

**CORNER MOUNTED
ROTATING DERRICKS EQUIPPED WITH HYDRAULIC DIGGER
DESCRIPTION AND OPERATION**

GENERAL

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DIGGING IN FROZEN GROUND	10	1.01 This section covers in general the description and operation of truck mounted, hydraulically powered, corner mounted rotating derricks equipped with hydraulic diggers. Each make and model may differ to some degree in design, but the general description, methods of operation, and safety precautions in this section apply to all hydraulically operated, rotating derricks now in general use. Whereas center mounted and rear axle mounted	
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NOTICE

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Pursuant to Judge Greene's Order of August 5, 1983, beginning on January 1, 1984, AT&T will cease to use "Bell" and the Bell symbol, with the exceptions as set forth in that Order. Pursuant thereto, any reference to "BELL" and/or the BELL symbol in this document is hereby deleted and "expunged".

derricks are available and in use, the system standard configuration is the right rear corner mounted derrick.

1.02 This section has been reissued to:

- (a) Establish general requirements for "qualified" operators
- (b) Include information in the vehicle manufacturer's maintenance manual as required knowledge prior to operator certification
- (c) Include additional safety requirements for rotating derrick digger trucks
- (d) Provide information concerning substitutes for hydraulic oils.

Since this is a general revision, arrows normally used to indicate changes have been omitted.

1.03 This section is intended to supplement information contained in the operation and maintenance manual furnished by the manufacturer. All instructions that are unique to a specific design must be observed.

1.04 It is expected that, prior to the use of these vehicles a presurvey of the job will have been made by a member of supervision and any unusual or hazardous conditions along with specific recommendations will be noted on the work print.

2. DESCRIPTION

2.01 The derrick equipment basically consists of a base that incorporates the rotation mechanism, a telescopic boom, a hydraulic digger, and hydraulic stabilizers or outriggers. For handling poles, different derrick models may be equipped with:

- (a) A hydraulic boom tip winch that also supports the top end of the pole, or a turret-mounted hydraulic winch
- (b) A pole grabber or claw that is used to support the top end of a pole
- (c) A combination winch and pole grabber.

2.02 Figure 1 illustrates a typical standard derrick mounted at the right rear corner of the

truck. The control console is mounted as recommended at the left rear corner.

2.03 The hydraulic digger is attached to the boom by means of a universal-type mounting that allows the digger to be inclined for digging anchor holes or placing screw anchors.

2.04 A control valve, retractable hose reel, and quick coupling outlets for use with hydraulic pole pullers are installed on the truck as part of the derrick equipment. The hydraulic control valves for the winch, derrick functions, digger, pole grabber, pole puller, and stabilizers are mounted on a control console. The control console is located to provide the operator with the best view of the work operation being performed and to prevent contact with ground when performing work near power lines. The control console location for an older model corner mounted derrick is shown in Fig. 2. Newer models are fitted with consoles to provide operator protection.

2.05 The control valve banks for each of the hydraulic systems are equipped with relief valves which govern the maximum operating pressure to protect the hydraulic system from overloads. The hydraulic system for the stabilizers includes holding valves that lock the stabilizers in the extended position during work operations and in the retracted position for road travel.

3. PRECAUTIONS

3.01 Only those operators who have been specifically trained and who meet company requirements shall be permitted to operate derrick equipment.

3.02 All persons working with derrick trucks shall wear standard safety headgear, eye protection, and, when required, insulating gloves.

3.03 Before using the derrick, it is important that information in BSP Division 621, pertaining to pole placement and removal, and information in BSP Division 649, pertaining to winches, be studied and all applicable precautions observed. In addition, the derrick manufacturer's manual shall be available to the operator. Special attention must be given to the load capacities of the derrick and the stability characteristics of the truck.

