POWER CONTROL UNIT

INSTRUCTION BOOK

FORM O-139

MODELS R, T, FTD7 AND N SERIES UNITS

Peoria, Ill. • **R. G. LeTOURNEAU, Inc.** • *Stockton, Calif.*

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Le Tourneau

POWER CONTROL UNIT

INSTRUCTION BOOK

(MODEL T, MODEL FTD7, MODEL R, AND MODEL N SERIES UNITS)

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Through Cable Control

. . . tractor power is transformed instantly into powerful, controlled action —the dynamic high lift of the 'Dozer blade; fast, regulated loading and ejection of Carryall Scrapers; and steel "dynamite" rooting. In every machine, cable has stepped-up operating efficiency, increased work range and reduced operating costs by eliminating slow, restricted operation of equipment.

"Bob" LeTourneau early realized this and pioneered, developed and proved the efficiency of the cable control method on the toughest earthmoving jobs. As a result LeTourneau has earned the distinction of being the leader in the cable controlled earthmoving field. Today this method of control is universally recognized as being superior wherever earthmoving equipment is used.

Cable control, by putting more power and action in the hands of the operator, returns greater reward for skill of operation. More difficult work can be accomplished and production increased.

FOREWORD

The LeTourneau Power Control Unit is the "heart" of all LeTourneau earthmoving and construction equipment. Through its action, the LeTourneau Scrapers, 'dozers, cranes, rooters, 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.

The fine operation of several cable-controlled machines may depend upon your wise operation and maintenance of the LeTourneau Power Control Unit. In view of the fact that so much depends upon the Power Unit and its fast accurate transmission of power to the dirt-moving unit, it is wise to keep it in perfect working condition. When LeTourneau Power Control Units are properly operated and maintained, they are practically trouble-free and will give years of profitable operation with a very nominal maintenance cost.

The instructions in this book are intended to familiarize the inexperienced operator and mechanic with the recommended practices in operation, the correct methods of making adjustments, and the proper maintenance procedure. Also it is intended to serve as a reference book for those who are already experienced in the operation and maintenance of the LeTourneau Power Control Unit.

Particular attention should be given to the instructions on adjustments, since the successful operation of the Power Control Unit depends to a large extent upon the Unit's being correctly adjusted.

For the convenience of you or others who might be benefited by the operating and maintenance instructions herein contained, we suggest that you place this book where it may be handy for quick reference or careful study.

This information is prepared for you with just one thought in mind—to make your work easier and more effective. We sincerely hope that it may succeed.

NOTE: The instructions in this book apply only to those models of LeTourneau Power Control Units that employ the use of the clutch engaging screw to actuate the clutch. (Refer to page 6). Individual instruction books are available for the few specialized models that do not use the clutch engaging screw.

POWER CONTROL UNIT MODELS

LeTourneau Power Control Units are built in models for both front and rear mounting on various makes and sizes of tractors. They are built in single, double, and four drum Units, with either short, standard length, or long cable drums. Also, heavy duty Units are available for extra heavy work. In brief, LeTourneau builds Power Control Units in a sufficient number of models to answer the varied needs of the many users of cable controlled earthmoving equipment.

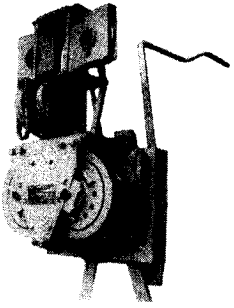
There is, however, a marked similarity in all of these different models, (those employing the screw type clutch engaging mechanism) in that the basic design and working principle of all are the same. Many of the working parts that are used in one model are identical with the corresponding parts of other models, and most of the parts that are not identical are similar. There is, in fact, such a similarity in these different models that the entire current line of LeTourneau Power Control Units (that employ a screw-type clutch engaging mechanism) can be grouped together into four model classifications—the Model T, Model R, Model FTD7, and a group of models which make up the Model N Series. This latter group consists of the models AN8, AN7, AND7, AN6, AN4, AD8, AF8, FD8, AD7, AD6, DND7, DN7, DN8 and a number of models which are no longer current.

The Model T Power Control Units are built with either two or four drums, for rear mounting on various sizes of tractors. All model T Power Control Units have an independent adaptor neck, thus making them interchangeable from one size or make of tractor to another, by merely changing the neck. (The model T four drum unit can be mounted on "Caterpillar" D8 tractors only.) An interchangeable gear ratio is available in each of the adaptor necks, thus providing the desired line speed.

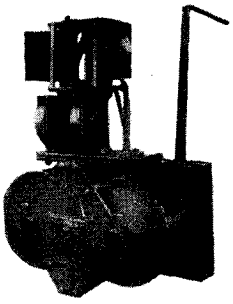
The Model R Power Control Unit is a rear, two drum Unit, of special heavy construction, for use with the "Caterpillar" D8 and D7 Tractors. This Unit is built for extra heavy work, with large capacity Carryall Scrapers, etc.

The Model FTD7 Power Control Unit is a front mounted single drum Unit, for use with the latest "Caterpillar" D7 tractor. This model differs mainly from other front mounted models in that it is an "underslung" Unit, mounted up beneath the front of the tractor.

The Model N series Units are built in models for both front and rear mounting on various makes and sizes of tractors, and in single, double and four drum models. The different models that make up this Model N series are not interchangeable from one tractor to another, but the working mechanism is the same in each.

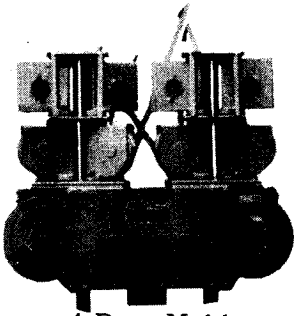


Model T

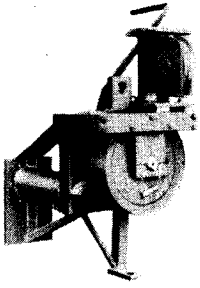


Model R

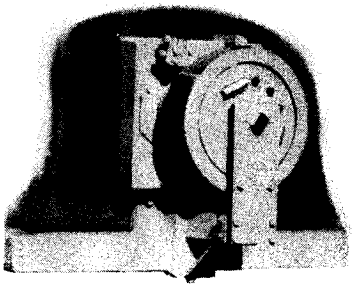
Model FTD7



4 Drum Model



Model N
Rear Single Drum Unit



Model N
Front Single Drum Unit

LeTOURNEAU POWER CONTROL UNIT FEATURES

A number of mechanical features are built into LeTourneau Power Control Units which distinguish them from the other makes of cable control units. These features add to the value of the Power Control Unit and should be known and appreciated by all LeTourneau Power Control Unit users.

Foremost among these is that they are built simple in design—easy to operate and easy to work on. Both the clutch and brake adjustments are out in the open, where they can be easily reached and quickly made, thus eliminating the extra work and lost time that is required when inspection plates must be removed to reach the point or adjustment. The number of working parts is held to a minimum—the strength of the parts being emphasized rather than the quantity. Complicated mechanisms, which are a common source of trouble, are entirely eliminated.

Electrically welded alloy steel construction of both the working parts and gear case structure make the Unit sturdy, yet light in weight. This extra strength makes for trouble-free operation and longer Power Control Unit life. The lightness of weight increases available tractor horse power, and lengthens tractor life.

The design of the Power Control Unit provides instant, positive and powerful action,—features which are made possible by the use of the cone-type clutch and the patented self-energizing brake.

The cone type clutch gives the quick engagement and disengagement that is required of a Power Control Unit clutch. It provides a minimum of slippage, and as a result develops a comparatively small amount of heat if properly operated and adjusted. Not only is a minimum of heat developed within the clutch, but also the parts of the clutch are few and are built more sturdy than the parts of other types of clutches; and therefore, the common tendency of clutch parts to warp is eliminated. Also, the cone-type clutch gives less springy action than other types of clutches, and develops a greater capacity than most clutches of a corresponding size.

It was after years of experience with all types of clutches in Power Control Units that LeTourneau standardized on the cone type clutch that is now being used.

The brakes on the LeTourneau Power Control Unit are of a

self-energizing design, with a patented linkage, which develops a powerful brake action.

The brake bands are un-enclosed, as are the clutches, and have a large area of surface from which to radiate the heat that is developed within the brake to the air which circulates freely about the brake drums.

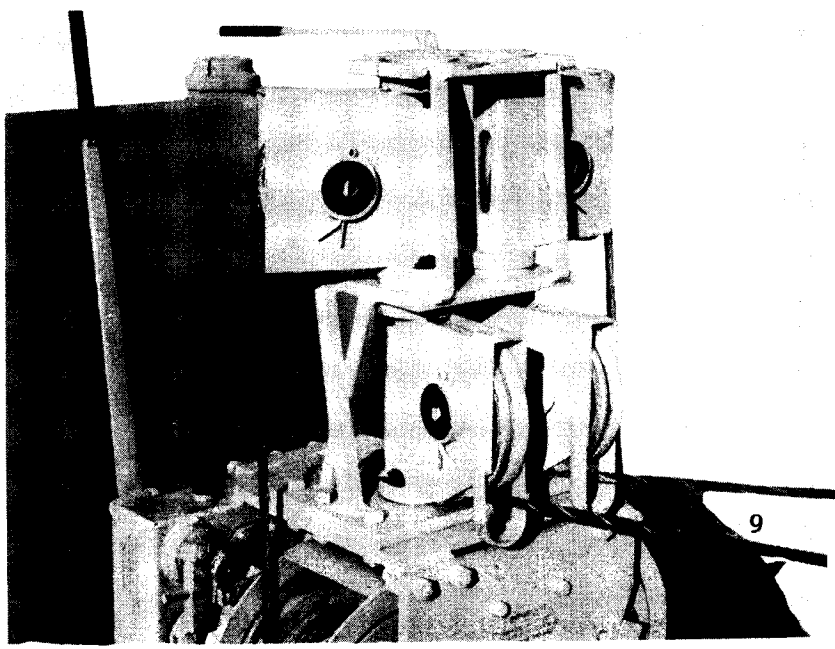
Thus, the capacity of the brakes is not hindered by the one factor which, more than anything else, limits brake capacities—the inability of the brake band to dissipate its heat.

The brakes and clutches may be equipped with either woven or metallic facings, as desired by the owner.

The LeTourneau Power Control Unit uses only stub spur tooth and herringbone tooth gears in transmitting the power to the cable drums and in providing the necessary gear reduction. Bevel and worm gears, which develop heat, cause loss of power through friction, and offer lubrication problems, are completely eliminated.

Roller bearings, both straight and tapered, of ample size, are used at all points of friction.

In addition to the above features, LeTourneau has developed and patented a method of leading the cable to the cable drums and of reeving the cable evenly onto the drums, without damage or excessive wear on the cable. This device is known as the Double Deck Sheave Assembly, and is available for use with all LeTourneau double drum Power Control Units. (For detailed description, refer to page 18.)



Not only does the double deck sheave assembly lead the cable evenly onto the cable drums, but special attention has been given to the design of the sheaves and sheave housings to make for longer cable life, and to prevent the cable from fouling or becoming cut.

Also, the design of the double deck sheave assembly is such that the pull of the cable is exerted on the Power Control Unit at a point near the center line of the tractor. This is brought about by the lower double-deck sheaves being located close to the center of the Power Control Unit. On power control units that have a wider spacing of the lower double deck sheaves, the pull is from a point farther from the center, and therefore the tractor upon which the power control unit is mounted has a tendency to continuously pull to one side when pulling a loaded scraper, because of the load on the scraper hoist line pulling back on the tractor at a point several inches on one side of the center line.

Interchangeability is also a feature of some models of the LeTourneau Power Control Units. The use of an independent adaptor neck enables the owner to change the Power Control Unit from one size or make of tractor to another by merely changing the neck to one which was designed especially for the tractor upon which the Unit is to be mounted. Interchangeable gear ratios are also available for these Power Control Units, to increase or decrease the cable drum speed.

The various mechanical features discussed above were made standard on the LeTourneau Power Control Units only after years of experimentation, development, and experience on the part of the manufacturer, and have now been proved on thousands of LeTourneau Power Control Units working under the toughest of job conditions.

The LeTourneau Power Control Unit has been especially designed to provide the correct amount of line pull and line speed that is required to operate LeTourneau Scrapers, Rooters, 'Dozers, etc. The action of the Power Control Unit is so balanced and synchronized with that of the equipment operated by the Unit that it can be considered actually a part of this equipment; and if other means of control is used, the equipment may be handicapped in its operation, and may not be expected to give maximum performance.

CABLE

LeTourneau Power Control Units are designed for use with ½" wire rope—the size that is recommended for use as the primary cable, connecting all LeTourneau equipment to the Power Control Unit.

In addition to being ½" in diameter, the cable should meet the following specifications—6 x 19 (with filler wires) wire rope with an independent wire rope center, pre-formed, of "Langlay" construction, and manufactured from improved plow steel. It should be internally lubricated. Right lay cable is ordinarily used.

This cable has the strength and wearing qualities that are required for economical operation of the Power Control Unit and of the equipment being operated by the Power Control Unit.

(For instructions on the lubrication of the cable, refer to tne "Lubrication Instructions" on page 44.)

CABLE CUTTER

The cable cutters supplied on rear mounted Power Control Units are designed to save effort.

Do not defeat this purpose by applying unnecessary force.

A 4 or 5 pound hammer will cut cable up to ¾" in diameter just as fast and much better than a 15 pound sledge. Take 3 or 4 more strokes with a lighter hammer, delivered more accurately and with less effort.

For cable from ¾" to 1" in diameter a 6 or 8 pound hammer is as effective as a heavier one.

Cutting speed and ease depend on the sharpness and accuracy of the blows rather than on the weight of them.

The hardest blows should be the first ones, the final blows the easiest.

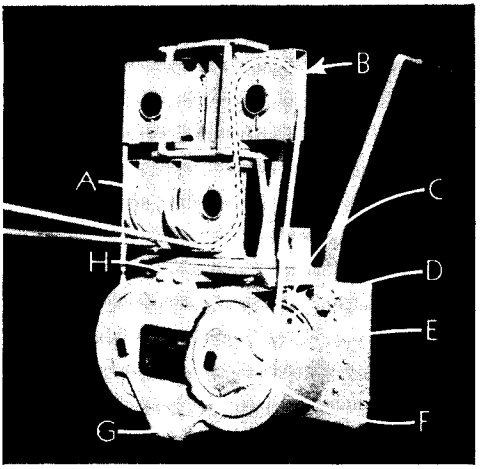
Do not grind the cutting edge.

