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WAR DEPARTMENT TECHNICAL MANUAL

U.S. Dept. of Army

POWER CONTROL UNIT,
CABLE-OPERATING,
REAR-MOUNTING,
2-DRUM,
LeTOURNEAU,
MODEL T-4



MAINTENANCE INSTRUCTIONS AND PARTS CATALOG

WAR DEPARTMENT • 12 MAY 1944

POWER CONTROL UNIT,
CABLE-OPERATING,
REAR-MOUNTING,
2-DRUM, LeTOURNEAU,
MODEL T-4



(FOR USE WITH D4 & R4 TRACTOR, SERIAL
No. 7J-1 AND UP, AND LeTOURNEAU REAR
DOUBLE DRUM MODEL "T" POWER UNIT).

MANUFACTURED BY

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STOCKTON, CALIF.

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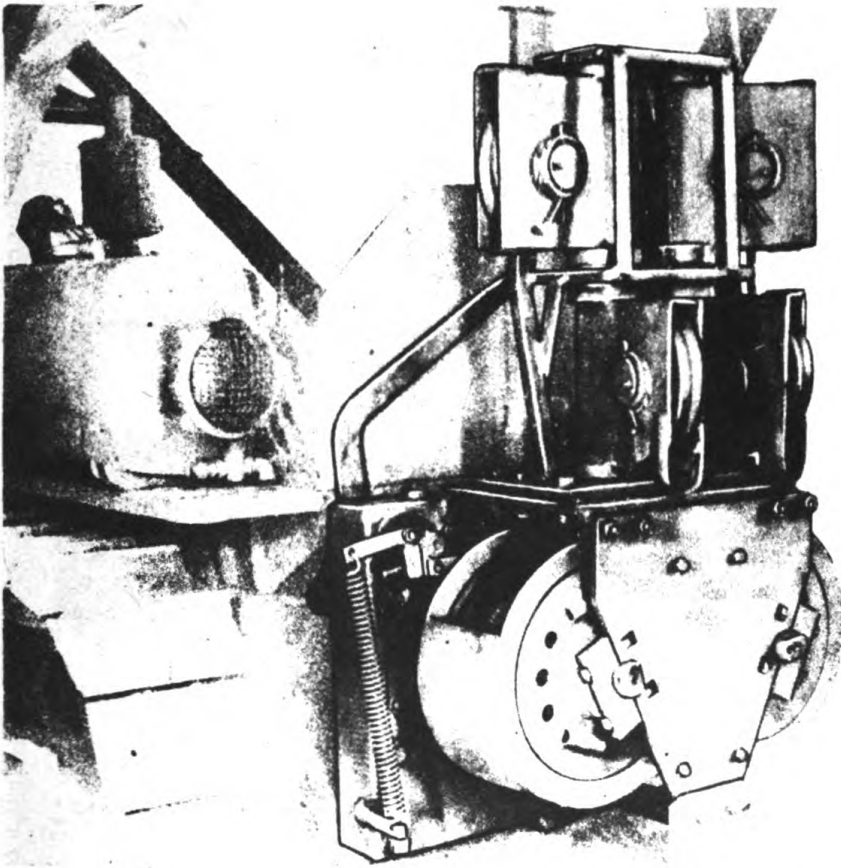
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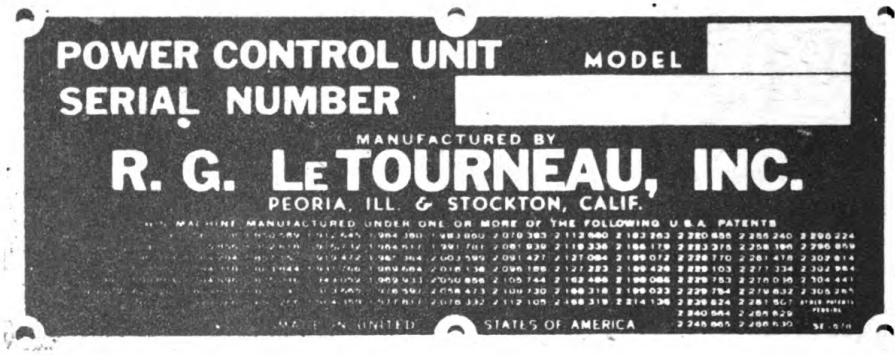
THE LeTOURNEAU MODEL T POWER CONTROL UNIT

The LeTourneau Model T Power Control Unit is a mechanical device mounted on the rear of Caterpillar tractors for the purpose of controlling LeTourneau Scrapers, Dozers, Cranes, and other cable controlled equipment.

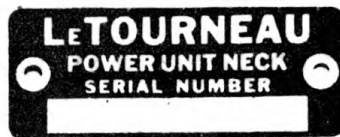
The Power Control Unit has two cable drums for spooling and unspooling cable in controlling the equipment used with the tractor. The control cables extend from the cable drums to the equipment being operated by the Power Control Unit, and it is the spooling and unspooling of the cable on and off the cable drums that controls the movement of this equipment in performing the work for which it is intended.

The tractor operator operates the Power Control Unit by moving the control levers which extend up behind the tractor seat.

Details of operation and maintenance procedures will be found on the pages which follow.



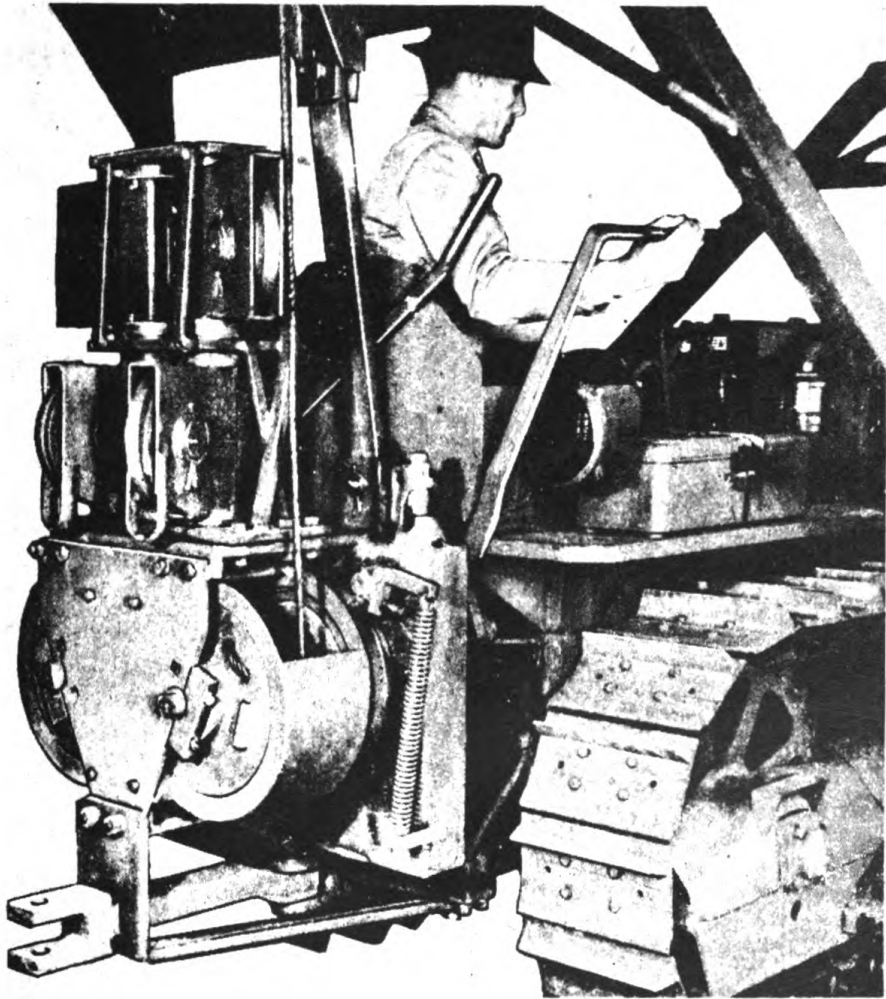
NAMEPLATE OF LETOURNEAU MODEL T POWER CONTROL UNIT



NAMEPLATE OF NECK FOR LETOURNEAU MODEL T POWER CONTROL UNIT

SECT. 1

OPERATION SECTION

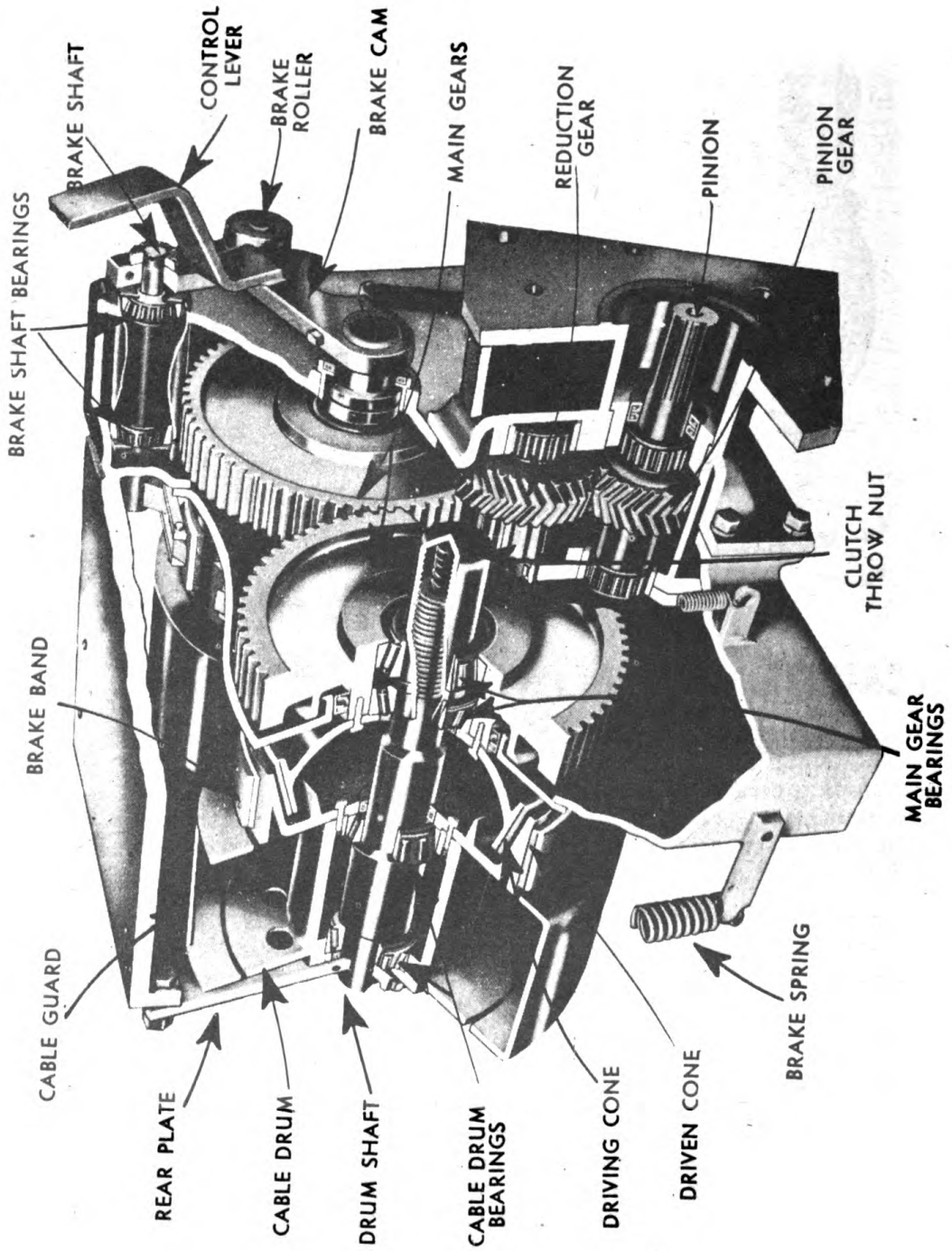


DESCRIPTION OF POWER CONTROL UNIT

The LeTourneau Power Control Unit is the "heart" of all LeTourneau earthmoving and construction equipment. Through its action, LeTourneau Scrapers, Dozers, Cranes, etc., are given the power with which to do their work—through its quick, positive response to the movement of the control levers, the operator can accurately control and manipulate the working parts of this equipment.

LeTourneau Model "T" Series Power Control Units have two cable drums and are mounted on the rear of Caterpillar Tractors. A take-off shaft, known as the "spline-shaft", connects the Power Control Unit with the tractor transmission shaft, and through this connection the Power Control Unit is driven by the tractor engine.

Control cables (wire ropes) extend from the Power Control Unit cable drums to the equipment that is being operated by the Power Control Unit. Two control levers (one for each drum) extend up behind the tractor seat and are within easy reach of the operator. By movement of these control levers, the operator can at will cause the control cables to be either spooled on or unspooled off the cable drums, thereby operating the various working parts of the Scraper, Dozer or other equipment operated by the Power Control Unit.



CUT-AWAY VIEW OF MODEL T POWER CONTROL UNIT

WORKING PRINCIPLE

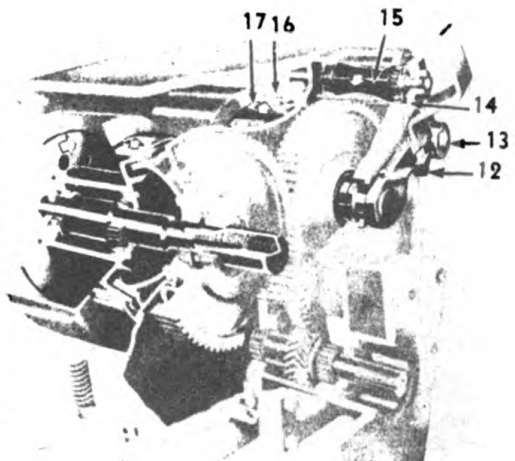
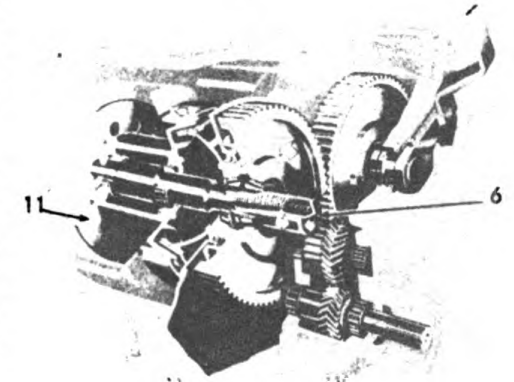
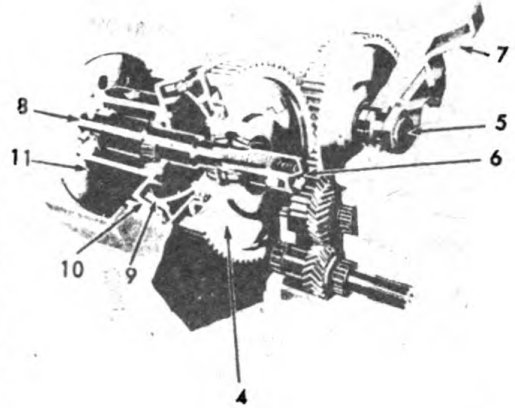
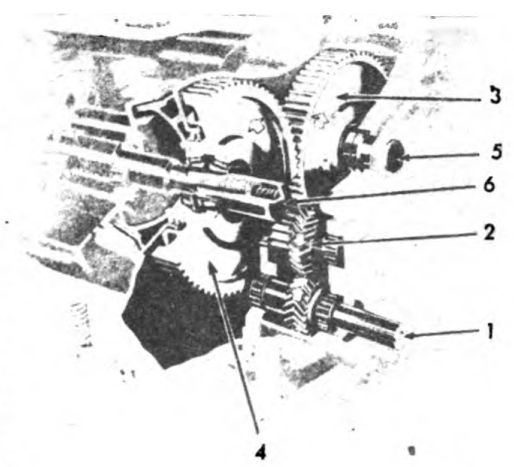
Power Control Unit pinion (1) is connected with tractor transmission shaft by a splined connector shaft, known as "spline shaft." When tractor engine is running with flywheel clutch engaged, the engine turns transmission shaft, causing Power Control Unit pinion (1) to turn. Pinion then turns reduction gear (2) which turns main gear (3) which turns remaining main gear (4). Each main gear and driving cone (assembled as one unit) ride on bearings on clutch throw nuts (5) and (6) and turn constantly when tractor engine is running with flywheel clutch engaged.

The clutches are engaged by moving control levers. When moved to the right, control lever (7) clamped around throw nut (5) at lower end, engages left clutch. Likewise, when moved to the left, a similar control lever (not shown in cut-away illustration) clamped around right throw nut (6), engages right clutch. (Inasmuch as both right and left clutch and cable drum assemblies are alike, only the right assembly, shown in cut-away, will be explained.) When right control lever (not shown) is moved to engage clutch, throw nut (6) turns on drum shaft (8), advancing throw nut to the rear on threads on shaft. Rotating main gear (4) and driving cone (9) are carried to rear with throw nut, and driving cone (9) is brought into contact with driven cone (10), thereby engaging clutch. Driven cone (10) and cable drum (11) now turn, spooling cable onto drum.

To disengage clutch and thereby stop spooling of cable onto cable drum, the control lever is returned to its original neutral position. As the control lever is returned, clutch throw nut (6) turns with lever, causing main gear and driving cone to be moved away from driven cone, thereby disengaging clutch. Cable drum (11) is held by the self energizing brake which takes hold when control lever is in neutral.

To release brake to permit unspooling of cable off cable drum, control lever is moved out of neutral position, in the direction opposite that used in engaging clutch. (Inasmuch as both right and left brake assemblies are alike, only left brake assembly will be explained). By moving control lever to release brake, brake cam (12) at lower end of control lever moves against brake roller (13), causing brake roller and lower end of roller arm (14) to be moved outward. This movement of brake roller arm (14), which is clamped to end of brake shaft (15), causes linkage (16), connecting end of brake shaft with brake band (17), to raise band away from drum, thereby releasing brake.

To re-engage brake, return control lever to neutral position.



SPECIFICATIONS

MODEL.....**T**
 For use with.....Caterpillar D4-R4-D6-D7 and D8 Tractors

CABLE DRUMS:

Number and Mounting.....2, Rear
 Diameter.....7⁵/₈"
 Length.....7⁵/₈"
 Flange Diameter.....13"

OPERATION.....Mechanical from Tractor Gears

GEAR REDUCTIONS:

Standard.....7.74 to 1

Other Reductions and Speeds Available:

Reduction	Speeds-Bare Drum-F.P.M.
11.33 to 1.....	D4, R4, D6-247': D7-176': D8-167'
19.60 to 1.....	D4, R4, D6-143': D7-102': D8-97'
28.30 to 1.....	D4, R4, D6-99': D7-71': D8-67'
37.98 to 1.....	D4, R4, D6-74': D7-53': D8-50'

LINE PULL:

Bare Drum:

D4-R4.....3200 lbs.
 D6-D7-D8.....4000 lbs.

Full Drum:

D4-R4.....2030 lbs.
 D6-D7-D8.....2540 lbs.

LINE SPEED: (7.74 to 1 Gear Reduction)

Bare Drum (feet per minute)

D4-R4-D6.....361'
 D7.....258'
 D8.....245'

Full Drum (feet per minute)

D4-R4-D6.....568'
 D7.....406'
 D8.....386'

CABLE CAPACITY (1/2", 6x19 Tournarope).....186'

WEIGHT (approximate):

Power Control Unit (minus neck assembly)1100 lbs.

Neck Assemblies:

For D4-R4.....240 lbs.
 For D6.....250 lbs.
 For D7.....325 lbs.
 For D8.....220 lbs.

PREPARATION FOR INITIAL OPERATION

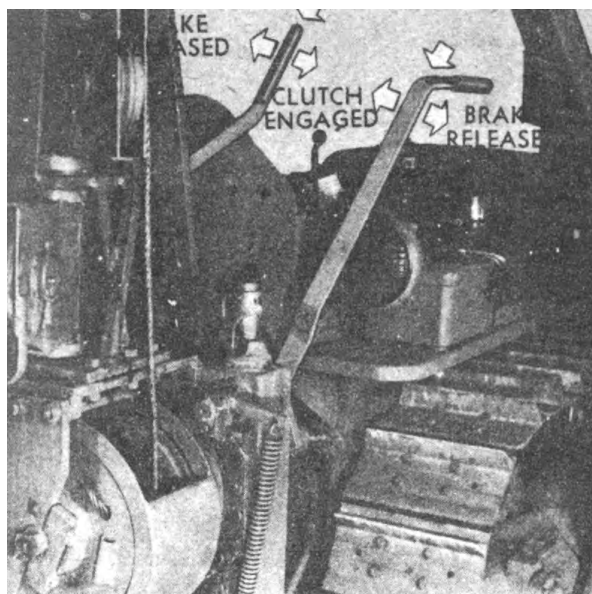
Before placing a newly delivered Power Control Unit in operation, check the following:

1. Make sure that the cork is removed from the breather hole in the oil fill plug.
2. Check oil level in the gear case. The oil should never be permitted to drop below the oil level plug.
3. If the Power Control Unit is to be used with a Scraper or Crane check the threading of the cable through the double-deck sheaves and onto the cable drums. (Refer to cable threading instructions on page 11.) When using the Power Control Unit with a Dozer, the cable is not threaded through the double-deck sheaves.
4. Make sure brake bands are not "frozen" to driven cones by moving control levers to lock-out position.
5. Check clutch and brake adjustments. (Refer to clutch and brake adjustment instructions on pages 14 thru 19.) Make any needed corrections.

OPERATION UNDER DUSTY, MUDDY, LOW TEMPERATURE AND OTHER ABNORMAL CONDITIONS

Few special instructions are required for operating the Power Control Unit in dusty, muddy, low temperature and other abnormal conditions.

1. In extreme dusty conditions do not apply lubricant to the cable. The reason for this is that the particles of dust, when mixed with the lubricant on the cable, may become abrasive, acting similar to a cutting compound and damaging the cable.
2. When operating in extreme muddy conditions, try to keep the clutches, brakes, brake springs, and cable drums free of mud. Remove all mud from unit after completing a day's work.
3. In cold weather, always make sure brake band is not frozen to drum before starting operation by moving control lever into lock-out position, freeing band from drum.
4. Use lighter weight lubricants when operating in cold temperatures than when operating in warm temperatures. (Refer to lubrication instructions on page 13.)



OPERATION SECTION

OPERATION

The Power Control Unit is operated by moving the control levers, located behind the operator at the rear of the tractor. The right control lever operates the right cable drum and the left lever operates the left drum.

Each control lever is normally in neutral position. To engage the clutches and thereby spool cable onto the cable drums, move the left control lever to

the right and the right control lever to the left, using a quick, full movement. To disengage the clutches and thereby stop the spooling of the cable onto the drums, allow the control levers to return to neutral position.

The brakes automatically release when the clutches are engaged and automatically take hold when the clutches are disengaged, with the control levers in neutral position. To release the brakes to permit free-spooling of the cables off the cable drums, move the left control lever to the left and the right control lever to the right. To stop the free-spooling of the cables, move the control levers back into neutral position, thereby allowing the brakes to take hold.

In order to avoid clutch and brake slippage and the resultant overheating of the Power Control Unit clutches and brakes, the operator should always fully engage and disengage the clutch with a quick, full movement of the control lever. Overheating of the Power Control Unit from improper operation may cause the leather in the oil seals to harden and result in oil and grease leakage.

The extreme brake released position of the control lever is known as the "lock-out" position. When in this position, the brake is fully released and the cable drum can be turned in either direction by hand.

Instructions which pertain to the use of the Power Control Unit with Scrapers, 'Dozers, etc., will be found in the Manuals covering those machines.

SAFETY PRECAUTIONS

1. When operating the Power Control Unit, keep the hands free from the cable and working parts.
2. Always lower 'Dozer bowl to the ground before working on Power Control Unit. Do not work on Unit while tractor engine is running.
3. When Power Control Unit has been idle for a period of a few days, move control lever into lock-out position to make sure brake band is not "frozen" tight on drum before operating.

CABLE

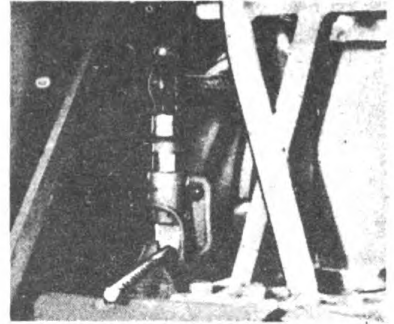
LeTourneau Model T Series Power Control Units are designed for use with Tournarope or other high quality wire rope meeting the following specifications:—6x19 wire rope of Warrington construction with strand center, preformed, Langlay, and made from improved plow steel. It should be internally lubricated during the manufacturing process. (Similar cable of equal construction can be used without harmful results.)

For size of cable (diameter and length), refer to the Parts Catalog covering the particular piece of equipment being operated by the Power Control Unit.

CABLE CUTTER

The cable cutter is mounted on the top of the Power Control Unit gear case.

To cut a piece of cable raise the cutting blade and push the cable thru to the desired length. Then, using a 4 or 5 pound hammer, strike the cutter with several sharp, accurate blows.



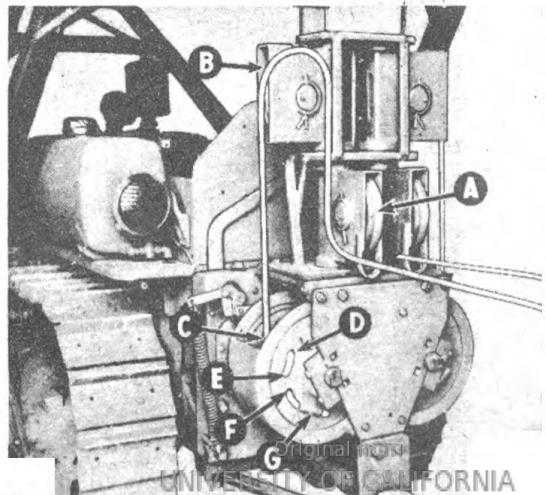
CABLE THREADING

When using the Power Control Unit with a Scraper or a Crane the cable should be threaded through the double-deck sheaves and onto the cable drums. When used with a Dozer the cable does not thread through the double-deck sheaves but is threaded directly onto the right Power Control Unit cable drum.

As a safety measure, cable threading, as outlined below, should not be attempted when the tractor engine is running with the flywheel clutch engaged.

To correctly thread the cable through the double-deck sheave assembly and onto either the right or left cable drum, first enter one end of the cable into the bottom of the lower sheave housing (A) and out through hole in rear of housing, pulling several feet of slack in the cable. Then insert cable back through hole in rear of housing (A) and up and over sheave in housing (B), pulling cable up tight, and then down to cable drum (C). Then extend the end of the cable out through hole (D) in the cable drum flange, pulling a few feet of cable through the hole. Then insert the cable back through hole (E) and out through hole (F), not drawing cable tight through holes. Extend the end of the cable through loop (G), allowing approximately 1" of the cable to protrude from end of loop.

Hold the end of the cable in this position and pull all slack between loop (G) and hole (F) back through hole (F). Then pull all slack between holes (F) and (E) out through hole (E), and all slack between holes (E) and (D) back through hole (D), drawing the cable tight. Then, with the tractor engine idling and the flywheel clutch engaged, engage the Power Control Unit clutch and spool the slack cable evenly onto the cable drum.