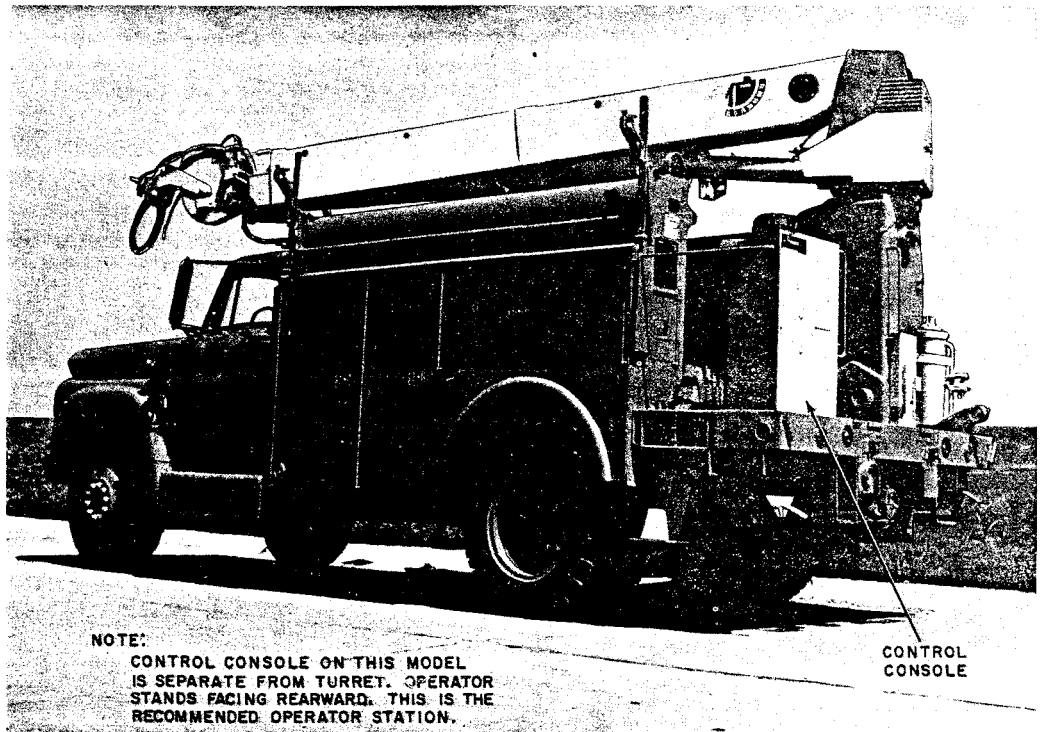


Fig. 1—Typical Rear Corner Mounted Derrick

3.04 While preparing the truck for normal roadway travel, be sure the digger is securely locked in its cradle and the derrick is stowed properly with the derrick resting firmly on its support to reduce possibility of equipment damage caused by road shock.

3.05 Before commencing derrick functions, the operator must be sure that all persons involved know and understand the signaling procedures described in Section 620-020-020 and recognize their importance to safe work operations.

3.06 Always set the parking brake and the Mico brake lock before leaving the truck cab to operate the derrick. Place wheel chocks against the rear wheels. On a grade, place wheel chocks on the downgrade side of both rear wheels. On

level ground, place wheel chocks in front of and behind one rear wheel.

3.07 Do not operate the derrick until both stabilizers are extended and in firm contact with the ground or adequate support structure. Do not attempt to retract or extend the stabilizers while a load is suspended from the derrick.

3.08 No operator shall move or cause conductive objects to be moved or taken closer to electrical conductors than Standard Bell System clearances allow. Any pole being set that may come in contact or near contact with an electrical conductor must be appropriately insulated. All personnel involved with the work operation must be adequately protected with insulating gloves unless the power conductors and equipment are

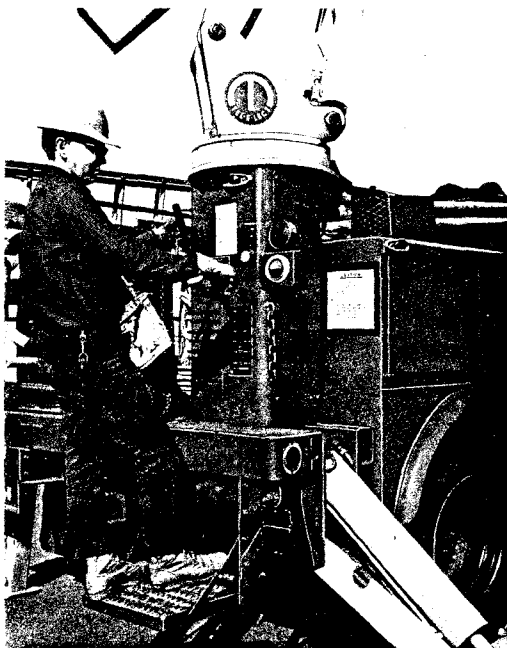


Fig. 2—Control Console Location—Rear Corner Mounted Derrick (Obsolete)

deenergized and grounded with ground connections visible to the operator.



At no time shall any part of the boom or ropes associated with it be brought closer than 3 feet to any energized power conductors. If the voltage exceeds 37,000 volts, this distance should be increased to a minimum of 6 feet.

3.09 When raising the derrick from the stowed position and while operating the derrick or digger, be alert for overhead obstructions or power lines that might interfere with movement of the derrick.

3.10 Do not place the truck at the job site in a position that will unnecessarily reduce truck stability. The truck should be as nearly level as possible with the stabilizers firmly supported. When

working in unstable or soft terrain, place planks or other suitable foundation material under the stabilizer pad. Exert sufficient thrust on the stabilizers to lock out the vehicle springs. This should almost raise the wheels from the ground.

3.11 Do not run the hydraulic pump at engine speeds in excess of those recommended by the equipment manufacturer. Do not apply sudden bursts of engine speed with the engine accelerator. Excessive speeds can cause cavitation with resultant pump damage.

3.12 Pressure relief valves in the hydraulic system are designed to bypass the hydraulic oil in order to prevent mechanical damage to the derrick. However, **the pressure relief valves do not protect the derrick from overloads caused by use of the winch.** Never attempt to lift a load with the winch that cannot be lifted with the boom. (Refer to 4.08.)

3.13 Do not use the derrick for removing poles or pole butts unless they have been properly loosened. Always use a pole jack when removing poles and butts. **Never** loosen a pole by extending and retracting the stinger.

3.14 Avoid using the derrick in a manner that allows side loading on the boom. When using the winch line, damage to the boom can be avoided by keeping the winch line and boom in alignment with the object being moved.

3.15 While storing or lowering the auger, the boom should be elevated high enough to allow the auger to swing free if the auger storage cable should fail. Stay clear of the auger path to avoid injury.