CABLE THREADING

REAR DOUBLE DRUM POWER CONTROL UNITS

(See diagram on following page)

To thread the cable onto the right hand drum of any rear double drum Power Control Unit (equipped with Double Deck Sheave Assembly), first enter one end of the cable into the bottom of sheave housing "A". Force the cable up through the center of the bracket until it enters the back side of sheave housing "B". Pass the cable over the sheave in sheave housing "B", and down to cable drum "C". Loop the cable clockwise once around the drum, and bring it out through hole "D". Then, insert the cable through hole "E" and back out through remaining hole "F". Continue by passing the cable through loop "G", which is welded to the cable drum flange, and then through final loop "H", allowing an inch or less of cable to protrude from the end of the loop.



The cable does not need to be secured to the cable drum in any other way.

The cable is threaded onto the left cable drum with exactly the same procedure, excepting that the cable should be looped around the drum counter-clockwise, rather than clockwise.

FOUR DRUM POWER CONTROL UNITS

The cable threading procedure for a four drum Power Control Unit is the same as that of two double drum units sitting side by side. The instructions above should therefore be followed.

REAR SINGLE DRUM POWER CONTROL UNITS

In threading a rear single drum Power Control Unit, loop the cable clockwise around the cable drum, excepting on "Caterpillar" 30 and D4 tractors, on which it is necessary to loop the cable counter-clockwise. Secure the cable to the cable drum as outlined in the cable threading instructions for double drum units.

FRONT SINGLE DRUM POWER CONTROL UNITS

In threading the cable onto a front single drum Power Control Unit, loop the cable counter-clockwise around the cable drum, and secure the cable to the drum as outlined in the cable threading instructions for double-drum units.

POWER CONTROL UNIT OPERATION

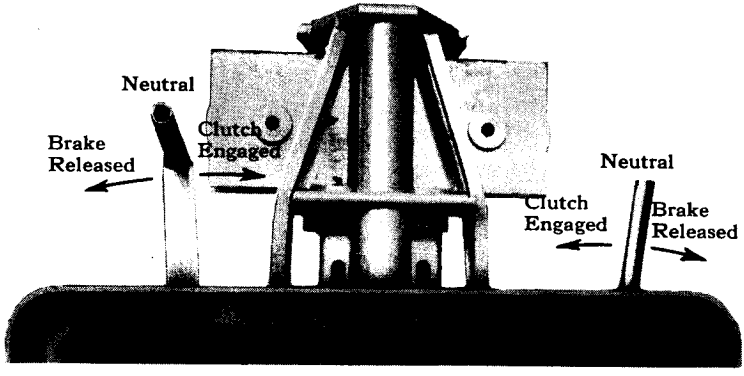
The actual operation of the Power Control Unit, that is, the engaging and disengaging of the Power Control Unit clutch and

the releasing of the brake for free-spooling of the cable, is comparatively simple and requires few instructions.

To engage the clutch, move the control lever quickly and fully in the direction that moves the driving cone toward the driven cone. To release the clutch, move the control lever quickly back into the neutral position.

The brake automatically releases when the clutch is engaged, and automatically takes hold when the clutch is disengaged, with the control lever in the neutral position. To release the brake for free-spooling of the cable off the cable drum, move the control lever in the opposite direction to that with which the clutch is engaged. To catch the load, or to stop the free-spooling of the cable, move the control lever back into neutral position, allowing the brake to take hold.

In order to avoid clutch and brake slippage, and the resultant over-heating 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 leakage.



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

NOTE: Before placing a new Power Control Unit in operation, the cork should be removed from the breather hole in the oil filler plug. This cork is placed in the filler plug at the factory to prevent oil leakage during shipment. Unless the cork is removed, a pressure will be built up inside the gear case when the unit is placed in operation, forcing oil out around the oil seals.

THE POWER CONTROL UNIT MECHANISM

Every operator and every mechanic should know how the LeTourneau Power Control Unit works—what happens inside the unit when the control levers are moved, in order that they might have the confidence that is required to do their best work.

A study of the accompanying illustration of a cut-away Power Control Unit will enable the reader to understand how the Power Control Unit works.

(The Power Control Unit illustrated is a Model T double drum unit. The working mechanism of this unit is similar to that of the other models, and therefore an understanding of the way this Power Control Unit works also carries with it an understanding of the other models.)

The Power Control Unit pinion "A" is connected with the tractor upper transmission shaft by a splined connector shaft, known as the "spline shaft". As the transmission shaft turns with the tractor engine, pinion "A" is also caused to turn.

The teeth on pinion "A" are in mesh with the teeth on idler gear "B", and the teeth at the small end of idler gear "B" are meshed with the teeth on left main gear "C".

Similarly, the teeth on the main gear "C" are in mesh with the teeth on right main gear "D".

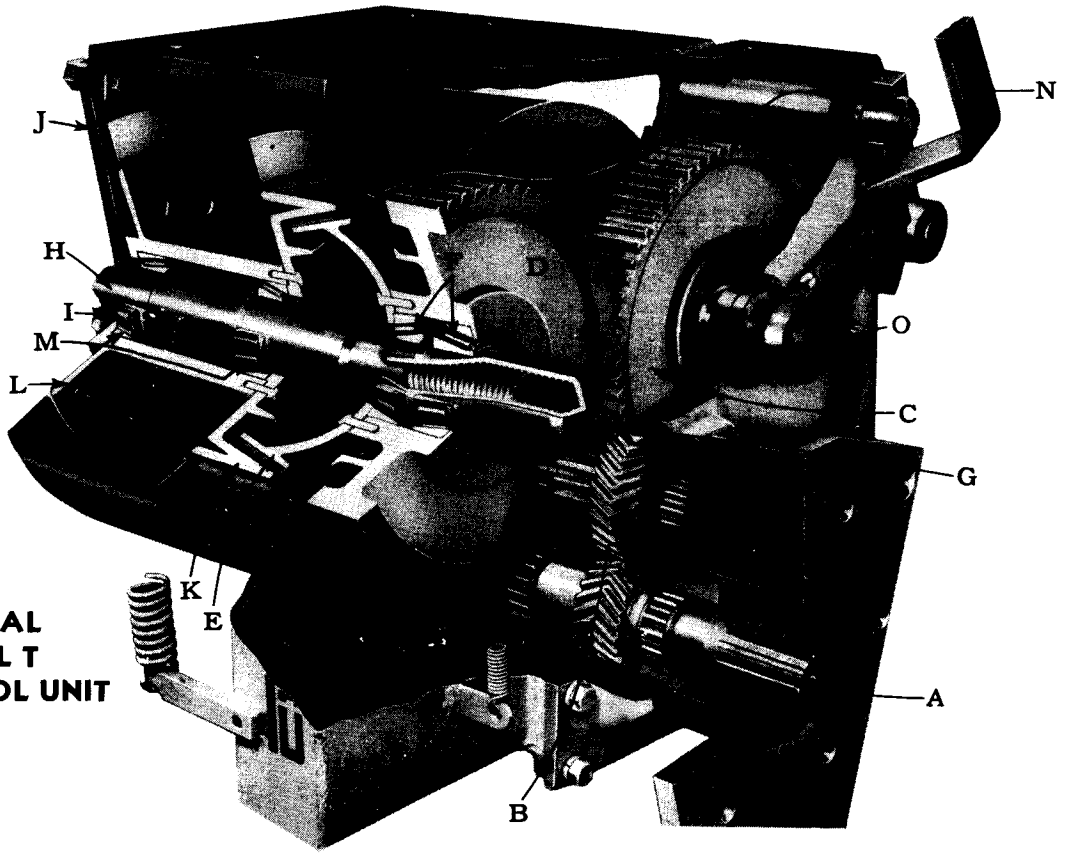
Thus, as pinion "A" rotates from the power of the tractor engine, this motion is transmitted up through idler gear "B" to main gear "C", and thence to main gear "D".

Main gears "C" and "D" drive the right and left clutch and cable drum assemblies. (Since both the right and left clutch and cable drum assemblies are alike, only the right assembly, which is shown in "cut-away", will be explained.)

The hub of main gear "D" is secured to the clutch male or lined driving cone "E" by 12 capscrews, and the two rotate together as one part on tapered roller bearings "F".

Bearings "F" are securely seated on the outer circumference of clutch throw nut "G", which in turn is screwed onto the end of threaded drum shaft "H". Drum shaft "H" is held stationary by clamp block "I", which is bolted to the Power Control Unit rear plate "J".

The female driven cone "K" and cable drum "L" are fastened together by 12 capscrews, and the two are mounted as one unit on



CROSS-SECTIONAL VIEW OF MODEL T POWER CONTROL UNIT

tapered roller bearings "M", which are seated on stationary drum shaft "H".

Driven cone "K" and cable drum "L" do not turn on bearings "M", excepting when the clutch is engaged, or, in other words, until the rotating, lined, driving cone "E" is moved into contact with driven cone "K".

The clutches are engaged by moving the control levers. Control lever "N", which is clamped around the left clutch throw nut "O", actuates the left clutch, and a similar control lever (not shown in the cut-away illustration) is clamped around the end of right clutch throw nut "G", and actuates the right clutch.

When the clutch throw-nut "G" is turned clockwise on drum shaft "H" by the movement of the control lever, it turns on the threads on the end of the drum shaft, and moves longitudinally along the shaft, toward the rear of the Power Control Unit.

The rotating main gear and driving cone, "D" and "E", are carried to the rear with clutch throw nut "G" during this movement, and the clutch facing on the outer circumference of the driving cone is forced into contact with the driven cone "K", causing the driven cone and cable drum to rotate with the gear and driving cone.

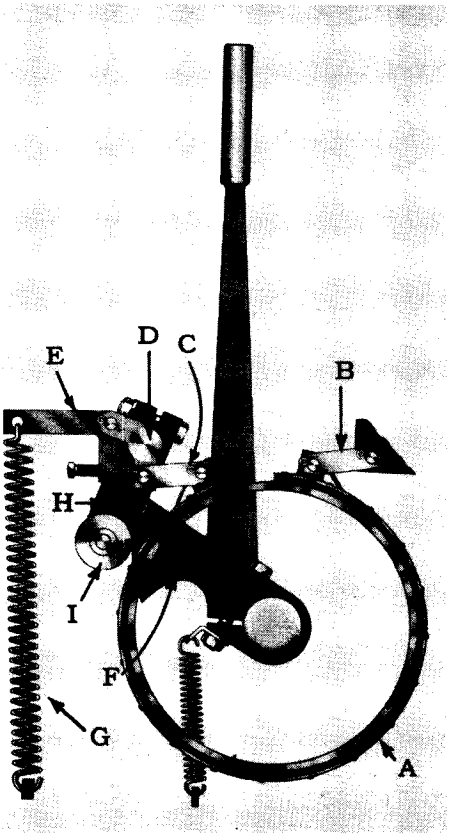
Then, when the operator moves the control lever in the opposite direction, thereby turning clutch throw-nut "G" counterclockwise on the drum shaft, the driving cone is moved away from the driven cone, and the driven cone and cable drum stop rotating.

The wire rope reeves onto the cable drum when the driving cone is moved against the driven cone, or, in other words, when the clutch is engaged. When the clutch is disengaged, this reeving of the wire rope onto the cable drum stops, and the Power Control Unit brake prevents the cable drum from turning in the opposite direction, or "free-spooling" from the force or tension which is ordinarily pulling back on the wire rope.

The brake is built so that it automatically releases when the Power Control Unit clutch is engaged, and so that it can be voluntarily disengaged by the operator when un-spooling of the cable is desired.

The action of the brake is as follows:

Lined brake band "A" encircles the outer circumference of the brake drum, which is a part of the clutch driven cone. The brake band is anchored to the Power Control Unit gear case at one end by means of brake link "B".



MODEL T
BRAKE MECHANISM

The other end of the brake band is fastened by means of brake link "C" to the pivot arm which extends down from brake shaft "D". Brake shaft "D" extends through the gear case, and is free to rotate either to the left or to the right on bearings. Brake spring arm "E" is fastened to brake shaft "D" and moves up or down when the brake shaft is rotated. Brake spring "G" is anchored to the gear case at one end and to the brake spring arm at the other end. The tension on spring "G" pulls down on arm "E", which causes brake shaft "D" to rotate counter - clockwise, moving the brake pivot arm toward the brake drum, and thereby tightening the brake band on the brake drum.

The brake linkage is such that the brake is "self-energizing", which means that as the brake drum and cable drum start to rotate to un-spool the cable, the brake band tightens on the brake drum. The more the brake drum tries to turn in this direction, the tighter the brake band takes hold.

As the brake drum starts to rotate in the opposite direction when the clutch is engaged, the brake band loosens its grip on the drum, and allows it to turn.

In order that the operator might release the brake to allow the cable to un-spool off the cable drum when necessary, a brake release cam (marked "F" in the above drawing) is provided at the lower end of the control lever. When the control lever

is moved from its neutral position in the direction opposite to that with which the clutch is engaged, the brake cam "F" moves against brake roller "I", thus causing the brake roller and roller arm "H" to be moved away from the center of the brake and clutch. Brake roller arm "H" is clamped to the end of brake shaft "D", at the opposite side of the gear case to that on which the brake spring arm "E", etc., are fastened to the shaft. Therefore, when the roller arm "H" is moved by the action of the cam against the roller, brake shaft "D" rotates in a clockwise direction and the brake pivot arm is moved away from the brake drum, releasing the brake band. The tension on brake spring "G" will re-engage the brake and throw the control lever back into neutral position when the operator lets go of the lever.

From the above discussion, it can be seen that by moving the control lever, the operator can engage the clutch and cause the cable drum to turn with the rotating main gear, thus reeving the cable onto the cable drum. He can then move the control lever back into the original neutral position, thereby disengaging the clutch and engaging the brake, thus causing the cable drum to stop turning. Also, he can move the control lever from this neutral position in the direction opposite to that with which he engaged the clutch, thereby disengaging the brake, and allowing the force that is pulling back on the cable to un-spool the cable off the cable drum. This unspooling can be stopped by returning the control lever to neutral position, and thus engaging the brake.

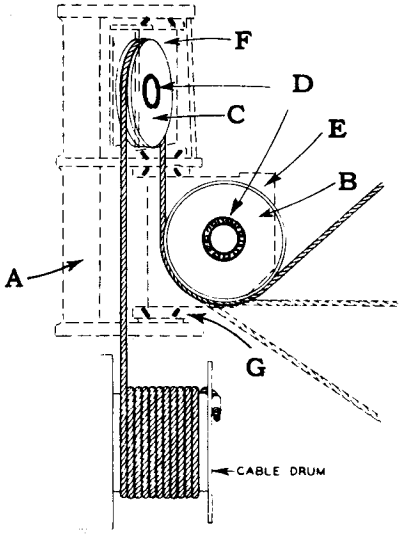
All LeTourneau cable controlled equipment is controlled by this spooling and un-spooling of the cable on and off the cable drum.