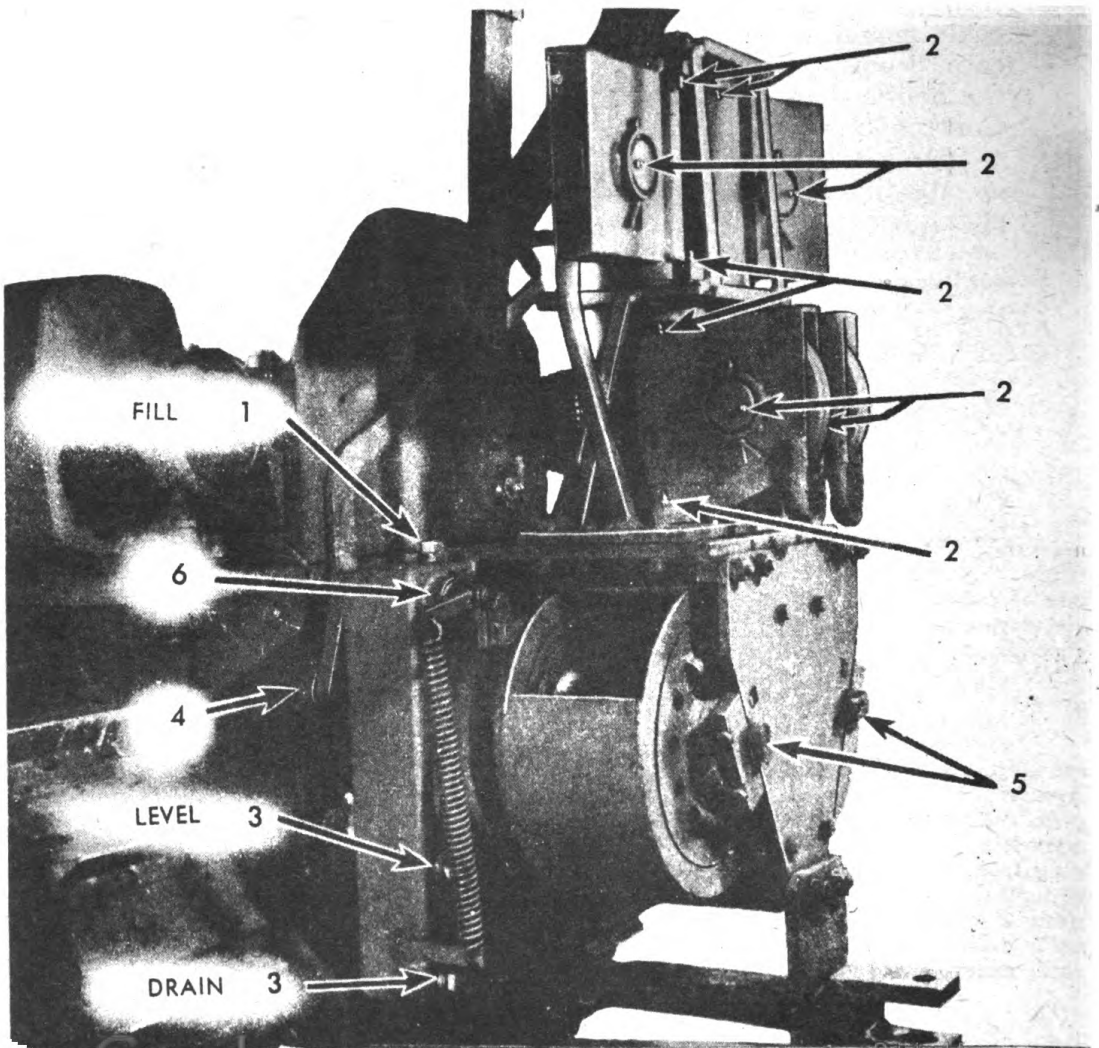
KEY TO LUBRICANTS

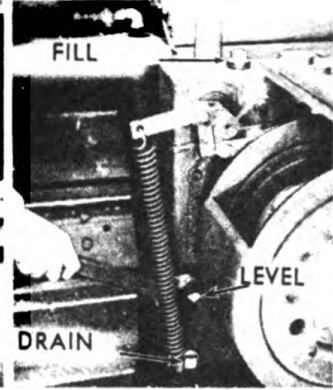
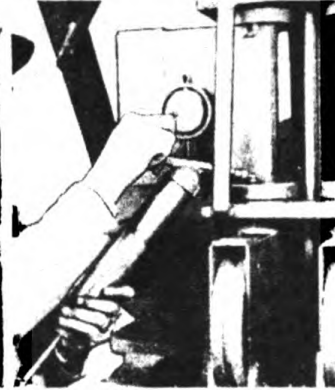
CG — Grease, general purpose
 No. 1 (above +32° F.)
 No. 0 (below +32° F.)

WB — Grease, general purpose
 No. 2 (above +32° F.)
 No. 2 (below +32° F.)

GO — Lubricant, gear, universal
 SAE-90 (above +32° F.)
 SAE-80 (+32° F. to 0° F.)
 Grade 75 (below 0° F.)

OE — Oil, engine
 SAE-30 (above +32° F.)
 SAE-10 (+32° F. to 0° F.)
 Below 0° F., dilute SAE-10 with diesel fuel (up to 30%) as required to bring about fluidity.

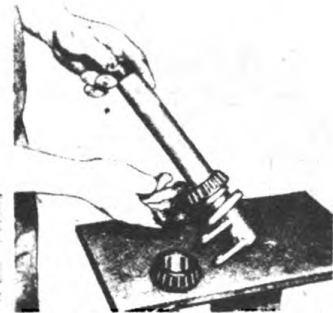
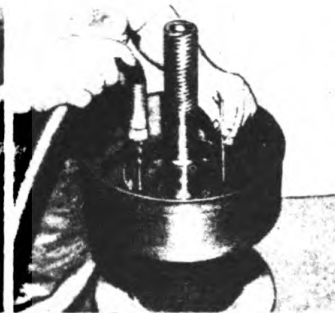




1. Breather Hole
When delivered remove cork from breather hole in oil fill plug. Keep hole open at all times.

2. Double Deck Sheave Bearings
Every 8 hours operation lubricate sheave bearings and sheave housing pivot bearings with **CG**, using conventional pressure grease gun.

3. Gear Case
Every 64 hours check oil level in gear case by removing oil level plug. Always keep filled to level plug. Drain, flush, and refill with **GO** every 1024 hours operation. (Capacity 15 quarts.)



4. Brake Rollers
Every 64 hours operation lubricate brake rollers with **OE**, using oil can.

5. Cable Drum Bearings
Every 1024 hours operation (or when disassembled) remove cable drum, hand-pack bearings and fill drum $\frac{2}{3}$ full of grease, using **WB**. (See Note A)

6. Brake Shaft Bearings
Every 2048 hours operation remove brake shaft bearings and hand-pack with **WB**.

NOTES: (A) After hand-packing cable drum bearings, reassemble cable drum assembly, leaving out two of the capscrews which secure the driven cone to the cable drum. Then, with the cable drum standing on end, insert recommended grease through one of capscrew holes, filling the drum only $\frac{2}{3}$ full of grease. In this operation, use a conventional pressure grease gun or any other suitable means of inserting the grease through the capscrew hole. Also, insert a measuring stick or wire down through the other capscrew hole to serve as a guide in determining when cable drum is $\frac{2}{3}$ full of grease.

For emergency lubrication, a drilled grease duct is provided in the drum shaft, extending from rear of shaft to grease chamber inside cable drum. In event an excessive amount of grease is lost around cable drum oil seals and for some reason it is impractical to disassemble the unit until after a few more hours of operation have been completed, the bearings may be temporarily supplied with lubricant by removing plug from end of drum shaft and inserting a grease fitting in its place. Then inject enough grease through grease fitting to replace that which was lost around the seals, using a conventional pressure grease gun. As soon as possible thereafter, disassemble cable drum assembly to replace leaky oil seals and again hand-pack bearings and fill cable drum $\frac{2}{3}$ full of recommended grease.

ADJUSTMENTS

The successful operation of the LeTourneau Power Control Unit is more dependent upon proper adjustment than any one other thing. If properly adjusted, the Unit should give trouble-free operation. However, if not in the correct adjustment, difficulty in its operation may result.

The clutch adjustments, brake adjustments, and brake shaft bearing adjustments can be made without disassembling the Unit, and can therefore be taken care of by the operator (refer to instructions which follow). The cable drum bearing adjustments and main gear bearing adjustments require partial disassembly of the Unit, and are therefore usually taken care of by maintenance and repair men. The double-deck sheave bearing adjustments are also usually taken care of by maintenance and repair men. (For instructions covering these adjustments refer to pages 40 thru 46.)

BRAKE ADJUSTMENT

Occasional adjusting of the Power Control Unit brakes is necessary because of brake lining wear.

There are two points to consider in checking or making the brake adjustment.

1. The position of the brake roller against the brake cam when the control lever is in neutral position.
2. The tension of the brake spring.

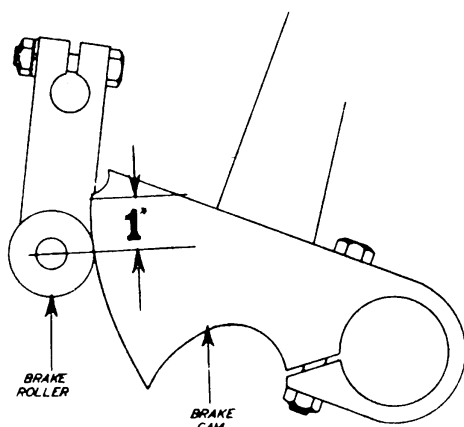
Check the position of the brake roller against the brake cam every 8 hours of operation. The operation of the Unit serves as a constant check on the brake spring tension.

HOW TO CHECK ADJUSTMENT

With the control lever in neutral position, check the position of the brake roller against the brake cam.

The accompanying drawing illustrates the correct relative position of the brake roller against the cam when the control lever is in neutral position (with slack in cable). If the position of the roller against the cam is not approximately as illustrated, an adjustment should be made to bring it into the correct position.

Also, if brake slippage should occur when the brake is under load, an adjustment should be made to increase the tension of the brake spring.



HOW TO MAKE ADJUSTMENT

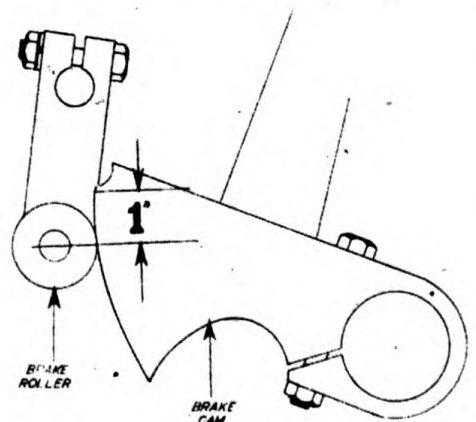
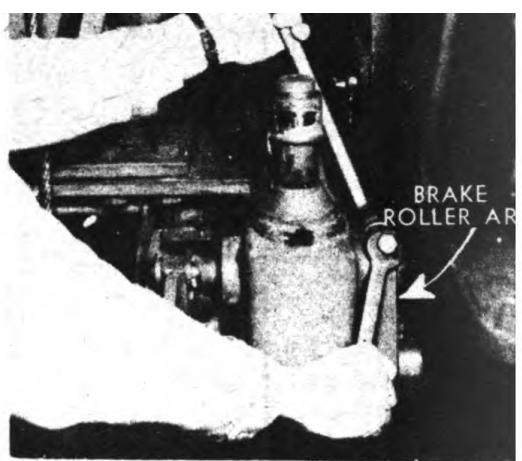
If the brake roller is incorrectly positioned against the brake cam, make the adjustment by first loosening the clamp bolt at the upper end of the brake roller arm.

Move the brake roller arm by slipping it on the brake shaft, either to the left or to the right as required to bring the brake roller into the correct position against the brake cam (approximately 1" down from the lock-out position). This can usually be done by moving the control lever and cam against the roller.

When the brake roller is correctly positioned against the cam, tighten the clamp bolt at the upper end of the brake roller arm.

To increase the brake spring tension in event brake slippage occurs, turn the set screw on the brake arm in a clockwise direction. This will raise the arm, thereby changing the length of the spring and increasing the spring tension. To decrease the spring tension, turn the set screw counter-clockwise. The brake spring should be adjusted only tight enough to prevent the brake from slipping when under load since added tension causes more effort to be required in disengaging the brakes than should be necessary.

Important—Always adjust clutch after changing position of brake roller against brake cam.



BRAKE SHAFT BEARING ADJUSTMENT

Since the brake shafts rotate only a part of a turn during operation, there is very little wear on the bearings. Therefore, the adjustment does not require frequent attention.

Check the brake shaft bearings for correct adjustment every 1,024 hours of operation or when brake slippage is experienced and cannot be traced to any other source.

HOW TO CHECK ADJUSTMENT

To check for bearing looseness, insert a pry bar or similar tool between brake roller arm and gear case, and by prying in and out, detect any end movement of shaft. If end movement is noticeable, the bearings are loose.

To check for bearing tightness, remove brake spring and disconnect brake band from brake shaft. Then rotate shaft by hand. If shaft does not turn freely, the bearings are adjusted too tight.

If bearings are adjusted either too tight or if there is noticeable looseness, an adjustment should be made.

IF ADJUSTMENT IS INCORRECT

If the Power Control Unit is operated with the bearings adjusted too tight, brake slippage may result. If the bearings are noticeably loose, the brake shaft and linkage will have excessive play, affecting the brake action, and the life of the bearings may be shortened.

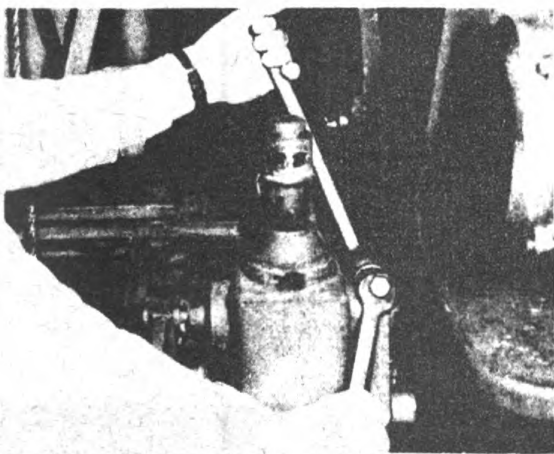
HOW TO MAKE ADJUSTMENT

To make adjustment, first remove brake spring. Then proceed as follows:

1. Loosen clamp bolt at upper end of roller arm. Then remove cotter pin from castellated nut at end of brake shaft.
2. To tighten the bearings, turn the castellated nut located at the upper end of the roller arm clockwise on brake shaft. To loosen the bearings, turn the nut counterclockwise.

The adjustment is correct when bearings are free rolling and without end play.

When correct adjustment is reached, reinstall cotter pin and tighten clamp bolt.



CLUTCH ADJUSTMENT

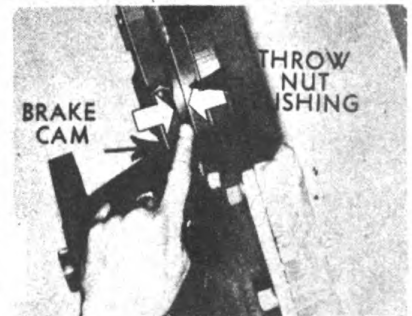
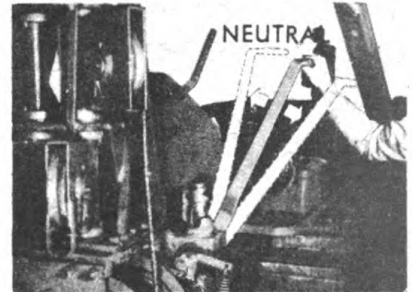
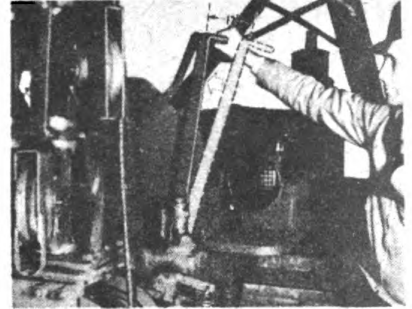
There is no set interval for checking the clutches for adjustment. Rather, the operation of the unit by the operator serves as a constant check on the adjustment.

If operating a Power Control Unit having an incorrectly adjusted clutch, the operator will have difficulty in making the Power Control Unit function properly, and there will be symptoms which will indicate to the operator that the clutch is incorrectly adjusted. These symptoms are: (1) Travel of control lever from neutral to the fully engaged position too great for efficient operation, (2) Clutch won't fully engage, (3) Clutch slippage, (4) Clutch won't release, (5) Clutch dragging, (6) Brake won't fully release, (7) Overheating as a result of the above.

If troubled by one or more of the above symptoms when operating the unit, it is an indication that the clutch is probably incorrectly adjusted and an adjustment should be made.

There are three factors which affect the clutch adjustment and which cause the symptoms listed above:

1. *Incorrect amount of clearance between driving cone and driven cone when control lever is in neutral.* This clearance regulates the distance the driving cone must travel to fully engage the driven cone. Since this clearance cannot be measured accurately without difficulty, it is usually thought of in terms of the distance the control lever travels between neutral and the fully engaged position. If the cones are spaced too far apart, the travel of the control lever from neutral to the fully engaged position will be so great that it will be difficult for the operator to efficiently operate the unit. If spaced too close, the driving cone may drag on the driven cone when the control lever is in neutral position. The clearance between the driving and driven cones is correct when the travel at the top of the control lever from the neutral to the fully engaged positions is approximately 12". (Slightly less for efficient Dozer operation.)
2. *Main gear incorrectly spaced inside gear case.* If spaced too far to the rear, the gear will strike rear side of gear case as control lever is moved to engage clutch, preventing the clutch from fully engaging. If spaced too far to the front, it will strike the reduction gear as control lever is moved in the direction that releases the brake, preventing control lever from being moved into lock-out position, and possibly preventing the brake from fully releasing.
3. *Insufficient clearance between the brake cam and throw-nut bushing.* If there is insufficient clearance at this point, the brake cam will ride against the throw nut bushing before the driving cone becomes fully engaged in the driven cone, thereby preventing the clutch from fully engaging. With the control lever in the fully engaged position there should be some clearance at this point.



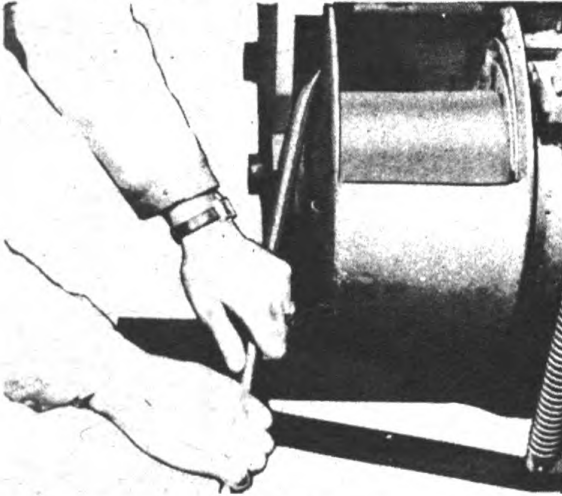
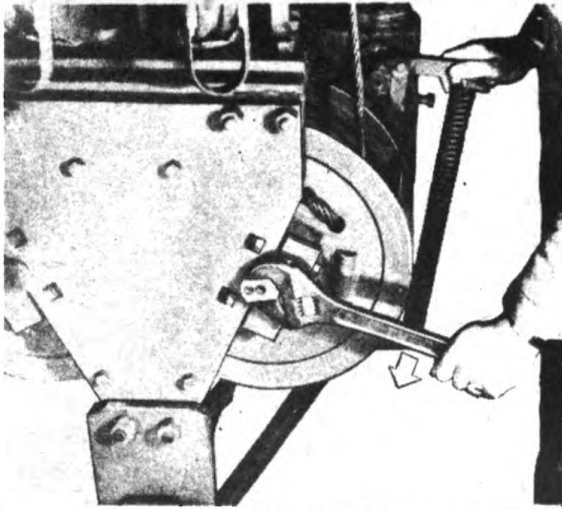
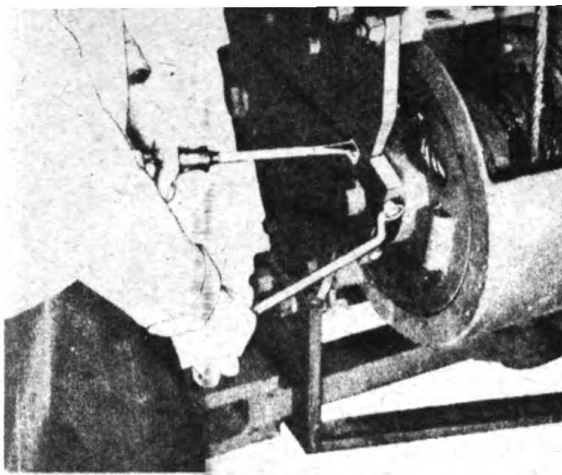
By making the clutch adjustment as outlined on the following pages, the three possible sources of trouble listed above will be corrected. If the same symptoms are present after making the adjustment, the difficulty is caused from some other source, and a different correction must be made. (Refer to 'Trouble Shooters' Guide at rear of Repair Section.)

HOW TO MAKE CLUTCH ADJUSTMENT

To adjust either clutch, first make sure that brake roller is correctly positioned against brake cam (refer to brake adjustment instructions on page 14).

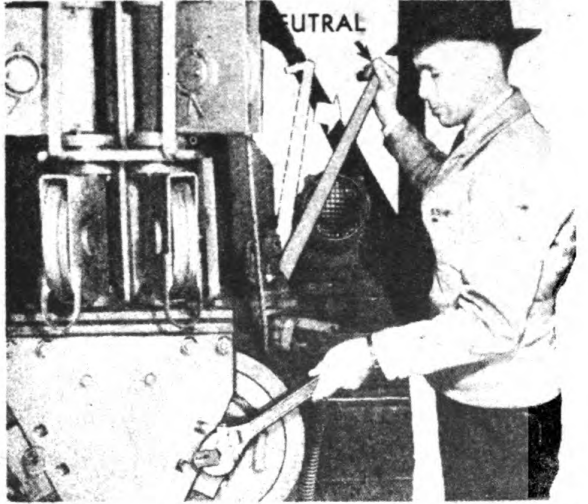
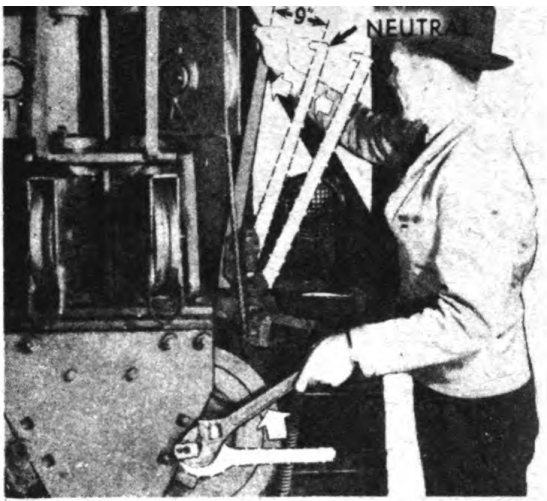
Then proceed as follows:

1. Move control lever into the lock-out position (extreme brake released position). Leave lever in this position and loosen drum shaft clamp bolts at rear end of drum shaft.
2. With control lever in lock-out position, turn drum shaft with a wrench, bringing the driving cone and driven cone together tight. (If adjusting the right clutch, turn the right shaft in a clockwise direction. If adjusting the left clutch, turn the left shaft in a counter-clockwise direction.)
3. Insert a pry bar between rear plate and cable drum and pry drum assembly toward the tractor as far as it will go.
4. Insert the bar between the driving cone and the gear case cover plate and pry the assembly in the opposite direction $\frac{1}{8}$ " to $\frac{3}{16}$ ". This will correctly space main gear inside gear case.

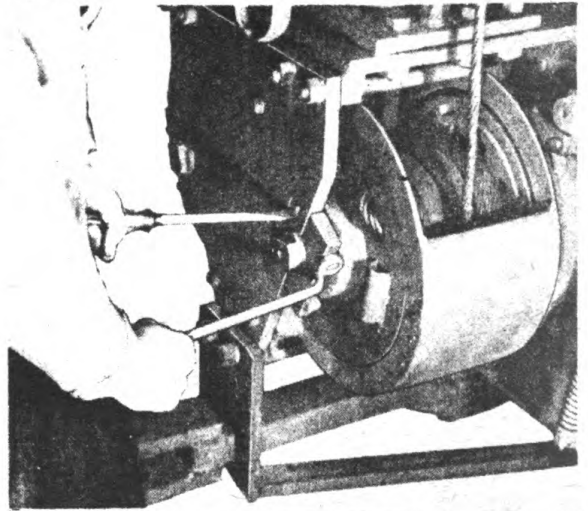


OPERATION SECTION

5. Place a wrench on end of drum shaft and move control lever from lock-out position, back to a point approximately 9" past neutral position, allowing the wrench to turn with drum shaft as control lever is moved. (If Unit is hot, 9" movement should be increased slightly due to expanded condition of driven cone.) The drum shaft will turn with the control lever in making this part of the adjustment. (The above 9" travel of control lever from neutral to fully engaged position will give approximately 12" travel of lever in actual operation after adjustment has been completed. This amount of travel will provide proper clearance between driving cone and driven cone when in neutral cone position.)



6. Hold the drum shaft from turning by holding the wrench stationary, and return the control lever to neutral position.



7. Then, without turning the drum shaft, clamp the drum shaft to the rear plate by tightening the drum shaft clamp bolts, turning them down evenly.

8. Fully engage clutch and check for clearance between brake cam and throw nut bushing. There should be some clearance at this point. If there is no clearance, release clamp bolt from lower end of control lever and space lever farther out on clutch throw nut, without changing the relative position of the lever. Then re-tighten clamp bolt.

IMPORTANT:

The above steps in making the clutch adjustment must be made in the order given and no steps can be eliminated.



PREPARATION FOR STORAGE

In preparing the Power Control Unit for storage the following precautions should be observed.

(a) LIMITED STORAGE

1. Clean all mud, grease, oil, and dirt from the Power Control Unit.
2. Lubricate unit by reference to Lubrication Chart, page 12.
3. Apply paint or a thin coating of oil to any unpainted spots to serve as a rust preventative.
4. Close breather hole in oil fill plug with a small cork to prevent dirt from entering gear case.

(b) DEAD STORAGE

For further instructions for preparing the Power Control Unit for storage, refer to Tentative Technical Manual TM5-9715, "Storage of Engineer Equipment", issued by Engineer Field Maintenance Office, Maintenance Division, Military Supply, P. O. Box 1679, Columbus, Ohio, (superseding Tentative Preventative Maintenance Manual, "Storage of Engineer Equipment").

PREPARATION FOR EXPORT SHIPMENT

For instructions covering the preparation of the Power Control Unit for export shipment, refer to "Technical Manual" TM5-9711, issued by Engineer Field Maintenance Office, Maintenance Division, Military Supply, P. O. Box 1679, Columbus, Ohio.

REPAIR SECTION

SECT. 2

REPAIR AND MAINTENANCE

The instructions on the pages which follow give complete information needed for correctly servicing and repairing the model T Power Control Unit. It has been prepared to be of assistance to Maintenance and Repair men and if these instructions are properly followed at the correct intervals, the Power Control Unit should give trouble-free operation.

CARE OF POWER CONTROL UNIT

WHEN POWER CONTROL UNIT IS DELIVERED:

Remove cork from breather hole in oil fill plug.

Check all points of adjustment and make any necessary corrections.

Check oil level in gear case.

Check threading of cable on cable drums.

WHEN NEEDED:

Make clutch adjustments.

ONCE EVERY 8 HOURS:

Check brake adjustments.

Lubricate double deck sheave bearings.

ONCE EVERY 64 HOURS:

Check oil level in gear case.

Lubricate brake rollers.

ONCE EVERY 128 HOURS:

Check double deck sheave bearings.

ONCE EVERY 256 HOURS:

Check cable drum bearings.

Check main gear bearings.

