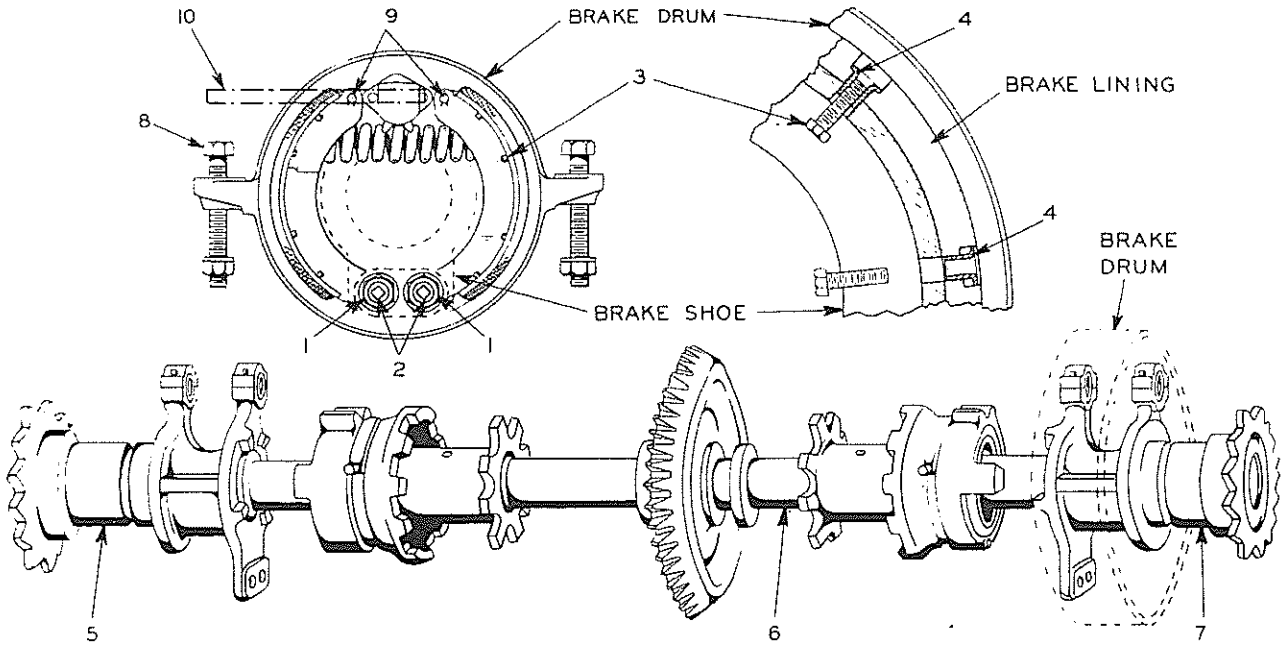

## ADJUSTMENT OF CRAWLER and DRIVE CHAINS

By rotating the adjusting nuts 3 and 4 to the right or left, will either tighten or loosen the crawlers. To make this adjustment, first loosen the adjusting nuts 1 and cap screws 2 on the outboard bearings. Turn back the adjusting nut 1 sufficiently to allow adjustment for the crawlers. Then loosen the lock nuts 5 on the adjusting bolt bracket and insert a bar in the holes of the adjusting nuts 3 and 4 to rotate in either direction. This will move the crawler end bearings either inward or outward. The adjusting nuts 3 on the front end will adjust the crawlers only, while the adjusting nut 4 will adjust both crawler and drive chain. If the crawlers are properly adjusted and the chain still requires tightening, loosen the adjusting nut 3. With the crawler loose, tighten adjusting nut 4 which will tighten the chain and also take up the slack in the crawler. To take up additional slack and allowing for sag, tighten up on adjusting nut 3. After crawler and chain are properly adjusted, extend the outboard bearings as required and lock in position with cap screws 2. The proper sag for the chains is approx. 1". The sag for the crawlers should be approx. 1 1/2". It is important that the amount of sag be equal on both chains.
NOTE: Outboard bearings are on 1020 models serial #48538 and over.

## HOOK ROLLER ADJUSTMENT (For 1020 Models Serial #48538 and over)

When the rear turntable rollers 1 raise off the roller path 1/8" or more when a load is applied on the boom or dipper, all the hook rollers 2 should be adjusted to overcome this clearance. Adjust hook rollers by balancing machine so all four turntable rollers contact the roller path. Then remove cap screws 3. Turn the eccentric pin 4 so that the hook rollers 2 are snug up against the roller path. With the rollers properly set so the holes in the eccentric pin line up with the tapped holes in the hook roller carriage 5, the cap screws 3 can be tightened.
CAUTION: Keep the roller path free from dirt and grease.



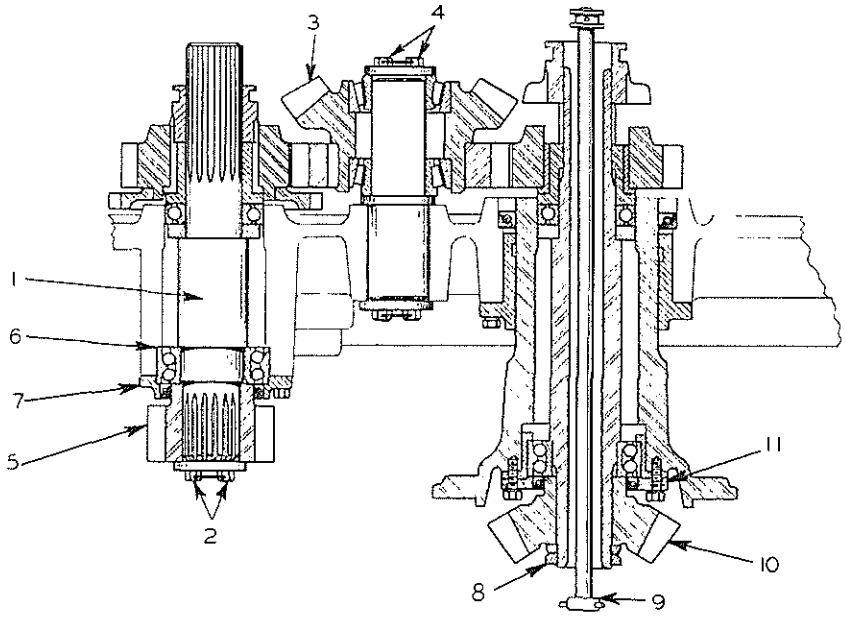



LOWER TRACTION SHAFT and BRAKES: To adjust lower traction brakes, first lock the crawlers by inserting a log through the front tumbler or by anchoring blocks in front of the crawlers. With the steering lever in neutral position and the machine engaged in traction, apply pressure on the operating clutch to free the brake from the drum. Then shut off the engine to hold brakes in open position. Now loosen lock nuts 1 and turn adjusting pins 2 in either direction to loosen or tighten the brakes. The square head on the adjusting pins are punch marked to indicate the adjusting points. A 1/4 turn of the pin should be enough adjustment. However, check the brakes and adjust until they hold. NOTE: A 1/2 turn is the max. adjustment. Be sure to tighten the lock nuts after each adjustment.

TO RELINE THE LOWER TRACTION BRAKES: Proceed to lock the crawlers and free the brakes, same as in brake adjustment. To remove brake lining, turn out all the cap screws 3 about 3/8", then tap the cap screws back to push out the lining nuts 4 into the counterbore of the lining so that the nut will clear the brake shoe as shown in the illustration. Now screw out and remove cap screws 3. This will allow the lining to be slipped out between the shoes and brake drum. Remove the lining nuts 4 from the old lining and insert them in the counterbore of the new lining and slide the new lining between the shoe and drum and fasten with cap screws 3.

TO REMOVE THE LOWER TRACTION SHAFT: Disconnect the controls attached to the shaft, and also the drive chains. At this point the shaft should be supported so that when the bolts are removed from the bearings, the shaft does not fall to the ground. Next remove the bolts from the bearing points 5, 6 and 7. Then remove the bolts 8 that hold the two brake drums. With all the bolts and nuts removed, the entire traction shaft can be removed for brake shoe replacement.

TO REMOVE BRAKE SHOES: Remove lower traction shaft as explained above. Then release brake shoes from the drum by inserting a bar 10 in the brake arm as shown. A hole is provided in the brake arm for this purpose. Move the bar so the brake arm will turn and compress the spring which will release the brake so it can be removed from the drum. To remove the brake shoes from the brake assembly, it will be necessary to press the shoes together to remove pins 9 and adjusting pins 2.