DOUBLE DECK SHEAVE ASSEMBLY

LeTourneau has developed and patented a method of leading the cable or wire rope to the Power Control Unit cable drum, and of reeving this cable onto the drum evenly, which adds almost as much to the economy of operation as the design of the Power Control Unit does to the efficiency of operation. This money saving device is known as the Double-Deck Sheave Assembly, and is available for use with all LeTourneau two and four drum rear Power Control Units.

The double-deck sheave assembly consists of a double-deck bracket structure, labeled "A" in the followng drawing, and two "fairlead" or swivel sheaves for each cable drum, labeled "B" and

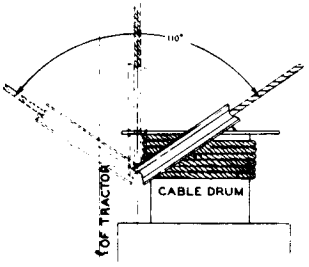
"C". Sheaves "B" and "C" roll freely on roller bearings "D" in the two swivel sheave housings "E" and "F". These two swivel sheave housings are mounted on tapered roller bearings "G", in the fairlead sheave bracket "A", one directly above the other, and are free to swing either to the left or to the right on these bearings. Sheaves "B" and "C" are 9½ inches in diameter, or large enough to prevent premature cable failure from sharp bends in the cable. Also the cable groove around the outer circumference of each sheave is machined especially for ½" wire rope, and the groove is deep enough not only to hold the cable on the sheave, but also to support the sides of the cable, and thereby prevent it from flattening out or becoming egg shaped.



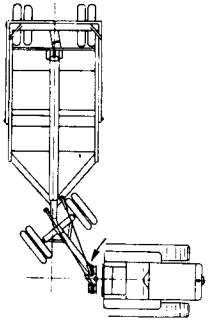
The cable or wire rope is spooled from the loading and unloading mechanisms of the Scraper (or other trailing equipment) up around the bottom and rear of swivel sheave "B". From here, it leads up over the top of swivel sheave "C", and then down and around the cable drum, to which the dead end of the cable is securely anchored.

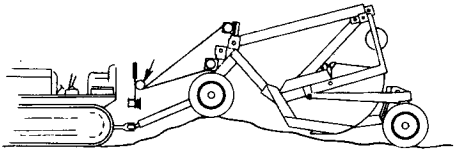
Sheave "B" is free to swing either to the left or to the right and thereby to always keep in perfect alignment with the trailing equipment, even when making the sharpest of turns. Also, the cable is free to lead off sheave "B" at an angle either above or below the horizontal position, when traveling over rough or un-

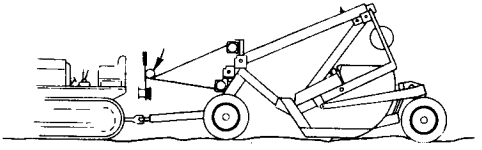
level country with the "fairlead" sheaves of the trailing equipment either above or below the level of the bottom of swivel sheave "B". This is illustrated in the drawings below.

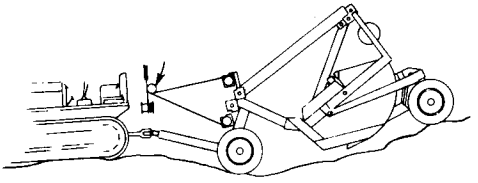


Right or Left









Above or Below

DIRECT PULL FROM ANY ANGLE

Sheave "C" is free to swing slowly back and forth as the cable spools onto the cable drum, and thereby to reeve the cable onto the cable drum in even layers and prevent its stacking up in any one place on the surface of the drum.

The use of this patented double-deck sheave assembly lengthens cable life considerably, thus decreasing cable costs.

Other types of sheave assemblies, mostly modifications of the "double decker", are also used with LeTourneau Power Control Units.

These are usually used when the equipment being operated by the Power Control Unit, such as Rooters, etc., does not require the use of the "double decker".

ADJUSTMENTS

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

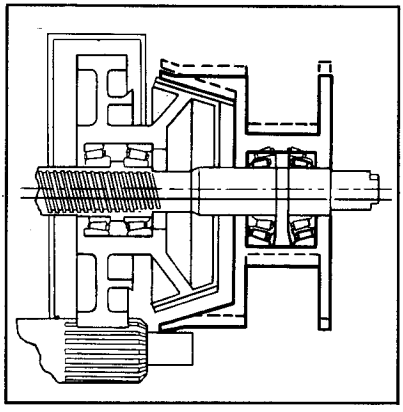
There are six points of adjustment on the Power Control Unit.

1. Cable drum bearing adjustment.
2. Main gear bearing adjustment.
3. Clutch adjustment.
4. Brake adjustment.
5. Double-deck sheave assembly bearing adjustment.
6. Pinion bearing adjustment (only on Model R Units having helical gears).

Each of these adjustments can be easily and quickly made, as outlined in the following instructions:

CABLE DRUM BEARING ADJUSTMENT

It is important that the bearings in the cable drums be kept in the correct adjustment in order to assure proper clutch action.

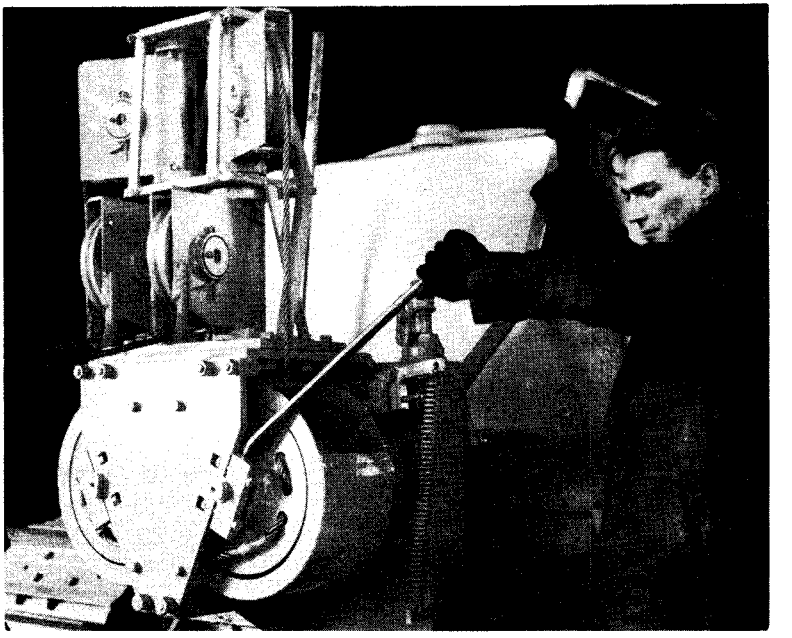


If the bearing adjustment is too loose, the cable drum and clutch driven cone will assume an off-center position on the drum shaft, and will be in misalignment with the clutch driving cone, as shown in the drawing, thus causing spongy, erratic clutch action. With loose bearings, the driven cone may move to the front or to the rear with the driving or lined cone as the control lever is moved, thereby preventing proper releasing of the clutch, and causing the throw of the control lever to be too great for efficient operation. It may also cause the driven cone to drag on the driving cone when the clutch is in the neutral position, resulting in over-heating of the clutch. Also, such a loose adjustment may cause cable breakage, due to a delay in quick clutch disengagement.

If the bearings are adjusted too tight, the cable drum will be very difficult to turn, and the bearings will heat up.

CABLE DRUM BEARING ADJUSTMENT

To determine whether the drum bearings are in the correct adjustment, insert a bar between the Power Control Unit rear plate (front plate on front mounted Units) and cable drum, and firmly engage and disengage the clutch, while closely watching the rear of the cable drum. If the drum bearings are loose, the cable drum will move back and forth on the drum shaft, and the end of the bar that was inserted between the end of the cable drum and rear plate will move. The "feel" of this movement will be very noticeable to the one holding the end of the bar.



If the cable drum bearings are loose they should be adjusted by removing the required number of shims from between the cable drum and driven cone. (Refer to "Disassembly Instructions" on page 50 for the procedure to be followed in removing these shims.)

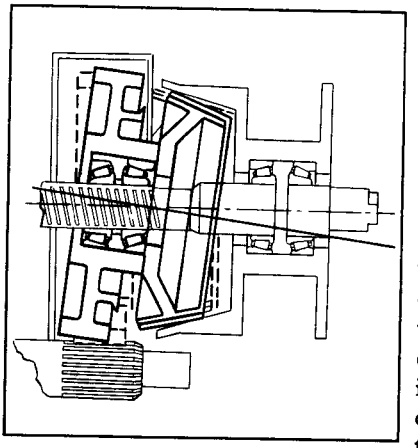
If the bearings are too tight, add the required number of shims.

The shims are of two thicknesses (.007 and .014 inches) in order to make possible a fine variation in adjustment.

The cable drum bearings should be slightly "pre-loaded", or, in other words, adjusted so that considerable force is required to turn the cable drum by hand.

MAIN GEAR BEARING ADJUSTMENT

The main gear bearings require more attention than the other bearings, because they run constantly.



If the bearings are in a loose adjustment, the clutch driving cone may become misaligned with the driven cone, as shown in the drawing, and jerky clutch action may result. Also the driving cone may drag on the driven cone when the clutch is in neutral position. In addition, the large double oil seal at the rear of the gear hub and the smaller oil seal in the hub of the driving cone may start leaking, due to excessive movement of the gear and driving cone.

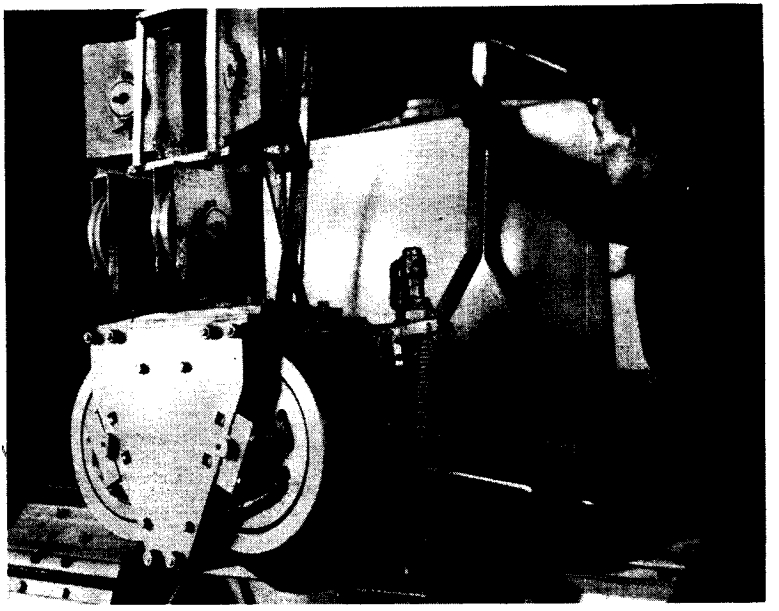
If the bearings are in too tight an adjustment, they will be overloaded, causing overheating and premature bearing failure. Also, the control lever and clutch throw-nut will have a tendency to turn with the gear and driving cone.

Symptoms of loose gear bearings are that the control lever will have a tendency to wobble when traveling, the clutch may chatter and the gear hub and driving cone oil seals may leak oil onto the clutch and brake surfaces, resulting in brake and clutch slippage. Also, an excessive amount of throw of the control lever may be required to engage and disengage the clutch and the driving cone may have a tendency to "hang up" in the driven cone when disengaging the clutch, which will often result in cable breakage because of the Power Control Unit's not responding properly to the operator's movement of the control levers.

To check the bearing adjustment, firmly engage the clutch and insert a tapered bar between the driving cone and the case cover plate. (If the clutch lining is worn and the driving cone is out of sight in the driven cone, use a curved bar to hold the driving cone tight in the driven cone.)

Then, slowly release the control lever, using no force.

The distance that the control lever moves during this operation determines whether the bearing adjustment is too loose, and



also indicates with a reasonable degree of accuracy the extent of this looseness.

Generally speaking, a movement of 8 inches or more at the top of the control lever (36 inch length) during this operation is an indication that the gear bearings have reached a looseness great enough to affect the operation of the Power Control Unit, thus making an adjustment of the main gear bearings advisable.

Allowance must be made in the above 8" dimension if control levers are of longer or shorter length than the 36" length specified.

Also, the movement at the top of the control lever during the above operation not only indicates the looseness of the bearings, but also includes any "play" or "lash" that there might be between the threads on the clutch throw nut and drum shaft. In other words, the distance of movement at the top of the control lever because of loose gear bearings will be increased if the threads on the clutch throw-nut and drum shaft have become worn; and therefore, allowance must be made in the above dimension for any wear which might have taken place in the threads through use.

If spongy, sticky clutch action should be noticeable before the bearings become loose enough to allow the 8 inch movement

at the top of the control lever (discussed above), a take up in the bearing adjustment should then be made, providing of course, that this action of the clutch is not caused from some source other than loose bearings.

To make the adjustment, first make certain that the clutch throw-nut is free in the gear, by turning the clutch throw-nut by hand. (not using control lever.) Then remove the necessary number of shims from between the main gear and driving cone. (Refer to "Disassembly Instructions" on page 52 for the procedure to be followed in reaching these shims.)

When making the adjustment, it is recommended that shims be removed until the bearing adjustment has been tightened enough to prevent the turning of the clutch throw-nut in the gear by hand (not using the control lever.) Then, add a shim, or shims, (the shims are of .007 in. and .014 in. thickness) in order to just allow the throw-nut to be turned in the gear by hand, using some force. This will place the bearings in the recommended, slightly pre-loaded, adjustment.

NOTE: Care must be taken when making the above adjustment to make certain that the bearing cup against which the shims press changes its position in the gear hub each time that a shim is removed or added.

To assure this, tighten the capscrews which secure the driving cone to the gear hub very tight each time that a shim is removed, thereby drawing the bearing cup further into the gear hub.

Each time that a shim is added, strike two or three blows against the end of the clutch throw-nut (closed end) with a hammer or light sledge. (Not in the center). Then install the capscrews which secure the driving cone to the gear hub, and draw them up tight.

(It is necessary to strike against the end of the clutch throw-nut, and then tighten the capscrews during the above operation, in order to make sure that a false adjustment is not obtained from the bearing race's hanging up in its original position in the gear hub.)

When the correct bearing adjustment is obtained, re-assemble the unit by installing the drum assembly, etc. (Refer to Assembly Instructions.)