ONCE EVERY 1024 HOURS:

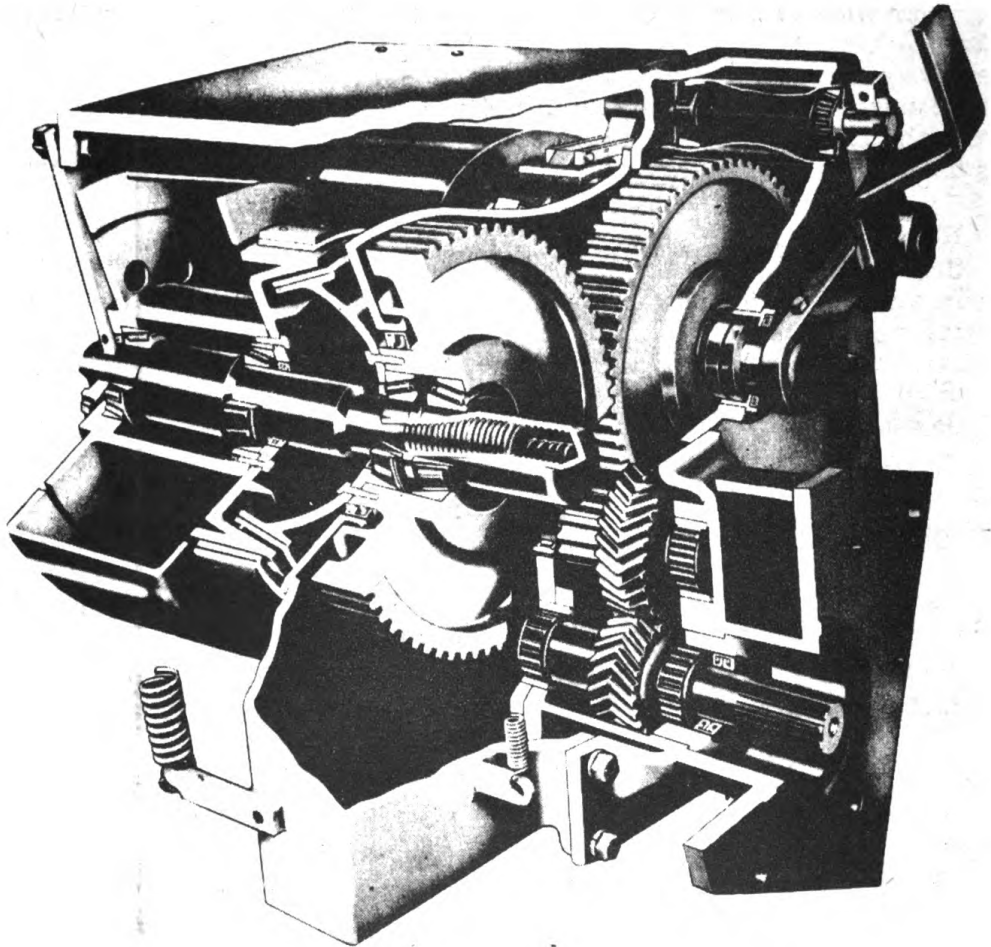
Check brake shaft bearing adjustment.

Change oil in gear case.

Hand-pack cable drum bearings with grease.

ONCE EVERY 2048 HOURS:

Hand-pack brake shaft bearings with grease.



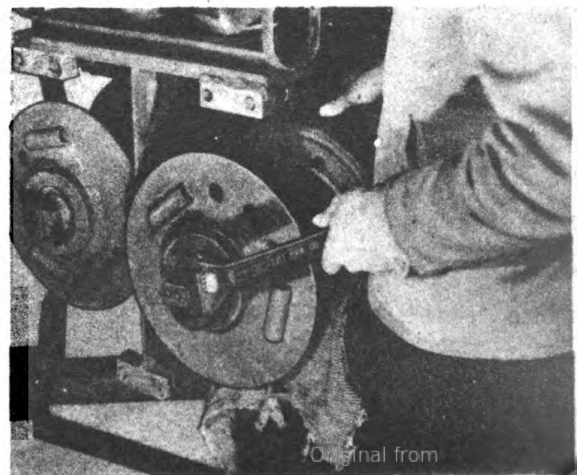
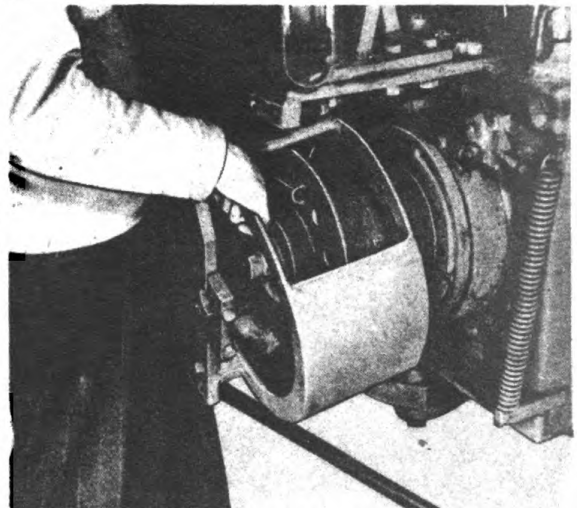
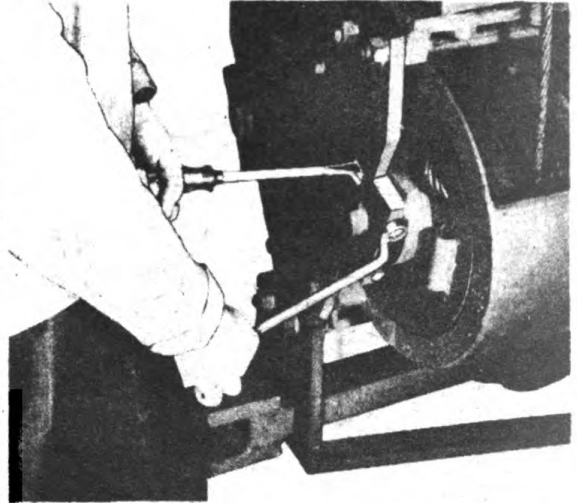
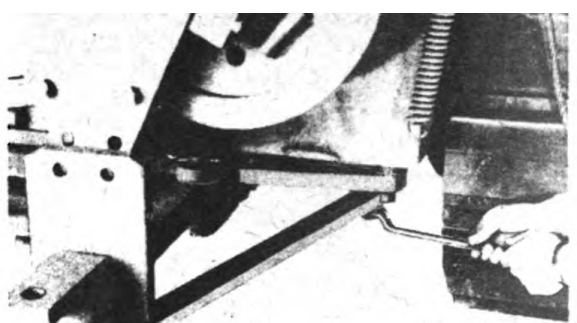
DISASSEMBLING

When disassembling a Power Control Unit to replace a worn part, install new clutch or brake facings, remove bearing adjusting shims, etc., the length of time that is consumed is quite often an important matter, especially if the disassembly results in other equipment being shut down during that period. Therefore, the instructions which follow explain the quickest and easiest method of correctly removing and disassembling each assembly or group of related parts.

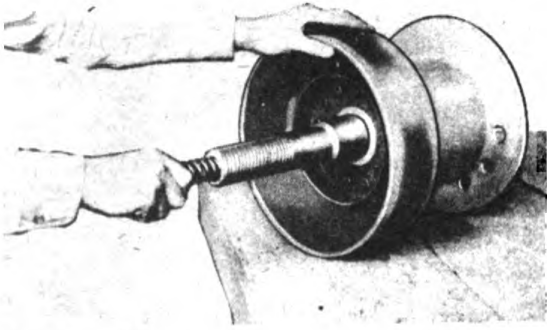
**REMOVING CABLE
DRUM ASSEMBLIES**

The cable drum assemblies can be removed without removing the Power Control Unit from the tractor. To remove either the right or left cable drum assembly, first remove the cable from the cable drum. Then proceed as follows:

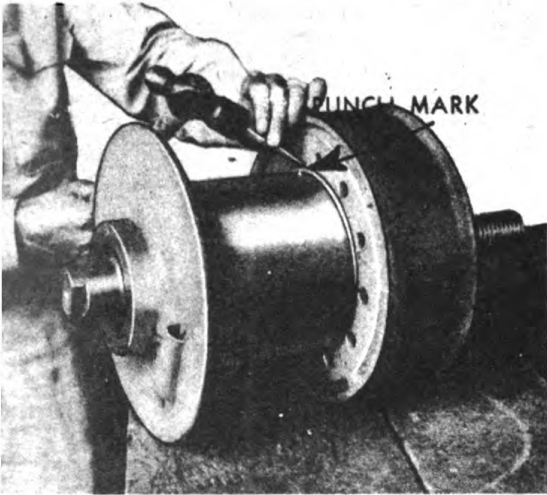
1. Remove the bolts which secure the drawbar extension assembly to the Power Control Unit and to the tractor, and swing the assembly to one side. (This procedure is necessary only with Power Control Units mounted on Caterpillar D4 and R4 tractors.)
2. Loosen clamp blocks which clamp rear ends of drum shafts to Power Control Unit rear plate by loosening clamp bolts. Then remove the bolts which secure top of rear plate to Power Control Unit.
3. Remove rear plate and cable guards as one unit by sliding them to the rear, off the ends of the drum shafts, as illustrated.
4. To remove either the right or left cable drum assembly first remove the brake band as outlined in instructions for removal of brake band on page 28. Then remove cable drum assembly by turning drum shaft out of clutch throw nut, using a wrench as illustrated. Turn the left drum shaft clockwise and the right drum shaft counter-clockwise. In this operation it is necessary to support the cable drum, as illustrated, in order to prevent damaging the oil seal in the hub of the driving cone as the drum shaft passes through the seal.



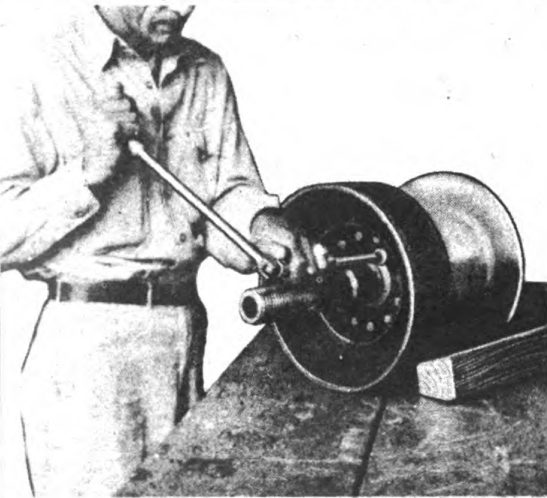
DISASSEMBLING CABLE DRUM ASSEMBLIES



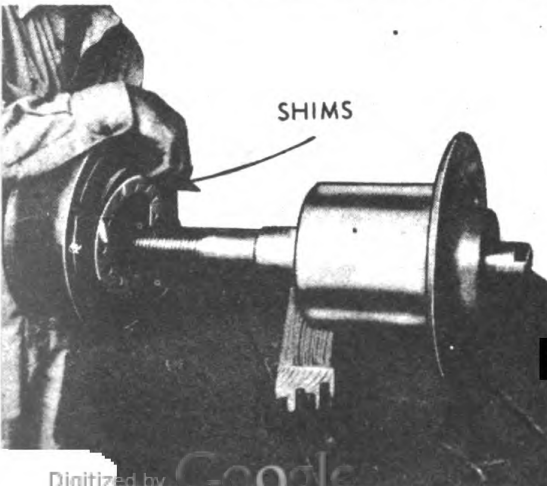
1. If spring at end of drum shaft is to be removed, pull it out of end of shaft.



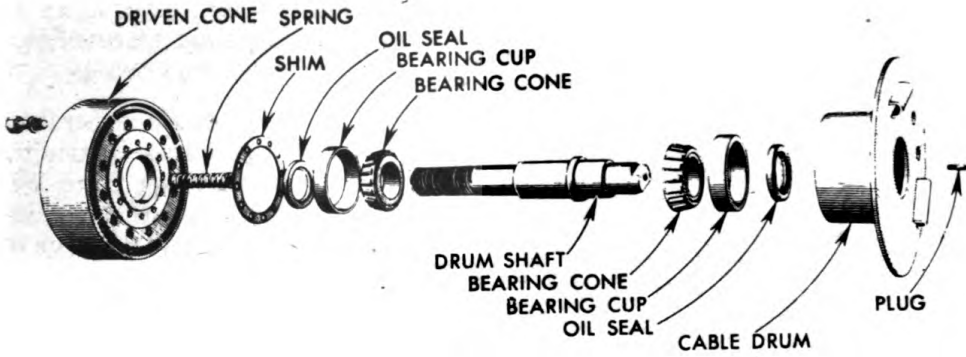
2. With hammer and punch, mark cable drum and driven cone at the points shown. This is done in order to assure proper alignment when reassembled.



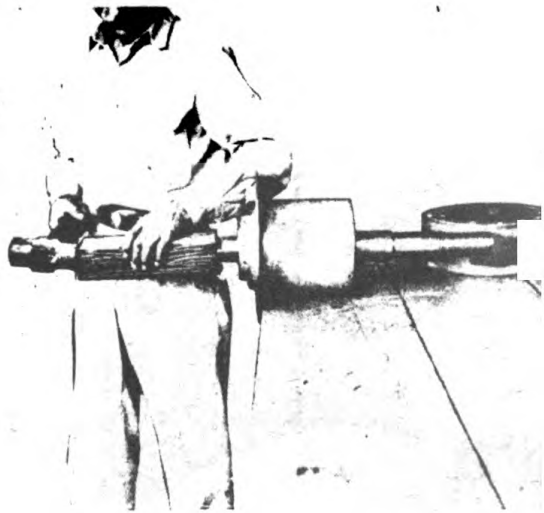
3. Remove capscrews which secure driven cone to cable drum. Then slide driven cone off over end of drum shaft, being careful not to damage hub oil seal.



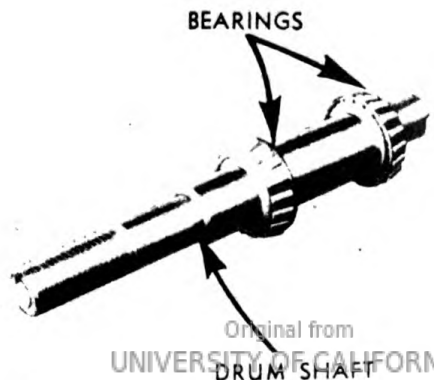
4. Remove bearing adjusting shims from between cable drum and driven cone. To avoid loss of shims, wire them together.



5. Remove drum shaft from cable drum by driving against short end of shaft, using a wood block and sledge. The bearing cup at opposite end of cable drum will be removed during this operation.



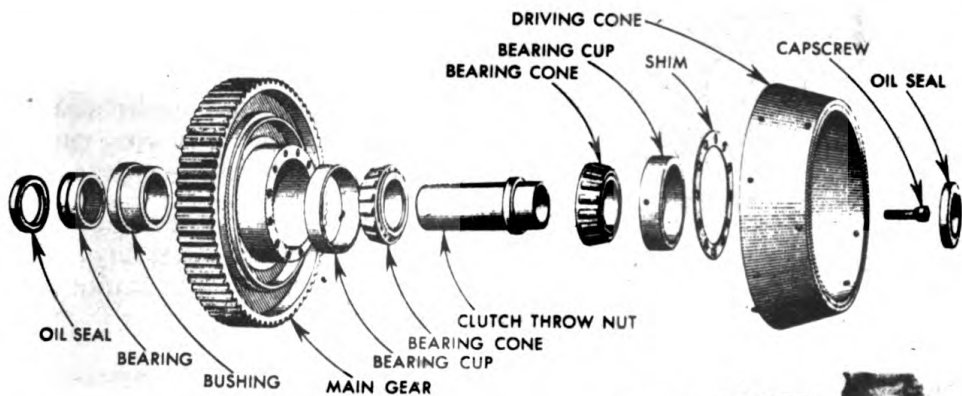
6. If bearing cones are to be replaced, drive or pull them off drum shaft. Also, the cable drum oil seal and the remaining bearing cup can be removed from the cable drum.



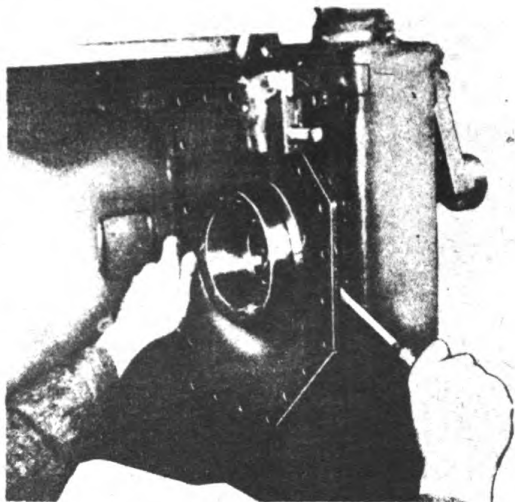
REMOVING MAIN GEAR AND DRIVING CONE ASSEMBLIES

All parts of the main gear and driving cone assemblies, except the main gears, can be removed from the Power Control Unit without removing the unit from the tractor. To remove and disassemble the left and right main gear and driving cone assemblies, follow the instructions below:

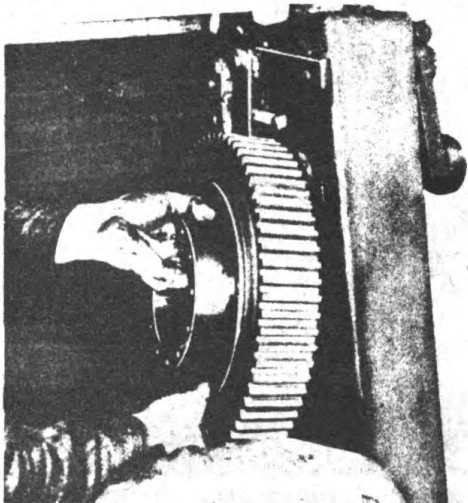
1. Remove cable drum assembly as outlined in preceding instructions. Then remove driving cone by removing capscrews which secure it to hub of main gear. Remove bearing adjusting shims from back side of driving cone. (To avoid loss of shims wire them together.) If driving cone oil seal is to be replaced, remove it from hub of driving cone.
2. To remove clutch throw nut and main gear bearings, loosen clamp bolt from lower end of control lever and remove control lever from clutch throw nut. Then place a wood block against front end of throw nut and drive it out of gear hub, using a sledge, (if Power Control Unit is removed from tractor). If Power Control Unit has not been removed from tractor, clutch throw nut can be removed by moving main gear as far to the rear in gear case as possible and then inserting wood block between front end of clutch throw nut and rear of tractor. Then drive against gear hub from rear, using wood block and sledge, thereby driving bearing cup out of the rear side of gear hub. Avoid marring gear hub.
3. Lift clutch throw nut and main gear bearings out of gear hub as one unit. If bearings are to be replaced, either drive or pull them off the throw nut.
4. To remove the main gears proceed by draining the oil from the gear case and removing capscrews which secure cover plate to gear case.



5. Strike cover plate a blow near center with a hammer, thereby breaking cover plate loose from gear case. Then pry cover plate away from gear case as illustrated, using a screw driver or similar tool. Care should be used to pry cover plate off evenly in order to avoid damaging oil seal and dowel pins. Remove oil seal from cover plate if it is to be replaced.



6. To remove the main gears, the Power Control Unit must first be removed from the tractor and the adaptor neck removed from the Power Control Unit as outlined in the instructions on page 30. (Both the right and left throw nuts must be removed before either main gear can be removed.)



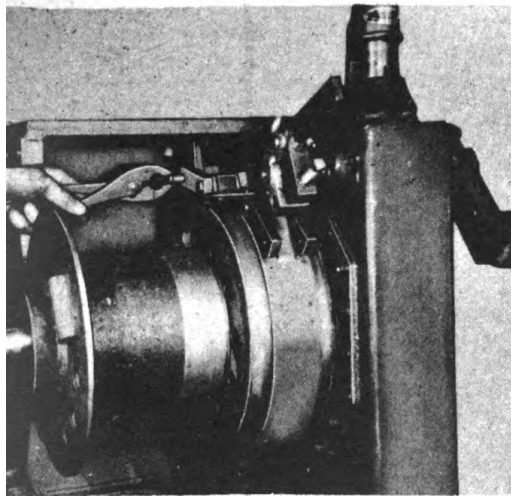
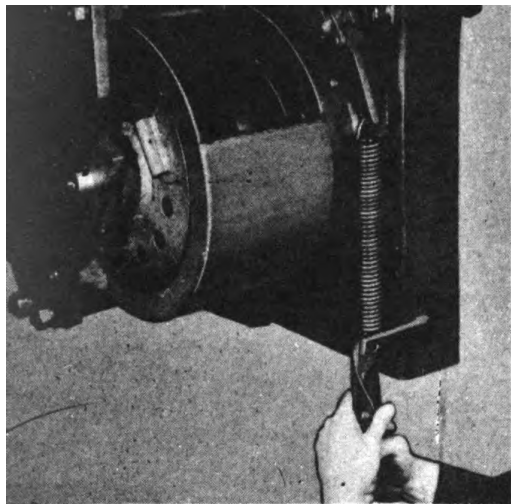
7. To remove clutch throw nut bearing and oil seal, drive against bearing from inside of case. If throw nut bushing is to be replaced, it can also be driven out of gear case.



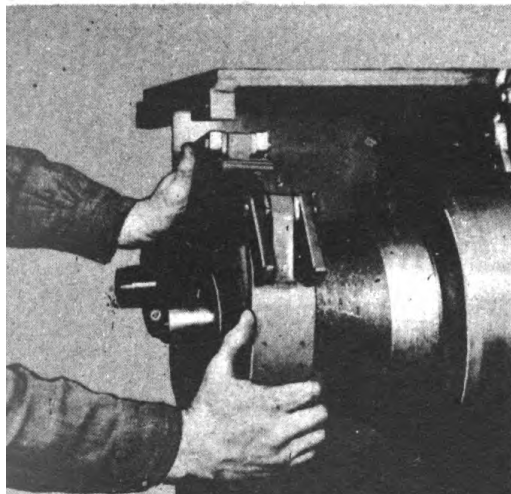
REMOVING BRAKE ASSEMBLIES

All parts of the brake assemblies can be removed without removing the Power Control Unit from the tractor.

1. Before removing any part of either the right or left brake assembly, it is usually advisable to first remove the brake spring.



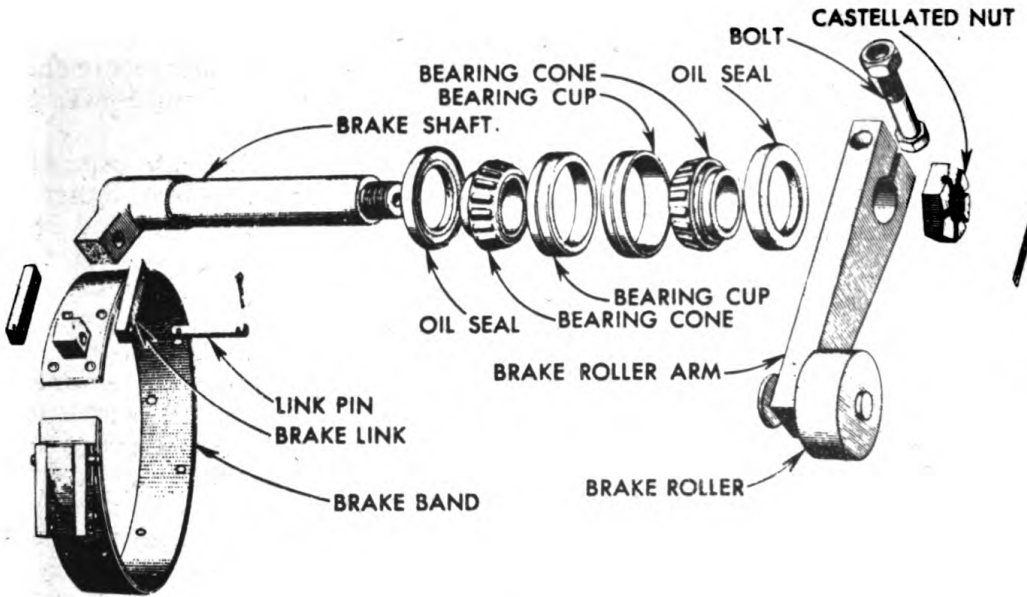
2. To remove a brake band, first remove the rear plate and cable guards. (Refer to disassembly instructions on page 23.) Then remove link pins which connect brake links with brake shaft and gear case, leaving brake links connected to brake band.



3. Slide brake band off over cable drum.



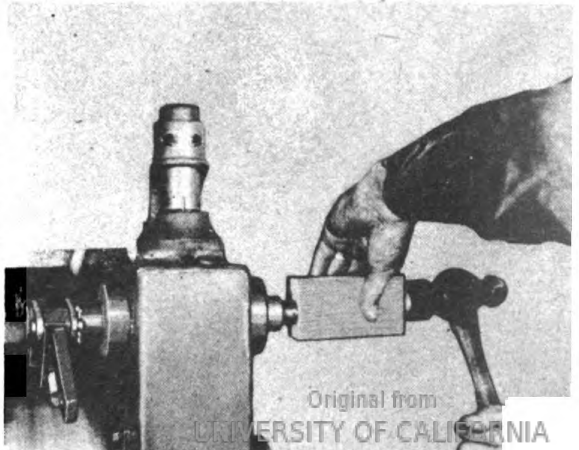
4. To remove a brake roller arm or brake shaft, it is not necessary that the brake band and cable guard first be removed. The first step in removing the roller arm is to release the clamp bolt at the upper end of the roller arm.



5. Remove the castellated nut from end of brake shaft. The roller arm can now be slipped off the front end of the brake shaft.



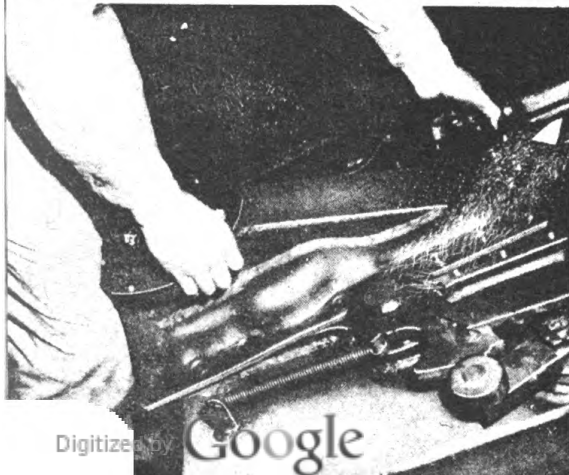
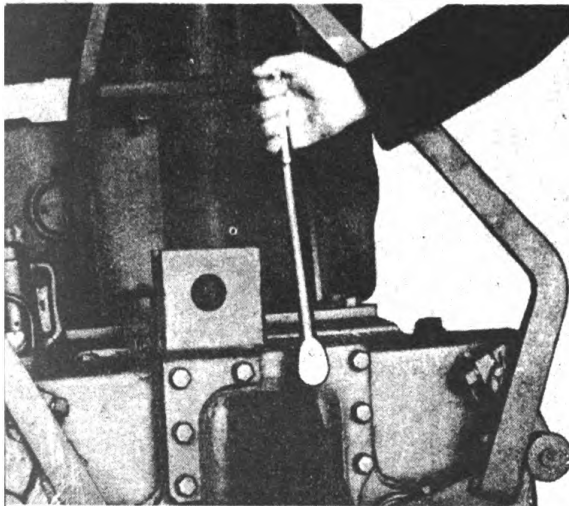
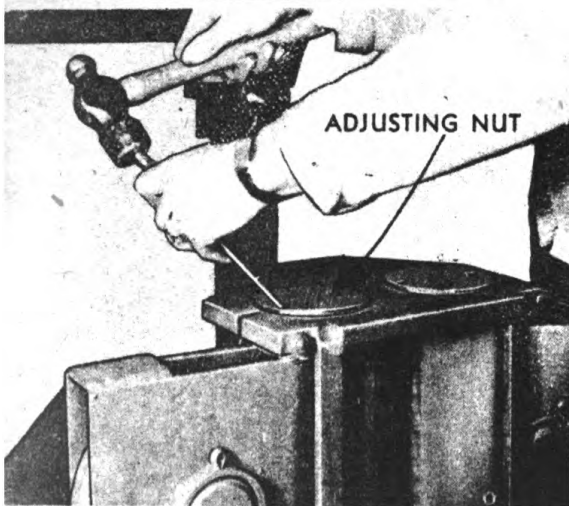
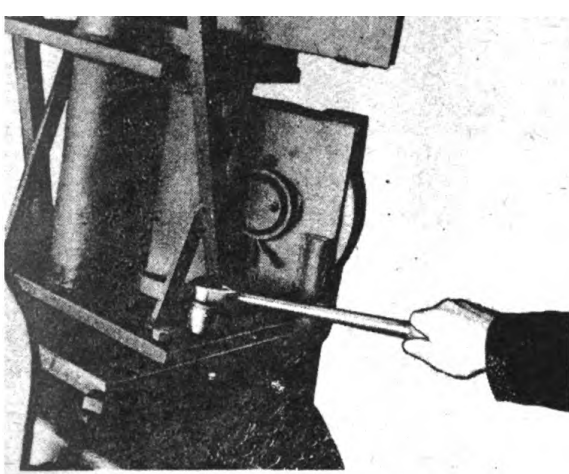
6. If the brake shaft is to be removed, pry or drive it out of gear case, using a pry bar or sledge and a wooden block. The rear bearing cone and oil seal can then be removed from shaft and the front bearing cone and oil seal from the housing. If bearing cups are removed, pull them out of housing.