3.16 When operating the derrick equipment, avoid sudden, jerking movements. Activate the control handle slightly to begin movement and then move the handle to the fully activated position to obtain maximum speed. Do not continue to hold any control handle in the activated position after the particular component has reached its limit of travel.

3.17 Any time the derrick is in the working position, avoid contact with the truck unless it is certain that the derrick or digger is not electrically energized. If there is any doubt about the possibility of contact, it must be assumed the

truck is energized and the following precautions in (c) and (d) adhered to.

- (a) When contact is established, the entire truck and its contents will be electrically charged, and no one shall attempt to enter the truck or in any way come in contact with its contents.
 - (b) Anyone in or on the truck should remain there until the electrical contact has been broken unless an emergency arises that makes it necessary to leave the truck.
 - (c) If an emergency arises, put on the available insulating gloves (3.08) and throw the opened insulating blanket to the ground.
 - (d) Jump from the truck onto the blanket without contacting any grounded object such as limbs, shrubbery, personnel on the ground, poles, etc, until clear of the truck.
 - (e) If, for some reason, insulating gloves and blankets are not available and personnel are required to leave the truck, they shall jump clear. However, **extreme** care must be taken to have **sure footing** during the jump from the truck and landing on the ground to avoid a stumble or fall which could cause simultaneous contact with the truck and ground.
- 3.18** At all times, keep bystanders away from all work operations. Work areas must be guarded in accordance with Division 620 of the Bell System Practices.
- 3.19** Discard steel slings and wire rope when their strength has been significantly reduced from any cause. Some of the more noticeable weakened indicators are crushing, kinking, fraying, pitting, and rust. See Sections 649-310-011 and 649-310-115 for use and inspection of wire rope and associated slings.
- 3.20** Operators shall not suspend loads over people; nor shall any person be permitted to work, stand, or pass under a suspended load.
- 3.21** Hydraulic oils (fluids) are flammable and vehicles have been destroyed by hydraulic oil contacting hot exhaust components. It is therefore recommended that a 10-pound dry chemical extinguisher be carried on the vehicle.
- 3.22** Man carriers fitted with derrick/diggers without upper controls and/or 2-way intercoms **shall not** be used in the moving mode of operation. They shall be used **only** for stationary work operations. When using derrick vehicles that are fitted for moving operations, all precautions applicable to aerial lifts shall be observed.

4. OPERATION

PREPARATION

4.01 Before placing the truck in operation, check to be sure that all equipment is in proper condition. Perform the daily checks given in 8.01. In extremely cold weather, run engine and hydraulic pump 5 to 10 minutes to warm up the oil.

4.02 Survey the work site to determine where to position the truck. Consider whether or not the job can be completed without moving the truck, the slope of the ground (the truck should be as nearly level as possible), and whether or not the ground is firm enough to support the stabilizers.

4.03 Position the truck, set the brakes, engage the power takeoff, and place wheel chocks and warning signs or markers as required.

4.04 Before moving the derrick from the stowed position, lower the stabilizers to make firm contact with the ground (Fig. 3). Extend the stabilizers far enough to almost raise the rear wheels of the truck from the ground. This will lock out the rear springs and provide maximum stability.

4.05 If operations on soft ground cannot be avoided, place a wood, steel, or other suitable pad of adequate strength under the stabilizer pads to provide a bearing surface that will prevent the stabilizers from sinking into the ground. If the stabilizers will not reach the ground because of holes or grade, use blocks to provide a firm, level support.

4.06 If the radial stabilizer, when extended, rests on a curb or other object that prevents it from extending the normal distance, truck stability will be reduced. The operator must take this into consideration and reduce the maximum allowable boom loads accordingly.