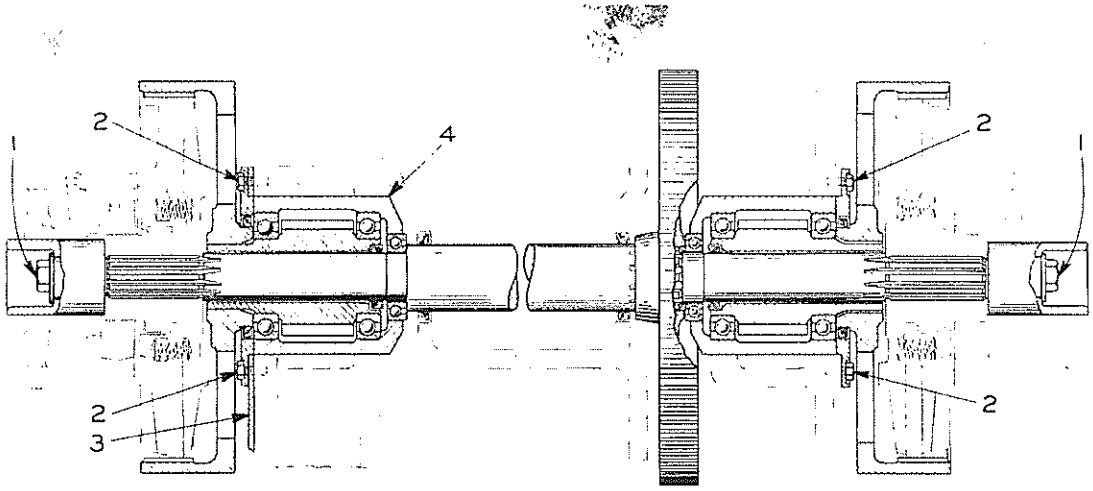

TO ADJUST VERTICAL SWING SHAFT: If there is end play in the vertical swing shaft 1, tighten cap screws 2 just enough so that there is a slight drag when the shaft is turned by hand. This drag will allow enough play for operating clearance. This adjustment applies to models 357 - 514 and also (model 1020 up to serial #48537). The hook roller model 1020 has ball bearings which do not require adjustment.

TO ADJUST VERTICAL IDLER SHAFT: Check the vertical idler gear 3 for end play. If there is too much end play, tighten the cap screws 4 until there is only a slight amount of end play and then lock the cap screws with wire. The cap screws 4 can be reached through an opening in the gear case beneath the front drum. Check these shafts at least once a month and adjust as required.

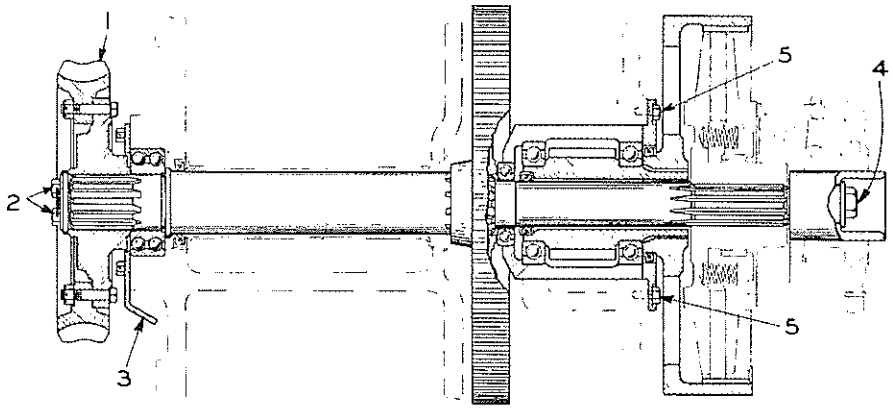
TO REMOVE VERTICAL SWING SHAFT: For hook roller model 1020, remove front and rear hook roller carriages and block up the entire upper unit so the bearing, retainer and seal can be removed. To do this, first remove the cap screws 2 from the bottom of shaft 1. This will allow the swing pinion 5 to be removed. With the upper unit blocked up to a sufficient height, block up the swing shaft high enough so that the bearing 6 and retainer 7 can be slipped out to allow the shaft to be dropped. The sleeve, bearing and retainer at the upper end of the shaft will come out with the shaft. NOTE: On models 357, 514 and also on model (1020 up to serial #48537) it is not necessary to block up the entire upper unit as the swing shaft can be pushed down through the roller bearings. The turntable should be in such a position as to provide clearance for dropping the shaft.

TO ADJUST VERTICAL TRACTION SHAFT: Back up one of the lock nuts 8 and take up on the other lock nut to adjust for operating clearance. Then lock in position to maintain the adjustment.

TO REMOVE VERTICAL TRACTION SHAFT: Disconnect the controls, shifter yokes and lower collar from rod 9. Then push rod through gear case. Now remove lower traction shaft as explained (LOWER TRACTION SHAFT). Next remove bevel pinion 10 by removing lock nuts 8 and remove cap screws 11 holding the bearing retainer, bearing and bearing cage. This will allow the entire shaft assembly to be dropped.

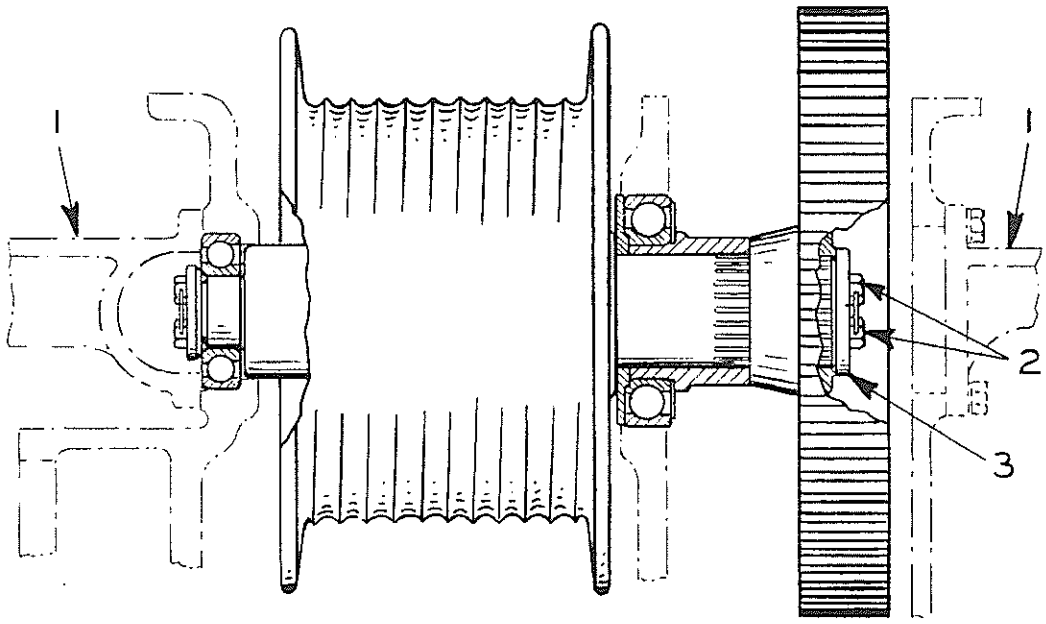



TO REMOVE FRONT and INTERMEDIATE COUNTERSHAFTS: It is necessary to remove the lever shafts, shifter forks and lever brackets on both ends of the countershafts. Remove cap screws 1 and remove both clutch assemblies. Screw out the cap screws 2 through the openings in the clutch housings and remove both clutch housings. Also remove cap screws holding cover 3. Now screw out the set screws holding the retainers 4. Then remove the cap screws holding the swing and traction gear. The gear can now be lifted out of the way at the same time the retainers are being removed from the operators side. The clutch assembly and clutch housing are then removed on the side opposite the operator. The shaft can now be tapped out towards the operators side.