REMOVING AND DISASSEMBLING DOUBLE-DECK SHEAVE ASSEMBLY

To remove the double-deck sheave assembly from the Power Control Unit, first remove the cable. Then remove the bolts which secure the assembly to the top of the Power Control Unit.

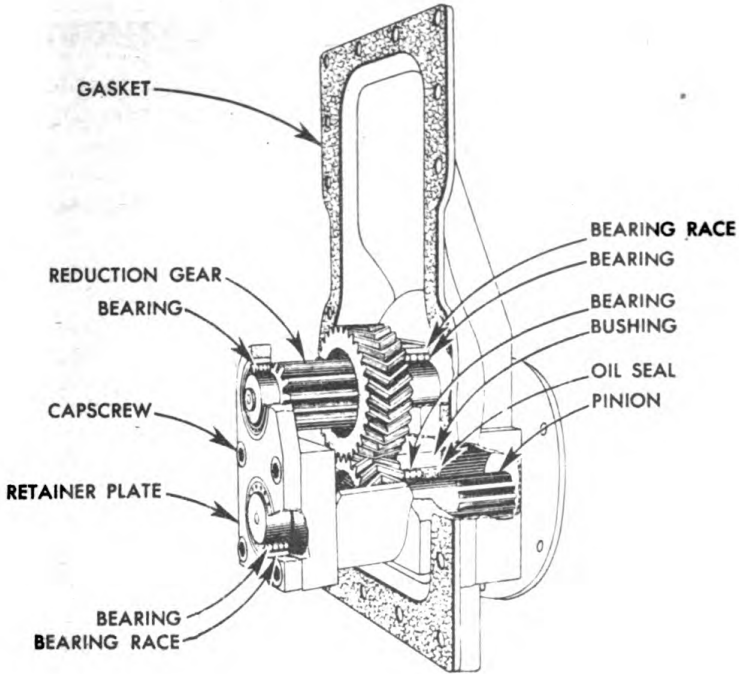
To remove the sheave housings from the sheave bracket, first loosen the clamp bolts at the upper end of the bracket and then turn the bearing adjusting nuts out of the bracket. The upper sheave housings can now be removed by raising and tilting the housings in the bracket. To remove the lower sheave housings, it is first necessary to remove the bearing cups at the top of the sheave housings from the bracket. After removal of these bearing cups, the lower sheave housings can be removed in the same manner as the upper housings.



REMOVING ADAPTOR NECK FROM POWER CONTROL UNIT GEAR CASE

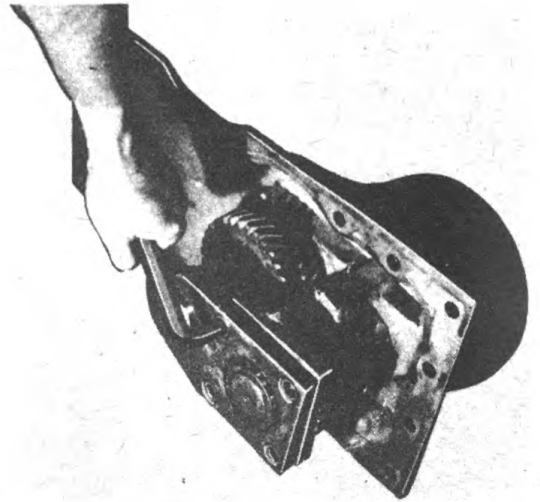
To remove the adaptor neck from the Power Control Unit gear case, first remove the Power Control Unit from the tractor. (Refer to instructions for removing Power Control Unit from tractor on page 37.) Then proceed as follows:

1. Remove capscrews which secure neck to gear case. (If the cable drum assemblies have not been removed from the Power Control Unit, loosen the clamp bolts at the rear of the drum shafts, insert a bar between the cable drums and rear plate, and pry the drum assemblies forward as far as possible, to permit the neck assembly to clear the main gears.)
2. Lower the neck enough to allow the bearing plate at the rear end of the pinion and reduction gear to pass under the main gears, and then remove the neck from the gear case.

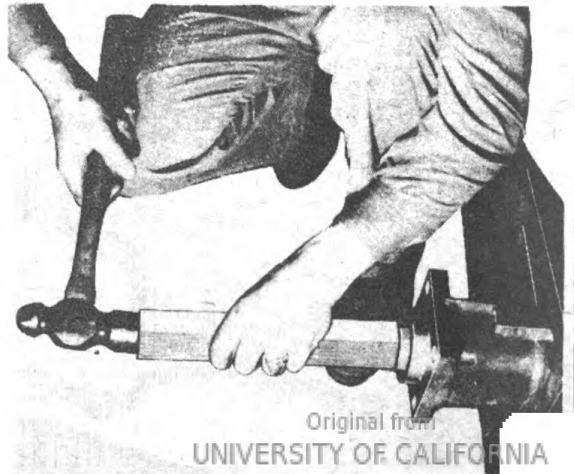


DISASSEMBLING POWER CONTROL UNIT ADAPTOR NECK

1. Remove the cap screws which secure the bearing plate to the neck and remove the plate. Slide pinion and reduction gear to the rear far enough to allow the reduction gear to be removed.



2. Drive against rear end of pinion with wood block and hammer or sledge, forcing pinion, bushing, bearing, and oil seal out through the hole in the face plate. Then drive or pull bearing, oil seal, and bushing off pinion and remove bearings and bearing races from neck.

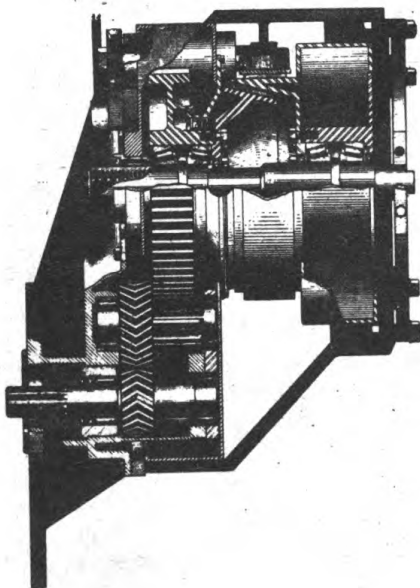


REASSEMBLY

INSPECTION OF PARTS

Before re-assembling the Power Control Unit, the following inspection and care of parts should be made:

1. Carefully examine oil seals before re-installing. Replace any oil seals which do not appear to be in good condition.
2. Make new oil seals pliable by soaking in light weight oil and by running a round object, such as the shank of a screw-driver or hammer handle, around the inner circumference of the seal, thus working the leather.
3. Replace all working parts that are worn excessively.
4. Examine bearings before re-installing. Use none that may have become Brinelled, pitted, or excessively worn.
5. Replace bearing cups when replacing bearing cones, and vice-versa.
6. Examine clutch and brake facings before re-installing driving cones or brake bands. Wash oil soaked woven facings with a suitable solvent. Roughen with a rasp woven facings that have become glazed. Make sure facings are tight on driving cone or brake band before re-installing. If driving cone has been newly re-lined with metallic facing, the facing should be machined to a 15° taper to take off any high spots.
7. Replace brake springs if they have become stretched and lost their tension.
8. Keep all parts clean and free from foreign particles during assembly.



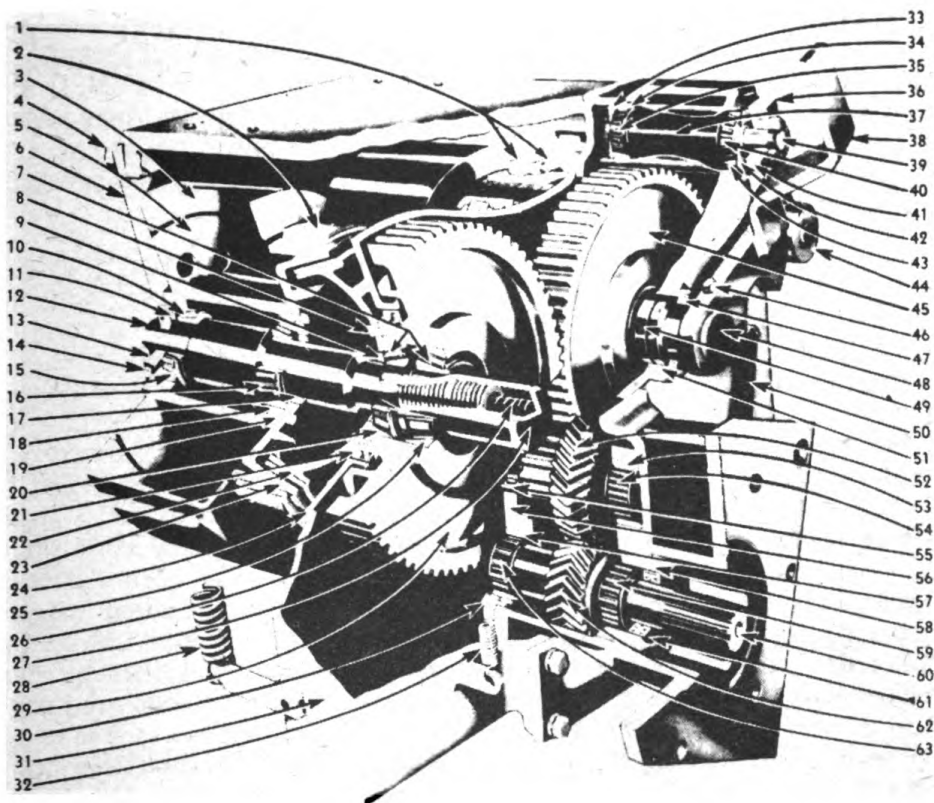
ASSEMBLING POWER CONTROL UNIT

The procedure for assembling the Power Control Unit is the reverse of that for disassembling the Unit. (Refer to disassembling instructions on pages 22 thru 31.)

The parts can be assembled in the following order:

BRAKE ASSEMBLIES

Install bearing cone (35) and felt seal (33) onto rear end of left brake shaft (37), if removed. Also press bearing cups (43 and 34) into front and rear ends of housing. Then insert brake shaft (37) through housing from the rear and install remaining bearing cone (40) and felt seal (42) over front end of shaft, up against the bearing cup. (NOTE: during assembly, the brake shaft bearings should be handpacked with lubricant, as outlined in Lubrication Instructions on page 13.) Install clamp bolt and lockwasher (36) at upper end of brake roller arm (41) and install roller arm on end of brake shaft (37). Install castellated nut (39) onto threads on end of shaft and tighten nut to point where all end play of shaft is eliminated, but without drag on the brake shaft bearings. Then install cotter pin in end of shaft, thereby locking nut (39), and tighten clamp bolt (36) in upper end of roller arm (41).



Install the right brake shaft in a like manner.

The right brake band (2) and similar left brake band are installed later during cable drum installation. Also, the right brake spring (28) and similar left brake spring not shown in the illustration are usually installed later, when the unit has been completely assembled.

CLUTCH THROW NUT BUSHINGS, BEARINGS AND OIL SEALS

If left throw nut bushing (51) has been removed from gear case, press or drive replacement bushing into case. Insert bearing (49) inside bushing. Do not install oil seal (47) in bushing (51) until after main gear and driving cone assembly has been installed and the main gear bearing adjustment made.

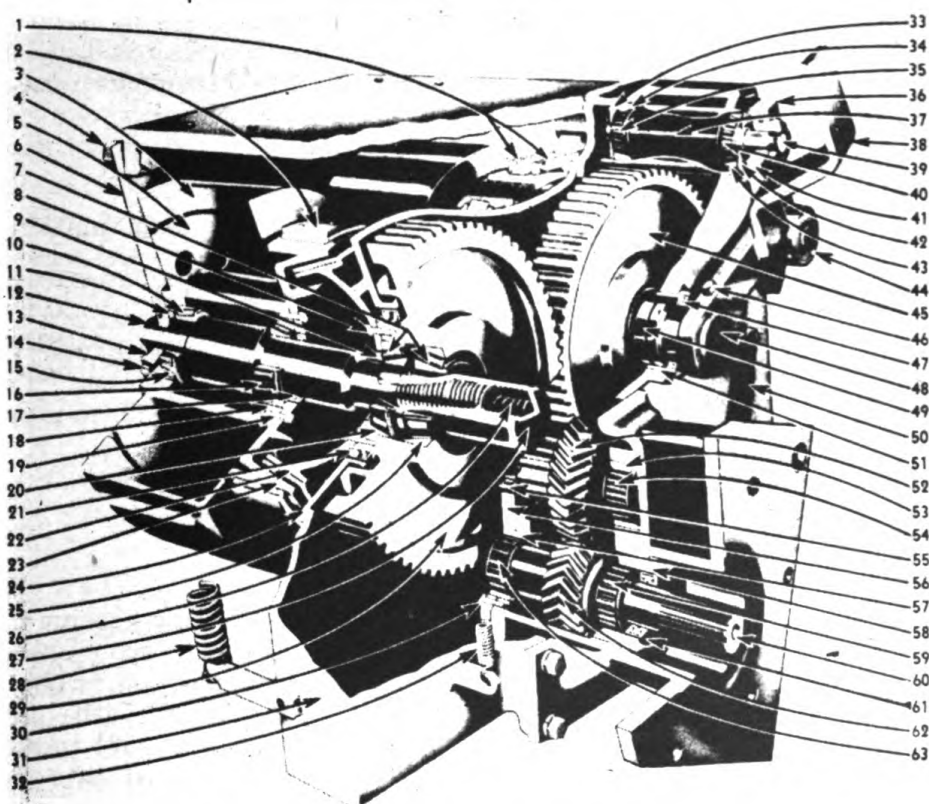
Install the right throw nut bushing, bearing and oil seal in a like manner.

MAIN GEAR AND DRIVING CONE ASSEMBLIES

Press or drive bearing cones (7) onto clutch throw nut (27), if removed. Also press bearing cup (25) into hub of main gear (29). Raise main gear into position in gear case. Insert throw nut (27) into gear hub from rear, with end of throw nut extending out through throw nut bushing. Install remaining bearing cup (20) in gear hub from rear, not drawing cup tight against bearing cone until later. Press oil seal (21) into cover plate (24) with heavy leather cupped toward inner side of plate. Then install gasket and cover plate (24) in position, lining up dowel pin holes with dowel pins, and install capscrews and lockwashers which secure cover plate to gear case (31). (Note:— $\frac{3}{8}$ " x $\frac{5}{8}$ " N. C. capscrews are used in the two lower capscrew holes along the inner edge of each cover plate because longer capscrews at this point would cause the Power Control Unit Neck to be obstructed by the ends of the capscrews when installed on the gear case.)

(Be careful not to damage or reverse leather in oil seal (21) when installing cover plate.) Press oil seal (9) into hub of driving cone (22) with leather cupped toward front side of cone. Raise driving cone (22) into position against hub of main gear (29), inserting between the two the number of shims required to correctly adjust the main gear bearings (refer to main gear bearing adjustment instructions in the Repair Section) and install capscrews and lockwashers (8), turning them up tight. (When installing driving cone on gear hub, it is advisable to insert two $\frac{1}{2}$ " stud bolts in opposite capscrew holes in gear hub to serve similar to dowel pins, in order to assure proper alignment of the cone on the gear. The studs should be removed after the cone has been secured to the gear, and capscrews installed in their place. Use care when installing the driving cone on the gear hub, to avoid peeling off a burr which might become deposited between the gear hub and cone and thereby cause misalignment.) After the main gear bearing adjustment has been made, install oil seal (same as 47) being careful not to damage or reverse leather in oil seal. The control lever (same as 38) can now be installed on the front end of throw nut (27). Also install neutral position springs (32 and 50).

Install the left main gear and driving cone assembly in the same manner.



ASSEMBLING CABLE DRUM ASSEMBLIES

Press bearing cones (10 and 16) onto drum shaft (12), if removed. Also press bearing cup (15) into rear end of cable drum (5). Insert drum shaft into cable drum from front end and install remaining bearing cup (18) in cable drum from front end, not installing it tight against bearing cone until later. Place clutch driven cone (23) in position against cable drum (5), inserting between the two the number of shims required to correctly adjust the cable drum bearings (refer to cable drum bearing adjustment instructions), and install capscrews and lockwashers (19), drawing them up tight. After cable drum bearing adjustment has been made, install oil seal (17) in front end of cable drum and oil seal (11) in rear end of cable drum with leathers cupped inward, being careful not to damage or reverse leather in oil seals. (NOTE: During assembly, the cable drum bearings should be packed with lubricant, as outlined in Lubrication Instructions on page 13.) Insert spring (26) in end of drum shaft (12).

The left cable drum assembly can be assembled in the same manner.

INSTALLING CABLE DRUM ASSEMBLIES

Raise drum assembly up to rear end of gear case and turn drum shaft (12) into clutch throw nut (27) using a wrench on rear end of shaft. (Be very careful in this operation not to damage leather in oil seal (9)

as threads on end of shaft pass through seal.) Slide brake band (2) over cable drum and onto driven cone (23). Connect outer end of band with rear end of brake shaft (37), and inner end of band with lug on gear case by means of brake links and pins (same as 1).

Install left cable drum assembly in a like manner.

If the cable guards (3) have been removed from rear plate (6), re-install by inserting between the two any shims that were removed and installing the capscrews and lockwashers which secure the cable guard to the rear plate. Install cable guard and rear plate as one unit by sliding over cable drums and fasten rear plate to gear case by inserting capscrews and lockwashers (4) in top and bottom of rear plate. Then install cap (13) on drum shaft (12) by turning capscrews (14) into tapped holes in rear plate.

NECK ASSEMBLY

Insert pinion (60) into neck from the front end. Slide bearing (59) over front end of pinion, back against pinion gear. Press or drive bushing (58) into place in neck. Press bearing race (53) into position. Also install bearing (54) on end of reduction gear (52). Then, with pinion moved as far to the rear as possible, place reduction gear (52) in mesh with the pinion and slide reduction gear and pinion forward, into their correct positions. Press oil seal (61) into place in neck. Then install bearing race (57) and bearing (63) in position in lower end of bearing plate (56), and also install bearing (55) in position in upper end of bearing plate. Then place bearing plate (56) in position against neck and install capscrews (30), turning capscrews up tight. The neck can now be installed in position on the Power Control Unit gear case.

INSTALLING NECK ASSEMBLY

When attaching the Model T Power Control Unit neck assembly to the gear case, provision must be made to prevent the rear pinion bearing from slipping off the end of the pinion. The following method may be used in holding this bearing in place while the assemblies are put together.

A wooden wedge is driven into the neck from the front, between the pinion and the bore. This wedge places a load on the bearing and holds it in place. After the neck is assembled, the bearing is held in place by the case, and the wedge can be removed.

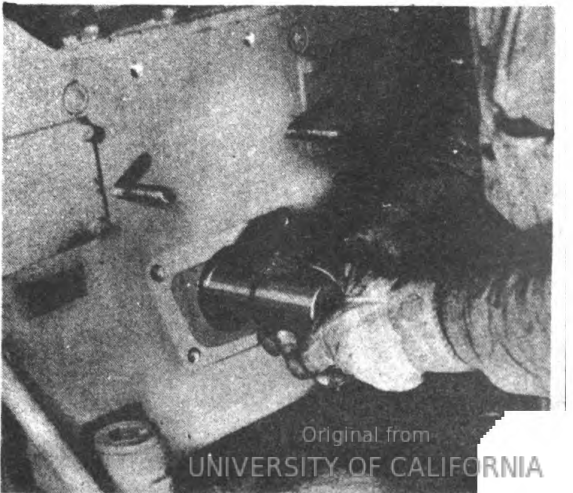
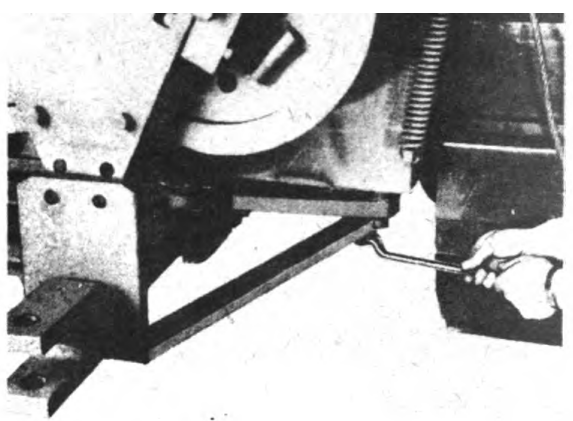
Move the Power Control Unit main gears toward the front of the gear case to install the neck assembly. Raise the neck to bring the reduction gear into mesh with the main gear after the neck has been positioned against the case. Then install the capscrews and lockwashers which secure the neck in position against the case.

Adjust the Power Control Unit clutches and brakes after the unit has been installed on the tractor.

REMOVING POWER CONTROL UNIT FROM TRACTOR

To remove the Power Control Unit from a Caterpillar D4 or R4 tractor it is first necessary to back the tractor up on blocks so that the oil in the main case will not run out of the face plate opening when the Power Control Unit is removed. (This applies to D4 and R4 tractors only.) Attach a hoist chain securely to the Power Control Unit and proceed as follows:

1. Remove the bolts which secure the drawbar extension assembly to the Power Control Unit and to the tractor and either remove the drawbar extension assembly or swing the assembly to one side. (This applies to a unit mounted on a D4 or R4 tractor only.)
2. With all the slack taken out of the hoist chain, remove the mounting capscrews and nuts which secure Power Control Unit face plate to rear of tractor.
3. Insert a pry bar between the Power Control Unit face plate and rear of tractor, thereby prying unit to the rear, away from tractor. Move the Power Control Unit to the rear far enough to permit the pinion to slide off the end of the spline shaft. Then lower the Power Control Unit to the floor or ground.
4. Complete the removal by pulling spine shaft to the rear, off the end of the tractor transmission shaft. If the tractor is to be operated without a Power Control Unit mounted on the rear, remove the boss ring from the opening at the rear of the tractor and install the inspection plate. Also install corks in bolt holes to prevent oil leakage.



INSTALLING POWER CONTROL UNIT ON TRACTOR

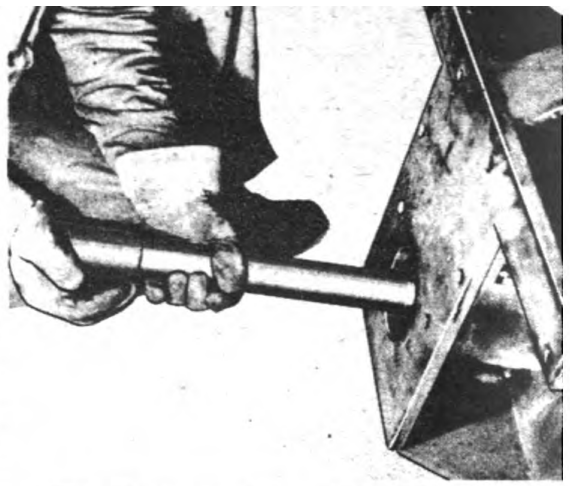
1. To install a Model T Power Control Unit on a D4 or R4 tractor first back the tractor up on blocks so that the oil in the main case will not leak out when the inspection plate is removed. (This step is not necessary on Caterpillar D6, D7 and D8 tractors.) Then proceed as follows:

2. Remove the inspection plate from the rear of the tractor.

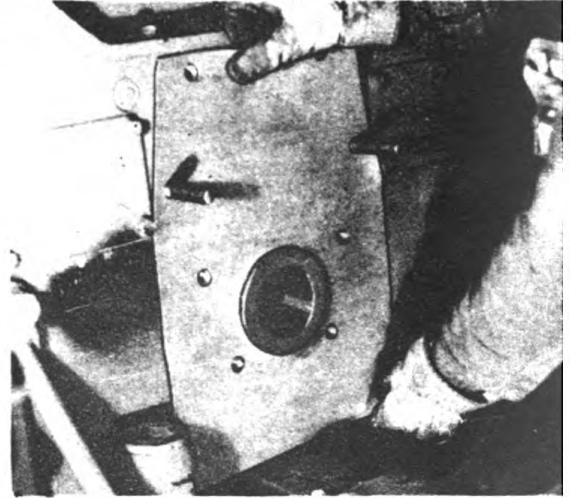
3. Remove the corks from the cap-screw holes at the rear of the tractor. Install the stud bolts supplied with the Power Control Unit in the bolt holes. (Units mounted on different sizes of tractors make use of different amounts of capscrews and stud bolts.)

4. Examine recess in ends of spline shaft and remove any wax or other foreign matter which might prevent the installation of spline shaft on pinion to full depth of recess. Test spline shaft for length by first inserting shaft through opening at rear of tractor and slipping it onto end of tractor transmission shaft as far as it will go. Scribe a mark on spline shaft flush with rear of tractor case.

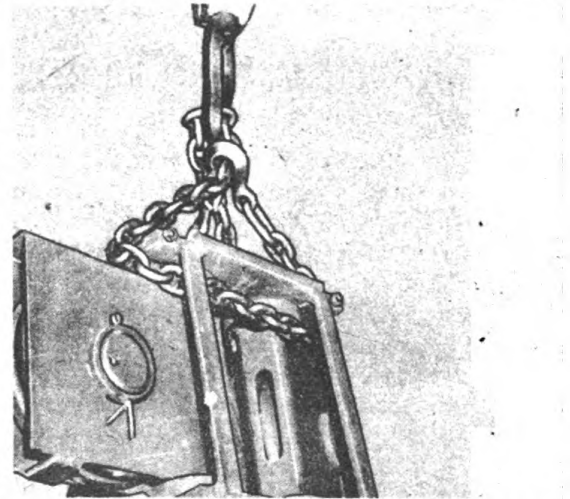
5. Remove the spline shaft from the tractor and insert rear end of shaft onto pinion in Power Control Unit face plate as far as it will go. Place another mark on the spline shaft, flush with Power Control Unit face plate. This mark should overlap the first mark on the spline shaft approximately $\frac{1}{8}$ " to $\frac{1}{4}$ ". If spline shaft is too long, it will be necessary to grind the required amount off the end of the pinion.



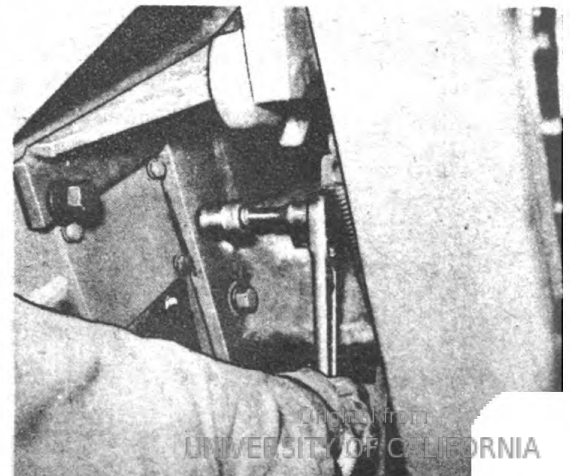
6. Install boss ring supplied with Power Control Unit in face plate opening at rear of tractor (Caterpillar D4 and R4 tractors only) and install face plate gasket over studs and boss.