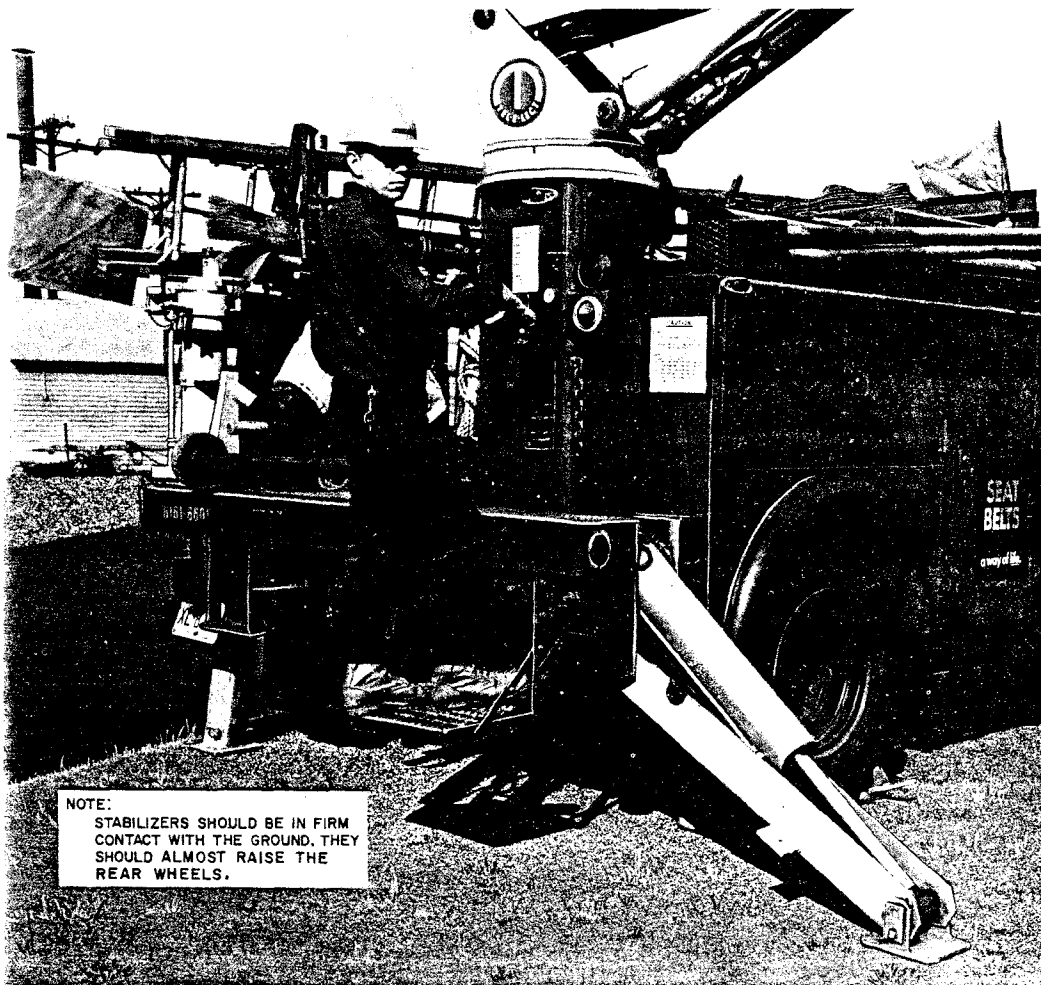


Fig. 3—Stabilizers in Lowered Positions

4.07 With the stabilizers properly set, be certain there is adequate side and overhead clearance, lift the boom from its rest high enough to clear truck body obstructions, and rotate the boom to the desired working position. A typical situation is illustrated in Fig. 4.

4.08 When using the boom for lifting loads, overloading is prevented by pressure relief

valves. However, when lifting with the *winch line*, there is no relief or safeguard to prevent boom overloading. Since the load lifting capabilities of the winch exceed those of the boom, use of the winch to lift a load of unknown magnitude could result in damaging the derrick. To lift such a load, secure the winch line to the load and take up the slack. Operate the boom elevation control. If the boom lifts the load, it is safe to handle the

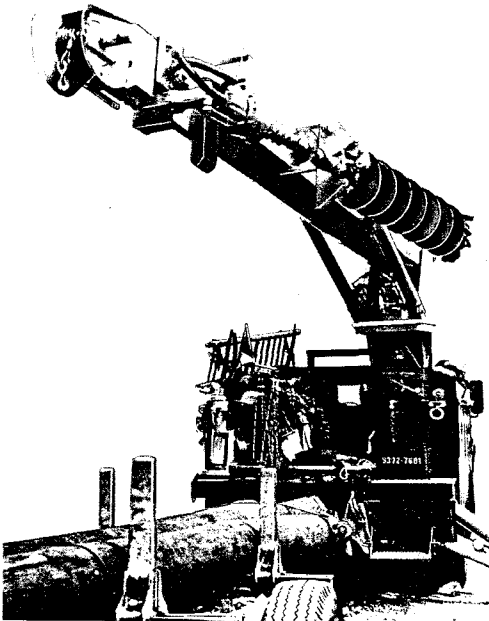
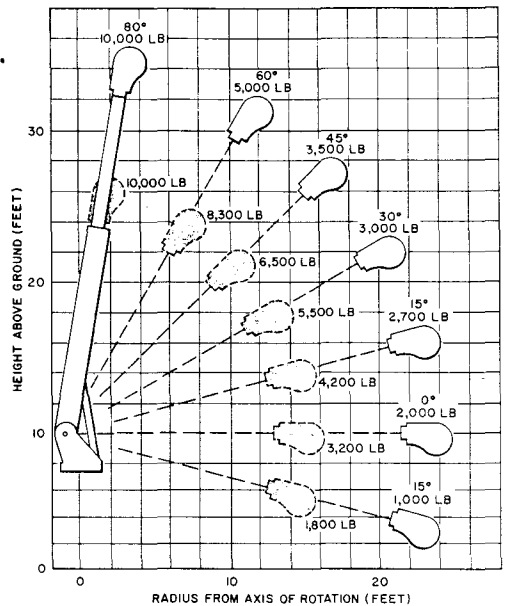


Fig. 4—Boom Rotated to Working Position

load with the winch if the boom radius is not increased. If the boom fails to lift the load on the first attempt, reduce the derrick overhang (radius) by retracting the boom extension or by elevating the boom. Try again to lift the load. Never attempt to lift a load with the winch that cannot be lifted with the boom.

4.09 It must be remembered that either extending or lowering the boom with a suspended load will **decrease** the boom weight lifting capacity and adversely affect truck stability. The same load, lifted safely with an elevated boom, if left suspended as the boom is lowered, could damage the boom or upset the truck. Load capacity as a function of height and reach is illustrated in Fig. 5 for a typical derrick.