PINION BEARING ADJUSTMENT

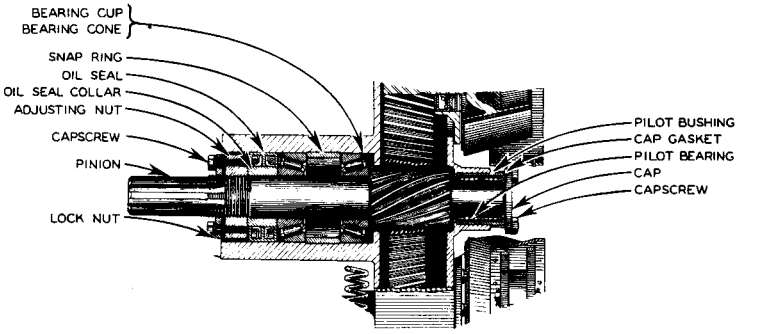
(Only on Model "R" Series Units having helical gears and pinions.)

Model "R" Series Power Control Units having serial numbers in or above the 26,000 series (such as P-26001 R8D) are equipped with helical gears and pinions.

Due to the end thrust which is thrown upon the pinion as a result of the use of helical gears, adjustable tapered roller bearings are used on the pinion shaft.

Check the pinion bearing adjustment once every 3 months of operation. To check the adjustment, first remove pinion pilot bearing cap by removing the 4 capscrews. Then remove pilot bearings from end of pinion and check pinion shaft for play or free movement by prying lightly on end of pinion with a bar.

If movement is noticeable, the pinion bearings are in a loose adjustment and a take-up in the adjustment should be made.



To make the adjustment, first remove the Power Control Unit from the tractor. Then proceed as follows:

1. Remove capscrews from lock-nut.
2. Remove lock-nut.
3. Turn adjusting nut clockwise on the threads on pinion shaft until all end play is taken out of pinion, but with pinion still left free to turn. Do not pre-load bearings.
4. When correct adjustment is reached, turn lock-nut clockwise on threads on pinion shaft, up tight against adjusting nut. Then back off one full turn and install and tighten the capscrews in the tapped holes in the lock nut and adjusting nut, thereby locking the adjustment.
5. Reinstall Power Control Unit on tractor.

CLUTCH ADJUSTMENT

Three minor adjustments of parts related to the clutch go together to make up the Power Control Unit clutch adjustment.

1. The clearance between the driving cone and driven cone when in neutral position.
2. The spacing of the main gear inside the gear case.
3. The clearance between the control lever clamp block and the throw-nut bushing.

Briefly, these three adjustments affect the action of the clutch as follows:

1. The clearance between the driving and driven cones, when the clutch is in neutral, regulates the distance the driving cone must travel to fully engage the driven cone. This distance can not be measured accurately without difficulty, and is usually thought of in terms of the distance the control lever moves between neutral position and the fully engaged position. If the clutch cones are spaced too far apart, the throw of the control lever between the neutral and fully engaged positions will be too great for efficient operation. If spaced too close, the driving cone may drag on the driven cone when the clutch is in neutral position.
2. The spacing of the main gear inside the gear case determines whether the clutch is free to engage without obstruction, and also whether the brake can be fully released without being hindered by the action of the clutch.

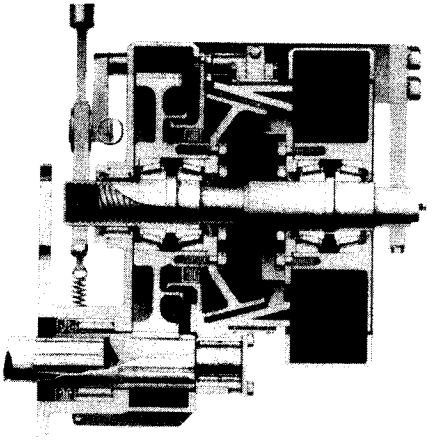
   If the main gear is spaced too near the rear of the gear case, (front of gear case on front mounted units) it may ride against the back of the gear case (case cover plate) and bearing block as the clutch is engaged, preventing full engagement of the driving cone in the driven cone.

   If the gear is spaced too near the front of the gear case (rear of gear case on front mounted Units) it may either strike the front of the gear case (Models N and R Units) as the clutch is disengaged and the control lever moved past neutral toward the brake release position, thus preventing full releasing of the brake, or the main gear may ride against the reduction gear and the clutch driving cone against the case cover plate (Model T Units), also preventing full releasing of the brakes.

3. The clearance between the control lever clamp block and the throw-nut bushing also affects the engagement of the clutch. If the clearance between the two is not great enough, the control lever clamp block may ride against the bushing before the driving cone becomes fully engaged in the driven cone, thereby preventing the clutch from fully engaging. Also, on Model T Units, the brake cam on the control lever may ride against the brake roller arm, thereby affecting both the engagement of the clutch, and the action of the brakes.

The following features of design make possible the three clutch adjustments:

1. The screw threads on the drum shaft and clutch throw-nut cause the shaft to screw either farther into or out of the throw-nut when turned either clockwise or counter-clockwise (drum shaft clamp released), thereby either increasing or decreasing the distance between the driving and driven cones when in neutral position.
2. The entire gear and drum assembly can be moved either to the front or to the rear, farther into or out of the gear case (drum shaft clamp released), thus spacing the gear inside the gear case.



3. The control lever clamp block can be released and moved farther out on the clutch throw-nut, providing more clearance between the clamp block and the throw-nut bushing.

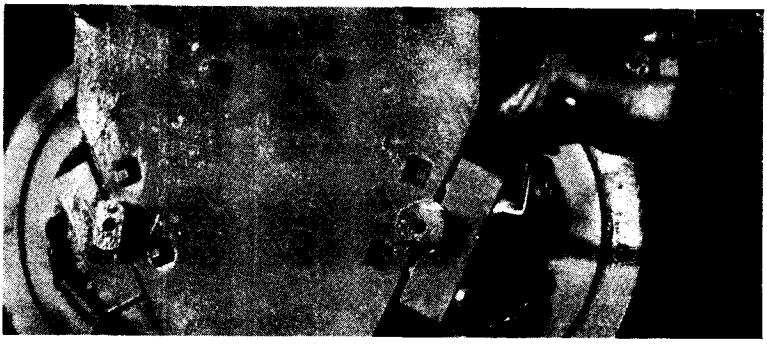
However, all three of these clutch adjustments are inter-related, a change in one causing a change in the others, and one

adjustment must *not* be made without also adjusting or checking the adjustment on the other two.

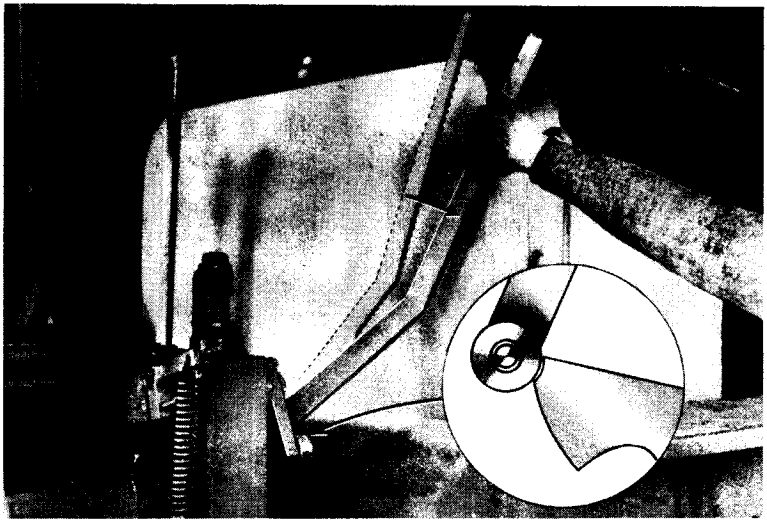
The adjusting procedure below combines these three clutch adjustments into one quick, simple and accurate adjustment.

First—make certain that the brake is properly adjusted and that the brake roller arm is correctly positioned. (Refer to brake adjustment instructions.)

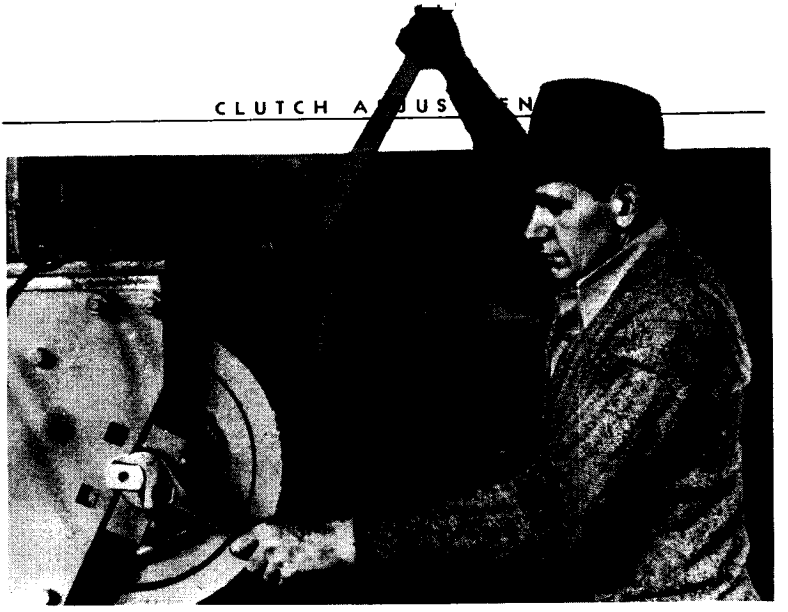
Then proceed as follows:



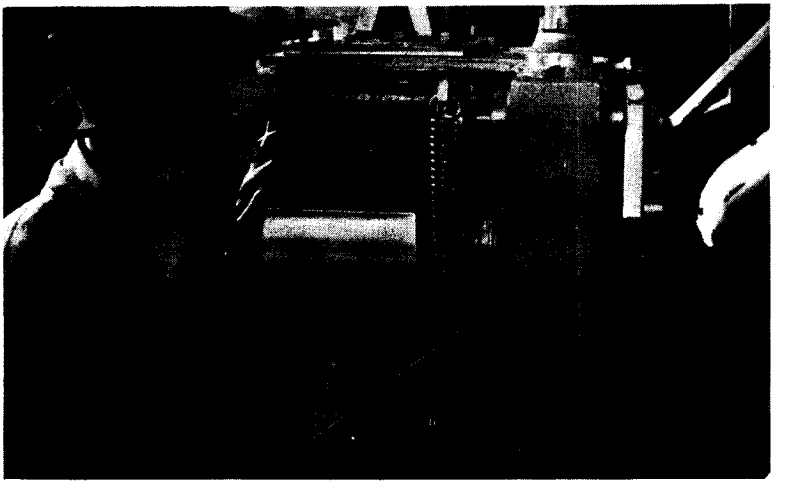
1. Release the clamp block from the rear end of the drum shaft by loosening the clamp bolts.



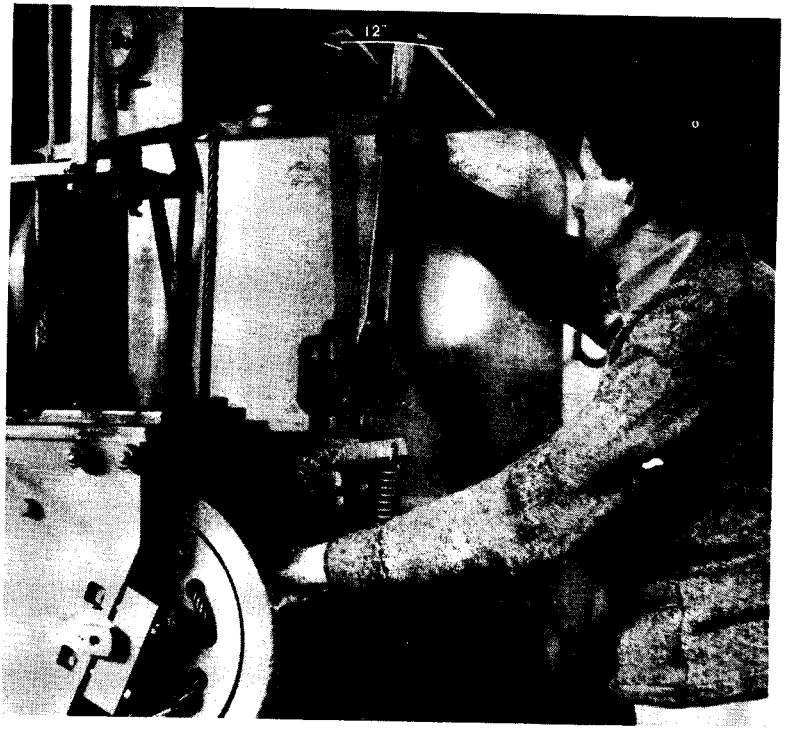
2. Move the control lever into the "lock-out" position, or the position where the brake is in the extreme released position. Leave the lever in this position.



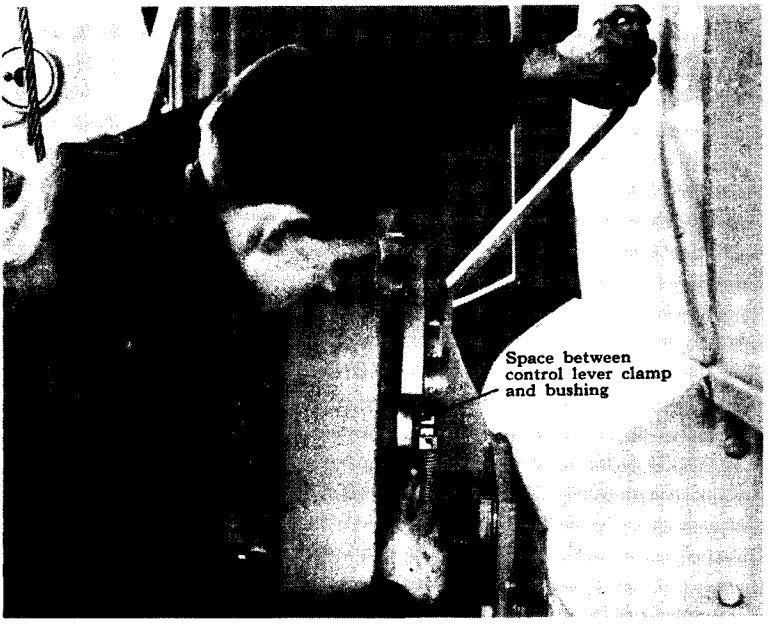
3. Turn the drum shaft with a wrench, in the direction that will move the clutch driving and driven cones together. Draw the cones together tight.