7. Attach a hoist chain to top of Power Control Unit as illustrated, and, with the spline shaft in place, raise unit into position on rear of tractor, inserting the end of the pinion into the splined recess in the end of the spline shaft.



8. Complete the installation by installing mounting capscrews and lockwashers which secure Power Control Unit to tractor. Also on Caterpillar D4 and R4 Tractors install the drawbar extension by installing the bolts which secure it to the Power Control Unit and the tractor.



(Note—In mounting units on Caterpillar D7 tractors, copper washers are used in place of lockwashers on the two stud bolts which are lowest in the bolt circle. This prevents oil seepage around stud bolts.)

ADJUSTMENTS

CABLE DRUM BEARING ADJUSTMENT

Occasional adjusting of the cable drum bearings is necessary because of bearing wear.

Check the cable drum bearing adjustment every 256 hours of operation.



HOW TO CHECK ADJUSTMENT

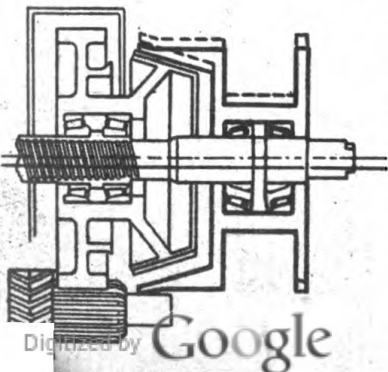
To check the adjustment, insert a pry bar between the rear plate and cable drum, and firmly engage and disengage the clutch while prying against cable drum with the bar. If the drum bearings are loose, the cable drum will move back and forth on the drum shaft, and the end of the bar will also move. The "feel" of this movement will be very noticeable to the one holding the end of the bar.

If movement is noticeable, the bearings are loose and an adjustment should be made.

For a more accurate check, clamp a dial indicator against cable drum, and repeat above operation, noticing end movement as recorded on indicator.

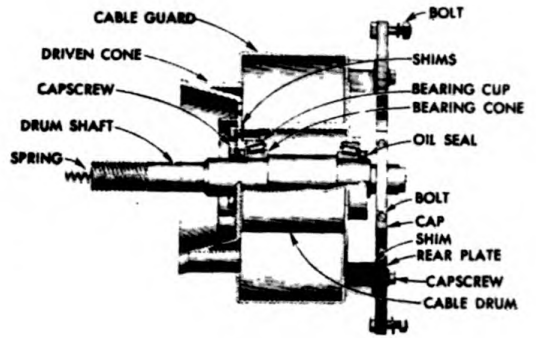
IF BEARINGS ARE LOOSE

If the unit should be operated with the bearings in either cable drum in a loose adjustment, the cable drum and clutch driven cone would assume an off-center position on the drum shaft and will be in misalignment with the clutch driving cone, as shown in the drawing, thus causing spongy, erratic clutch action. With loose bearings the driven cone might move to the front or to the rear with the driving cone as the control lever is moved, thereby preventing proper releasing of the clutch, and causing the throw of the control lever to be increased, possibly resulting in the throw of the control lever being too great for efficient operation. It might also cause the driven cone to drag on the driving cone when the control lever is in neutral position, resulting in over-heating of the clutch, which in turn might cause oil seal leakage, due to hardening of the leather in the seals. Also, loose cable drum bearings might result in cable breakage, due to a delay in quick clutch disengagement.

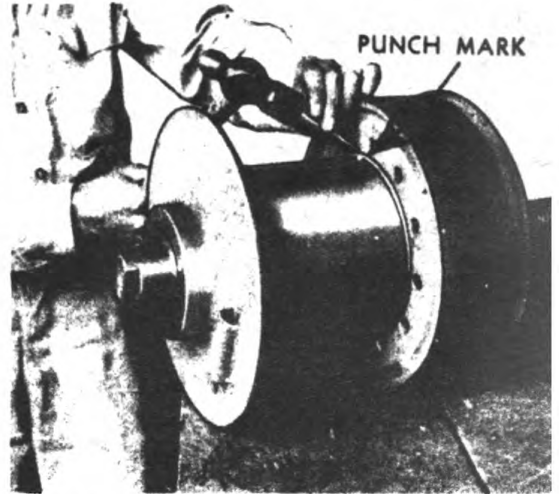


HOW TO MAKE ADJUSTMENT

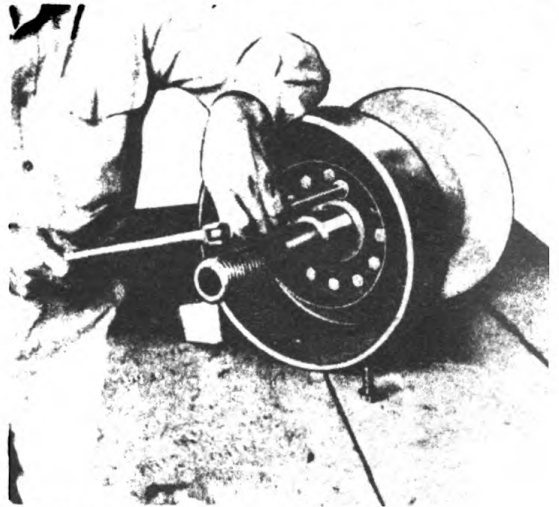
To make cable drum bearing adjustment, first remove cable drum assembly from unit. (Refer to disassembly instructions on page 23.) Then proceed as follows:



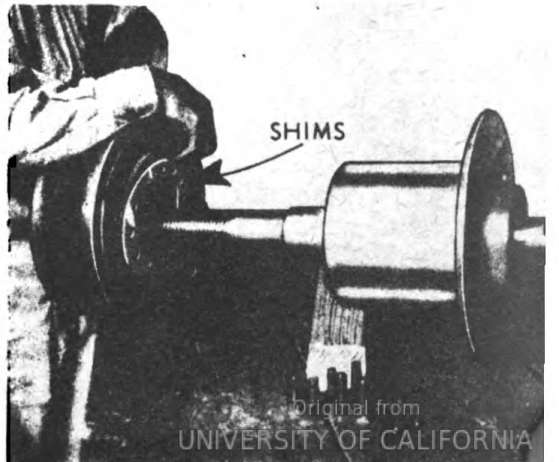
1. With hammer and center punch, mark cable drum and driven cone at points illustrated in order to assure proper alignment when reassembled.

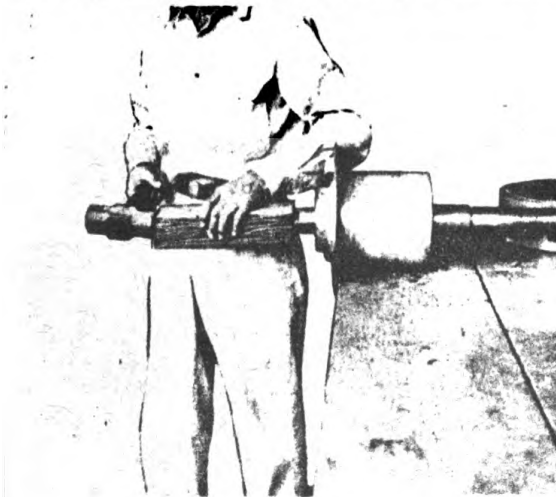
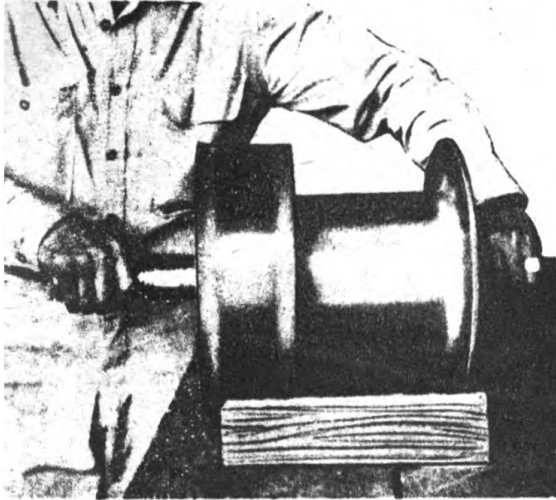
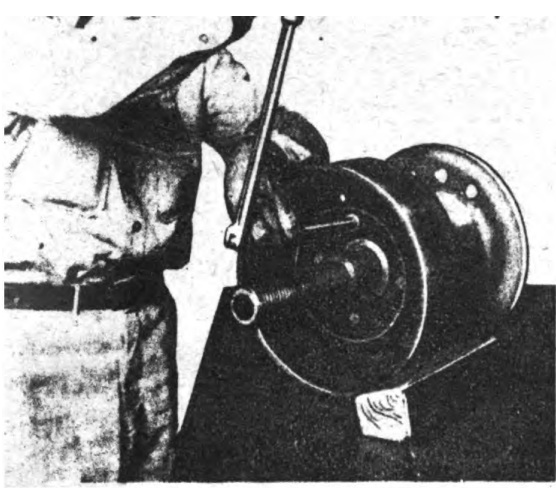


2. Remove capscrews which secure driven cone to cable drum. Then slide driven cone off drum shaft, being careful not to damage oil seal.



3. Remove bearing adjusting shim (or shims) from between driven cone and cable drum to take up adjustment. (Shims are of two thicknesses, .004" and .007", in order to make possible a fine variation in adjustment.) Remove shims one at a time in making adjustment.





4. Re-install driven cone on cable drum, lining up center punch marks on cone and drum. (This operation is done only to determine bearing tightness. Therefore, it is only necessary to install capscrews in every third capscrew hole. Do not use lockwashers in this operation due to damage to washers.) Turn capscrews up tight. If new oil seals are to be installed, leave them out until after the following test has been made.

5. Test adjustment by turning drum shaft in cable drum, using both hands. If adjustment is correct, there will be a definite drag on the drum shaft during this operation. Unless there is a noticeable drag on the drum shaft, the bearings are still loose and another shim must be removed. Repeat the above operation until the correct adjustment is reached.

6. In event the bearings are drawn up so tight in the above operation that the drum shaft cannot be turned by hand, it will be necessary to again remove the driven cone and then drive against the short end of the drum shaft, using a wooden block and sledge, thereby freeing the bearings. Then add one .004" shim and repeat operations 4 and 5.

7. When correct adjustment is reached, install capscrews and lockwashers in driven cone, drawing them up tight. If oil seals have been omitted or if release spring has been removed from end of drum shaft, install them in place. Then re-install drum assembly in unit.

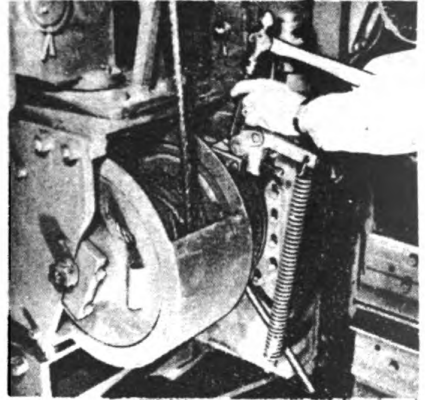
NOTE -The cable drum bearings should be hand-packed with lubricant whenever the drum assembly is disassembled. This should therefore be done when making the above adjustment. (Refer to page 13.)

MAIN GEAR BEARING ADJUSTMENT

Occasional adjusting of the main gear bearings is necessary because of bearing wear. Check the main gear bearings for looseness every 256 hours of operation.

HOW TO CHECK ADJUSTMENT

1. Fully engage clutch, using considerable force on control lever. With clutch engaged, wedge driving cone tightly into driven cone by driving two chisels or wedges between driving cone and cover plate on opposite sides of cone.



2. If dial indicator is available, clamp indicator to unit with the contact point bearing against end of clutch throw nut at center. Move control lever slowly out of fully engaged position, back toward neutral, using little force. In other words, take up only the free travel of control lever. (Check to make sure driving cone is not moving in and out by placing finger between driving cone and cover plate, with which to feel any movement.) While moving control lever back and forth, check reading on indicator. If bearings are loose, throw nut will move in and out and indicator will show within approximately .002" amount bearings are loose. (As much as .002" of movement may not be due to loose bearings.)



3. If indicator is not available, fully engage clutch and drive wedges behind cone as in Step 1. Scribe a mark part way around clutch throw nut with a sharp tool such as a knife. (Mark should be right up against throw nut oil seal.) Then move control lever, as in Step 2, while closely watching mark on throw nut. If bearings are loose, throw nut will move in and out and this movement will be visible to the eye when watching mark. The amount of movement determines extent to which bearings are loose.



If dial indicator shows an end movement of as much as .005" (Step 2), or if there is visible end movement of mark (Step 3), an adjustment should be made.

IF BEARINGS ARE LOOSE

If the Power Control Unit should be operated with the gear bearings in a loose adjustment, the driving cones may become misaligned with driven cones, thus causing spongy, erratic, clutch action. Also, the driving cones may "hang-up" in the driven cones when disengaging the clutches, resulting in cable breakage. In addition, the clutch cones may drag when in neutral position, resulting in over-heating of the unit. This in turn may cause oil seal failure.

HOW TO MAKE MAIN GEAR BEARING ADJUSTMENT

To make main gear bearing adjustment, first remove cable drum assembly from unit. (Refer to disassembly instructions on page 23.) Also remove neutral position spring from lower end of control lever. Then proceed as follows:

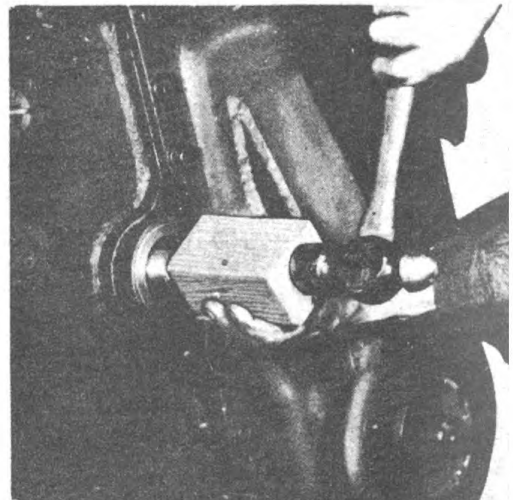
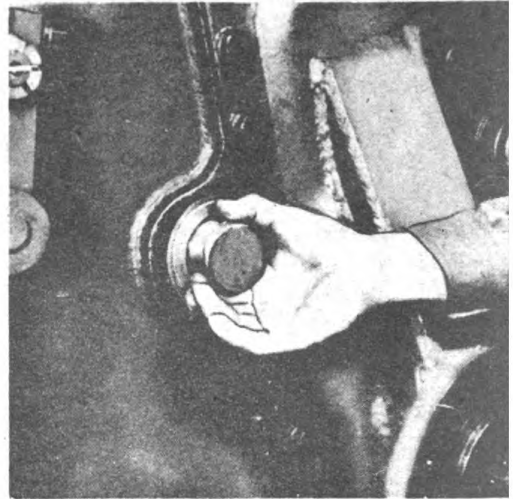
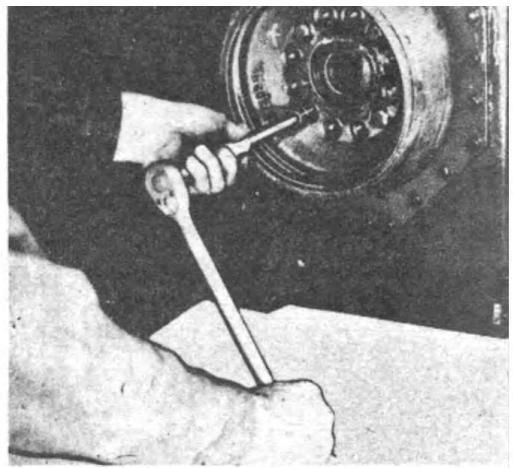
1. Remove control lever from clutch throw nut.

2. Turn clutch throw nut by hand in order to feel amount of drag on throw nut caused by oil seals. (If bearings are loose, the only drag on throw nut will be from oil seals and this will be very little.)

3. Remove capscrews which secure driving cone to hub of main gear and remove driving cone.

4. Remove bearing adjusting shim (or shims) from between driving cone and gear hub in order to take up adjustment. (Shims are of two thicknesses, .004" and .007", in order to make possible a fine variation in adjustment.) Remove shims one at a time in making adjustment.

5. Re-install driving cone on gear hub. (This operation is done only to determine bearing tightness. Therefore, it is only necessary to install capscrews in every third capscrew hole. Do not use lockwashers in this operation due to damage to washers.) Turn capscrews up tight.
6. Check bearing tightness by feeling the drag on the throw nut as in Step 2. The bearings are correctly adjusted when all end play of the throw nut in the gear hub has been eliminated, without the bearings causing a heavy drag on the throw nut. (The drag may be slightly more than that caused by oil seals alone, as felt in Step 2, but should not be great enough to prevent the throw nut from being turned with one hand.) In event the bearings are drawn up so tight in the above operation that there is a heavy drag on the throw nut, it will again be necessary to remove the driving cone and then free the bearings as follows:
7. If unit is removed from tractor, free the bearings by driving against front end of throw nut, using wood block and sledge. If unit is installed on tractor, move throw nut to rear in gear case as far as possible, and then insert a wood block between front end of throw nut and rear of tractor. Then drive against gear hub from rear to free the bearings, using a wood block and sledge to avoid marring face of gear hub. Re-adjust bearings by adding one .004" shim and repeating operations 5 and 6.
8. When correct adjustment is reached, install capscrews and lockwashers in driving cone, drawing them up tight. Examine oil seal in hub of driving cone and replace if necessary. Then re-install control lever, cable drum assembly, cable guards, and rear plate. Also make brake and clutch adjustments.



DOUBLE-DECK SHEAVE HOUSING BEARING ADJUSTMENT

There should be a slight drag on the double-deck sheave housing bearings at all times.

Check the adjustment every 128 hours of operation.

HOW TO CHECK ADJUSTMENT

To check the bearings for looseness, insert a pry bar between the bottom of each sheave housing and the sheave bracket, and pry up and down with the bar.

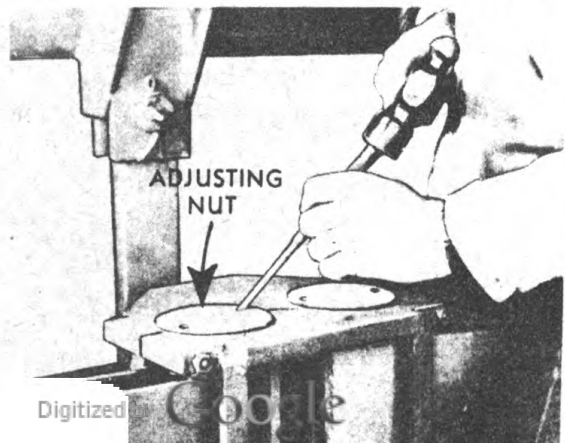
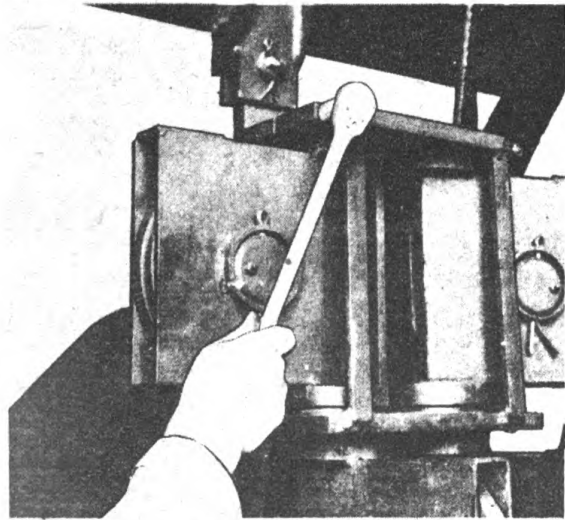
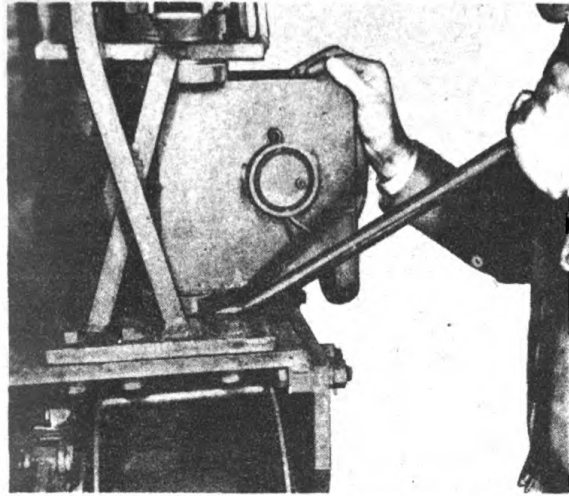
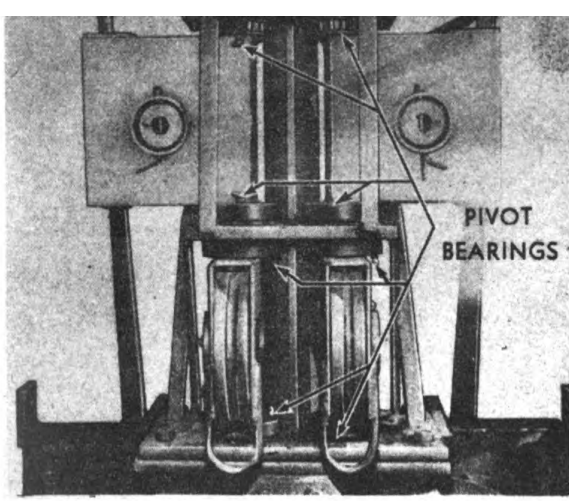
If in this operation up and down movement of the sheave housings is found, it is an indication that the bearings are loose and an adjustment should be made.

HOW TO MAKE ADJUSTMENT

To make the adjustment, first loosen the clamp bolt at the top of the double deck sheave bracket as illustrated.

Then turn the adjusting nut in a clockwise direction until a slight drag is felt when turning the sheave housings by hand. During this operation, tap on the sheave housings with a hammer to make sure that the take up in bearing adjustment is equally distributed to both the upper and lower housings.

When the correct adjustment is reached, re-tighten the clamp bolt at the top of the sheave bracket.



BRAKE ADJUSTMENT

The Power Control Unit brake adjustments are of a type which can be taken care of by operators. For instructions refer to page 14.

CLUTCH ADJUSTMENT

The Power Control Unit clutch adjustments are of a type which can be taken care of by operators. For instructions refer to page 17.

BRAKE SHAFT BEARING ADJUSTMENT

The Power Control Unit brake shaft bearing adjustments can be taken care of by the operators. For instructions refer to page 16.

LUBRICATION

Complete lubrication instructions will be found on page 13.

CLUTCH AND BRAKE FACINGS

TYPES OF FACINGS

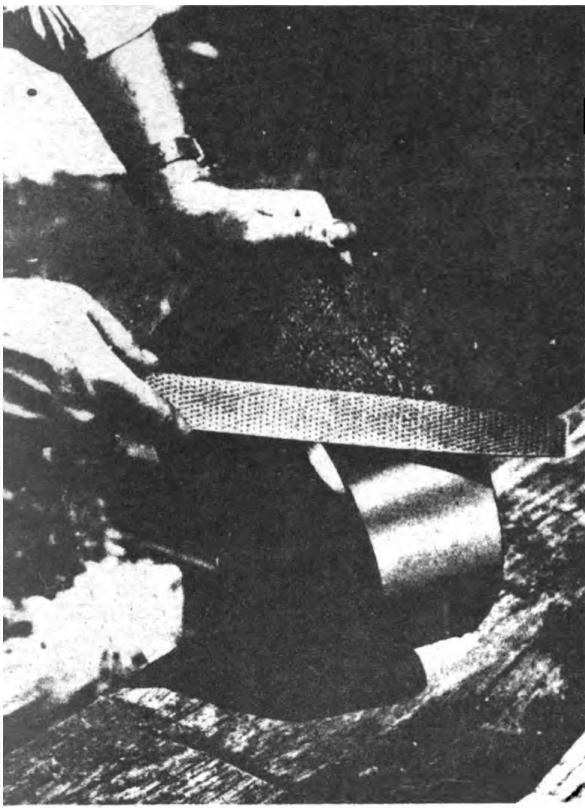
LeTourneau Power Control Units may be equipped with either woven or metallic clutch and brake facings. Both types of facings used are of the highest grade, and both have a comparatively high co-efficient of friction. The metallic lining is especially resistant to wear, and ordinarily lasts somewhat longer than the woven lining.

CARE OF FACINGS

The clutch and brake facings usually require very little attention after having been properly installed. There are, however, a few things that can be done to the facings under certain conditions which help the operation of the Power Control Unit. There are also other practices which are sometimes resorted to which do not help the operation and which should be avoided, as discussed below.

(a) WOVEN FACINGS:

Woven facings must be kept free of oil if proper operation is to be expected. If oil or grease should leak onto the facings, the cause of this



oil leakage should be determined, and the necessary corrections should be made. Unless the clutch and the brake facings are too badly oil soaked, the oil can usually be removed from the facing by washing the facing in a suitable solvent.

Facings sometimes become glazed after they have become worn, and in a case of this kind, the surface of the facings may be roughened with a rasp to improve operation, and to prevent having to replace the lining before it has received its maximum amount of wear.

If the clutch or brake facings overheat during operation, do not pour water on them to cool them off. Instead, check the Unit and the operation to determine the cause of the overheating, and allow the lining to cool slowly by its contact with the air. Pouring cold water on a hot clutch will often cause the clutch cones to warp.

The most common causes of overheating of either the clutches or brakes are improper adjustment and slow engaging and disengaging of the clutch and brake by the operator.

(b) METALLIC FACINGS:

To obtain the maximum usefulness from metallic clutch and brake facings, a small amount of light weight oil, such as fuel oil, may be poured on them each day. This helps to keep the facings free from dust and other foreign particles, and makes for longer facing life.

(Note: It is recommended that if the clutch facings are metallic, the brake facings should also be metallic, and vice-versa. This is due to the fact that oil may be applied to one type facing but must not be applied to the other, and it is practically impossible to apply oil to either the clutch or brake facing without the oil also leaking onto the other.)

As with woven facings, do not pour cold water onto the facings to cool them off in event they should overheat during operation. Cold water applied to a hot clutch sometimes causes the clutch cones to warp. If overheating does occur, determine the cause, and make the necessary corrections. The most common causes of overheating of either the clutches or brakes are improper adjustment and slow engaging and disengaging of the clutch by the operator.

RELINING CLUTCH DRIVING CONES

(a) WOVEN CLUTCH FACINGS:

To install a new facing on a driving cone, remove the cone from the Power Control Unit. (Refer to disassembly instructions on page 26.) Remove the worn facings and rivets from the cone. Proceed with the installation by heating the new facing either in hot water or in an oven, causing it to expand. Then place the facing on a bench with the smaller diameter on the bottom, or in an up-turned driven cone. Lower the unlined driving cone into the heated facing, making certain that the cone and facing are in perfect alignment with each other. Also, in doing this, line up the seam in the lining with the proper rivet holes in the cone, as illustrated.



Place the cone and facing under a press and force the cone tight into the facing. (If a press is not available, other means of exerting heavy pressure on the cone may be used.) Make certain that the cone is not obstructed from being pressed extremely tight in the facing because of coming in contact with the bench during this operation. (Other methods of installing the facings are also sometimes used with fairly satisfactory results, such as hammering the facing tight onto the cone, etc.) Check to determine whether the facing is tight on the cone by striking around the surface of the facing with a hammer. If the facing is tight, a clear "ring" will be heard. Any points where the facing is not tight will show up by giving off a dull noise with no "ring". Drill or punch rivet holes into the facing, making them line up with the rivet holes in the cone. Counterbore each rivet hole to a depth not less than half the thickness of the facing, and not more than $\frac{2}{3}$ the thickness of the facing, using a $\frac{3}{8}$ " counterbore. Then insert the rivets and rivet the facing to the cone.