4.10 Operating instructions and rated load capacities shall be conspicuously posted on each derrick with a permanent weather-resistant plate or decal in a location plainly visible to the operator.



NOTE:
CAPACITIES SHOWN ARE FOR A TYPICAL DERRICK. THEY DO NOT NECESSARILY APPLY TO A SPECIFIC PIECE OF EQUIPMENT OR TAKE INTO CONSIDERATION THE STABILITY OF THE TRUCK.

Fig. 5—Lifting Capacities of a Typical Boom

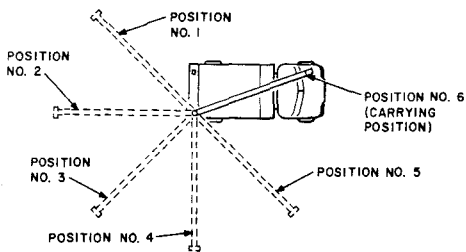
ROTATING THE DERRICK

4.11 Side loads on the boom caused by pulling or dragging a load with the winch line can damage the rotating mechanism. Always rotate the derrick in line with or over the load before pulling or lifting with the winch line.

4.12 When rotating the derrick, keep suspended loads close to the ground and the derrick elevated as high as practicable. As the derrick rotates, weight distribution on the vehicle shifts. Fig. 6 illustrates weight distribution for a rear, corner mounted derrick. The best work position is one which permits the right stabilizer to support the greater part of the load weight with the rest of the weight distributed as if the derrick were in the carry position.

EXTENDING THE BOOM

4.13 The telescoping extension (stinger) will extend and retract (approximately 5-1/2 to 8 feet,



BOOM POSITION	LOAD ON GROUND AT WHEEL (LBS)					RIGHT STABILIZER LOADING	TOTAL CARRYING LOAD WITH 2000 LB PAYLOAD
	FRONT		REAR		TOTAL		
	LEFT	RIGHT	LEFT	RIGHT			
NO. 1	1935	1505	8600	5805	17,845	3655	21,500
NO. 2	1075	1290	8170	7955	18,490	3010	21,500
NO. 3	1935	2580	4300	7095	15,910	5590	21,500
NO. 4	3010	4085	1505	6450	15,050	6450	21,500
NO. 5	3440	4515	1290	6450	15,695	5805	21,500
NO. 6	3315	3315	6240	6630	19,500	—	—

NOTES:

1. BOOM POSITIONS 1 THROUGH 5 ARE WITH BOOM HORIZONTAL, EXTENDED 20 FEET, AND SUPPORTING A 2000 POUND LOAD AT THE BOOM END.
2. GVW IS 19,500 POUNDS.
3. TRUCK IS WORKING ON LEVEL TERRAIN.

Fig. 6—Total Weight Distribution of Rear Corner Mounted Derrick Truck

depending on make and/or model of equipment) to permit having a relatively short derrick when stowed and yet give the necessary boom length flexibility for pole placing and digging operations. Combining extension and retraction of the stinger with boom movements is necessary in most work operations.

4.14 The stinger hydraulic control valve is equipped with a pressure relief valve that protects the stinger hydraulic system from damage when extending the stinger.

Note: The stinger is *not* protected when lowering the boom. It is protected only when it is in motion itself.

5. USING THE DIGGER

REMOVING AUGER FROM STOWED POSITION

5.01 Elevate the derrick from the storage bracket and rotate the derrick to the working position.

5.02 Rotate the auger just enough to place tension on the auger storage cable, release the auger storage lock, and rotate the auger to unwind the storage cable.

Note: Different makes and models of equipment use different means for locking the auger in the stowed position. Check the operation and maintenance manual supplied by the manufacturer to be sure the operation of the locking mechanism is understood.

5.03 When the auger is in a vertical position, detach the storage cable.

5.04 To place the auger in the stowed position, fully retract the stinger. Reverse the procedure in 5.01 through 5.03.

Caution: Stop auger rotation as soon as the auger is in the storage bracket to prevent breaking the auger storage cable. After the auger is locked in the storage bracket, release the tension on the storage cable.

NORMAL DIGGING PROCEDURE

5.05 Position the digger with the auger vertical and the auger point resting firmly on the ground.

5.06 To start digging, apply down-pressure with the boom and start auger rotation. Slowly feed the auger into the ground as the auger starts to rotate. Keep the auger vertical by retracting or extending the stinger as the boom is lowered.

5.07 Full rotation speed may be used after the auger has dug into the ground a short distance. Regulate the feed of the auger to allow the auger rotation motor to develop maximum power.

5.08 When the auger becomes loaded with spoil, raise the auger out of the hole. Stop rotation as soon as the auger starts to move up. Keep the auger vertical as it is raised by combining stinger extension or retraction with boom elevation movements.

5.09 When the auger is clear of the hole (Fig. 7), spoil can be spun off by rotating the auger

at maximum speed or by alternating the direction of auger rotation to shake off the spoil.