TO REMOVE REAR COUNTERSHAFT: The rear panel and radiator will have to be removed so that the worm housing and motor can be moved. With these parts out of the way, proceed to remove the cap screws that hold the worm housing to the gear case. Next remove the bolts from the front motor support. The worm housing and motor can now be swung to one side. With the parts moved out of the way, the worm gear and spider assembly 1 can be taken off by removing cap screws 2. Next screw out the six cap screws holding the retainer plate 3 to the gear case. By removing the cap screws 4 on the opposite end of the shaft, the entire clutch assembly can be taken off. Now remove cap screws 5 through the openings in the clutch housing and remove the clutch housing. The shaft can now be tapped out toward the operators side. To remove the retainer, it will be necessary to lift the drum gear out of the way

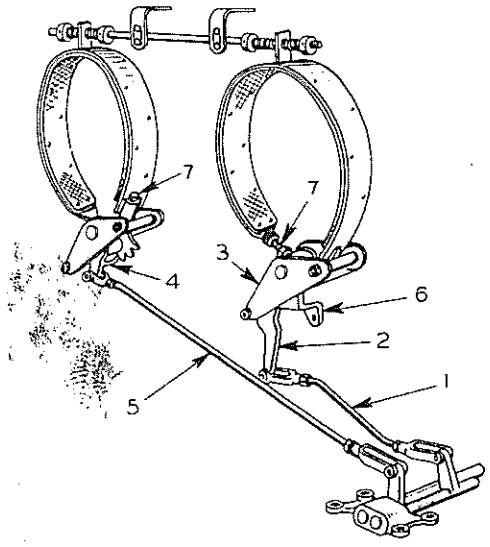
Should there be a power trip on the worm housing, it must be removed before the worm housing can be moved. For instructions on removing the power trip, refer to (POWER TRIP).



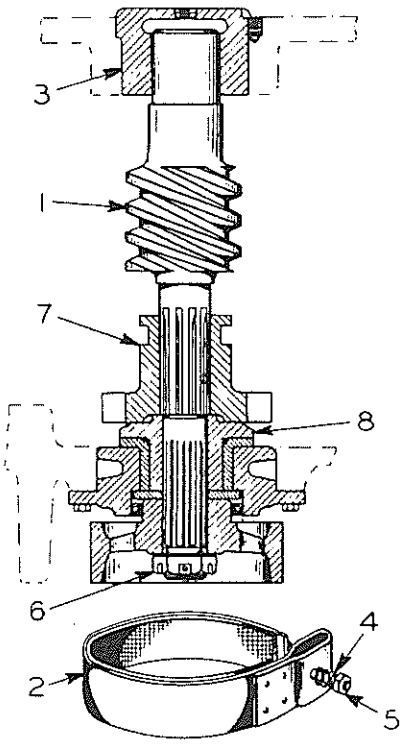

TO REMOVE FRONT DRUM SHAFT: Take off the brackets 1 that are fastened to the gear case at each side of the shaft. Then remove cap screws 2 and washer 3 on the end of the shaft opposite the operator's side. With the nut and washer removed, this shaft can be pushed out through the operators side of the cab. In shovel operation a crowd drive sprocket replaces the front drum.
TO REMOVE THE REAR DRUM: Follow the same procedure as the front drum except remove cover on the operators side.

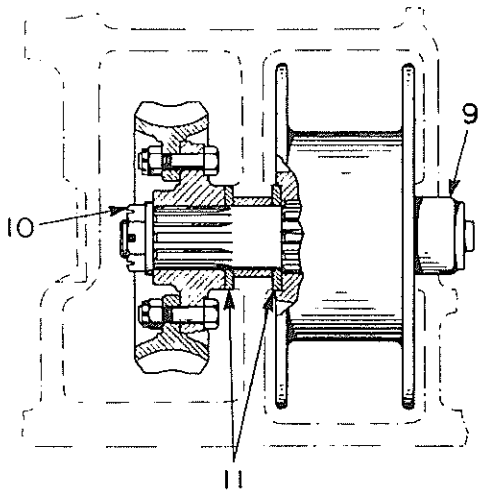
TO REMOVE SPLIT TYPE DRUM OR SPROCKET: It is necessary to remove the four socket head cap screws that hold the drum halves together. To do this, be sure to first screw out the socket head pipe plugs from the bottom of the socket head cap screws.

DRUM BRAKE ADJUSTMENT: The illustration shows the brake assembled for shovel operation. Reach rod 5 should be adjusted so the brake crank 4 is in a vertical position and that it approaches the line of center when the brake is engaged. If crank 4 moves past the vertical line of center when brake is engaged reach rod 5 should be lengthened. This is important because the crank provides the brake action and controls the ease of operation. To tighten the front and rear drum brakes, just release lock nuts and take up on the adjusting bolt 7 and tighten lock nuts.
IMPORTANT: (For wear on lining, adjust brake bands, not the reach rods). Brake crank 2 used only in shovel operation should be in vertical position when brake is engaged. Lengthen reach rod 1 to keep crank in this position.




For clamshell, dragline and trenchoe work, reverse action of front brake by removing plate 3, rod 1 and crank 2. Turn crank and brake band around so that crank 6 is in the same position as the crank on rear brake. Replace plate 3, fasten rod to crank 6 and adjust.



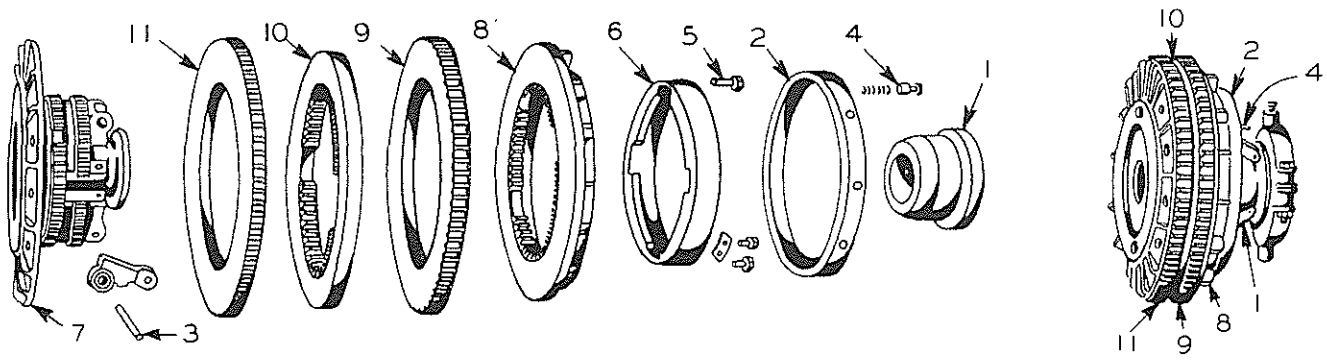




BOOM HOIST BRAKE ADJUSTMENT: The safety brake which keeps the boom from lowering is located beneath the turntable just behind the swing shaft, it is not manually operated, but is held tight by a spring 4. When the suspension cable allows the boom to lower, it is an indication that the brake requires adjustment. The brake is adjusted by increasing the tension of the spring 4 by taking up on nuts 5 on the brake band assembly 2.

TO REMOVE BOOM HOIST WORM: On models 357 - 514 and also on (model 1020 up to serial #48537), remove nut 6 and the entire brake assembly 2. Next take off the grease fitting and also screw out the allen head screw from the top bearing 3. Remove bearing 3 by jacking up the worm shaft 1 so that the bearing will be forced upward. To provide clearance for removing the bearing 3, it is necessary to remove the rear drum and drum shaft. Now the boom hoist worm shaft 1 can be lifted out through the bearing bore just above the shaft. The boom hoist pinion 7 and thrust collar 8 should be taken out at this time, inspected and replaced if necessary. On hook roller model 1020, the boom hoist worm can be removed from the bottom of the machine, by removing the rear hook roller cradle.

TO REMOVE BOOM HOIST DRUM SHAFT: It is necessary that the worm housing and motor is swung to one side the same as is required when removing the rear countershaft. Then take out the welch plug that can be seen under the worm housing. The rear drum brake support on the side opposite the operator must be removed. Then take off the nut 9. Use a tool that will fit over the threaded end of the shaft and tap the shaft out on the side opposite the operator. This tool should keep the boom hoist drum and the two thrust washers 11 in position while the shaft is out of the case.

TO REMOVE BOOM HOIST GEAR: Swing the worm housing and motor to one side. It will be necessary to remove the pin holding the rear A frame leg to the turntable, so that the leg can be moved out of the way when removing the boom hoist gear. Next remove the welch plug under the housing. Then remove nut 10 and remove the drum shaft by tapping it out from the operators side of the case. Now the worm gear will be free to be removed through an opening in the lower left hand side in the rear of the gear case. When replacing the worm shaft and gear, be sure that the thrust washers 11 are replaced in proper position. The bushing 9 is to be installed to the shaft after the assembly has been replaced in the gear case.