Unless the facing is installed exceptionally tight on the cone, spongy clutch action may result. If the facing should be installed eccentric and out of alignment with the cone, clutch drag will occur and the clutch will overheat.

(b) METALLIC CLUTCH FACINGS:

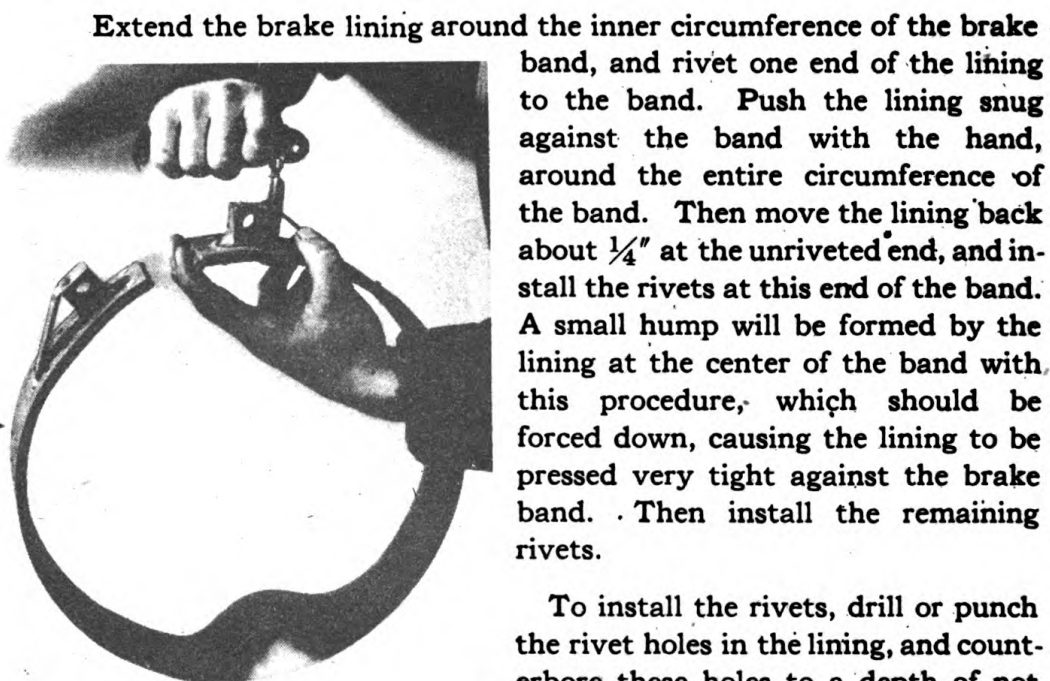
Metallic clutch facings come in segments, shaped to fit the outer circumference of the driving cone, and with the rivet holes already drilled in them. To install the segments on the cone, merely line the holes in the segments up with the holes in the outer circumference of the cone, and rivet the facing to the cone. The rivets should be drawn down very tight in order to prevent the segments from breaking loose when the cone is placed in operation. Only steel rivets should be used.

If possible, the newly lined cones should be placed in a lathe and any high spots or irregularities in the thickness of the different segments machined off. (The facings should be machined or ground to a 15° taper.)

If the clutch surface of the driven cone has worn rough or grooved, it may be advisable to either replace the cone or to machine a very thin cut off the surface of the cone. This machining should also be done on a 15° taper.

RE-LINING BRAKE BANDS**(a) WOVEN LINING:**

To re-line a brake band with woven lining, first remove the brake band from the Power Control Unit. (Refer to disassembly instructions on page 28.) Remove the worn lining and rivets from the brake band.



Extend the brake lining around the inner circumference of the brake band, and rivet one end of the lining to the band. Push the lining snug against the band with the hand, around the entire circumference of the band. Then move the lining back about $\frac{1}{4}$ " at the unriveted end, and install the rivets at this end of the band. A small hump will be formed by the lining at the center of the band with this procedure, which should be forced down, causing the lining to be pressed very tight against the brake band. Then install the remaining rivets.

To install the rivets, drill or punch the rivet holes in the lining, and counterbore these holes to a depth of not less than $\frac{1}{2}$ and not more than $\frac{2}{3}$ the thickness of the lining to provide for the heads of the rivets. Use a $\frac{3}{8}$ " counterbore. Then install the rivets, cinching them down very tight.

(b) METALLIC LINING:

To re-line a brake band with metallic lining, first remove the brake band from the Power Control Unit. (Refer to disassembly instructions on page 28.) Remove the worn segments and rivets from the brake band.

To install the new segments, place them in position on the inner circumference of the brake band, line the rivet holes in each segment up with the corresponding rivet holes in the brake band, and rivet the segments to the band, using steel rivets. Draw the rivets up very tight in order to prevent the segments from breaking loose when the brake band is placed in operation.

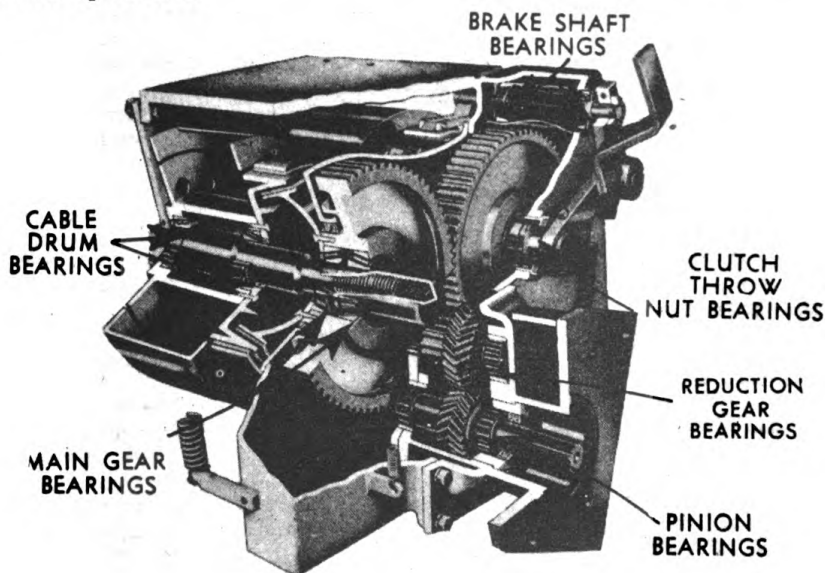


TABLE OF CLEARANCES AND TOLERANCES OF BEARINGS AND ADJUSTABLE PARTS

POINT OF ADJUSTMENT	CORRECT ADJUSTMENT	ALLOWABLE TOLERANCE
Main Gear Bearings	.002" pre-load	.000" to .003" pre-load
Cable Drum Bearings	.005" pre-load	.003" pre-load to .006" pre-load
Brake Shaft Bearings	.000"	.002" loose to .001" pre-load
Reduction Gear Bearings	non-adjustable	
Pinion Bearings	non-adjustable	
Clutch Throw Nut Bearings	non-adjustable	

TROUBLE SHOOTER'S GUIDE

CLUTCH SLIPPAGE

CAUSE	REMEDY
<i>Control lever installed too far to the rear on clutch throw-nut and therefore riding against throw nut bushing as control lever is moved, preventing driving cone from fully engaging driven cone.</i>	Space control lever farther to the front on clutch throw nut. (Refer to Step 8 of clutch adjustment.)
<i>Main gear incorrectly spaced inside gear case, thereby riding against back side of gear case when control lever is moved to engage clutch, preventing driving cone from fully engaging driven cone.</i>	Make clutch adjustment, correctly spacing main gear inside gear case.
<i>Oily or greasy clutch facing (woven facing only.)</i>	Remove driving cone and either replace facing or wash facing with a suitable solvent. Also prevent further oil or grease from reaching clutch surfaces as follows:—Correct oil seal leakage, if present (refer to "Oil Seal Leakage" corrections.) Do not lubricate that portion of cable which wraps onto cable drum. Never apply oil to woven facings.
<i>Clutch facing installed eccentric on driving cone (woven facing) or high spots on facing not having been machined off (metallic facing), causing only a part of clutch facing to bear against driven cone when clutch is fully engaged.</i>	If woven facing, either remove facing and install it concentric on cone or machine surface or facing true with cone, using a grinder. If metallic facing, machine off high spots.
<i>Worn out clutch facing.</i>	Either install new facing on driving cone or install a replacement lined driving cone.
<i>Smooth, glazed clutch facing.</i>	Remove driving cone and roughen clutch facing with a rasp.

CLUTCH WON'T RELEASE—CLUTCH DRAGGING

CAUSE	REMEDY
<i>Clutch adjustment incorrect, with travel of control lever from neutral to fully engaged position set at less than the recommended distance, thereby providing insufficient clearance between driving and driven cones when in neutral.</i>	Make clutch adjustment, correctly setting travel of control lever from neutral to fully engaged position.
<i>Main gear bearings in a loose adjustment, causing driving cone to drag on driven cone when control lever is in neutral position.</i>	Correctly adjust main gear bearings.
<i>Cable drum bearings in a loose adjustment, causing driven cone to drag on driving cone when control lever is in neutral position.</i>	Correctly adjust cable drum bearings.
<i>Clutch facing loose on driving cone, resulting in facing dragging on driven cone when control lever is in neutral.</i>	Remove driving cone and either reinstall facing on driving cone or install new lined cone.
<i>Threads excessively worn on drum shaft or clutch throw nut, resulting in full travel of control lever being required to take up play in threads instead of moving driving cone away from driven cone.</i>	Replace worn drum shaft or throw nut.

TRUBLE SHOOTER'S GUIDE

CLUTCH WON'T ENGAGE

CAUSE	REMEDY
<i>Control lever installed too far to the rear on clutch throw nut, therefore riding against throw nut bushing as control lever is moved, preventing driving cone from fully engaging driven cone.</i>	Space control lever farther to the front on clutch throw nut. (Refer to Step 8 of clutch adjustment.)
<i>Main gear incorrectly spaced inside gear case, thereby riding against back side of gear case when control lever is moved to engage the clutch, preventing driving cone from fully engaging driven cone.</i>	Make clutch adjustment, correctly spacing main gear inside gear case.
<i>Clutch incorrectly adjusted, causing excessive throw of control lever, possibly resulting in control lever striking seat before clutch becomes fully engaged.</i>	Adjust clutch, correctly setting distance of travel of control lever from neutral to the fully engaged position. (Refer to clutch adjustment instructions.)

CLUTCH WON'T HOLD ADJUSTMENT

CAUSE	REMEDY
<i>Clamp block at rear end of drum shaft insufficiently tightened, allowing drum shaft to turn.</i>	Re-adjust clutch and tighten clamp block on drum shaft by turning capscrews down tight, using force.
<i>Control lever not clamped tight on clutch throw nut, allowing lever to slip on throw nut.</i>	Clamp control lever tight on clutch throw nut by turning clamp bolt up tight, using force. Then re-adjust clutch.
<i>Brake roller arm not clamped tight on brake shaft, allowing roller arm to slip on shaft.</i>	Re-adjust brake and tighten clamp bolt at upper end of roller arm, using force.

SPONGY CLUTCH

CAUSE	REMEDY
<i>Main gear bearings in a loose adjustment, allowing end play of driving cone on clutch throw nut, and mis-alignment of driving cone with driven cone.</i>	Correctly adjust main gear bearings.
<i>Cable drum bearings in a loose adjustment, allowing end play of cable drum and driven cone on drum shaft and misalignment of driven cone with driving cone.</i>	Correctly adjust cable drum bearings.
<i>Clutch facing not tight on driving cone, thereby tending to "give" and become "spongy" when engaging and disengaging clutch.</i>	Remove driving cone and re-line or install a replacement lined cone.
<i>Clutch facing installed eccentric on driving cone, causing only a portion of facing to contact driven cone when engaging clutch, resulting in slippage until heavy force is applied on control lever, giving "spongy" action.</i>	Remove driving cone and machine surface of facing true with cone.

TRUBLE SHOOTER'S GUIDE

BRAKE SLIPPAGE

CAUSE	REMEDY
<i>Brake spring tension not adjusted tight enough.</i>	Make brake adjustment, tightening set screw to increase brake spring tension. (Refer to brake adjustment instructions.)
<i>Tension of brake spring decreased, due to old age or long period of operation.</i>	Replace brake spring.
<i>Brake shaft bearings adjusted too tight, preventing free rotation of brake shaft and causing shaft to bind, sometimes holding brake band away from drum.</i>	Correctly adjust brake shaft bearings.
<i>Oily or greasy brake lining (woven lining only.)</i>	Remove brake band and either replace band or wash lining with naphtha or gasoline. Also prevent further oil or grease from reaching brake lining as follows:—If oil seals are leaking, correct leakage (refer to "Oil Seal Leakage" corrections). Do not lubricate that portion of cable which wraps onto cable drum, Never apply oil to woven lining.
<i>Mud, rocks or other obstacles lodged in brake spring or behind brake roller arms or linkage.</i>	Remove mud, rocks, or other obstructions.
<i>Worn out brake lining.</i>	Replace brake lining.
<i>Brake band improperly formed to fit drum, possibly through accident.</i>	Replace or re-shape brake band.

BRAKE WON'T RELEASE

CAUSE	REMEDY
<i>Brake roller positioned too high against brake cam, preventing cam from moving roller arm outward far enough to cause brake to release when control lever is moved.</i>	Make brake adjustment, correctly positioning brake roller against brake cam. (Refer to brake adjustment instructions.)
<i>Brake roller arm not clamped tight on brake shaft, allowing roller arm to slip on shaft.</i>	Correctly adjust brake and tighten clamp bolt at upper end of roller arm, using force.
<i>Main gear incorrectly spaced inside gear case, thereby riding against reduction gear inside gear case as control lever is moved to release brake, limiting travel of control lever and preventing brake from fully releasing.</i>	Make clutch adjustment, correctly spacing gear inside gear case.
<i>Brake band frozen to drum.</i>	Move control lever into lock-out position, freeing band from drum.

TROUBLE SHOOTER'S GUIDE

OVERHEATING

CAUSE	REMEDY
<i>Operator not engaging and disengaging clutch fully and quickly, causing short intervals of clutch slippage and overheating.</i>	Engage and disengage clutch with a quick, full movement of control lever.
<i>Brake slipping.</i>	Correct the cause for brake slippage. (Refer to "Brake Slippage" corrections.)
<i>Clutch slipping.</i>	Correct the cause for clutch slippage. (Refer to "Clutch Slippage" corrections.)
<i>Clutch dragging.</i>	Correct the cause for clutch dragging. (Refer to "Clutch Dragging" corrections.)

OIL SEAL LEAKAGE

CAUSE	REMEDY
<i>Breather hole in oil fill plug not open, causing a pressure to be built up inside the gear case, forcing oil out around the seals.</i>	Remove cork (or dirt) from breather hole in fill plug. Also replace leaky oil seals.
<i>Power Control Unit overheating and thereby burning and hardening leather in oil seals.</i>	Correct cause for overheating (refer to "Overheating" chart above.) Also replace leaky oil seals.
<i>Cable drum filled more than $\frac{2}{3}$ full of grease (possibly by inserting grease through rear end of drum shaft with grease gun), causing grease to be forced out around seals as pressure is built up inside drum through heat of operation.</i>	Remove cable drum and pack only $\frac{2}{3}$ full of recommended lubricant. Also replace leaky oil seals. Lubricate through holes in drum shafts only in case of emergency.
<i>Lubricants may not be those which are recommended. Oils lighter than recommended may seep out under seals, while incorrect type grease may break down and become fluid from heat of operation.</i>	Remove incorrect lubricants and replace with lubricants which are recommended.
<i>Main gear bearings in a loose adjustment, causing gear and driving cone to wobble, thereby whipping out leather in oil seals.</i>	Correctly adjust main gear bearings. Also replace leaky oil seals.
<i>Cable drum bearings in a loose adjustment, allowing cable drum to raise and lower on drum shaft each time load is raised and lowered, thereby working cable drum oil seals up and down on shaft, permitting grease to escape.</i>	Correctly adjust cable drum bearings. Also replace leaky oil seals.
<i>Oil seals damaged during assembly.</i>	Replace leaky oil seals, being careful not to damage replacement seals.
<i>Oil seals incorrectly installed during assembly, with leathers cupped outward, away from oil or grease chamber.</i>	Remove oil seals and install with leathers cupped inward, toward oil or grease chamber. Double leather oil seals should be installed with heavy leather facing inward.
<i>Gear case filled with oil above the oil level plug.</i>	Lower oil level to oil level plug.

PARTS CATALOG

WARNING

SPARE PARTS can be supplied promptly and accurately only if positively identified by correct part number and correct part name.

FURNISH THIS INFORMATION ON ALL REQUISITIONS. WITHOUT FAIL, on all requisitions, give name of machine, name of manufacturer, model or size, manufacturer's serial number of each machine and subassemblies attached to machine, and components and accessories for which spare parts are required.

List spare parts for only one make or kind of machine on each requisition.

Requisitions must be double spaced to provide room for office notations when necessary.

SECT. 3

PARTS CATALOG
FOR
POWER CONTROL UNIT
CABLE - OPERATING,
REAR MOUNTING,
2 DRUM
LeTOURNEAU
MODEL T4

On this page is shown a sample spare parts requisition on QMC Form No. 400 which conforms to the latest revisions. The marginal notes give instructions for preparing a requisition for spare parts for Engineer equipment.

The revised QMC Form 400 has new column headings. Until new forms are available use the present form and type or write in corrections in column headings as shown below.

Under revised heading "Nomenclature" and "Unit" list the article and the unit (ea for each; lb for pound; etc.). Under heading "Maximum or Authorized Level" list the authorized organizational allowances or depot stock levels given in ENG 7 and ENG 8 of the ASF

Engineer Supply Catalog (superseding Part III, Corps of Engineers Supply Catalog). The total number on hand for each item is listed under "On Hand". In column headed "Due In" enter the total quantity previously requisitioned but not delivered. Column headed "Required" is to be changed to read "Quantity Desired" and column headed "Approved" is to read "Remarks." For "Initial" and "Replenishment" requisitions, the sum of "Quantity Desired", "Due In", and "On Hand" should equal "Maximum or Authorized Level."

(Additional details on this subject are covered in ENG 1 of the ASF Engineer Supply Catalog which incorporates information formerly contained in Section AA-1, Part III, Engineer Supply Catalog.)

State PERIOD designation by use of one of the following terms:

- (1) "INITIAL"—first requisition of authorized allowances.
- (2) "REPLENISHMENT"—subsequent requisitions to maintain authorized allowances.
- (3) "SPECIAL"—requisitions for necessary repairs not covered by allowances.

Type "SPARE PARTS" in upper right hand corner of requisition.

Address requisitions to Engineer Field Maintenance Office, P. O. Box 1679, Columbus, Ohio (except for spare parts for searchlights and barrage balloons which are addressed to Schenectady, N. Y. or Ogden, Utah ASF depots).

Give complete shipping instructions. Special instructions for packing, marking, routing, etc., should be given at bottom of requisition.

State proper nomenclature of machine, also make, model, machine serial number and U. S. A. registration number.

Prepare a separate requisition for each different machine.

State basis or authority and date delivery is required, immediately below description of machine.

Double space between items.

Group parts required under group headings as shown in manufacturers' parts catalogs (Technical Manuals).

State OCE stock numbers, manufacturers' parts numbers and nomenclature accurately and completely. Do not use abbreviations.

SPARE PARTS

REQUISITION

To: **Engineer Field Maintenance Office** No. of Sheets **1** Sheet No. **1**
 P. O. Box 1679, Columbus, Ohio
 Regulation No. **E-908-A-44** Date **10 JANUARY, 1944** Period **Replenishment**

SHIP TO: **Engineer Property Officer, FORT LEWIS, WASHINGTON**

MARKED FOR: **Supply Officer, 150th Engr. Regiment, FORT LEWIS, WASHINGTON**
 Requisitioned by (show Signature, Rank, Organization, Destination, if different from "same to" include address): **Approved For the Commanding Officer:**

Robert E. Roe
 Robert E. Roe,
 Major, G. S.
 Engineer Property Officer

John E. Doe
 John E. Doe
 Col., G. S.
 Executive Officer

Stock No.	NOMENCLATURE AND UNIT	AITH BY DATE 1944	ON HAND	DUE IN	QUANTITY DESIRED	REMARKS
PARTS FOR POWER CONTROL UNIT, GABLE OPERATING, REAR-MOUNTING, 2-DECK, LEITCHFIELD, MODEL T-4.						
	BASIS: to replenish second exhaust set					
	DELIVERY: by 5 February 1944					
CASE GROUP						
C-143	GEAR	EA	4	3	0	1
D-4476	NUT	EA	6	3	0	3
L-3725	OIL SEAL	EA	1	0	0	1
DOUBLE DECK GROUP						
0-65	BRACKET	EA	2	0	0	2
0-137	SERVAE VEHICLE	EA	4	2	0	2
0-54	HOUSING	EA	2	0	0	2
0-175	BEARING	EA	2	1	0	1
0-69	ADJ. NUT	EA	4	2	0	2

*Nonexpendable items such as tools must be accounted for, when requisitioned, by a statement that they have been placed on REPORT OF SURVEY or STATEMENT OF CHARGES.

Emergency requisitions sent by telephone, teletype, cablegram, telegraph or radio must be confirmed immediately with requisition marked: "Confirming (state identifying data)."

PREPARATION OF REQUISITIONS

A Sample requisition in the correct form for submission by the Engineer Property Officer is shown on the opposite page.

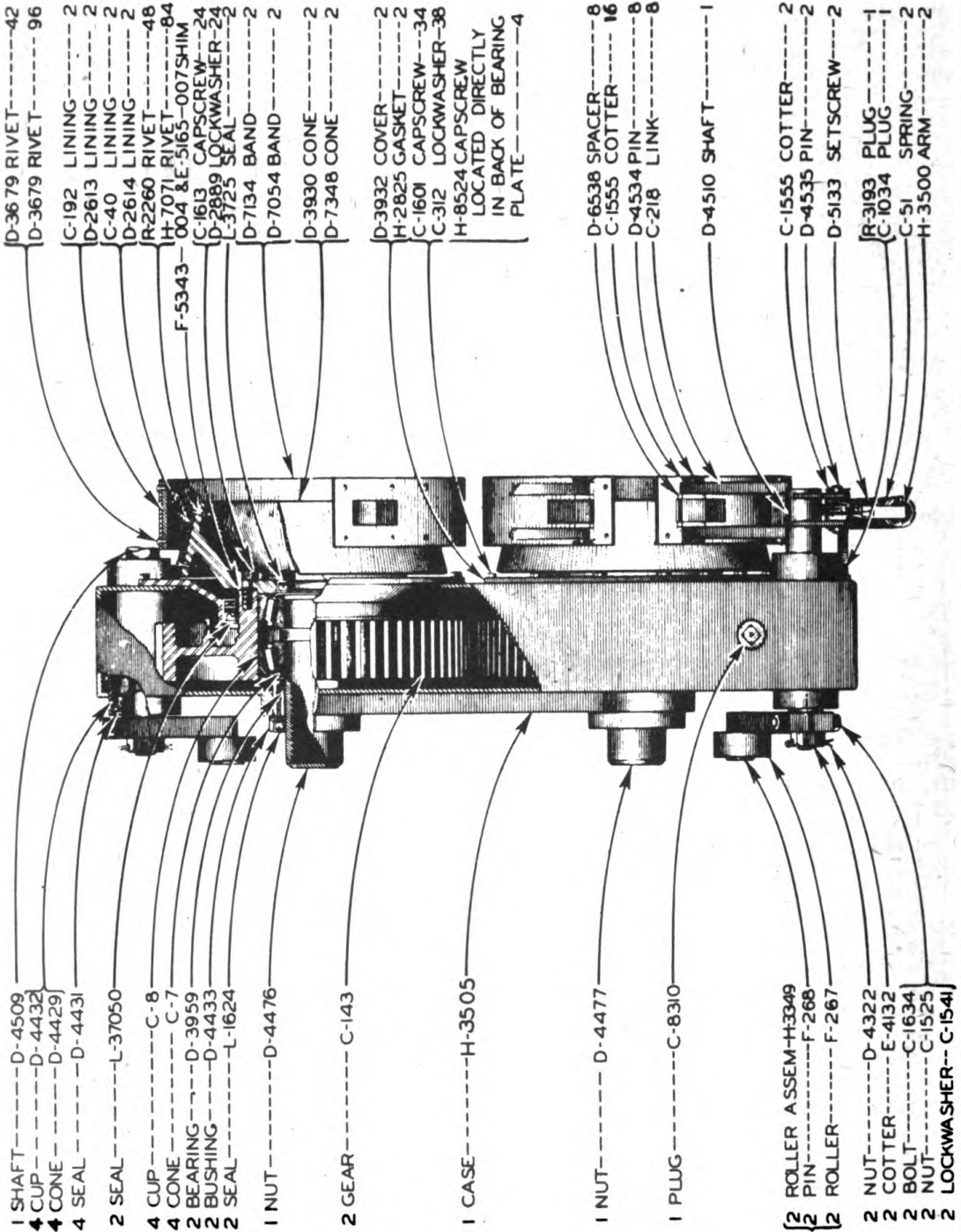
THIS SHALL BE FOLLOWED IN MAKING OUT REQUISITIONS.

In order to eliminate duplication of work, Property Officers may authorize organizations to prepare requisitions in final form, leaving requisition number space blank for completion by Property Officer.

THE FOLLOWING RULES WILL BE OBSERVED CAREFULLY IN PREPARING REQUISITIONS FOR SPARE PARTS:

- a. Prepare a separate requisition for each different machine.
- b. Type "SPARE PARTS" in upper right hand corner of requisition form.
- c. State PERIOD designation by use of one of the following terms:
 - (1) "INITIAL"—first requisition of authorized allowances.
 - (2) "REPLENISHMENT"—subsequent requisitions to maintain authorized allowances.
 - (3) "SPECIAL"—requisitions for necessary repairs not covered by allowances.
- d. Give complete shipping instructions.
- e. State proper nomenclature of machine, and make, model, serial number and registration number.
- f. State basis or authority, and date delivery is required, immediately below description of machine.
- g. Group parts required under group headings as shown in manufacturers' parts catalogs.
- h. State manufacturers' parts numbers and nomenclature descriptions accurately and completely. Do not use abbreviations.
- i. Double space between items.
- j. Emergency requisitions sent by telephone, telegraph, or radio must always be confirmed immediately with requisition marked: "Confirming (state identifying data)".
- k. Nonexpendable items must be accounted for.