4. Insert a pry bar between the cable drum and the Power Control Unit rear plate, (front plate on front mounted units) and pry the drum assembly toward the tractor as far as it will go. Then insert the bar between the driving cone and the gear case cover plate and pry the assembly in the opposite direction about 3/16" to ¼" (Model T Units) or ⅛" to 3/16" (All Units other than the Model T).



5. Move the control lever from the lock-out position, back to a point approximately 12" past the neutral position. (This top lever distance varies slightly due to variation in the length of control levers on different models, and due to different types of work requiring slightly different adjustments of the clutch for efficient operation. However, it is recommended that this adjustment be held as close to 12" as possible.) The drum shaft will turn with the control lever in making this part of the adjustment.
6. Hold the control lever in this position and clamp the drum shaft to the Power Control Unit rear plate by tightening the clamp bolts at the rear of the drum shaft. (Neither the control lever nor the drum shaft can be allowed to turn during this operation).
7. Engage the clutch and make certain that the control lever clamp block does not touch the throw-nut bushing when the clutch is fully engaged. If the clamp block does touch the bushing, or if the brake cam on



the control lever rubs against the brake roller arm, the clamp should be released and the control lever moved farther out on the throw-nut without changing the upright position of the lever.

The above steps in the adjustment of the clutch must be made in the order given, and no steps should be eliminated. This method of making the adjustment is used almost without exception in the field, and in order to avoid trouble, we recommend that it be used exclusively. The above adjustment should not be made when the clutch is hot. If it is necessary to make the adjustment while the clutch is hot, allowance should be made for the expanded condition of the clutch cones.

BRAKE ADJUSTMENT

The brakes on LeTourneau Power Control Units usually require very little adjusting. When adjustments are required, they can be taken care of easily and quickly.

The brake mechanisms vary somewhat with the different models, and therefore the methods of making the adjustments are also different on the various models. For this reason, the different models are dealt with separately in the instructions which follow:

MODEL R POWER CONTROL UNITS

Model R Series Power Control Units whose serial numbers contain a suffix ending in the letter "C" or any letter above "C" (such as P-17219-R8C) have both a brake adjustment and a brake shaft bearing adjustment.

Model R Series units whose serial numbers contain a suffix ending either with the letters "A" or "B" or with no suffix letter do not have adjustable bearings on the brake shaft, and therefore have only the one brake adjustment.

The adjustment instructions follow:

BRAKE SHAFT BEARING ADJUSTMENT (Only on Model R Units whose serial numbers end in letter "C" or above.)

The Model R Power Control Unit brake shaft bearing adjustment is the same as the brake shaft bearing adjustment on Model T Units.

For adjustment instructions, refer to the instructions for the Model T Power Control Unit on page 38.

BRAKE ADJUSTMENT

The main brake adjustment on Model R Power Control Units is comparatively simple.

A change in this adjustment causes two things:

1. A change in the tension of the brake spring.
2. A change in the position of the brake roller against the brake cam.

Both the brake spring tension and the position of the brake roller against the brake cam are important to successful operation of the brakes, and since the two are taken care of by the same adjustment, the design is such that when the brake spring tension is correct, the position of the brake roller is also correct, and vice-versa. Briefly, the spring tension and the position of the roller against the cam affect the action of the brakes as follows:

1. If the brake spring tension is not tight enough, brake slippage may result. If the tension is greater than is actually required to prevent this slippage, more force will have to be applied by the operator in releasing the brake than would be necessary to do the work.
2. Unless the brake roller is in the correct relative position with the brake cam (at the lower end of the control lever) the brake will not properly release when the control lever is moved in the direction that moves the cam against the roller.

The method of making the adjustment follows:

(*Model R Power Control Units whose serial numbers end in Letter "C" or above.*)

To make the main brake adjustment on Model R Power Control Units whose serial numbers end with the letter "C" or any letter above "C", loosen the clamp bolt at the upper end of the brake roller arm, and move the brake roller arm either to the right or to the left, slipping it on the brake shaft, enough to cause the roller to be positioned approximately 2/3 of the way up on the brake cam when the control lever is in the neutral position. Then re-tighten the clamp bolt at the top of the brake roller arm.

When the position of the brake roller against the brake cam is correct, the brake spring tension is automatically correct.

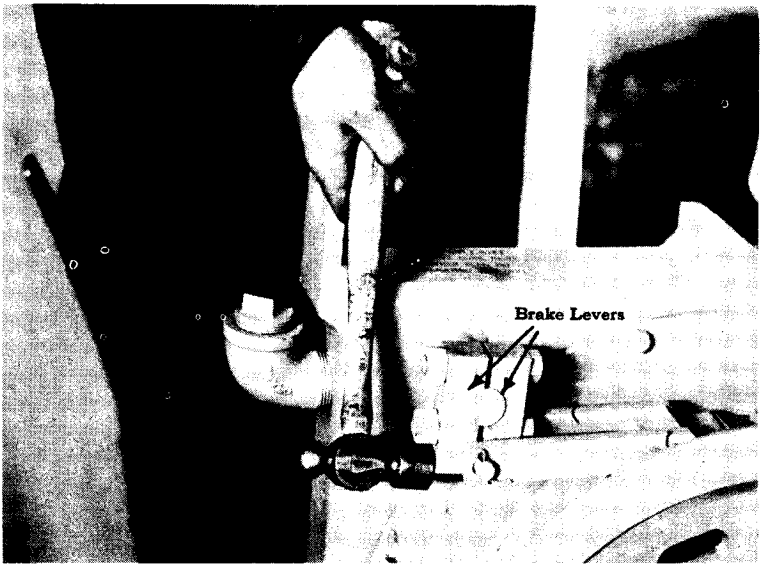
A change in the brake spring tension and in the position of the brake roller against the brake cam takes place as the brake lining wears, and it is in overcoming these changes that the adjustments are required.

(NOTE: In adjusting the brakes, the position of the control levers is changed. Therefore, the clutch adjustment is also affected, and for this reason, each brake adjustment must be followed by an adjustment of the clutch.)

(*Model R series Power Control Units whose serial numbers end with the letter "A", "B" or no suffix letter.*)

The adjustment is made by loosening the clamp bolts in the brake levers, and by slipping the brake levers on the brake shaft, turning them on the shaft in the direction that brings about the proper brake action. To increase the brake spring tension and to move the brake roller farther up on the brake cam, move the control lever into the extreme "free-spooling" or "lock-out" position. Loosen the clamp bolts enough to free the brake levers. Tap the lower end of the levers toward the brake drum with a hammer. When the levers have been moved toward the drum in a sufficient amount to bring about the correct spring tension and the correct position of the brake roller against the brake cam, tighten the clamp bolts, and then release the brake.

To decrease the spring tension and to move the brake roller down or inward on the brake cam, loosen the clamp bolts, with the control lever in the neutral position, and by tapping on the levers with a hammer, move the blocks away from the brake drum until the correct brake spring tension and correct position



of the brake roller against the brake cam is reached. Then tighten the clamp bolts.

The adjustment is correct when the brake spring is spread to a distance of approximately 15½" (new Units) not including the eyes, and when the brake roller is positioned approximately 2/3 of the way up on the cam, with the control lever in the neutral position.

A change in the spring tension and in the position of the brake roller against the brake cam takes place as the brake lining wears, and it is in overcoming these changes that adjustments are required.

(NOTE: In adjusting the brakes, the position of the control levers are changed. Therefore, the clutch adjustment is also affected, and for this reason, each brake adjustment *must be followed* by an adjustment of the clutch.)

MODEL "N" SERIES POWER CONTROL UNITS

The method of adjusting the brakes on Model N Series Power Control Units is exactly the same as on Model R Units. (Refer to the Model R brake adjusting instructions above.) On the Model N series double drum and four drum Units, the brake spring tension is correct when the spring is stretched to a distance of approximately 15½ inches (on new Units) not including the

eyes. On both the front and rear mounted single drum Units of the Model N series, this spring length should be approximately 10¼ inches, (on new Units) not including the eyes.

The brake roller is positioned approximately 2/3 of the way up from the bottom of the cam on all Model N series Units when the brakes are in the correct adjustment.

(NOTE: In adjusting the brakes, the positions of the control levers are changed. Therefore, the clutch adjustment is also affected, and for this reason, each brake adjustment *must be followed* by an adjustment of the clutch.)

MODEL T POWER CONTROL UNITS

There are three points of adjustment on the Model T Power Control Unit brakes.

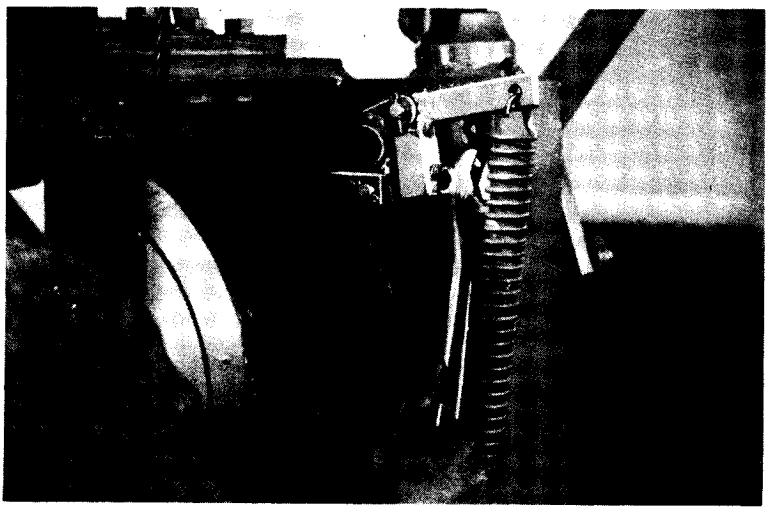
1. Brake spring tension adjustment.
2. Brake roller arm adjustment.
3. Brake roller shaft bearing adjustment.

The methods of making each of these adjustments are covered by the following instructions:

(a) BRAKE SPRING TENSION ADJUSTMENT

To increase the brake spring tension and thereby overcome brake slippage, turn the brake spring adjusting screw clockwise until the desired spring tension is obtained.

To decrease the spring tension, turn the set screw counterclockwise.



The brake spring arm is raised and lowered by turning this set screw, thereby changing the length of the spring and increasing or decreasing the spring tension.

The brake spring should be adjusted only tight enough to prevent the brake from slipping when under load, since the effort that is required by the operator in releasing the brake is increased as the brake spring tension is increased.

(The brake springs on the latest Model T Power Control Units extend vertically from the brake spring arm, while on some of the earlier Models, the spring extends out from the brake spring arm in a horizontal position. This, however, does not change the location of the adjustment set screw, nor the method of making the brake adjustment.)

(b) BRAKE ROLLER ARM ADJUSTMENT

As the brake lining wears, the brake roller arm changes its position, causing the brake roller to move farther down on the brake cam, thereby affecting the action of the roller against the cam, and causing the brake not to properly release. When this happens, the brake roller arm must be re-adjusted so that the roller is returned to its original correct position against the cam.

Three different types of brake cams have been used on Model T Power Control Units, and the position at which the brake roller should set against the cam to give the proper brake action is slightly different on each of the three cams. The drawings below show the three types of brake cams that have been used on the Model T Units, and illustrate the correct relative position of the brake roller against the cam when the control lever is in the neutral position.

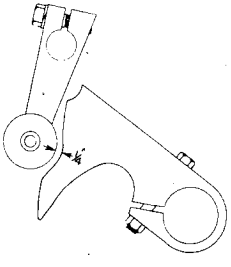


Fig. 1

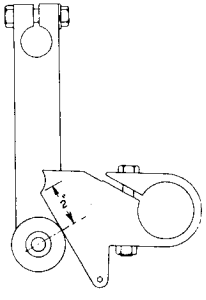


Fig. 2

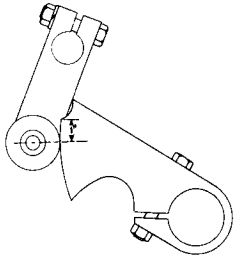


Fig. 3

Figure 1.

The brake cam illustrated in Fig. 1 is the original cam used

on Model T Power Control Units. The feature of this cam is that it provides automatic releasing of the brake as the clutch is engaged.

The brake roller arm is correctly adjusted if there is a clearance of approximately ¼" between the roller and the recess in the cam (shown in the illustration) when the cam is moved into the position shown, with the brake not under load.

Figure 2.

This brake cam replaced the cam shown in Figure 1 for use on later Model T Power Control Units.

The brake roller arm is correctly adjusted when the roller is positioned approximately 2" down from the top of the cam, as shown, when in neutral position (with the brake not under load.)

Figure 3.

The brake cam shown is now standard on Model T Power Control Units.

The roller arm is correctly adjusted when the roller is positioned approximately 1" down from the top of the cam (with the brake not under load.) One feature of this cam, however, is that the position of the roller against the cam can be varied somewhat from the position specified above, without affecting the action of the brake, thus making possible a slight repositioning of the control levers for the convenience of the operator.

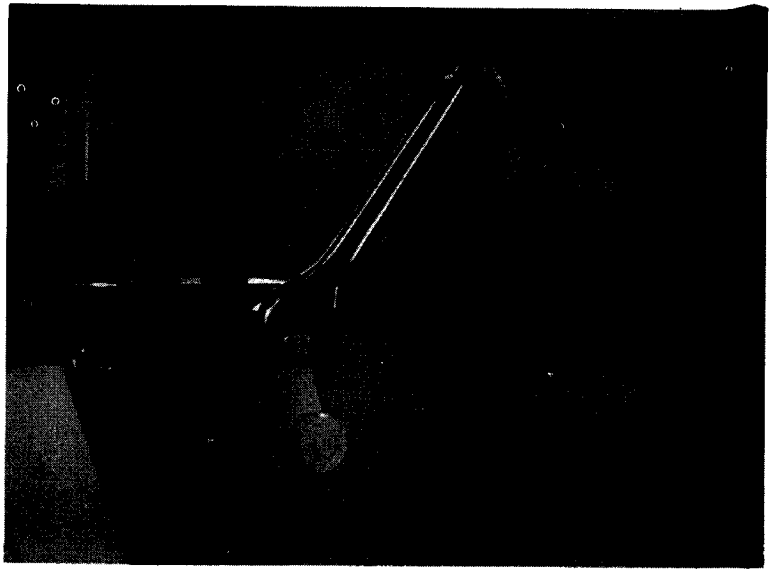
To adjust the position of the brake roller against the cam (on all Model T Power Control Units) loosen the clamp bolt at the upper end of the brake roller arm; and move the roller arm either to the left or to the right, enough to cause the roller and the cam to be in the same relative position as outlined above. Then tighten the clamp bolt, completing the adjustment.