OPERATING CLUTCHES: When any of the clutches are slipping and before any adjustments are made, check to see that the countershafts are rotating at a uniform speed while the slipping occurs. If the countershafts slow down or stop rotating, the engine clutch needs adjusting. If the countershafts continue to rotate at the usual speed, then one of the operating clutches need adjusting.

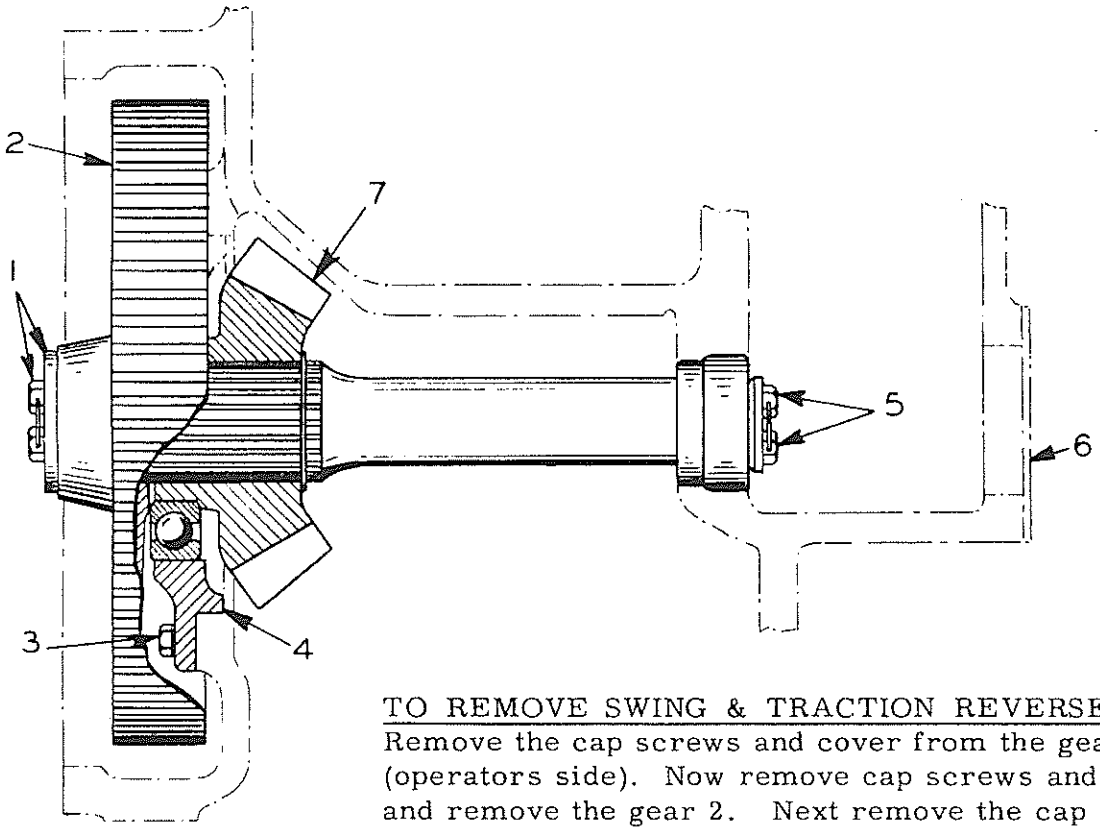
To adjust the clutches, pull out lock pin 4 and turn the adjusting nut 2 in a clockwise direction to tighten the clutch. The nut 2 should be turned one notch at a time until the proper adjustment has been made. To make the above adjustment on the engine clutch which is enclosed in the worm housing, a small tool is provided to make this adjustment. There is an opening in the bottom of the worm housing to get at the engine clutch for adjustment.

In shovel operation the hoist clutch should be adjusted so that it will lock easily. The crowd and rack clutches should be adjusted so they are tight enough, but will not backlock. Also the swing clutch should not backlock. In dragline and clamshell operation, the front clutch and rear clutch on the side opposite the operator, should be adjusted so that it engages completely. In trenchoe and dragline work. the center clutch on the side opposite the operator can be removed and replaced with a cover made for that purpose.

The swing and traction clutches must be adjusted to the neutral position, so that when one clutch is engaged, the other clutch must be in neutral. This is done by adjusting the yoke on the clutches. A bolt with two nuts connects these clutch yokes and the adjustments of this bolt will move the clutch yokes into proper position. This same adjustment applies to the crowd and rack clutches on the side opposite the operator.

TO REPLACE CLUTCH FACINGS: Remove the clutch shifter fork that is attached to the shifter yoke. Take off the cone collar 1. Remove the adjusting nut 2 in a counter clockwise direction until it comes off the clutch. Now remove the four clutch fingers by taking out pins 3. (It is not necessary to remove the clutch fingers on single disc clutches). The two locating pins 5 in the adjusting plate 6 can be removed by taking out the cap screws. Take off adjusting plate 6, by turning it so the slots clear the hub and back plate 7. The outside plate 8 can be removed in the same manner. The outer friction plate 9, center drive plate 10 and inner plate 11 can now be removed. The clutch facings can now be replaced if necessary and the entire clutch reassembled and adjusted for proper operation.

CAUTION: Do not overheat clutches by unnecessary slipping as this will glaze the surface of the linings. If the linings are glazed, replace with new linings.

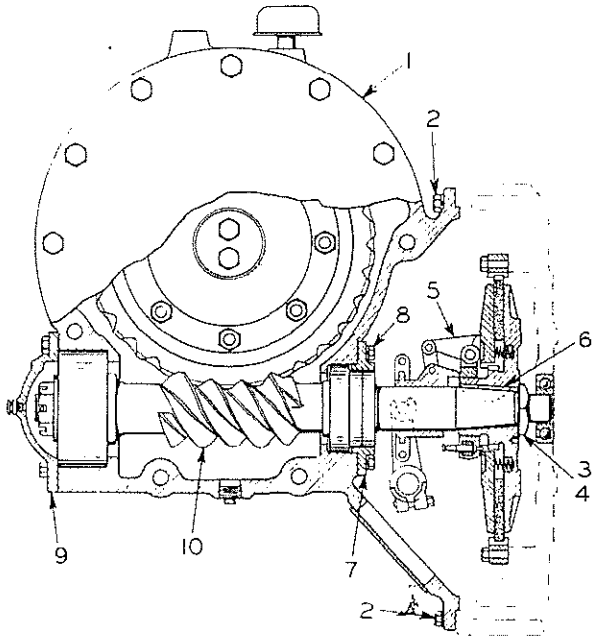



TO REMOVE SWING & TRACTION REVERSE GEAR: Remove the cap screws and cover from the gear case (operators side). Now remove cap screws and washer 1 and remove the gear 2. Next remove the cap screws 3 holding the bearing retainer 4. With the bearing retainer free, remove the cap screws 5. Cap screws 5 can be reached inside the gear case after the cover 6 (opposite operators side) has been removed. The shaft can now be tapped out and the bevel gear 7 will come out with the shaft.

TO REMOVE GEAR CASE FROM TURNTABLE: First drain the lower grease chamber by removing the drain plug under the turntable. Remove the necessary hood and cab parts and move the front part of the A frame forward and out of the way. Then disconnect all of the controls attached to the gear case. Next, remove the front cover and disconnect the reach rods in the gear case. Now remove the lever shaft brackets and the five shifter forks from the lever shafts. Then swing the worm housing and motor to the side as explained in ( REMOVING MAIN DRIVE WORM).

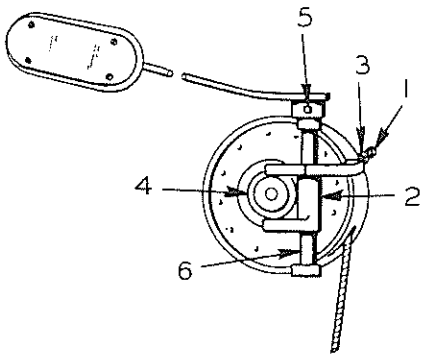
With all parts free from the gear case, remove the nuts that hold the gear case to the turntable. The gear case can now be lifted from the turntable.