50 MODEL T POWER CONTROL UNIT



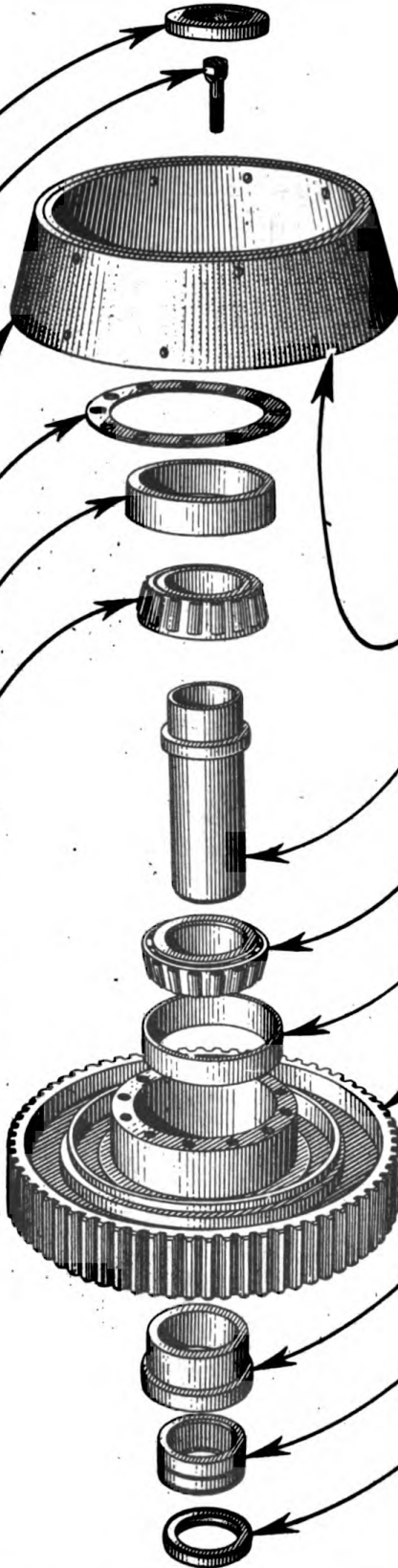
952-G

CASE CROSS SECTION

TWO ASSEMBLIES REQUIRED

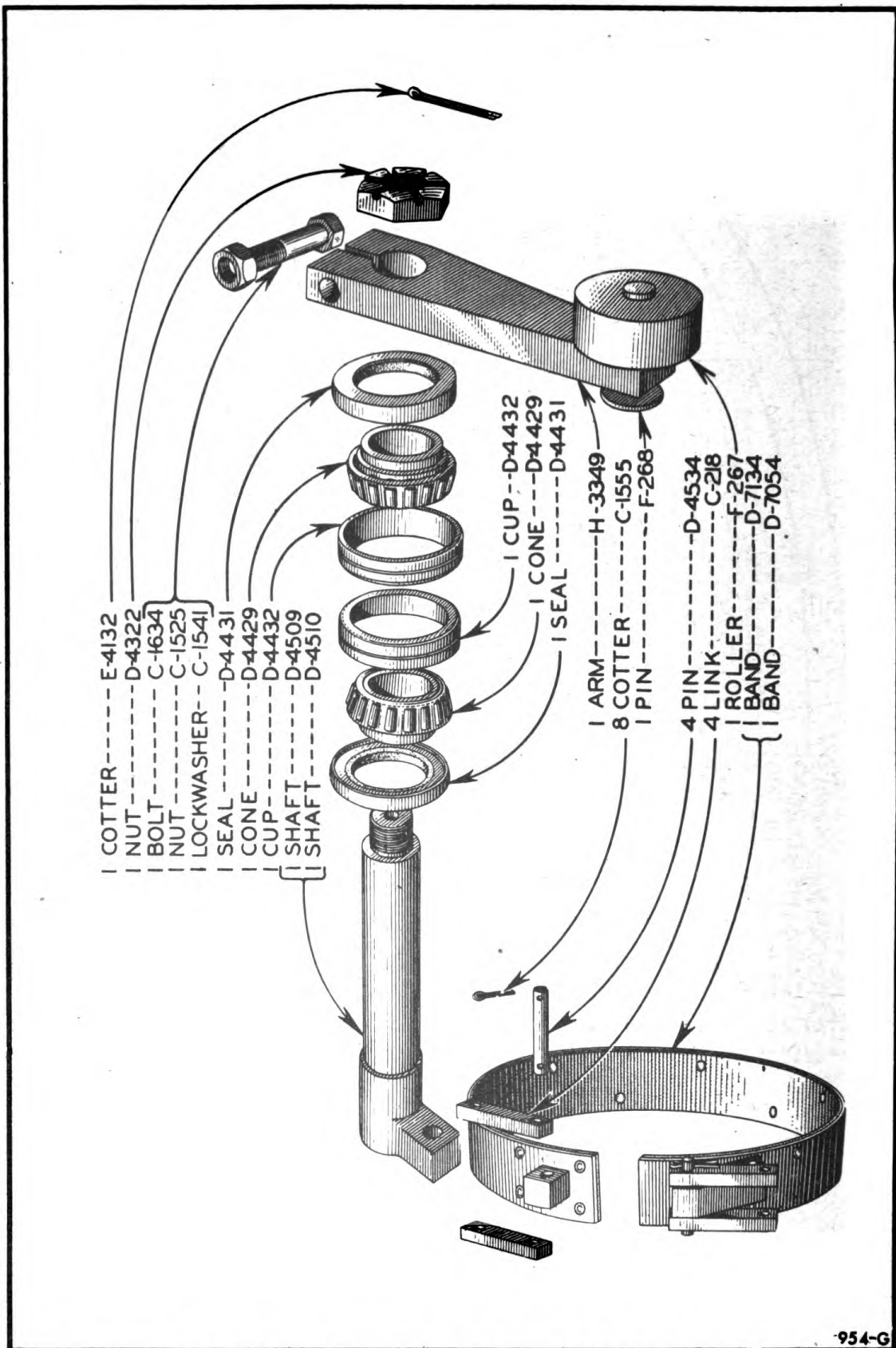
- | SEAL-----L-3725
- | 12 CAPSCREW---C-1613
- | 12 LOCKWASHER D-2889
- | CONE-----D-3930
- | CONE-----D-7348
- | SHIM-----E-5165
- | CUP-----C-8
- | CONE-----C-7

- C-40 LINING-----
- D-4476 NUT-----
- D-4477 NUT-----
- C-7 CONE-----
- C-8 CUP-----
- C-143 GEAR-----
- D-4433 BUSHING-----
- D-3959 BEARING-----
- L-1624 SEAL-----



MAIN GEAR & DRIVING CONE - EXPLODED

953-G



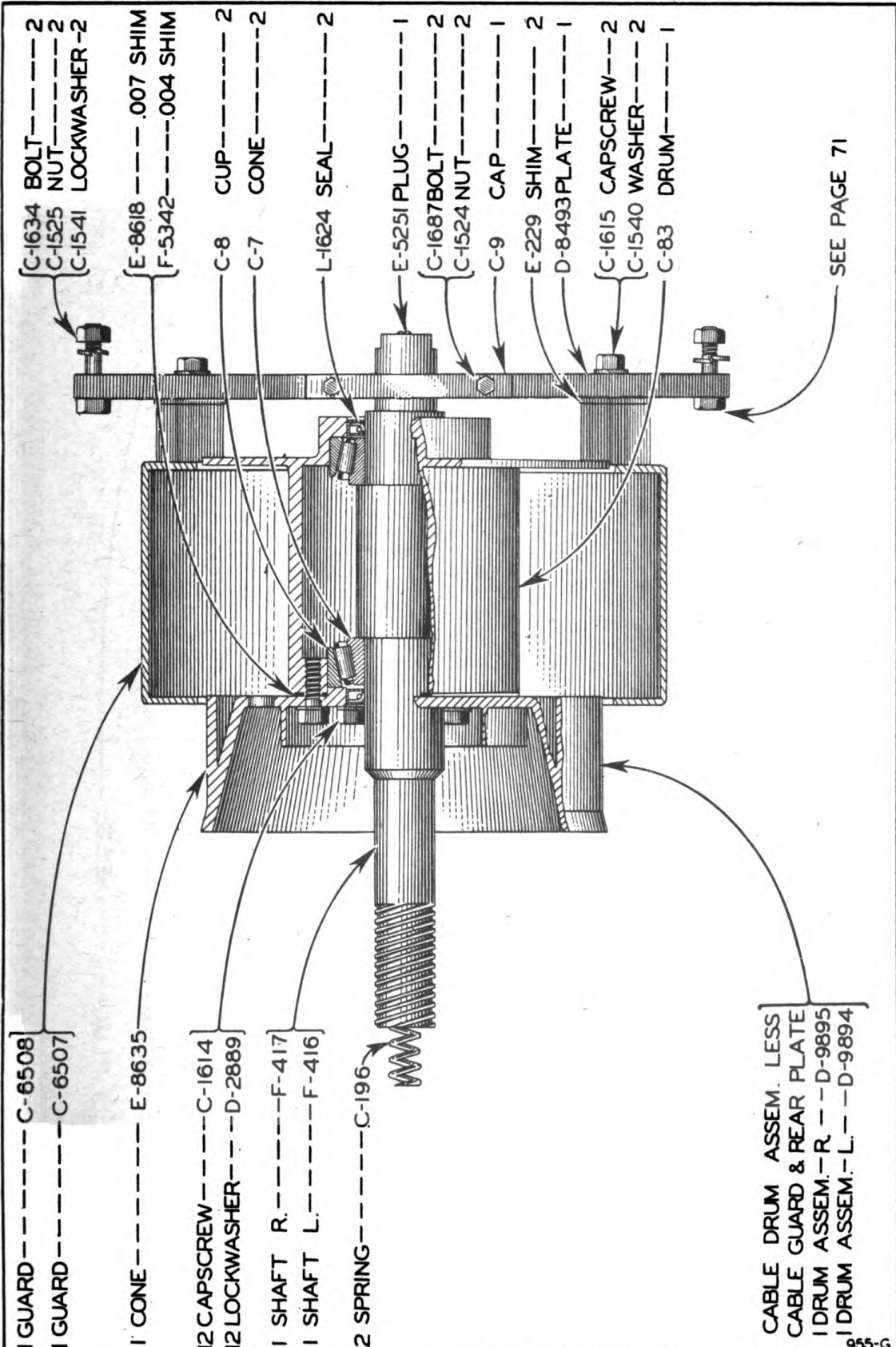
- 1 COTTER ----- E-4132
- 1 NUT ----- D-4322
- 1 BOLT ----- C-1634
- 1 NUT ----- C-1525
- 1 LOCKWASHER -- C-1541
- 1 SEAL ----- D-4431
- 1 CONE ----- D-4429
- 1 CUP ----- D-4432
- 1 SHAFT ----- D-4509
- 1 SHAFT ----- D-4510
- 1 CUP -- D-4432
- 1 CONE -- D-4429
- 1 SEAL -- D-4431
- 1 ARM ----- H-3349
- 8 COTTER -- C-1555
- 1 PIN ----- F-268
- 4 PIN ----- D-4534
- 4 LINK ----- C-218
- 1 ROLLER -- F-267
- 1 BAND -- D-7134
- 1 BAND -- D-7054

TWO ASSEMBLIES REQUIRED

BRAKE ASSEMBLY-EXPLODED

954-G

TWO ASSEMBLIES REQUIRED



C-1634 BOLT---2
 C-1525 NUT---2
 C-1541 LOCKWASHER-2

E-8618 ---.007 SHIM
 F-5342---.004 SHIM

C-8 CUP---2
 C-7 CONE---2

L-1624 SEAL---2

E-5251 PLUG---1
 C-1687BOLT---2
 C-1524 NUT---2

C-9 CAP---1
 E-229 SHIM---2
 D-8493PLATE---1

C-1615 CAPSCREW---2
 C-1540 WASHER---2
 C-83 DRUM---1

SEE PAGE 71

1 GUARD---C-6508
 1 GUARD---C-6507

1 CONE---E-8635

12 CAPSCREW---C-1614
 12 LOCKWASHER---D-2889

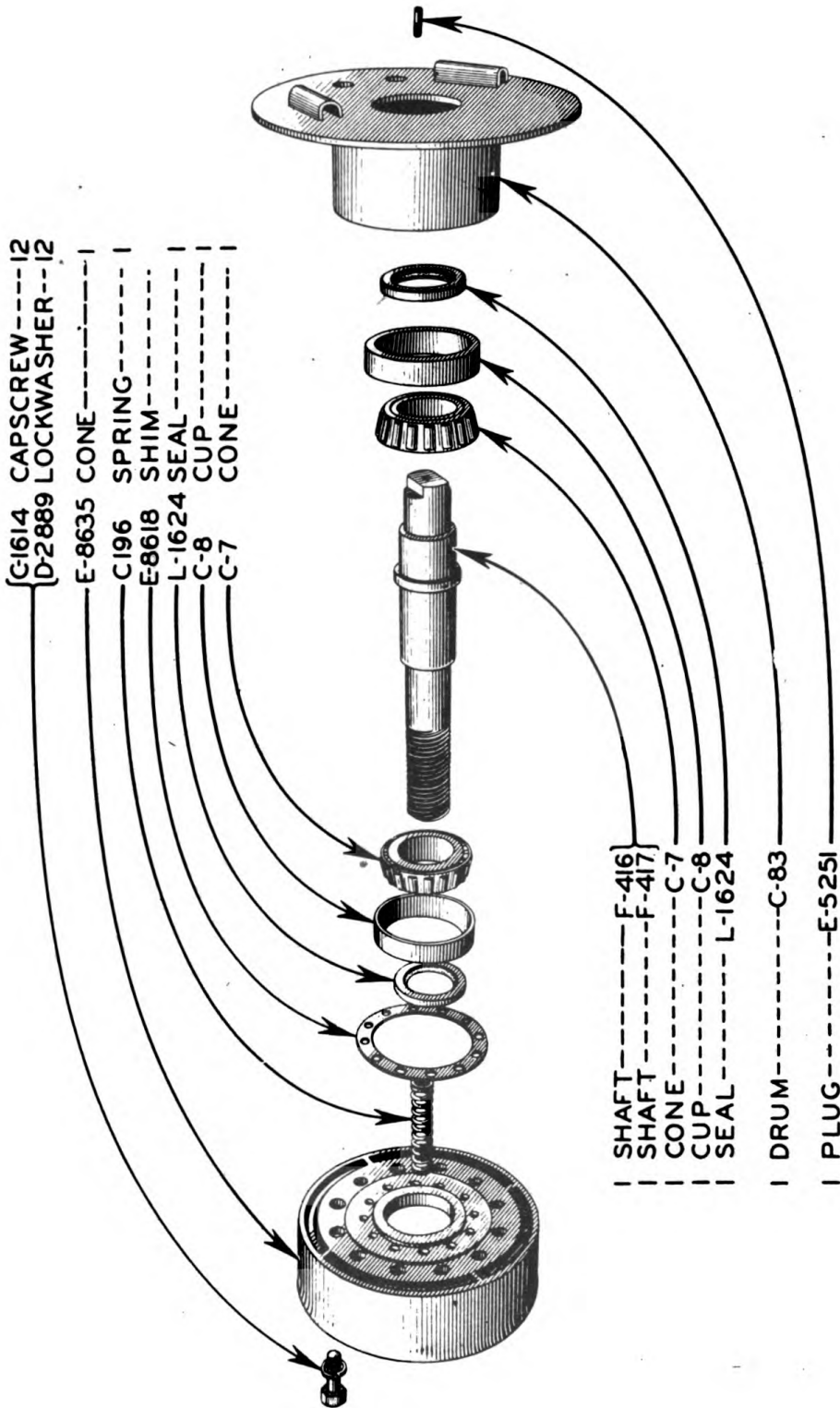
1 SHAFT R.---F-417
 1 SHAFT L.---F-416

2 SPRING---C-196

CABLE DRUM ASSEM. LESS
 CABLE GUARD & REAR PLATE
 1 DRUM ASSEM.-R.-D-9895
 1 DRUM ASSEM.-L.-D-9894

955-G

CABLE DRUM-CROSS SECTION

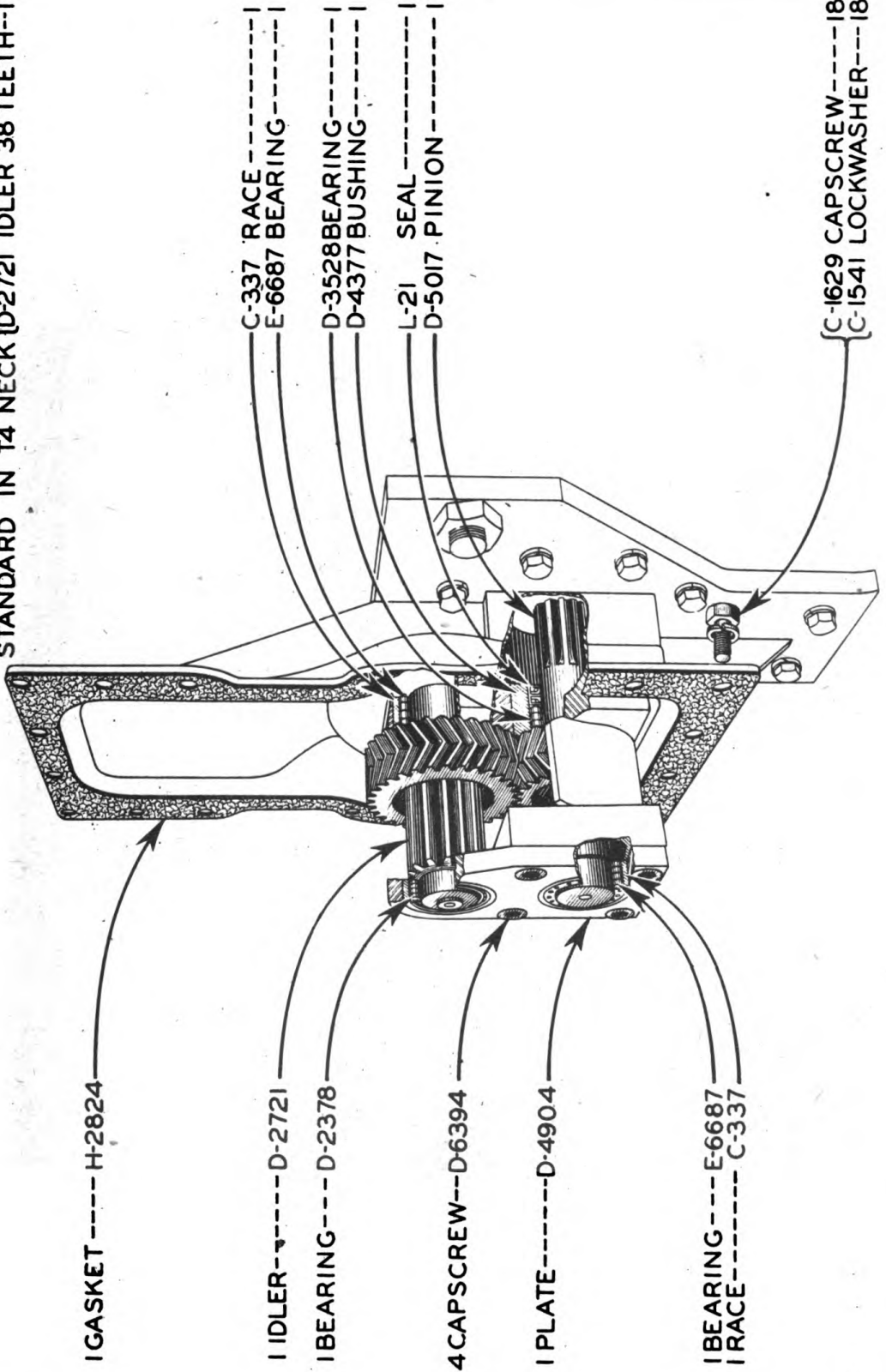


TWO ASSEMBLIES REQUIRED

956-G

CABLE DRUM & DRIVEN CONE-EXPLODED

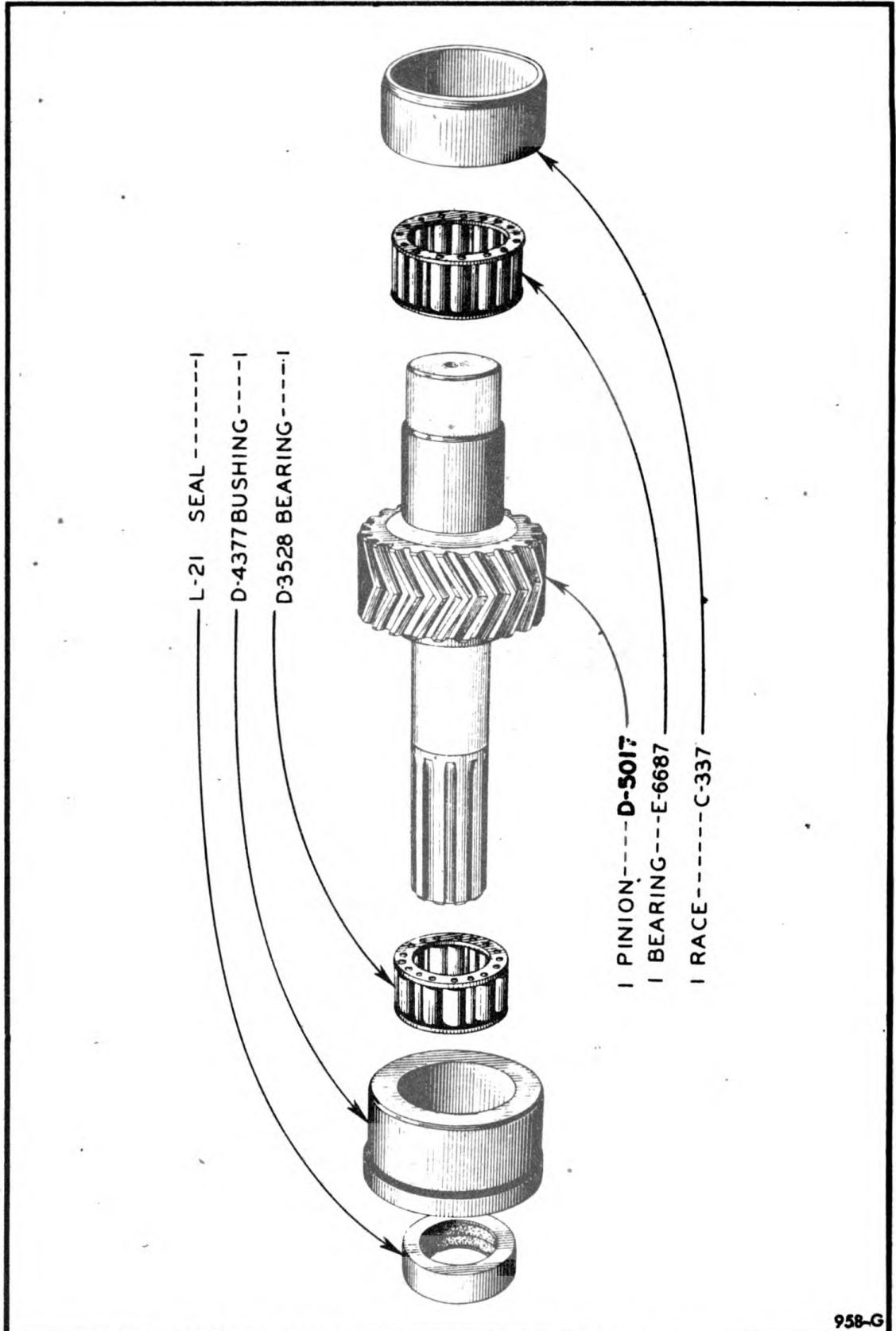
RATIO 11.33 TO 1 {D-5017 PINION 16 TEETH-I
STANDARD IN T4 NECK {D-2721 IDLER 38 TEETH--I