NOTE: In making a brake roller arm adjustment, the neutral position of the control lever is changed; and therefore the clutch adjustment is also changed. For this reason, an adjustment of the clutch *must follow* each brake roller arm adjustment.

(c) BRAKE SHAFT BEARING ADJUSTMENT

The brake shaft bearing adjustment on Model T Power Control Units is provided to compensate for the wear that takes place on the bearings.

To make the adjustment, remove the cotter pin from the castellated nut at the front end of the brake shaft. Then, either



tighten or loosen the bearing adjustment by turning the castellated nut either to the right or to the left.

When the correct bearing adjustment is reached, re-insert the cotter pin, locking the adjustment.

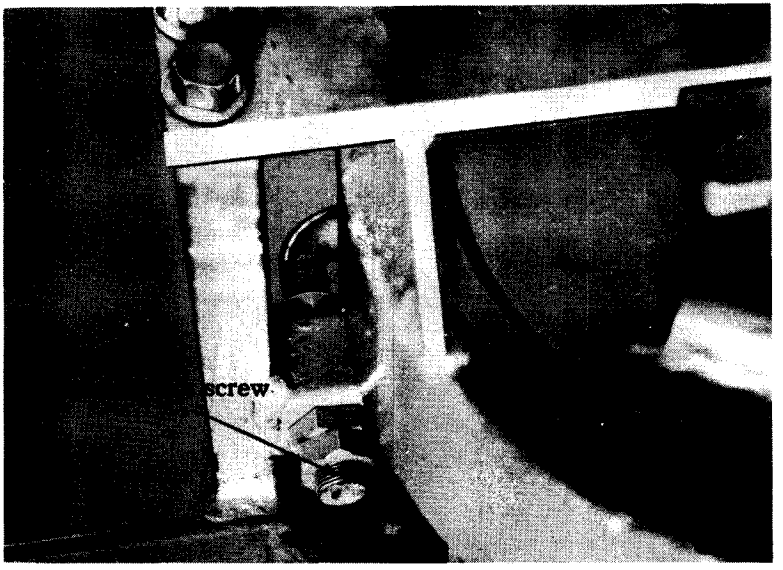
(CAUTION: This bearing adjustment must be drawn up only snug. If the adjustment is taken up too much, the bearings will be tight, and brake slippage may result.)

MODEL FTD7 POWER CONTROL UNIT

The Model FTD7 Power Control Unit brake has two points of adjustment.

1. Brake anchor screw adjustment.
2. Brake shaft bearing adjustment.

(a) The brake anchor screw adjustment controls the position of the brake roller against the brake cam, and also the tension on the brake spring. To tighten the spring tension, and to lower the roller on the cam, release the brake, with the cam in the "lock-out" position, and turn the upper lock nut farther up on the anchor screw. Then take up on the two lower lock nuts enough to cause the brake roller to move into the correct position on the brake cam. Then tighten the upper anchor screw lock nut.



To decrease the spring tension, and to raise the position of the brake roller on the brake cam, release the brake, loosen the lower lock-nuts and take up on the upper lock-nuts until the correct adjustment is reached. Then, tighten the two lower lock nuts.

The brake spring tension and the position of the roller against the cam are correctly adjusted when the brake roller is located approximately ¾" up from the "lock-out" position on the cam.

As the brake lining wears, the brake roller gradually moves up on the brake cam, and the tension on the brake spring gradually decreases. It is in overcoming these changes that the brake anchor screw adjustment is required.

(b) The brake shaft bearing adjustment is provided to compensate for the wear that takes place on the bearings.

To make the adjustment, remove the cotter pin from the castellated nut at the front end of the brake shaft. Then, either tighten or loosen the bearing adjustment by turning the castellated nut either to the right or to the left.

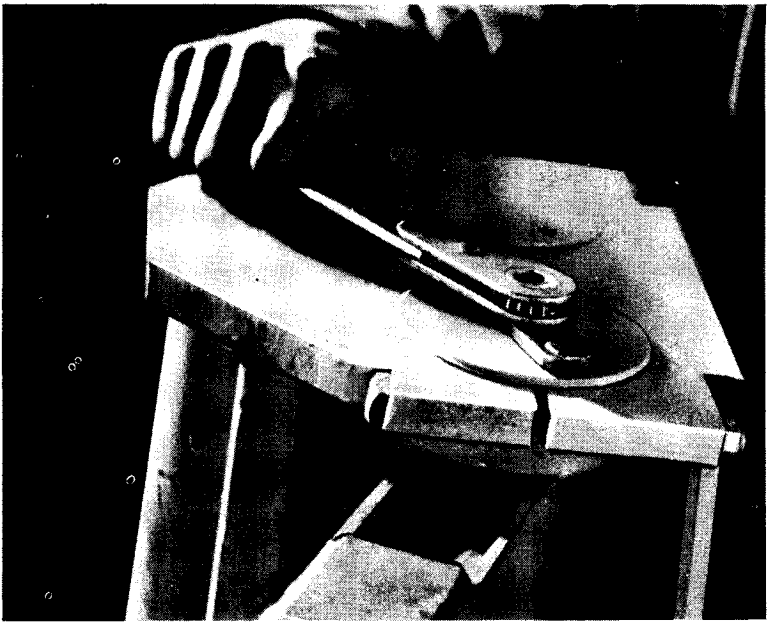
When the proper bearing adjustment is reached, reinsert the cotter pin, locking the adjustment.

(CAUTION—This bearing adjustment must be drawn up only snug. If the adjustment is taken up too much, the bearings will be tight, and brake slippage may result.)

DOUBLE DECK SHEAVE ASSEMBLY BEARING ADJUSTMENT

To tighten the adjustment on the tapered roller bearings in the double deck sheave housings, loosen the adjusting nut clamp bolts, and turn the adjusting nuts at the top of the double-decker clockwise, spreading the clamp with a chisel if necessary.

To loosen the bearing adjustment, turn the bearing adjusting nuts counter-clockwise.



To check the adjustment, pry up and down on the sheave housings with a bar. If end play, or, in other words, up and down movement of the sheave housing is evident during this operation, the bearing adjustment is loose and should be tightened.

The sheave bearings in the "double-decker" sheave housings require no adjustment.

When tightening a bearing adjusting nut, tap on the top of both the upper and lower sheave housings to make sure that the take up in the adjustment is equally divided between both the upper and lower sheave housing bearings, and not localized on any one bearing. Tighten the adjusting nut clamp bolts after the correct adjustment is reached.

These bearings are in correct adjustment when the sheave housings can be moved by hand, either to the left or the right, without being free to swing back and forth from their own weight when traveling over unlevel ground. The bearings should be slightly pre-loaded, and it is important that they be kept in the correct adjustment at all times.

LUBRICATION

The following instructions and the adjoining lubrication chart thoroughly covers the points of lubrication, the recommended lubricants, and the correct lubrication intervals.

It is important that these instructions be closely followed. The use of lighter lubricants than those recommended may result in oil or grease leakage onto the clutch and brake surfaces, resulting in clutch or brake slippage.

GEAR CASE

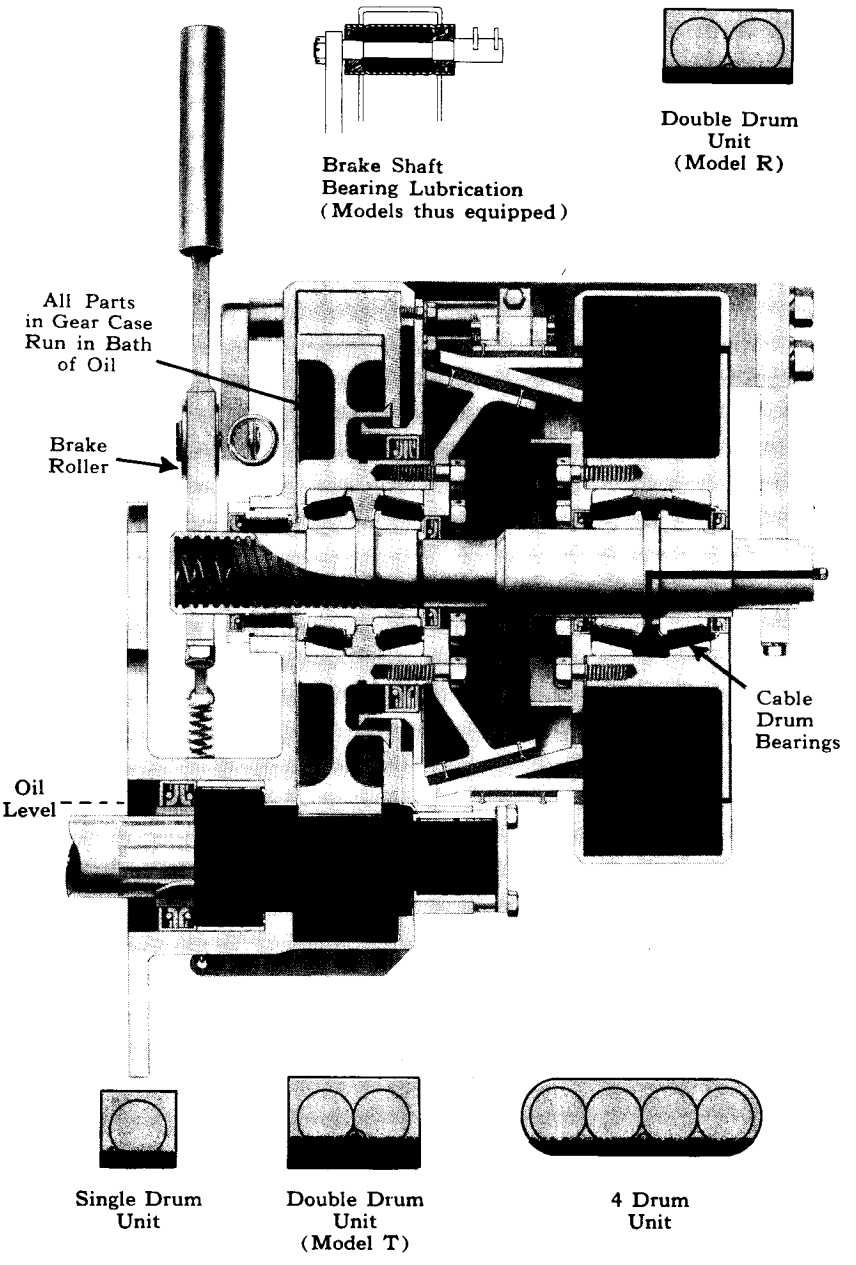
The oil level in the gear case should be kept up to the oil level plug at all times. When checking oil level, stop the Power

» LUBRICATION CHART «

LUBRICATION POINTS	RECOMMENDED LUBRICANTS
Gear Case	S.A.E. No. 90 Transmission oil.
Cable Drum Bearings (for use with grease gun)	A short fibre grease of a consistency suitable for use with a grease gun.
Cable Drum Bearings (for hand-packing)	A short fibre grease of a consistency suitable for hand-packing.
Brake Roller Shaft Bearings	A short fibre grease of a consistency suitable for hand-packing.
Brake Roller	Light weight lubricating oil.
Double-Deck Sheave Bearings	Chassis lubricant (medium).
Double-Deck Sheave Housing Tapered Roller Bearings	Chassis lubricant (medium).

The above recommendations are for normal operating temperatures. Slightly heavier lubricants should be used in extreme heat and lighter lubricants used in extreme cold.

(For detailed specifications, instructions, etc., refer to accompanying discussion on lubrication.)



LUBRICATION DIAGRAM

Control Unit by disengaging tractor flywheel clutch (rear Power Control Units) or stopping engine (front Power Control Units) and allow oil to settle a few minutes before removing oil level plug. A complete change of the oil in the gear case should be made with each 1000 hours of operation.

An S.A.E. No. 90 Transmission oil is recommended for use in the gear case. A slightly lighter weight oil may be used when operating in extremely cold weather.

NOTE: Make certain that the breather hole in the oil fill plug is kept open at all times.

CABLE DRUM BEARINGS

The bearings in the cable drums receive lubrication through the rifle drilled grease duct in the end of each drum shaft.

To fill the grease chamber inside the cable drum (from which these bearings receive lubrication) remove the brass plug from the end of the drum shaft, insert a straight zerk fitting in the end of the shaft, and inject the desired amount of the recommended grease with a conventional pressure grease gun. Then remove the grease fitting and re-insert the brass plug in the end of the drum-shaft.

The grease chamber in the cable drum is packed about 2/3 full of grease before a unit leaves the factory. This grease should be removed at the end of each year of operation, and the cable drum again hand packed about 2/3 full of recommended grease. There should normally be no leakage of this grease around the drum shaft oil seals. However, if the grease chamber in the cable drum is filled more than 2/3 full of grease, a pressure will be built up inside the drum from the heat that is developed through operation, and grease will be forced out around the seals. In this case, more grease should not be added. If the cable drum is not over 2/3 full and the seals leak, this leakage may be caused by overheating of the leather in the oil seals, and in this case, a few shots of grease should be added to replace that which was lost, and new oil seals installed as soon as is convenient.

The recommended lubricants for use in the cable drums are as follows:

For Hand Packing

A high quality or short fibre grease made with a sodium soap having an ASTM worked penetration of 250 to 325, a minimum ASTM Dropping point of 325 and which is suitable for hand packing of roller bearings. It must be free from any fillers, grit or other harmful impurities. Slightly heavier greases are recom-

mended for operation in extreme heat, and lighter greases for operation in extreme cold.

For Use With Grease Gun

A high quality grease made with a sodium soap base and of a consistency suitable for application with a conventional pressure grease gun. It must be free from any fillers, grit or other harmful impurities. A slightly lighter grease should be used when operating in extreme cold than that used in extreme heat.

BRAKE ROLLER SHAFT BEARINGS

(On All Models Thus Equipped)

The brake roller shaft bearings on all models thus equipped are packed in grease in assembly at the factory, and this grease should seldom require adding to or replacing, unless a bearing is replaced and during the process some of the grease is lost.

A high quality smooth or short fibre grease made with a sodium soap base and of a consistency suitable for hand packing should be used. It must be free from any fillers, grit, or other harmful impurities.

A slightly heavier grease should be used when operating in extreme heat than when operating in extreme cold.

BRAKE ROLLER LUBRICATION

The brake roller should be lubricated with a few drops of light weight oil from an oil can at the end of each operating shift. This will make for easy turning of the brake roller on the brake roller arm, which, of course, will add to the ease of operation.

DOUBLE DECK SHEAVE BEARINGS

All double-deck sheave bearings receive lubrication through the Zerk fittings in the end of the sheave pins. The sheave pins are drilled, and these grease ducts carry the lubricant up to the bearings.