CAUTION: Before removing the gear case, check to be sure that the boom hoist crank and yokes attached to the jaw clutches are removed. When removing the bolts holding the gear case to the turntable, be sure to remove the one bolt from underneath the turntable. This bolt is located at the rear of the gear case.




TO REMOVE MAIN DRIVE WORM: The worm housing and motor must be swung to one side. If necessary remove the radiator so the motor will clear. Then remove the cap screws that hold the worm housing to the gear case. Now remove the bolts from the front motor support. With the worm housing and motor moved, the worm housing 1 can be removed from the motor by taking out cap screws 2. The clutch can now be removed as follows: First hold the clutch in position with C clamps. Then remove the nut and lock washer 3 and 4. Loosen the clutch by tapping it with a wood block or lead hammer. Remove toggle assembly 5 from the clutch by turning it loose on the shaft. The clutch can now be removed. The toggle assembly 5 will come off when key 6 is removed. With the clutch and toggle assembly off, remove the bearing retainer 7 by taking out the cap screws 8. By removing bearing cap 9 the shaft 10 can be tapped out of the housing from the clutch end. The double row ball bearing will come out with the shaft. IMPORTANT: Change lubricant regularly (see lubrication chart).

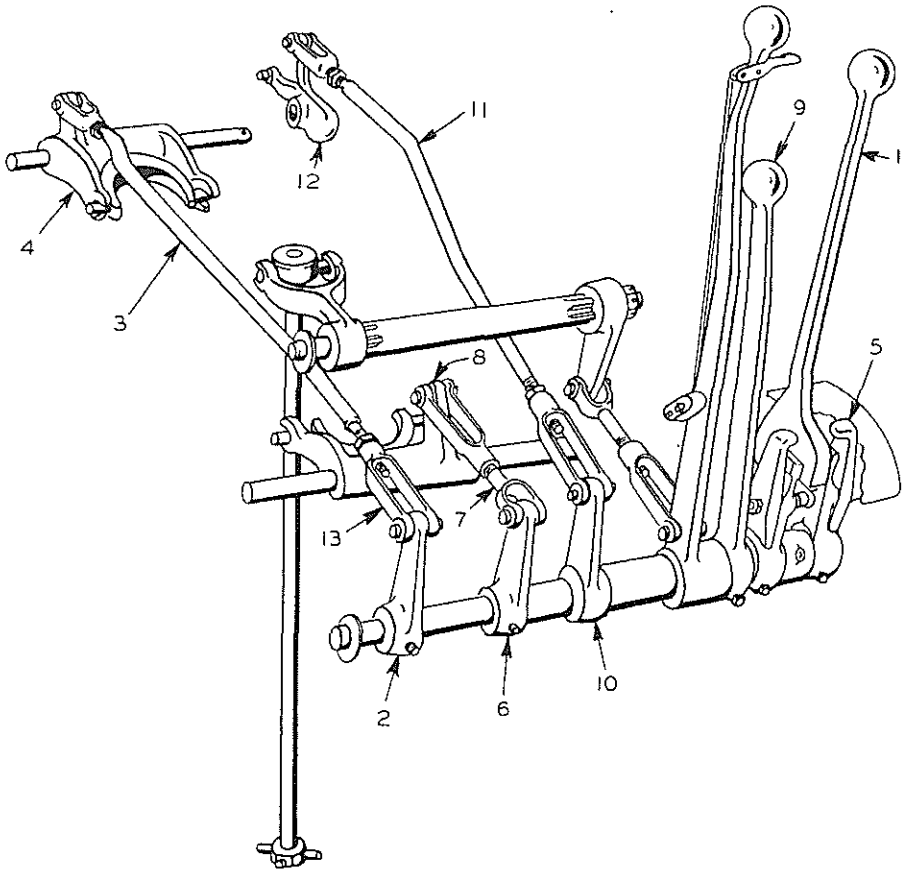
TO ADJUST POWER TRIP: To regulate the tension on the trip cable, turn the adjusting screw 1 to increase the pressure on the drum through the lever 2. This will tighten the cable. The cable tension should be adjusted so that when the dipper trip is engaged, the bucket will open. If the cable is too tight, the bucket will open too soon. When the proper adjustment is made, lock the adjusting screw with lock nut 3 to maintain the adjustment. It may be necessary to adjust the power trip twice in one day, once when it is cold and again when it heats up, because when it heats up, it may trip the bucket without being fully engaged.




TO REMOVE THE LINING: Take off the power trip lever by removing cap screw 5. Release the adjusting nut 1 so that the lever 2 is free to allow the shaft 6 to be removed. Now the thrust ring 4 can be taken off. With these parts removed, the clutch plate and lining, the drum and the disc lining can now be removed for inspection and replacement.

TO REMOVE THE HOUSING: It is necessary to remove all the parts from the drive shaft as explained above. With these parts taken off, all that is required is to remove the six allen head cap screws holding the housing.

TO REMOVE DRIVE SHAFT: Take out the cap screws that hold the drive shaft to the worm gear assembly.




SWING, TRAVEL and BOOM HOIST LEVERS: When the shift lever 1 is moved into swing position, crank 2 moves forward pulling reach rod 3 which tilts the yoke 4 forward and engages the swing jaw clutch. Pulling lever 1 back to neutral position, disengages the swing clutch. If the machine has a tendancy to swing while in neutral, then the swing clutch is not completely out of engagement and adjustment is required. First check to see if crank 5 is in neutral position. If so, then adjust reach rod 3. To make this adjustment, remove the front cover in the gear case to get at the reach rod clevis 13. Turn the clevis to the left to lengthen the rod sufficiently to give the swing clutch about 1/4" clearance when it is out of engagement. There must also be clearance between the swing jaw clutch and the swing gear when the swing clutch is disengaged. To check this clearance, remove the cover plate above the swing jaw clutch.

When shift lever 1 is moved into traction position, crank 6 moves backward and pushes reach rod 7 which tilts yoke 8 backward and downward and engages the traction jaw clutch. Moving lever 1 to neutral position, disengages the traction jaw clutch. If the traction jaw clutch lifts too high out of engagement, the reach rod 7 should be lengthened. If it does not move high enough, the reach rod should be shortened. Adjust by turning the clevis on reach rod 7.

BOOM HOIST LEVER: When the shift lever 9 is moved forward, crank 10 is also moved forward, pulling reach rod 11 which rotates crank 12. This movement lifts the boom hoist pinion out of engagement. If the boom hoist pinion does not engage properly, it is because the reach rod 11 is too long and does not rotate the crank 12 far enough to lift the boom hoist pinion into engagement. To adjust for proper engagement, shorten the reach rod 11 by turning the clevis.