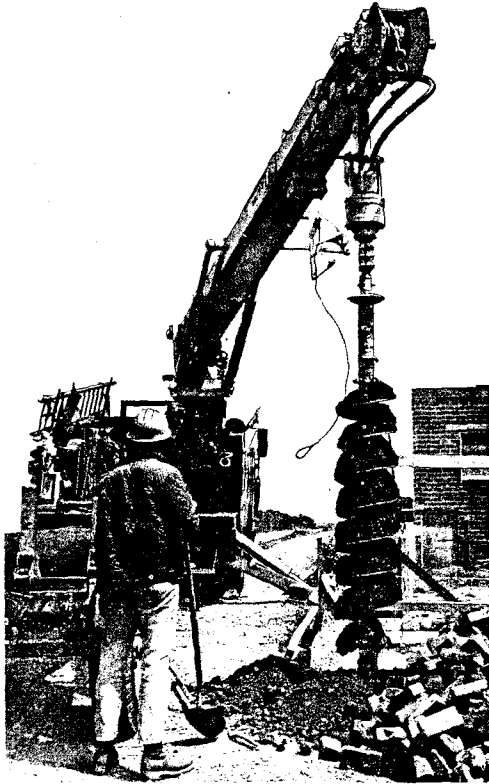


Fig. 7—Preparing to Spin Off Spoil

5.10 After spin-off of the spoil, stop auger rotation and lower the auger into the hole. Start auger rotation just before the auger reaches the bottom of the hole. Continue digging and removing spoil until the desired hole depth is reached.

DIGGING EXTRA DEPTH HOLES

5.11 If it is necessary to dig holes deeper than 6 or 7 feet or to dig a hole over an embankment where greater auger length is required, the auger may be extended. Support the auger

by screwing it partly into the ground, and remove the pin that attaches the auger to the digger shaft. Withdraw the digger shaft from the auger by elevating the derrick until the desired attaching hole in the shaft is aligned with the attaching hole in the auger. Reinsert the pin. On most models of derricks, the digger shaft is approximately 5 feet long and has several attaching holes which can be used to extend the auger. When the digging operation has been completed, the auger should be returned to the normal position before placing the digger in the stowed position.

DIGGING IN WET GROUND

5.12 In wet ground there is a tendency for the auger to actually screw itself into the ground rather than cut a hole. To prevent this, feed the auger into the ground more slowly by reducing down-pressure. This ensures hole cutting, cleaning, and spoil distribution on the auger.

5.13 When removing spoil, keep the auger rotating until it is almost clear of the hole. This will prevent creating a vacuum which would result in a heavy pull on the auger.

5.14 A liberal coating of paraffin or pouring water on the auger flight may help spin off wet, sticky soil.

DIGGING IN SANDY SOIL

5.15 When digging in sandy soil, operate the digger as smoothly and carefully as possible to prevent a cave-in. Auger rotation should be stopped before raising the auger from the hole to prevent the spoil from falling back into the hole. When lowering the auger, rotation should not be started until the auger reaches the bottom of the hole to avoid bumping the sides of the hole with the auger and causing a cave-in.

5.16 In soil where there is a considerable amount of loose sand or small stones, excessive caving-in may be prevented by depositing the spoil a few feet from the hole. To do this, raise the auger clear of the hole and carefully rotate the derrick away from the hole before depositing the spoil.

DIGGING IN ROCKY SOIL

5.17 When digging in rocky soil, start digging with slow auger rotation so surface obstructions will not cause the auger to move from the desired hole location.

5.18 If a rock should stall the digger, it may be possible to remove the rock by one of the following methods:

- (a) Raise the auger and start auger rotation. Feed the auger down slowly, letting the auger bump the rock on each revolution, until the rock is broken up or dislodged.
- (b) Rotate the auger in reverse and then forward approximately one-eighth of a turn. Repeat several times while maintaining a continuous down-pressure on the auger. Hold forward rotation as the auger is raised to attempt to hook the auger under the rock and dislodge it.

DIGGING IN FROZEN GROUND

5.19 Digging in frozen ground requires heavy down-pressure and slow auger rotation. If the auger spins on frozen ground, a glaze will form that is more difficult to cut than the original frost. To avoid this, it is essential that sharp blades and points be used. Special augers equipped with carbide cutters are recommended for extensive digging in frost.

5.20 With heavy down-pressure on the auger, a point is reached at the lower level of the frost where the auger may break through and screw into the softer ground below. If the auger breaks through leaving part of the frost, retract the auger with forward rotation or raise the auger slightly and cut out the remaining frost using a slow down-feed.

DIGGING ANCHOR HOLES

5.21 The auger can be positioned to dig anchor holes at any angle. When preparing to dig an anchor hole, it is desirable to position the truck so that the auger, when digging, will be in line with the derrick boom. This will permit controlling the angle and depth of the auger by coordinated movements of only the boom elevate-lower control and the stinger in-out control. If the derrick is set up so the auger will be at an angle to the boom during the digging operation, the boom

rotation control must also be used to control angle and depth of the auger.

5.22 The anchor auger should be attached to the end hole in the digger shaft to allow maximum distance between the auger head and digger head. This permits digging a deep anchor hole with good control.

5.23 Coordinated movements of the boom and stinger are necessary to maintain the correct hole angle and to prevent excessive strain on the auger rotation when applying down-pressure or when pulling the auger from the hole to keep from bending the auger driveshaft or placing stresses on the derrick.

PLACING SCREW ANCHORS

5.24 To place a screw anchor, position the derrick so the boom will be in line with the anchor as it is being placed. Start the anchor by applying pressure in line with the anchor rod as the anchor is rotated.