NECK ASSEMBLY

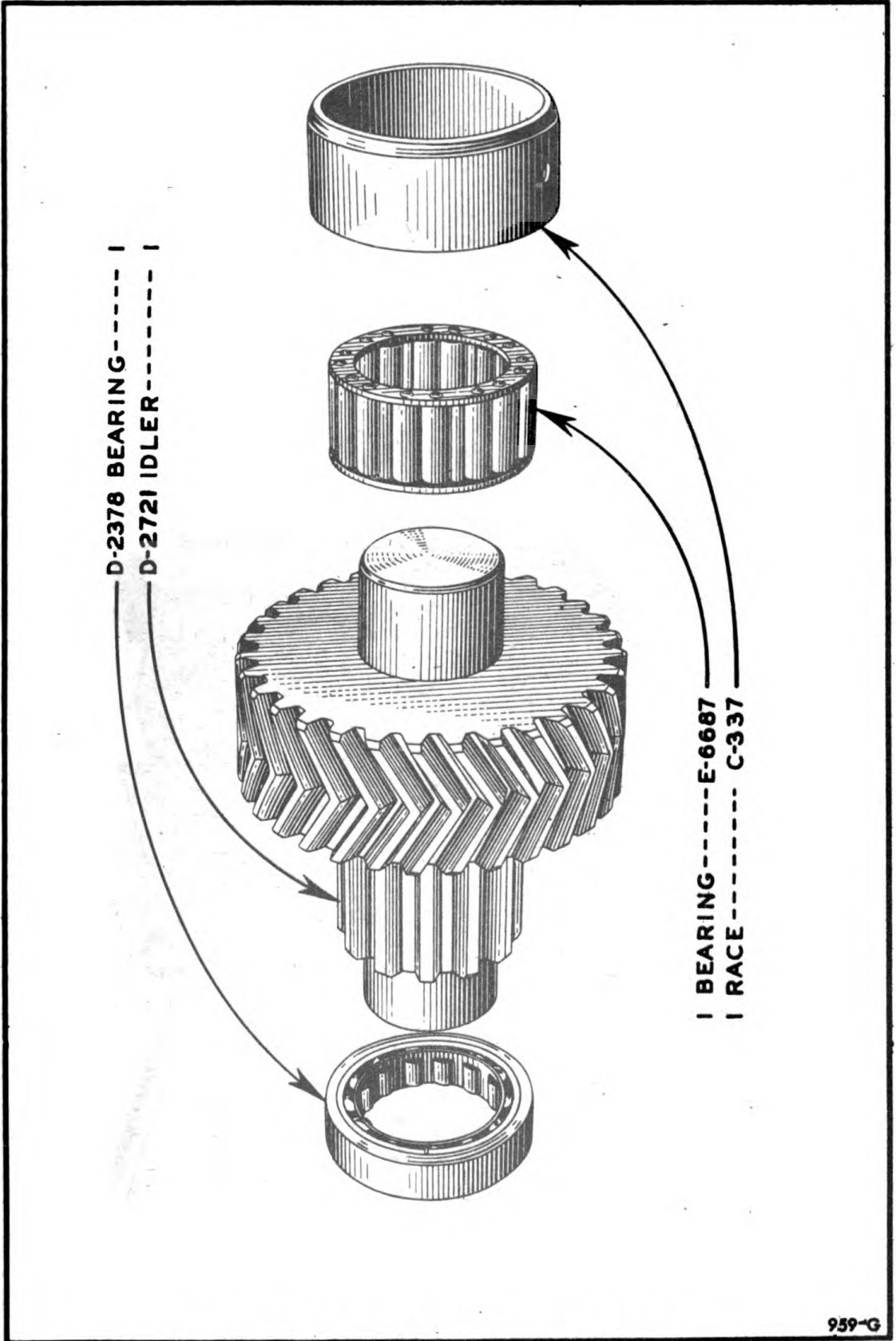
957-G

66 MODEL T POWER CONTROL UNIT

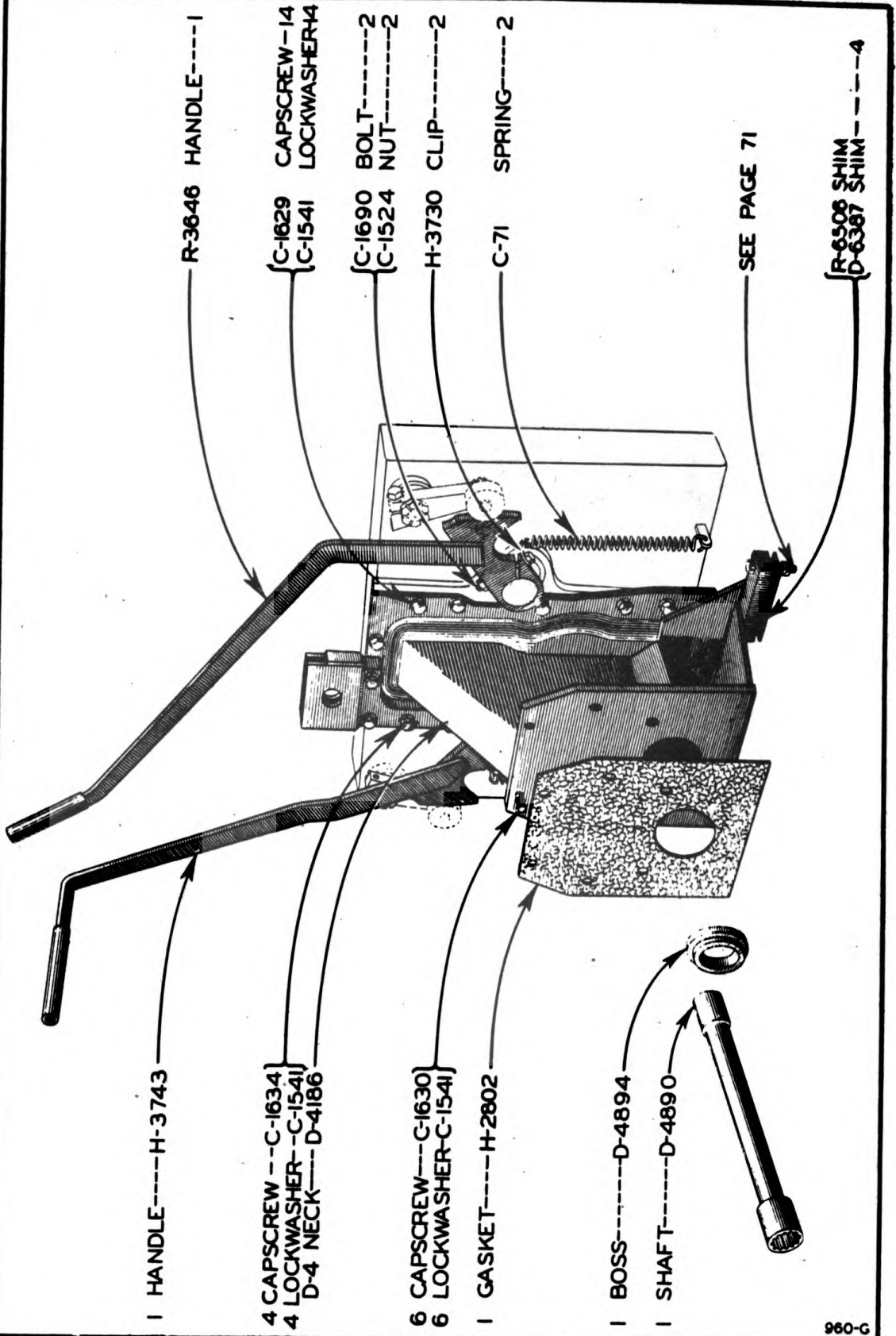


PINION ASSEMBLY—EXPLODED

958-G

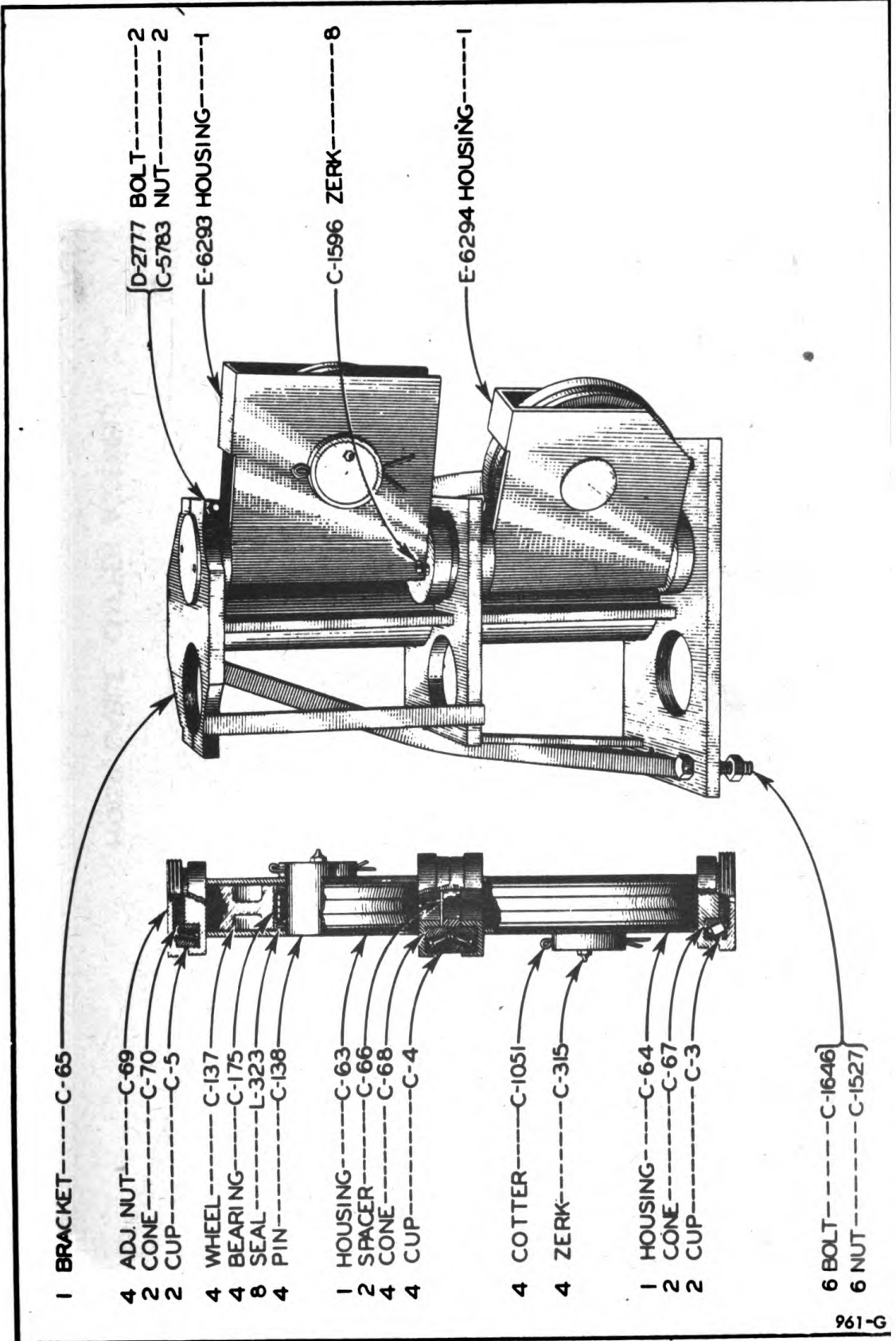


IDLER ASSEMBLY—EXPLODED



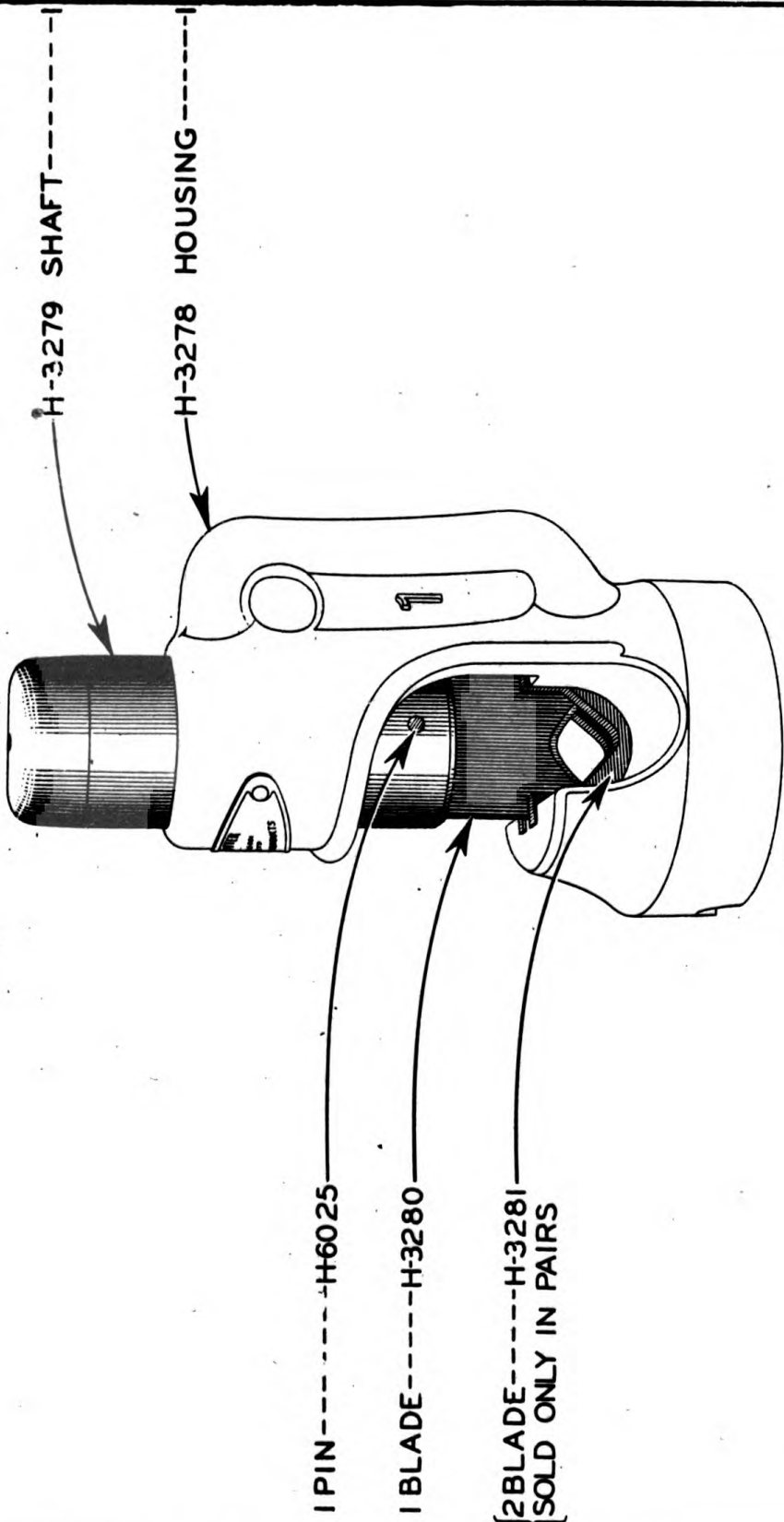
960-C

NECK GROUP



DOUBLE DECK ASSEMBLY

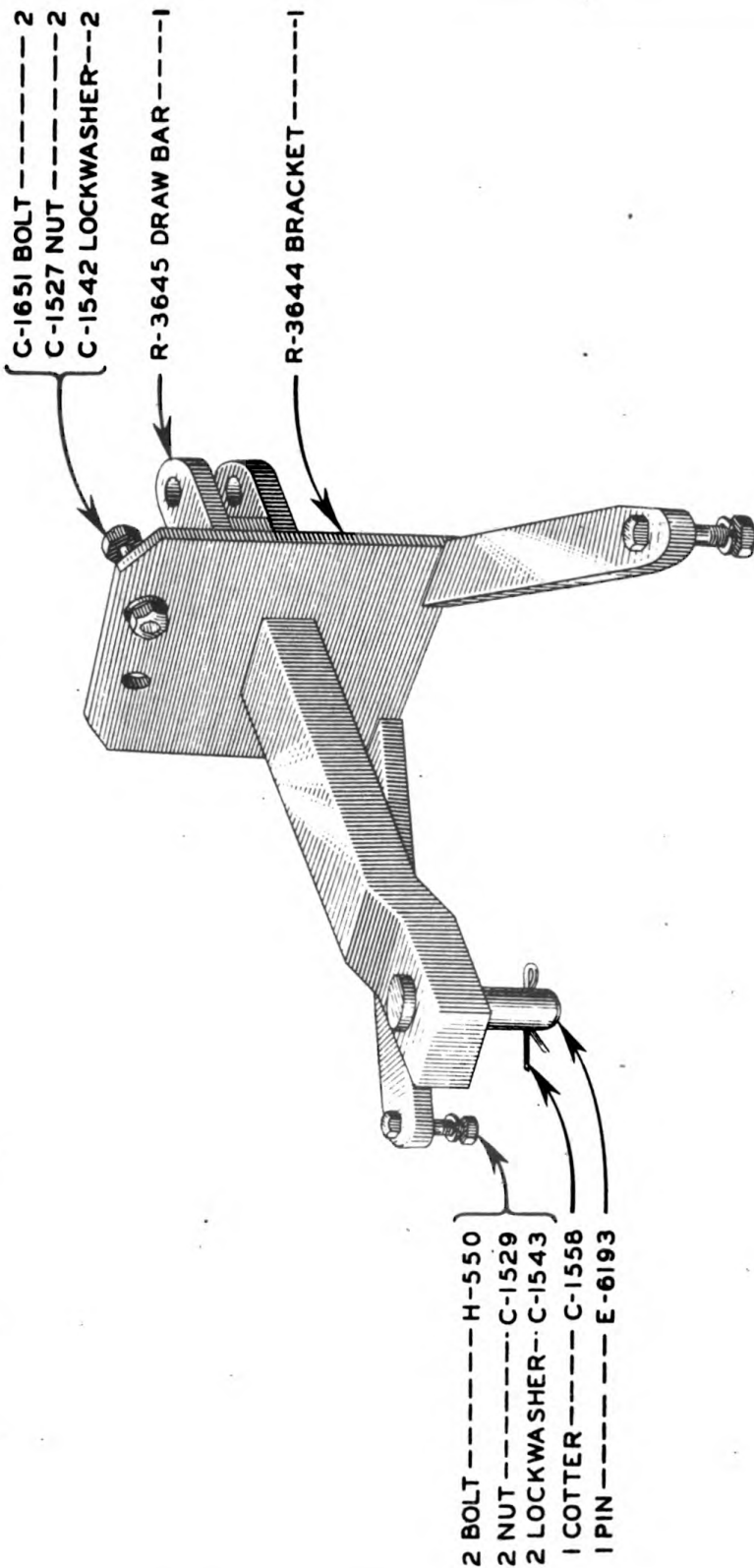
961-G



H-3150 CABLE CUTTER ASSEMBLY

CABLE CUTTER ASSEMBLY

962-G



DRAWBAR EXTENSION GROUP

963-G

12 MODEL T POWER CONTROL UNIT

LIST OF ASSEMBLIES

PART No.	DESCRIPTION	PAGE	QTY.	WEIGHT Lb. Oz.	PRICE EACH
D-9894	CABLE DRUM ASSEMBLY (LEFT).....	63	1	110	\$114.58
	(Includes Following):				
E-8635	CONE (DRIVEN)		1		
C-1614	CAPSCREW		12		
D-2889	LOCKWASHER		12		
F-416	DRUM SHAFT		1		
C-196	SPRING		1		
C-83	DRUM STRUCTURE		1		
L-1624	OIL SEAL		2		
C-7	BEARING CUP		2		
C-8	CONE (BEARING)		2		
E-8618	SHIM .....		..
F-5342	SHIM .....		..
E-5251	PLUG		1		
D-9895	CABLE DRUM ASSEMBLY (RIGHT).....	63	1	110	114.58
	(Includes Following):				
F-417	DRUM SHAFT		1		
E-8635	DRIVEN CONE		1		
C-83	DRUM STRUCTURE		1		
C-7	BEARING CONE		2		
C-8	BEARING CUP		2		
L-1624	OIL SEAL		2		
E-8618	SHIM .....		..
F-5342	SHIM .....		..
C-1614	CAPSCREW		24		
D-2889	LOCKWASHER		24		
E-5251	PLUG		1		
E-4283	DOUBLE DECK SHEAVE ASSEMBLY.....	69	1	300	167.50
	(Includes Following):				
C-3	CUP		2		
C-4	CUP		4		
C-5	CUP		2		
C-63	HOUSING		1		
C-64	HOUSING		1		
C-65	BRACKET		1		
C-66	SPACER		2		
C-67	CONE		2		
C-68	CONE		4		
C-69	ADJUSTING NUT		4		
C-70	CONE		2		
C-137	WHEEL		4		
C-138	PIN		4		
C-175	BEARING		4		
C-315	ZERK		4		
C-1051	COTTER		4		
C-1527	NUT		6		
C-1596	ZERK		8		
C-1646	BOLT		6		
C-5783	NUT		2		
D-2777	BOLT		2		
E-6293	HOUSING		1		
E-6294	HOUSING		1		
L-323	SEAL		8		

964-G

LIST OF ASSEMBLIES

ALWAYS GIVE MACHINE NUMBER WHEN ORDERING PARTS

MODEL T POWER CONTROL UNIT 73

H-3150	CABLE CUTTER ASSEMBLY.....	70	1	8 ..	10.70
	(Includes Following):				
H-3278	HOUSING		1		
H-3279	SHAFT		1		
H-3280	BLADE		1		
H-3281	BLADE		2		
H-6025	PIN		1		
R-3849	DRAWBAR EXTENSION ASSEMBLY.....	71	1	110 ..	27.75
	(Includes Following):				
H-550	BOLT		2		
C-1529	NUT		2		
C-1543	LOCKWASHER		2		
C-1558	COTTER		1		
E-6193	PIN		1		
C-1651	BOLT		2		
C-1527	NUT		2		
C-1542	LOCKWASHER		2		
R-3645	DRAWBAR		1		
R-3644	BRACKET		1		

973-G

LIST OF ASSEMBLIES

ALWAYS GIVE MACHINE NUMBER WHEN ORDERING PARTS

74 MODEL T POWER CONTROL UNIT

PART No.	DESCRIPTION	PAGE	QTY.	WEIGHT Lb. Oz.	PRICE EACH
C-3	CUP, TAPERED BEARING	69	2	8	\$.97
C-4	CUP, TAPERED BEARING	69	4	1 12	1.75
C-5	CUP, TAPERED BEARING	69	2	12	1.07
C-7	CONE, TAPERED BEARING	60,61,63,64	8	2 10	3.95
C-8	CUP, TAPERED BEARING	60,61,63,64	8	1 10	2.55
C-9	CAP, REAR PLATE	63	2	2	1.30
C-40	LINING, CLUTCH (WOVEN)	60,61	2	2 4	5.56
C-51	SPRING, BRAKE	60	2	1 12	1.69
C-63	HOUSING, TOP SHEAVE, LEFT	69	1	20	11.25
C-64	HOUSING, BOTTOM SHEAVE, LEFT	69	2	20	11.16
C-65	BRACKET, DOUBLE DECKER	69	1	109	77.73
C-66	SEAL, DUST	69	2		.76
C-67	CONE, TAPERED BEARING	69	2	1	2.15
C-68	CONE, TAPERED BEARING	69	4	1 4	2.85
C-69	NUT, ADJUSTING	69	4	2	3.30
C-70	CONE, TAPERED BEARING	69	2	1	2.01
C-71	SPRING, LEVER NEUTRAL POSITION	68	2	6	.66
C-83	DRUM, STD. CABLE	63,64	2	40	28.50
C-137	WHEEL, 9 1/2" SHEAVE (WIDE)	69	4	15	5.28
C-138	PIN, SINGLE SHEAVE	69	4	6	2.65
C-143	GEAR, MAIN	60,61	2	38	54.18
C-175	BEARING, STRAIGHT	69	4	1 8	2.38
C-192	LINING, BRAKE (WOVEN)	60	2	1 1	2.29
C-196	SPRING, CLUTCH RELEASE	63,64	2	4	.51
C-218	LINK, BRAKE	60,62	8	6	.26
C-312	LOCKWASHER, 3/8"	60	38		.01
C-315	FITTING, 1/8" STRAIGHT GREASE	69	4		.06
C-337	RACE, BEARING	65,66,67	2	12	1.35
C-1034	PLUG, 1/4" PIPE	60	1	12	.17
C-1051	KEY, 3/8 x 5" COTTER	69	4	4	.06
C-1524	NUT, 1/2" NF HEX	63	4		.03
C-1525	NUT, 5/8" NC HEX	60,62,63	4		.04
C-1527	NUT, 3/4" NC HEX	69,71	8		.05
C-1529	NUT, 7/8" NC HEX	68,71	16		.08
C-1540	LOCKWASHER, 1/2"	63	2		.02
C-1541	LOCKWASHER, 5/8"	60,62,63,65, 68	46		.02
C-1542	LOCKWASHER, 3/4"	71	2		.03
C-1543	LOCKWASHER, 7/8"	71	2		.05
C-1555	KEY, 5/32 x 1" COTTER	60,62	18		.01
C-1558	KEY, 3/8 x 3 1/2" COTTER	71	1		.05
C-1596	FITTING, GREASE	69	8		.10
C-1601	CAPSCREW, 3/8 x 3/4" NC	60	34		.03
C-1613	CAPSCREW, 1/2 x 1 1/4" NC	60,61	24		.06
C-1614	CAPSCREW, 1/2 x 1 1/2" NC	63,64	24		.06
C-1615	CAPSCREW, 1/2 x 1 3/4" NC	63	2		.06
C-1629	CAPSCREW, 5/8 x 1 3/4" NC	65	18	4	.11
C-1630	CAPSCREW, 5/8 x 2" NC	68	6	4	.12
C-1634	CAPSCREW, 5/8 x 3" NC	60,62,63,68	8	4	.15
C-1646	CAPSCREW, 3/4 x 2 1/2" NC	69	6	8	.18
C-1651	CAPSCREW, 3/4 x 3 3/4" NC	71	2	8	.23
C-1687	CAPSCREW, 1/2 x 3 1/2" NF	63	4	4	.12
C-1690	CAPSCREW, 1/2 x 4 1/4" NF	68	2	4	.14
C-5783	NUT, 7/16" NF HEX	69	2		.03
C-6507	GUARD, CABLE—LEFT	63	1	22	7.55
C-6508	GUARD, CABLE—RIGHT	63	1	22	7.55
C-8310	PLUG, 1/4" PIPE—DRILLED	60	1	8	.23

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SPARE PARTS & PRICE LIST

MODEL T POWER CONTROL UNIT 75

D-2378	BEARING, STRAIGHT	65,67	1	12	2.63
D-2613	LINING, BRAKE (Bi-Metallic—Not Available for Duration)	60	2	3 8	8.19
D-2614	LINING, CLUTCH (Bi-Metallic—Not Available for Duration)	60	2	5 8	16.52
D-2721	GEAR, REDUCTION	65,67	1	21	31.23
D-2777	BOLT & NUT, 7/16 x 6" NF MACHINE	69	2	8	.11
D-2889	LOCKWASHER, 1/2" SHAKEPROOF	60,61,63,64	48		.01
D-3528	BEARING, STRAIGHT ROLLER	65,66	1	12	1.75
D-3679	RIVET, BRAKE LINING	60	96		C .80
D-3930	CONE, T DRIVING (Lined with Woven Lining)	60,61	2	86	26.65
D-3932	PLATE, T COVER	60	2	11 12	9.52
D-3959	BEARING, NEEDLE	60,61	2	1 4	5.59
D-4186	NECK STRUCTURE	68	1	120	47.50
D-4322	NUT, BRAKE SHAFT	60,62	2	8	.37
D-4377	BUSHING, NECK	65,66	1	5	5.38
D-4429	CONE, TAPERED	60,62	4	8	1.27
D-4431	CLOSURE, FELT	60,62	4	4	.26
D-4432	CUP, TAPERED	60,62	2	2	.47
D-4433	BUSHING, THROW NUT	60,61	2	1 12	2.85
D-4476	NUT, RIGHT THROW	60,61	1	4 4	13.96
D-4477	NUT, LEFT THROW	60,61	1	4	13.96
D-4509	SHAFT, RIGHT BRAKE	60,62	1	5 8	3.89
D-4510	SHAFT, LEFT BRAKE	60,62	1	5 8	3.89
D-4534	PIN, BRAKE LINK—W/COTTERS	60,62	8	2	.25
D-4535	PIN, BRAKE SPRING ARM	60	2	2	.25
D-4890	SHAFT, SPLINE	68	1	17	22.28
D-4894	BOSS, NECK	68	1	1 4	1.54
D-4904	BLOCK, PINION BEARING	65	1	4 4	2.86
D-5017	PINION	65,66	1	1 8	21.79
D-5133	SETSCREW, 1/2 x 2 1/2"	60	2	4	.16
D-6387	SHIM, FOOT	68	4		.10
D-6394	CAPSCREW, 3/4 x 1" NC SOCKETHEAD	65	4	4	.26
D-6538	SPACER	60	8		.10
D-7054	BAND, BRAKE (Lined with Bi-Metallic— Not Available for Duration)	60,62	2	6	15.75
D-7134	BAND, BRAKE (Lined with Woven Lining)	60,62	2	5 8	9.89
D-7348	CONE, DRIVING (Lined with Bi-Metallic— Not Available for Duration)	60,61	2	30	37.63
D-8493	PLATE, REAR	63	1	50	16.90
D-9894	CABLE DRUM ASSEMBLY, LEFT	63	1	110	114.58
D-9895	CABLE DRUM ASSEMBLY, RIGHT	63	1	110	114.58
E-229	SHIM, CABLE GUARD	63	2		.10
E-4132	KEY, 1/8 x 2" COTTER	60,62	2		.01
E-5165	SHIM, POWER UNIT	60,61			.10
E-5251	PLUG, 1/8" PIPE	63,64	2		.05
E-6193	PIN	71	1	2	1.30
E-6293	HOUSING, TOP R. SHEAVE	69	1	20	11.25
E-6294	HOUSING, BOTTOM R. SHEAVE	69	1	20	11.25
E-6687	BEARING, STRAIGHT	61,63,67	2	12	1.69
E-8618	SHIM, DRUM	61,64			.10
E-8635	CONE, DRIVEN	62,64	2	38	42.20
F-267	ROLLER, T BRAKE	60,62	2	1 4	.73
F-268	PIN, T BRAKE ROLLER	60,62	2	4	.31
F-416	SHAFT, LEFT DRUM	63,64	1	27 4	24.18
F-417	SHAFT, RIGHT DRUM	63,64	1	27 4	24.18
F-5342	SHIM, DRUM	63			.10
F-5343	SHIM, GEAR	60			.10

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SPARE PARTS & PRICE LIST

76 MODEL T POWER CONTROL UNIT

H-550	CAPSCREW, $\frac{7}{8}$ x $4\frac{1}{4}$ " NC	71	2	1	..	.43
H-2802	GASKET	68	1	..	..	.35
H-2824	GASKET	65	1	..	..	.65
H-2825	GASKET	60	2	..	..	.65
H-3150	CUTTER, CABLE	70	1	8	..	10.70
H-3278	HOUSING, CABLE CUTTER	70	1	5	..	6.90
H-3279	SHAFT, CABLE CUTTER	70	1	2	12	4.90
H-3280	BLADE, CABLE CUTTER—TOP	70	1	..	2	1.75
H-3281	DIE, CABLE CUTTER—BOTTOM	70	2	..	2	Pr. 1.50
H-3349	ROLLER ARM ASSEMBLY	60,62	2	5	..	2.08
H-3500	ARM, BRAKE SPRING ARM PIVOT	60	2	1	4	.78
H-3505	CASE, T MAIN—STD.	60	1	193	..	99.83
H-3730	CLIP, SPRING	68	1	..	2	.16
H-3743	LEVER, RIGHT	68	1	14	..	5.35
H-6025	PIN, CABLE CUTTER	70	1	..	..	.10
H-7071	RIVET, (Lined with Bi-Metallic)	60	84	..	..	C .80
H-8524	CAPSCREW, $\frac{3}{8}$ x $\frac{5}{8}$ " NC	60	4	..	..	.04
L-21	SEAL, OIL	65,66	1	..	4	1.36
L-323	SEAL, DUST	69	8	..	2	.50
L-1624	SEAL, OIL	60,61,63,64	6	..	4	.66
L-3725	SEAL, OIL	60,61	2	..	3	.60
L-37050	SEAL, OIL	60	2	2	..	7.35
R-2260	RIVET (for Woven Lining)	60	48	..	..	C .80
R-3193	PLUG, $1\frac{1}{4}$ " MAGNETIC PIPE	60	1	..	8	1.00
R-3644	EXTENSION, DRAWBAR	71	1	50	..	13.75
R-3645	DRAWBAR	71	1	50	..	13.75
R-3646	LEVER, LEFT CONTROL	68	1	15	..	5.38
R-6506	SHIM	68

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SPARE PARTS & PRICE LIST