# CABLE LENGTHS

| MODEL NO. OF MACHINE | | | | | | ATTACHMENTS | DIA. (inches) | TYPE | CABLE LENGTH IN FEET FOR VARIOUS BOOM LENGTHS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1520 | 1020A | 1020 | 1014 | 357 | 514 | | | | 25' | 30' | 35' | 40' | 45' | 50' |
| | | | | | | BOOM SUSPENSION (High A Frame) | | | | | | | | |
| x | x | x | | | | Pendant Type Boom Hoist | 1/2 | A | | | 120* | 120* | 120* | 120* |
| x | x | x | | | | Live Boom Hoist - 6 Part | 1/2 | A | | | 285 | 315 | 345 | 375 |
| x | x | x | | | | Live Boom Hoist - Worm Type | 1/2 | A | | | 120* | 120* | 120* | 120* |
| | | | | | | BOOM SUSPENSION (Std. A Frame) | | | | | | | | |
| | x | x | | | | Boom Hoist - 4 Part | 1/2 | A | | | 177 | 197 | 217 | 237 |
| | x | x | | | | Pendant Type Boom Hoist | 1/2 | A | | | 90* | 90* | 90* | 90* |
| | x | x | | | | Live Boom Hoist - 6 Part | 1/2 | A | | | 255 | 285 | 315 | 345 |
| | x | x | | | | Live Boom Hoist - Worm Type | 1/2 | A | | | 90* | 90* | 90* | 90* |
| | | | | | | BOOM SUSPENSION | | | | | | | | |
| | | | x | x | x | Boom Hoist - 4 Part | 1/2 | A | 137 | 157 | 177 | 197 | | |
| | | | x | x | x | Pendant Type Boom Hoist | 1/2 | A | 70* | 70* | 70* | 70* | | |
| | | | x | x | x | Live Boom Hoist - 6 Part | 1/2 | A | 197 | 225 | 255 | 285 | | |
| | | | x | x | x | Live Boom Hoist - Worm Type | 1/2 | A | 70* | 70* | 70* | 70* | | |
| | | | | | | CRANE | | | | | | | | |
| x | | | | | | Hook Block - 3 Part | 5/8 | B | | | 160 | 180 | 200 | 220 |
| x | | | | | | Hook Block - 2 Part | 5/8 | B | | | 125 | 140 | 155 | 170 |
| x | | | | | | Hook Block - 1 Part | 5/8 | B | | | 83 | 93 | 103 | 113 |
| | x | x | | | | Hook Block - 3 Part | 5/8 | B | | | 157 | 177 | 197 | 217 |
| | x | x | | | | Hook Block - 2 Part | 5/8 | B | | | 123 | 138 | 153 | 168 |
| | x | x | | | | Hook Block - 1 Part | 5/8 | B | | | 82 | 92 | 102 | 112 |
| | | | x | | | Hook Block - 3 Part | 5/8 | B | 125 | 145 | 165 | 185 | | |
| | | | x | | | Hook Block - 2 Part | 5/8 | B | 94 | 109 | 124 | 139 | | |
| | | | x | | | Hook Block - 1 Part | 5/8 | B | 64 | 74 | 84 | 94 | | |
| | | | | x | | Hook Block - 3 Part | 1/2 | B | 123 | 143 | 163 | 183 | | |
| | | | | x | | Hook Block - 2 Part | 1/2 | B | 93 | 108 | 123 | 138 | | |
| | | | | x | | Hook Block - 1 Part | 1/2 | B | 63 | 73 | 83 | 93 | | |
| | | | | | x | Hook Block - 3 Part | 1/2 | B | 120 | 140 | 160 | 180 | | |
| | | | | | x | Hook Block - 2 Part | 1/2 | B | 91 | 106 | 121 | 136 | | |
| | | | | | x | Hook Block - 1 Part | 1/2 | B | 62 | 72 | 82 | 92 | | |
| | | | | | | MAGNET | | | | | | | | |
| x | | | | | | Hook Block - 2 Part | 5/8 | B | | | 125 | 140 | 155 | 170 |
| x | x | x | | | | Tagline | 3/8 | A | | | 65 | 70 | 75 | 80 |
| | x | x | | | | Hook Block - 2 Part | 5/8 | B | | | 123 | 138 | 153 | 168 |
| | | | x | | | Hook Block - 2 Part | 5/8 | B | 94 | 109 | 124 | 139 | | |
| | | | x | x | x | Tagline | 3/8 | A | 55 | 60 | 65 | 70 | | |
| | | | | x | | Hook Block - 2 Part | 1/2 | B | 93 | 108 | 123 | 138 | | |
| | | | | | x | Hook Block - 2 Part | 1/2 | B | 91 | 106 | 121 | 136 | | |



(Continued otherside)

# CABLE LENGTHS

| MODEL NO. OF MACHINE | | | | | | ATTACHMENTS | DIA. (inches) | TYPE | CABLE LENGTH IN FEET FOR VARIOUS BOOM LENGTHS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1520 | 1020A | 1020 | 1014 | 357 | 514 | | | | 25' | 30' | 35' | 40' | 45' | 50' |
| | | | | | | CLAMSHELL | | | | | | | | |
| x | | | | | | Holding | 5/8 | B | | | 80 | 90 | 100 | 110 |
| x | | | | | | Closing | 5/8 | B | | | 101 | 111 | 121 | 131 |
| | x | x | | | | Holding | 5/8 | B | | | 79 | 89 | 99 | 109 |
| | x | x | | | | Closing | 5/8 | B | | | 100 | 110 | 120 | 130 |
| | | | x | | | Holding | 5/8 | B | 64 | 74 | 84 | 94 | | |
| | | | x | | | Closing | 5/8 | B | 84 | 94 | 104 | 114 | | |
| | | | | x | | Holding | 1/2 | B | 63 | 73 | 83 | 93 | | |
| | | | | x | | Closing | 1/2 | B | 83 | 93 | 103 | 113 | | |
| | | | | | x | Holding | 1/2 | B | 62 | 72 | 82 | 92 | | |
| | | | | | x | Closing | 1/2 | B | 82 | 92 | 102 | 112 | | |
| | | | | | | DRAGLINE | | | | | | | | |
| x | | | | | | Hoist | 5/8 | B | | | 84 | 94 | 104 | 114 |
| x | x | x | | | | Drag | 3/4 | C | | | 50 | 55 | 60 | 65 |
| | x | x | | | | Hoist | 5/8 | B | | | 83 | 93 | 103 | 113 |
| | | | x | | | Hoist | 5/8 | B | 64 | 74 | 84 | 94 | | |
| | | | x | | | Drag | 3/4 | C | 40 | 45 | 50 | 55 | | |
| | | | | x | | Hoist | 1/2 | B | 63 | 73 | 83 | 93 | | |
| | | | | x | x | Drag | 5/8 | C | 40 | 45 | 50 | 55 | | |
| | | | | | x | Hoist | 1/2 | B | 62 | 72 | 82 | 92 | | |
| | | | | | | SHOVEL(19 Ft.Boom,14 Ft.Stick) | | | | | | | | |
| x | x | x | | | | Boom Suspension | 1/2 | A | 121 | | | | | |
| x | x | x | | | | Hoist - 3 Part | 5/8 | B | 90 | | | | | |
| x | x | x | | | | Hoist - 2 Part | 5/8 | B | 82 | | | | | |
| x | x | x | | | | Dipper Trip | 5/16 | A | 35 | | | | | |
| | | | | | | SHOVEL(15'-6" Boom,12'-0" Stick) | | | | | | | | |
| | | | | x | x | Boom Suspension | 1/2 | A | 104 | | | | | |
| | | | | x | x | Hoist - 3 Part | 1/2 | B | 78 | | | | | |
| | | | | x | x | Hoist - 2 Part | 1/2 | B | 66 | | | | | |
| | | | | x | x | Dipper Trip | 5/16 | A | 30 | | | | | |
| | | | | | | TRENCHOE(19' Boom,8'-9" Stick) | | | | | | | | |
| x | x | x | | | | Jib Suspension | 1/2 | A | 52 | | | | | |
| x | x | x | | | | Hoist | 5/8 | B | 93 | | | | | |
| x | x | x | | | | Drag | 5/8 | C | 55 | | | | | |
| | | | | | | TRENCHOE | | | | | | | | |
| | | | | x | x | Jib Suspension | 1/2 | A | 52 | | | | | |
| | | | | x | x | Hoist | 1/2 | B | 80 | | | | | |
| | | | | x | x | Drag | 5/8 | C | 50 | | | | | |

* Plus Necessary Pendants

TYPE A-6 x 19 Filler Reg. Lay Hemp Center Improved Plow Steel Preformed.
TYPE B-6 x 19 Filler Reg. Lay IWRC Improved Plow Steel Preformed.
TYPE C-6 x 19 Filler Lang Lay IWRC Improved Plow Steel Preformed.