One or two shots of a high quality grease, which is suitable for use in roller bearings and which can be applied with a conventional pressure grease gun, should be inserted at the end of each operating shift. This grease must be free from any fillers, grit or other harmful impurities.

A slightly heavier grease should be used when operating in extreme heat than that which is used in extreme cold.

A small amount of grease will be forced out around the dust seals when grease is inserted, thereby forcing out dirt or

dust that may have worked itself into the sheave bearings. Care should be exercised to see that this excess grease does not drop onto the clutch or brake surfaces.

DOUBLE-DECK SHEAVE HOUSING TAPERED ROLLER BEARINGS

The double-deck sheave housing tapered roller bearings receive lubrication through the Zerk angled grease fittings at the top and bottom of each sheave housing.

Insert one or two shots of the same grease that is used in the sheave bearings (recommendations on page 43) at the end of each operating shift. Care should be exercised to see that any excess lubricant which might be forced out around the bearings does not drop onto the clutch or brake surfaces.

CABLE LUBRICATION

Many users of cable controlled equipment lubricate the cable (wire rope) in order to obtain maximum cable life.

Cable lubrication is recommended, and will normally increase cable life and reduce cable costs. However, unless the cable is properly lubricated with the correct type of lubricant, the increased cable life may be more than nullified by the loss in efficiency of operation.

When lubricating the cable, use any good grade of cable coating which will not run under operating conditions.

This lubricant should not be applied to the end of the cable which wraps around the cable drum, but should be applied at the point where the cable passes over sheave wheels on the equipment which is being operated by the Power Control Unit.

If lubricant is placed on the portion of the cable which wraps around the cable drum, this lubricant may be carried onto the brake and clutch surfaces, causing brake and clutch slippage.

If light weight lubricant is used, it may run down the cable and reach the portion of the cable which wraps around the cable drum and result in the trouble that is mentioned above.

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:

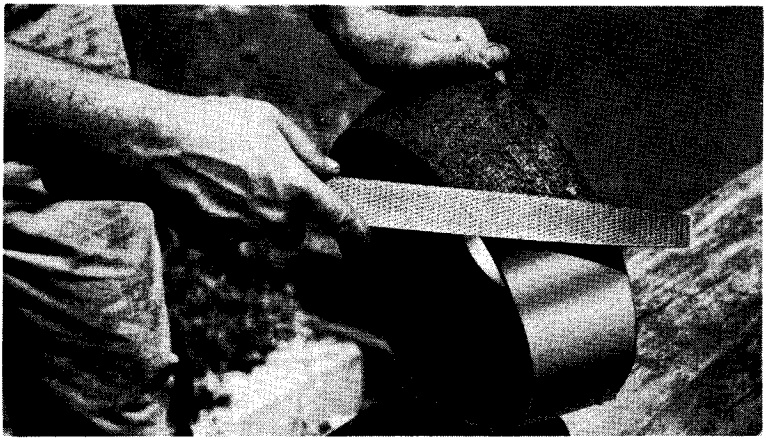
The clutch and brake facings usually require very little attention after having been properly installed. There are, however, a few things that can be done to the facings under certain conditions which help the operation of the Power Control Unit. There are also other practices which are sometimes resorted 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 burned out of the facing by pouring naphtha, or gasoline onto the facing; and, with the cable drum blocked to keep it from turning, slipping the clutch until the lining overheats. The oil will usually disappear after a few minutes of this overheating of the facing.

If the facing appears glazed after the oil has been burned out, roughen the surface of the facing with a rasp or wire brush.

Facings which have not been oil soaked sometimes become glazed after they have become worn, and in a case of this kind, the surface of the facings may also be roughened with a rasp or wire brush 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, pour a small amount of light weight oil, such as fuel oil, 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. Fabric brake facings should not be used with the metallic clutch facings, nor metallic brake facings with fabric clutch facings. This is due to the fact that the one type of facing requires lubrication, while the other must not be lubricated; and it is practically impossible to apply lubricant to either the clutch or brake facing without the oil leaking onto the other also.)

If either the clutch or brake should overheat during operation, do not pour cold water onto the facings to cool them off. 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.

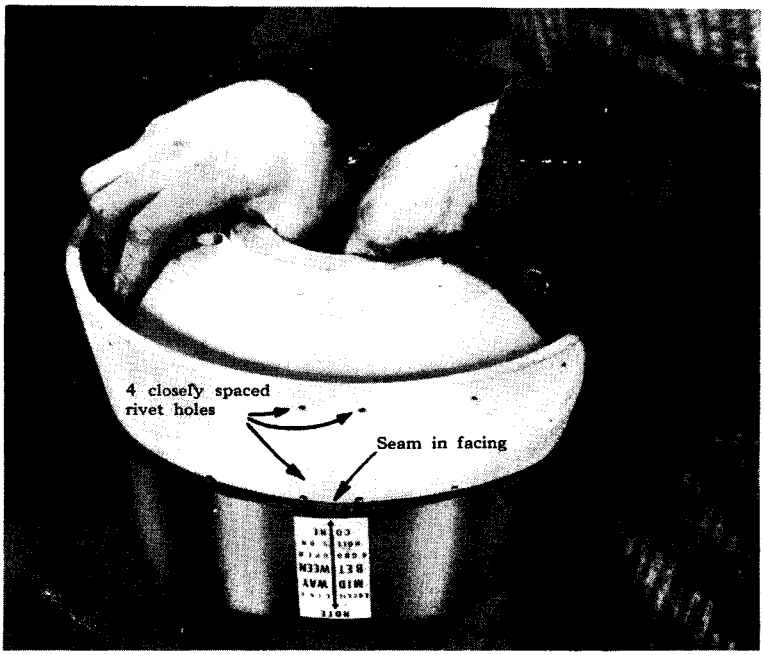
RELINING CLUTCH DRIVING CONES

(a) WOVEN CLUTCH FACINGS:

It is difficult to properly install woven clutch facings on clutch driving cones without the use of special tools. For this reason, it is recommended that wherever possible the worn lined cones should be traded in to the distributor on new cones which were lined at the factory. (Most United States distributors offer this exchange service to their customers.)

However, woven facings can be installed on driving cones in a shop or in the field with fairly satisfactory results, if the proper steps are taken.

To install a new facing on a driving cone, remove the cone from the Power Control Unit. (Refer to disassembly instructions.) 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. 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 2/3 the thickness of the facing, using a 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.

After installing a newly lined cone in a Power Control Unit, burn the high spots off the facing by blocking the cable drum and slipping the clutch for a few minutes.

(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.

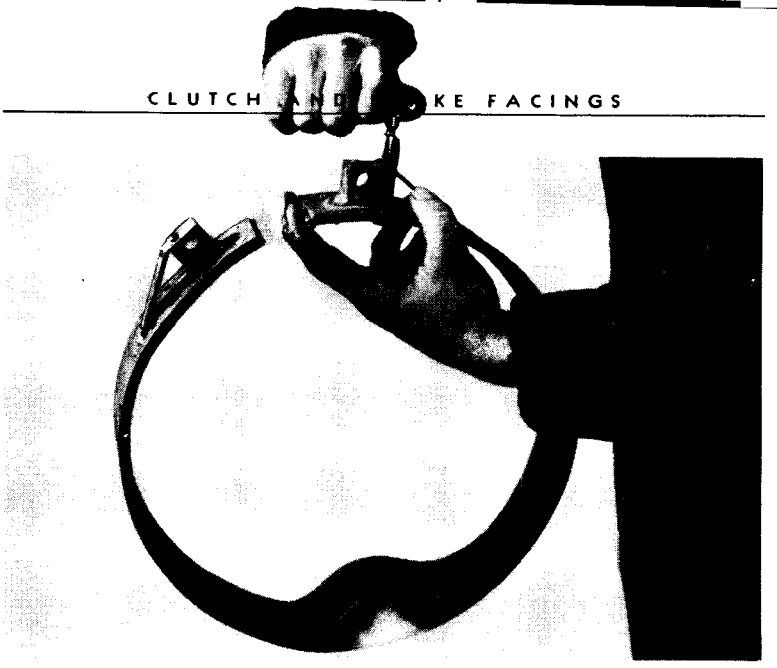
If possible, the newly lined cones should be placed in a lathe and any high spots or irregularities in the thickness of the different segments machined off. (The facings should be machined to a 15° taper.) This is always done on cones which are lined at the factory, and for this reason, many have found it advisable to trade their worn lined cones in to the distributor for new lined cones, wherever this is possible. (If in the United States ask your LeTourneau Distributor about the "Exchange Plan" on lined clutch cones.)

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 a woven lining, first remove the brake band from the Power Control Unit. (Refer to disassembly instructions.) 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 ¼ inch 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 ½ and not more than 2/3 the thickness of the lining to provide for the heads of the rivets. Use a ⅜" counterbore. Then install the rivets, cinching them down very tight.

In localities where LeTourneau distributors offer an exchange on lined brake bands, many prefer to trade their worn bands in on new ones which were lined at the factory, rather than making the installation themselves.

(b) METALLIC LINING

To reline a brake band with metallic lining, first remove the brake band from the Power Control Unit. (Refer to disassembly instructions). 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.

Many distributors in the United States have an exchange plan, whereby the worn lined bands can be traded in on new brake bands which were lined at the factory.

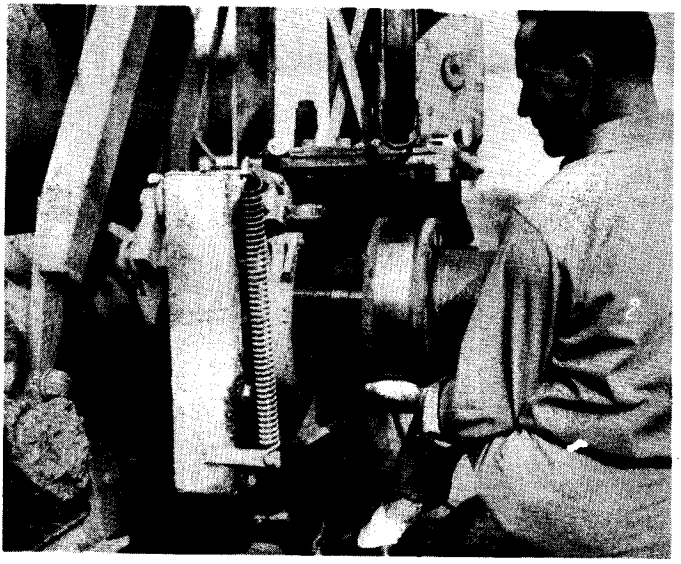
DISASSEMBLING A POWER CONTROL UNIT

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 in this disassembly and in building the Unit back up 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 method of removing and disassembling each assembly or group of related parts separately, in order to explain the quickest and easiest method of removing each individual part.

REMOVING A CABLE DRUM, DRIVEN CONE. DRUM SHAFT, CLUTCH RELEASE SPRING, AND CABLE DRUM BEARINGS, OIL SEALS, AND BEARING ADJUSTING SHIMS: (DRUM ASSEMBLY)

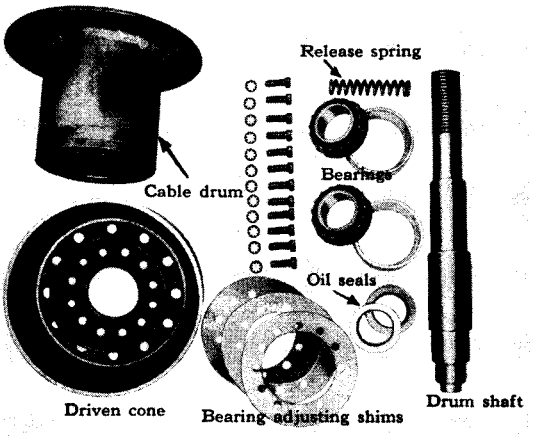
To remove the above assembly of parts, or any one of the parts which make up this assembly, follow the procedure below:

1. The drum assembly may be removed with the Power Control Unit, either installed on the tractor, or with the Unit unmounted. Unless other parts are to be removed which require the removal of the Power Control from the tractor, this disassembly is usually done without removing the Power Control Unit.
2. Loosen the drum shaft clamp, and remove the Power Control Unit rear plate (front plate on front Units) and cable guards as one Unit.
3. Remove the brake band.
4. Turn end of drum shaft with a wrench, unscrewing shaft out of clutch throw-nut. Support cable drum during this operation, holding it as nearly level as possible, in or-



der to prevent the threads on the end of drum shaft from cutting into the leather in the oil seal that is in the hub of the driving cone. We recommend that the oil seal be replaced with a new seal each time that the drum shaft is removed. However, if no other oil seal is available, making it impossible to install a new seal, the above precaution should be taken. After the end of the shaft has passed through the oil seal, lower the drum assembly to the floor or bench.

5. Dismantle the drum assembly by first removing the clutch release spring from the end of the drum shaft.
6. Remove capscrews that secure driven cone to cable drum.
7. Slip driven cone off drum shaft, being careful not to damage leather in oil seal, if oil seal is to be used again.
8. Remove shims. If making bearing adjustment, remove only the amount of shims that will be required to bring the bearings into the correct adjustment. (Refer to cable drum bearing adjustment instructions.)
9. If bearings or drum shaft are to be removed, press or drive against rear end of the drum shaft, forcing bearing cup out of the front of cable drum, and thereby making possible the removal of the drum shaft and bearing cones.

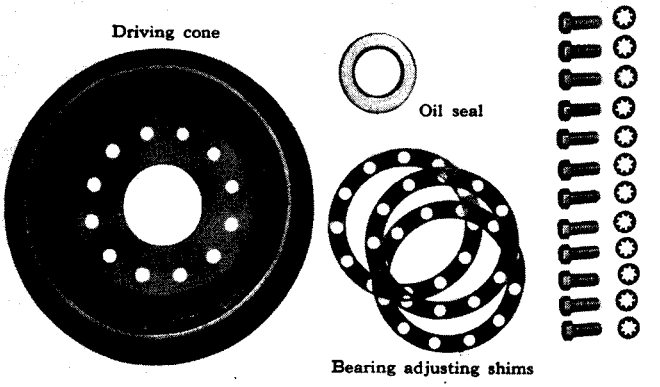


10. Then remove remaining bearing cup.
11. Press or drive bearing cones off drum shaft.
12. Remove oil seal from rear of cable drum.

REMOVING DRIVING CONE, DRIVING CONE OIL SEAL, AND MAIN GEAR BEARING ADJUSTING SHIMS

The driving cone, driving cone oil seal, and main gear bearing adjusting shims may be removed without removing the Power Control Unit from the tractor.