5.25 Proper coordination of the derrick controls is essential to properly place the screw anchor and to avoid damaging stresses on the derrick. Do not let the anchor pull the boom down. Follow the anchor with the boom as the anchor screws into the ground.

6. HANDLING AND SETTING POLES

6.01 Position the truck adjacent to the hole location in which the pole will be set so the boom tip can be maneuvered over the hole when the pole is held erect.

6.02 Lower the boom to place the boom tip as close as practicable to the point of attachment, and attach the winch line to the pole above but close to the balance point. Position the boom tip directly over the point of attachment. Take up the winch and elevate the boom to raise the pole while also rotating and adjusting the boom length to keep the boom tip positioned above the point of attachment.

6.03 When the pole has been raised to a vertical position, take up fully on the winch (if the boom is so equipped, operate the pole claw or grabber) to hold the pole securely as illustrated in Fig. 8.

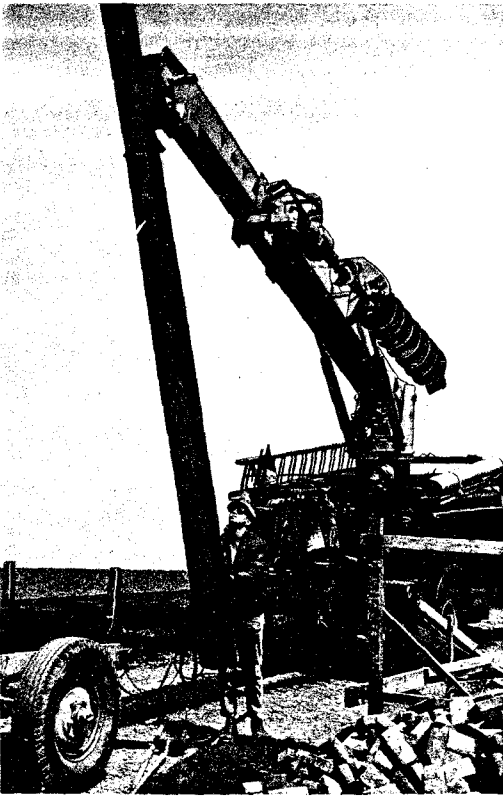


Fig. 8—Pole Held in Position With Boom Tip Winch

6.04 Use the boom to lower the pole into the hole. As the boom is being lowered it will be necessary to retract the stinger slightly to maintain proper pole alignment. After the pole has been tamped, release the claw or grabber and winch line.

Note: When handling a pole among existing lines, it may be desirable to position the derrick first and then raise or lower the pole by using the winch line so the pole can be more readily guided between the lines. **Remember to avoid placing side loads on the boom with the winch line.**

6.05 It is permissible to move the truck a short distance with a pole suspended provided the following conditions are met:

- (a) Load is positioned at the rear of the vehicle, not to the side
- (b) Truck is on a hard paved surface
- (c) Speed is kept to a slow walking pace
- (d) Outriggers are positioned several inches above the ground but high enough to clear any obstructions
- (e) The pole is guided at the butt to prevent swinging.

7. EMERGENCY PROCEDURES

7.01 If a break occurs in a pressurized hydraulic line, stay clear. Do not attempt to stop or slow the leak with any kind of physical resistance. Operate the engine "kill" switch or disengage the system as soon as the leak is detected.

7.02 It is possible for hydraulic oil to catch fire when sprayed on a hot surface such as the muffler or exhaust pipe of a truck. Most trucks are equipped with guards designed to prevent such an occurrence. However, if smoke or flame is detected coming from under the truck, immediately shut down the engine by operating the "kill" switch. If it can be done safely, use the fire extinguisher to put out the fire.

7.03 Failure of the hydraulic system while the derrick is in use will make it necessary to manually rotate or lower the derrick and manually raise the stabilizers so the truck can be moved to a different location for repairs. However, consult with supervision to learn if there are other repair possibilities. If other repair alternatives are not viable and it becomes necessary, proceed as follows:

- (1) Manually rotate or lower the boom, using procedures in the operation and maintenance manual furnished by the manufacturer.
- (2) Manually raise the stabilizers by disconnecting the hydraulic lines which are connected to

the stabilizer cylinders. Force the stabilizers into the retracted position with available tools such as chain blocks, pry bars, etc. and secure with wire or rope.

8. MAINTENANCE

Note: Maintenance checks given here are supplementary to those recommended by the manufacturer of the equipment. Proper lubrication and all maintenance checks recommended by the manufacturer are essential for safe, dependable operation of the equipment.

8.01 Daily Checks—Operator:

- (a) Inspect all visible hydraulic lines, hoses, fittings, cylinder heads, and seals for signs of oil leakage or damage. While slight leakage does not indicate serious equipment trouble, it does create potentially hazardous conditions from slippery surfaces and fires. Report them to the responsible maintenance force for correction. Leakage of a few drops a day is beneficial in that packing is kept lubricated.
- (b) Visually check the derrick, base, pedestal, etc. for cracks, deformation, or bends. Cracking of paint often indicates cracks in the structure or weld joints.
- (c) Perform an operational test by completing one complete cycle of all functions. During the test, check that the relief valves operate and the engine governor functions at the proper speed.
- (d) Check the auger storage cable and replace when broken strands, fraying, or signs of wear occur.
- (e) To ensure they are operating properly, check the truck brakes, including the parking brake and brake lock system in accordance with the manufacturer's instructions or instructions of responsible motor vehicle personnel. In addition, the horn and lights should also be checked.