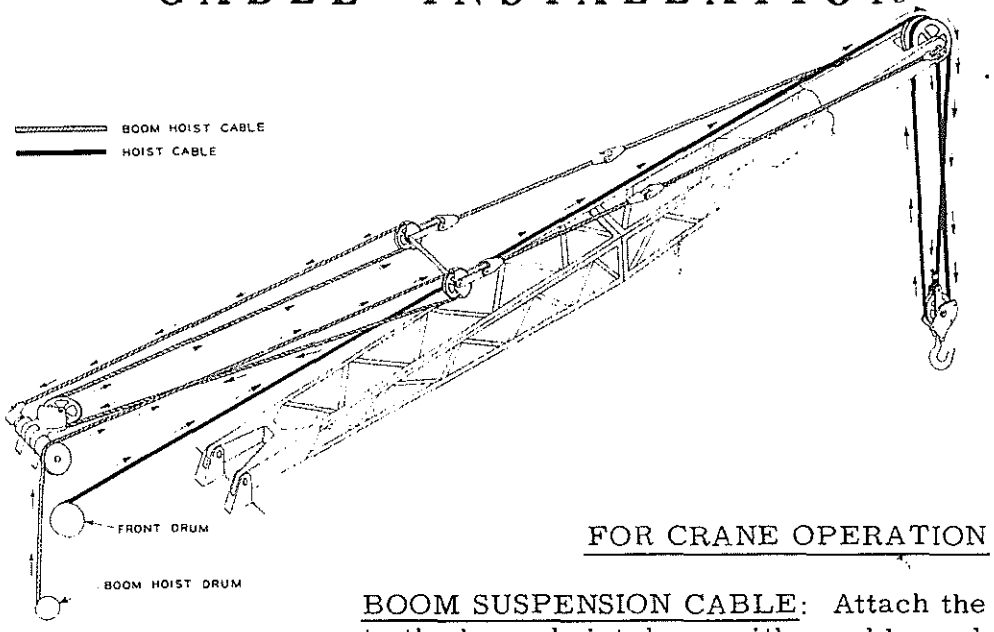
# CARE OF CABLES

Cables should be dressed at regular intervals, except when working in sandy soil or in soil of an abrasive nature, then the cables should have a minimum of dressing. Spare cables should be dressed with a grease used for this purpose to insure against corrosion. Be careful when uncoiling the cable so that there are no kinks or bends. If the cable is on a reel, mount the reel on an axle arrangement so the cable can be pulled straight out until a sufficient length of cable has been let out.

Watch the windings of the cables on the drums. Cables should never kink or pile on the drums. This causes breaks which will fray the cables. When one end of the cable wears faster then the other, reverse the ends before the cable wears too much. Cutting the cable to the right length and reversing the cable ends is more practical then using a longer cable and working the extra length on the drum. Check cable wedges and clamps to make sure they are tight. A loose clamp or wedge may cause serious damage.

CAUTION: Always use the length of cable as specified in the cable chart.

# CABLE INSTALLATION

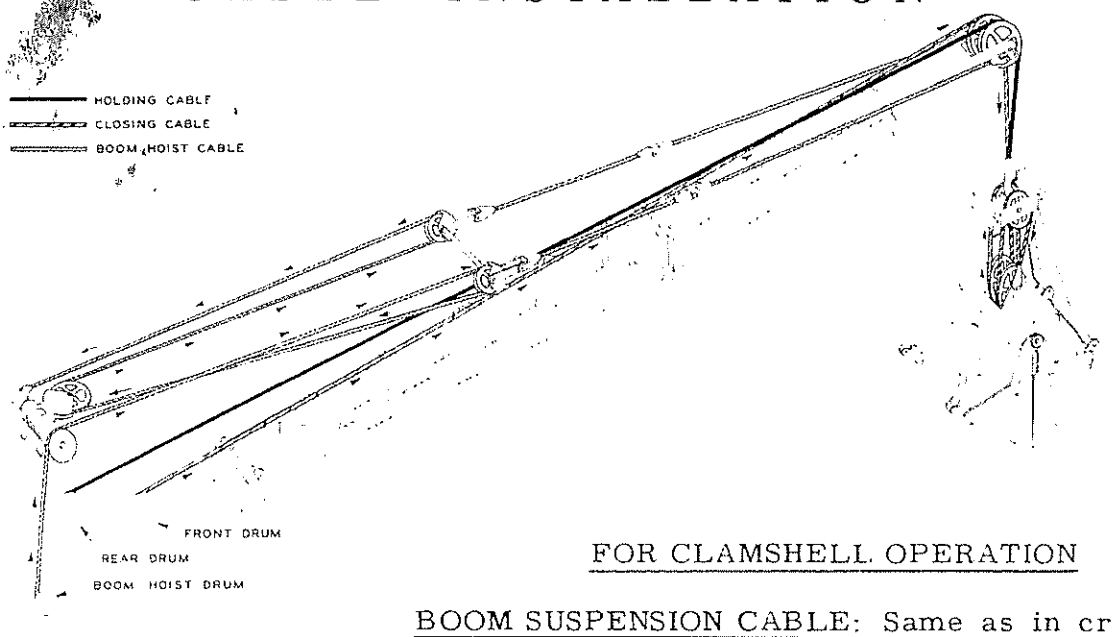



FOR CRANE OPERATION

BOOM SUSPENSION CABLE: Attach the end of the cable to the boom hoist drum with a cable wedge. Lead the cable over and around the vertical sheave in the A frame. Now bring it over the right hand outer pendant sheave and back around the horizontal sheave in the A frame. Then under and over the left hand outer pendant sheave and back to the A frame where the dead end of the cable is anchored with a cable clamp.

HOIST CABLE: Attach the end of the cable to the front drum with a cable wedge. Lead the cable over the left hand inside sheave in the boom point, then down through the cargo hook sheave and back through the right hand inner sheave in the boom point. Bring it back to the cargo hook where the dead end of the cable is anchored with a cable clamp.

# CABLE INSTALLATION

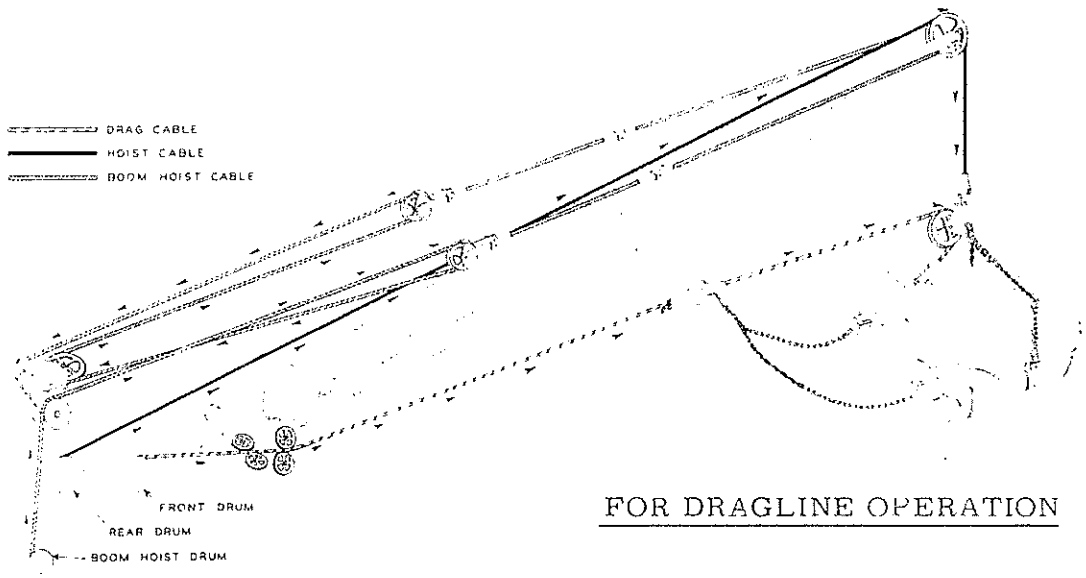



FOR CLAMSHELL OPERATION

BOOM SUSPENSION CABLE: Same as in crane operation.

CLOSING CABLE: Attach the end of the cable to the front drum with a cable wedge. Bring it over the left hand inner sheave in the boom point, and down to the bucket where it is woven through the upper and lower sheaves in the bucket. Alternate the weaving by bringing the cable through one sheave, up and over another and down to the dead end where it is anchored to the bucket.

HOLDING CABLE: Attach the end of the cable to the rear drum with a cable wedge. Bring it over the right hand inner sheave in the boom point and down to the bucket where it is anchored with a cable clamp. The method of reeving the holding cable is optional. The cable can also be reversed so that the closing cable is on the rear drum and the holding cable is on the front drum.

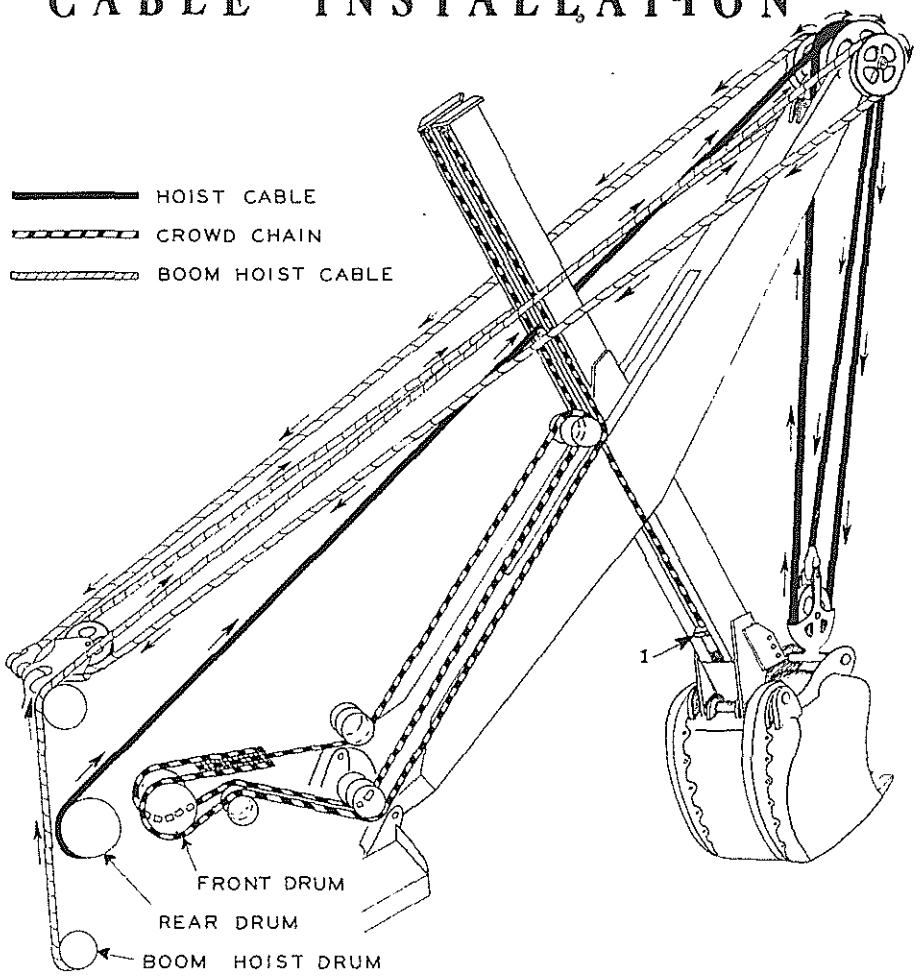



FOR DRAGLINE OPERATION

HOIST CABLE: Attach the end of the cable to the rear drum with a cable wedge. Lead the cable over the center sheave in the boom point and anchor the other end of the cable to the bucket.

DRAGLINE CABLE: Fasten the end of the cable to the front drum. Then weave it through the dragline fairlead and anchor to the chain on bucket as shown.

# CABLE INSTALLATION




## FOR SHOVEL OPERATION

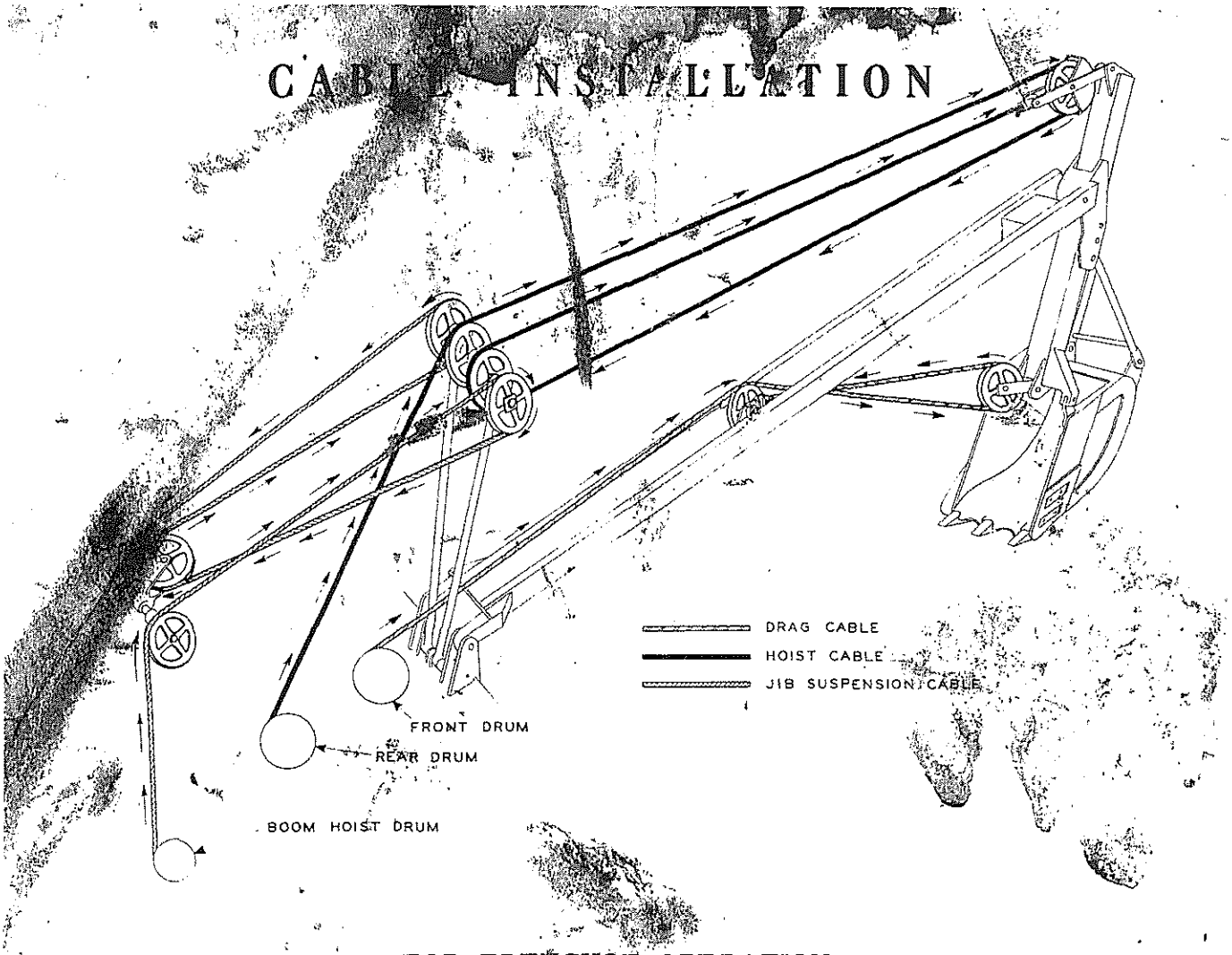
BOOM SUSPENSION CABLE: Same as in crane operation, except reeving is direct to the boom point sheave.

HOIST CABLE: This cable is attached to the rear drum with a cable wedge and is started over the drum and then up to and over the right hand inner sheave in the boom point. Then down through the bucket sheave and then up and around the left hand inner sheave in the boom point and back down where the dead end of the cable is anchored to the bucket with a cable clamp.

POWER TRIP CABLE: (not shown) This cable is anchored to the power trip drum which is located at the rear and right hand side of the gear case. It is then brought down through the sheave in the turntable below the power trip drum. Then through the front end of the cab and up through the pulley in the center of the shovel boom. The cable is then brought to the bucket where it is fastened to the door latch lever.

CROWD CHAIN ADJUSTMENT: The crowd chain must run with a small amount of slack. Set the boom at an angle when adjusting the crowd chain. To tighten the chain, loosen the jam nut and take up on the adjusting nut 1. After proper adjustment is made, lock in position with jam nut. Do not tighten the crowd chain with the boom in a horizontal position.

# CABLE INSTALLATION




## FOR TRENCHOE OPERATION

JIB FRAME SUSPENSION CABLE: Fasten the end of the cable to the boom hoist drum. Bring it over the vertical sheave in the A frame, then over the right hand outer sheave in the jib frame. Now bring it back to and around the horizontal sheave in the A frame and then under and around the left hand outer sheave in the jib frame. Now bring it back and fasten the dead end of the cable to the A frame with a cable clamp.

HOIST CABLE: Attach the end of this cable to the rear drum with a cable wedge. Lead the cable over the left hand inner sheave in the jib frame and over the sheave in the stick point sheave block. It is then brought back under the right hand sheave in the jib frame and back to dead end at the stick point sheave block.

DRAG CABLE: Fasten the end of this cable to the front drum with a cable wedge. Then lead it over the top of the sheave in the middle of the boom then under and around the sheave in the bucket. Now bring it back and anchor it next to the sheave in the middle of the boom.