8.02 Monthly Checks—Qualified Mechanic:

- (a) Check all accessible hydraulic lines and fittings for leaks, wear, chafing, or other damage

and replace any that are damaged. Bent or crushed lines of metal tubing should be replaced.

- (b) Check pedestal tie-down bolts for tightness and proper installation of tie wires. Check for loose frame, body, and rotating gear housing bolts.
- (c) Perform a test on each hydraulic cylinder to be sure the check or holding valve functions properly. If any drift occurs, the valve should be repaired or replaced.
- (d) Inspect the winch line in accordance with Section 649-310-011 and local practices.

Note: Because most hydraulic system malfunctions can be traced to impurities in the oil, clean the filler cap and the area around the filler cap before removing to check or fill the reservoir. Use type oil specified in the manufacturer's maintenance or operator's manual or as designated by local practices.

- (e) Check the oil level in the hydraulic reserve tank while all hydraulic cylinders are retracted. The level must be properly maintained.

8.03 Semiannual and Annual Checks: These checks shall be performed in accordance with the manufacturer's recommendations by a qualified mechanic. Records of such inspections with lists of corrective action taken must be maintained in file in order to comply with OSHA record keeping practices.

9. TROUBLESHOOTING

9.01 Since most troubles will occur during the operation of the equipment, the operator should be constantly alert for any unusual or excessive oil leakage, erratic operation, or excessive or unusual equipment noise. If any trouble is detected, it should be reported in accordance with local routine.

9.02 Table A lists possible troubles which can occur during equipment operation. The probable causes and remedies for the troubles are also given.

TABLE A
TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
1. No response to any controls.	a. Power take-off (PTO) not engaged.	Engaged PTO shifting control. If difficulty is encountered, check clutch pedal adjustment and PTO shifting cable or linkage for proper throw.
	b. Low hydraulic fluid supply	Fill reservoir to "Full" reading on dipstick with all cylinders retracted.
	c. Broken hydraulic pressure line or loose fitting.	Check all lines and fittings. Tighten, repair, or replace as required.
	d. Defective hydraulic pump.	Repair or replace as required.
	e. Broken compression spring inside relief valve housing.	Valve is defective and should be repaired. Replace spring.
2. Slow operation of any control.	a. Pump not operating at proper speed level.	Check truck engine governed setting for proper rpm. If "split-shaft" type PTO is provided, engage truck transmission in fourth gear.
	b. Same as 1b.	
	c. Excessive load.	Lighten to rated loads or shorten working radius.
	d. Suction hose to pump kinked, collapsed, or pinched causing pump starvation. Loose fitting in suction line. Suction strainer plugged.	Reroute hose to remove any kink or pinching. Clamp or otherwise secure in place to prevent recurrence. Tighten fitting. Clean strainer.
	e. Same as 1c.	
	f. Control valve linkage out of adjustment causing only partial opening of the valve.	Check the control linkage to be certain the valve spools are completely actuated in either direction with full movement of the valve handles.
	g. Pilot-operated holding valves on boom cylinder adjusted too tightly causing unnecessary restriction.	Readjust as described in Maintenance Manual.

TABLE A

TROUBLE SHOOTING (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
2. Slow operation of any control. (cont)	h. Defective hydraulic motor or cylinder.	Repair or replace as required.
	i. Hydraulic pump worn or defective control valve.	Repair or replace as required.
3. No response, slow or erratic operation of boom tip winch or digger.	a. Drive motor drive shaft key sheared.	Replace.
	b. Gears damaged or locked in gear case.	Repair or replace as required.
	c. Defective drive motor.	Repair or replace as required.
4. No response, slow or erratic operation of topping cylinder.	a. Same as 1c, 2c, 2f, 2g, and 7b.	
	b. Defective pressure relief valve.	Replace pressure relief valve.
5. No response, slow or erratic operation of rotation.	a. Preload lost in turret mast bearings.	Adjust to proper preload as prescribed in the Operation and Maintenance Manual.
	b. Rotation drive motor worn.	Repair or replace as required.
	c. Rotation motor drive shaft key sheared.	Replace.
	d. Gears damaged or locked in turret.	Repair or replace as required.
6. Excessive noise during operation.	a. Same as 1b, 2c, 2d, and 2f.	
	b. Pump operating at too high speed. Air in oil. Oil too viscous.	Check truck engine governed setting for proper rpm. Adjust remote throttle linkage or governor system as necessary. Change oil.

TABLE A
TROUBLE SHOOTING (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
7. Boom fails to maintain position with controls neutralized and loads suspended.	a. Pilot-operated check valve on topping cylinder out of adjustment	Readjust as described in Maintenance Manual.
	b. Topping or extension cylinder internal seals worn.	
8. Outrigger will not retract.	a. Outrigger leg wedged in housing.	Refer to Operation Manual.
	b. Defective outrigger cylinder, check valve, or control valve.	Repair or replace.
9. Outrigger drifts down from retracted position or yields during boom operation.	a. Internal seals in cylinder worn.	Repair or replace.
	b. Defective pilot-operated check valve.	Replace