1. Remove drum assembly from Power Control Unit, as described above.



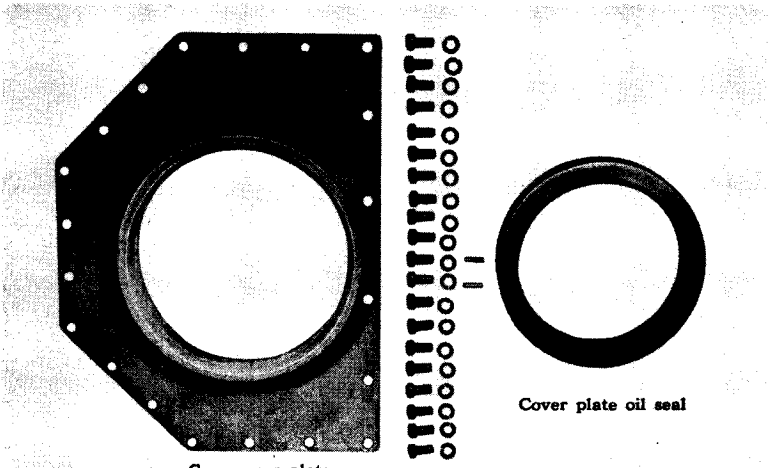
2. Remove the capscrews which secure the driving cone to the hub of the main gear, and then remove the cone.
3. Remove oil seal from hub of driving cone.
4. Remove gear bearing adjusting shims. If a bearing adjustment is being made, remove only the amount of shims that are required to bring the bearings into correct adjustment. (Refer to main gear bearing adjustment instructions.)

REMOVING COVER PLATE AND OIL SEAL

The cover plate and cover plate oil seal may be removed without removing the Power Control Unit from the tractor.

1. Remove drum assembly and driving cone as previously described.
2. Remove capscrews which secure cover plate to gear case.
3. If necessary, break cover plate loose from dowel pins by prying between cover plate and gear case.
4. Move cover plate away from gear case, sliding the cover plate oil seal off hub of the main gear.
5. Remove oil seal from cover plate.

NOTE: We recommend that this oil seal never be used a second time. When reassembling use a new oil seal if possible.



Case cover plate

Cover plate oil seal

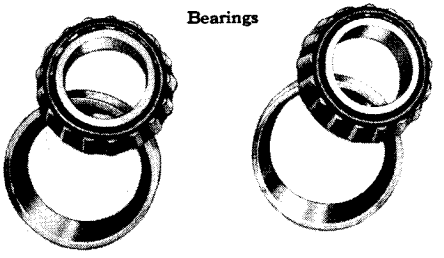
REMOVING CLUTCH THROW NUT AND MAIN GEAR BEARINGS

The clutch throw nut and main gear bearings may be removed from rear mounted Power Control Units without removing the Unit from the tractor. On front Power Control Units, it is usually easier to take these parts from the Unit by first removing the Power Control Unit from the tractor.

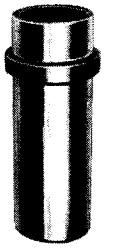
1. Remove drum assembly, driving cone, and case cover plate as previously described.
2. Remove control lever from end of clutch throw-nut.
3. Remove clutch throw nut from hub of main gear as follows:

   Unless the main gear bearing cups are seated exceptionally tight in the hub of the gear, the clutch throw-nut can be removed by prying against the end of the throw nut around which the control lever was clamped. If the bearings are seated exceptionally tight in the gear hub, it may be necessary to place a block against the end of the throw nut and drive against the block with a sledge, to free the bearing cup from the gear. If the Power Control Unit is a rear mounted unit, and this part of the disassembly is being done without removing the Unit from tractor, it may be necessary to follow the procedure below to free the bearings from the gear hub.

   Move the main gear as far to the rear in the gear case as possible, and, with a block inserted between the front end of the throw-nut and the rear of the tractor, drive against the gear from the rear. In order to not mar the



Bearings



Clutch throw-nut

face of the gear hub, a block should be placed against the hub to drive against, or a punch should be used to drive against the body or center portion of the gear, next to the hub.

One bearing cup will be forced out of the gear with the clutch throw nut and bearing cones by this operation.

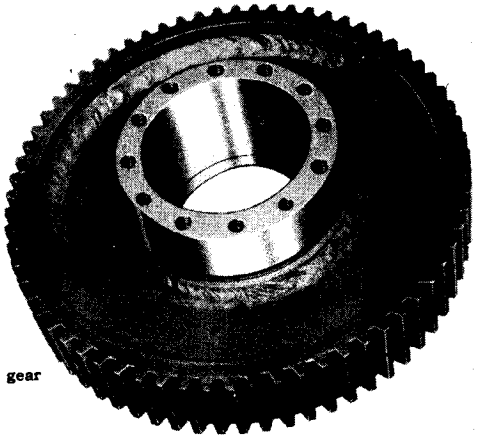
4. Remove the remaining bearing cup from the gear.
5. Drive or press the two bearing cones off the clutch throw nut.

REMOVING A MAIN GEAR

To remove a main gear from a Power Control Unit, it is usually necessary to first remove the Power Control Unit from the tractor.

Remove the drum assembly, driving cone, case cover plate, and clutch throw nut. Then remove the pinion. (Explained below). On Model T Power Control Units, remove the neck from the gear case.

Then lift the gear out through the opening in the rear of the case.



Main gear

REMOVING P.C.U. PINION, BEARINGS, ADJUSTING NUT, OIL SEAL, ETC.

(Only on Model "R" Series Units having helical gears.)

To remove the pinion, pinion bearings, adjusting nut, lock nut, oil seal, etc., from Model "R" Series Power Control Units having helical gears and pinions (models whose serial numbers are in or above the 26,000 series), follow the procedure outlined:

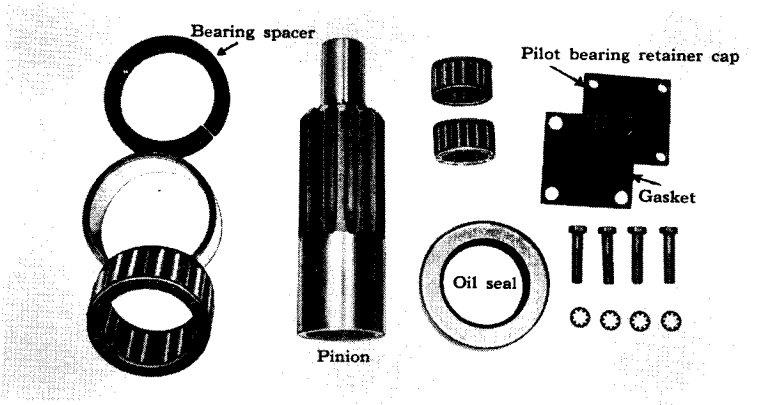
1. Remove Power Control Unit from tractor.
2. Back off capscrews in bearing adjustment lock nut, and then turn lock nut and adjusting nut counter-clockwise, off the pinion threads.
3. Remove oil seal collar. (Tapped holes are provided in collar to be of assistance in pulling collar off over end of pinion). Also remove oil seal.
4. Remove pinion pilot bearing cap by removing capscrews.
5. Remove pilot bearings from end of pinion.
6. Press or drive pinion approximately ¼" to rear, toward pilot bearing end of unit. (Pinion will strike against case when moved ¼" to rear and cannot be moved further.) Then move pinion ¼" forward, into the original position. This will cause the outer bearing cone to be moved far enough away from the bearing cup to make it possible to easily hook the cone with a bearing puller.
7. Pull outer bearing cone off end of pinion.
8. Remove outer bearing cup from pinion bore, using bearing puller.
9. Using screw driver or similar tool, reach into pinion bore and raise snap ring up out of recess into which it seats.
10. With snap ring raised out of recess in bore, drive against pilot end of pinion, thereby forcing snap ring a short distance away from recess. Then reach into bore and remove snap ring.
11. Pull inner bearing cup out of bore. (Be careful not to mar cup or bore.)
12. Remove pinion from bore, and then pull remaining bearing cone off end of pinion.

REMOVING PCU PINION, PINION RETAINER CAP, GASKET, BEARINGS, AND OIL SEAL

(All Models excepting Model "R" Series Units having helical gears and Model "T" Units).

To remove a pinion from a Power Control Unit (Excepting Model "R" Units having helical gears and Model "T" Units) remove the Power Control Unit from the tractor and slide the spline shaft out of the pinion.

Continue by removing the four capscrews from the pilot



bearing retainer cap, and then remove the cap and gasket. Drive against the pilot end of the pinion, forcing the pinion out of the Power Control Unit case.

Then remove the double oil seal, bearings, etc. The pilot bearing bushing is pressed into the Power Control Unit case in assembly, and it is therefore necessary to force the bushing out if it is to be removed.

REMOVING ADAPTOR NECK FROM POWER CONTROL UNIT GEAR CASE

(Model T PCU's Only)

To remove the adaptor neck from a Power Control Unit gear case, first remove the Power Control Unit from the tractor.

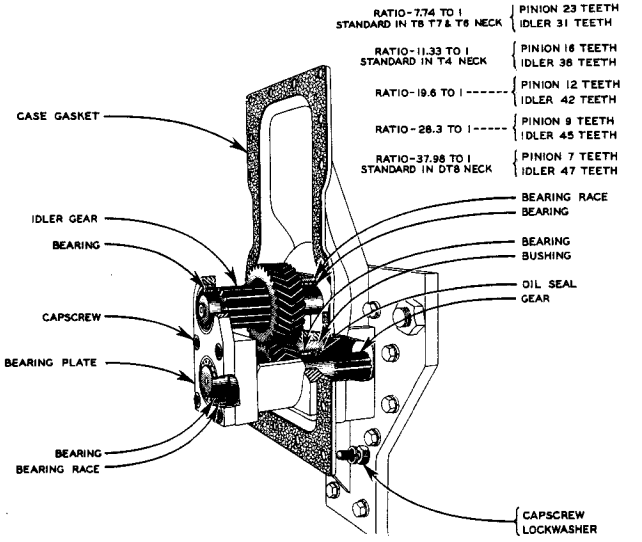
Then remove capscrews which secure the neck to the gear case, and lower the neck enough to allow the bearing retainer plate at the rear end of the pinion and idler gear to pass under the Power Control Unit main gears. Then remove the neck from the gear case.

DISASSEMBLING A POWER CONTROL UNIT ADAPTOR NECK

(Model T PCU's Only)

To disassemble a Model T Power Control Unit Neck, first remove the neck from the gear case. Then proceed with the disassembly by removing the four capscrews which secure the bearing retainer plate to the neck.

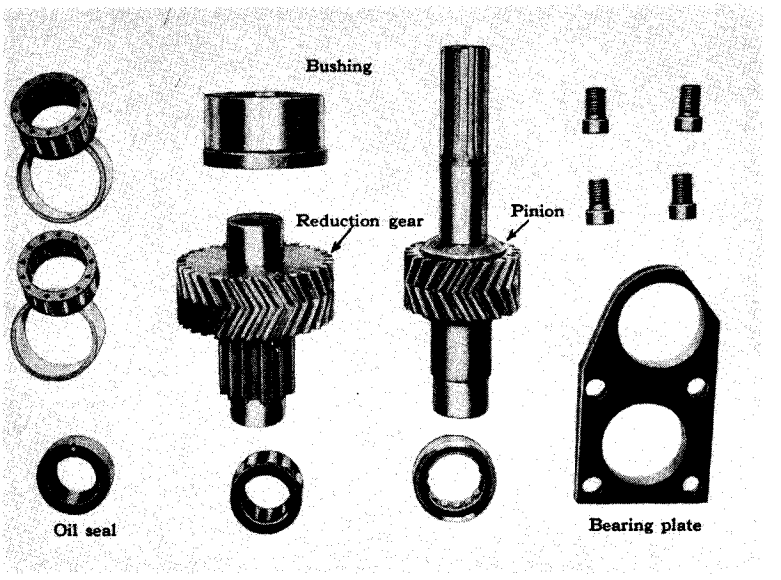
Then remove the bearing retainer plate. Slide pinion and idler gear to the rear far enough to allow the idler gear to be removed.



Model T Neck

Drive against the rear end of pinion, forcing pinion, bushing, bearing and oil seal out through the hole in the face plate.

Then remove bearing, oil seal, and bushing from pinion, and remove bearings and bearing races from neck.

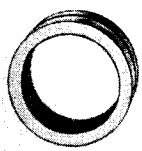


REMOVING CLUTCH THROW NUT BUSHING, BEARING AND OIL SEAL

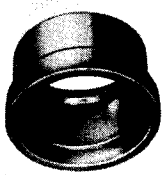
To remove the clutch throw nut bushing, bearing, and oil seal from a Power Control Unit, first remove the drum assembly, driving cone, case cover plate, clutch throw nut, and main gear.

Then force the bushing out of the gear case. (This bushing is pressed into the gear case during assembly, and a considerable amount of force may be required in removing. The bushings in Model T Units are not hardened, and therefore caution should be used in removal, if they are to be used again.)

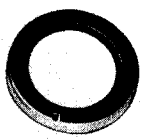
Then remove the bearing and oil seal from the bushing.



Bearing



Throw-nut bushing



Oil seal

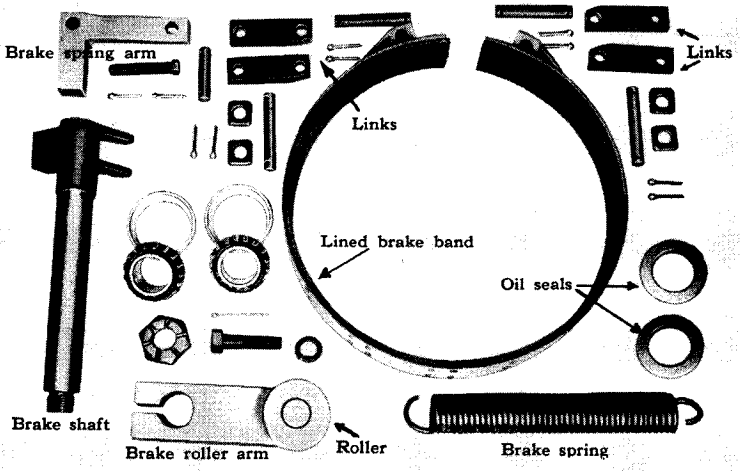
REMOVING THE BRAKE ASSEMBLY

Remove the parts which make up the brake assembly in following order:

First remove the brake spring. Remove brake band and linkage. Then remove brake roller arm and brake shaft as follows:

MODELS WITH ROLLER BEARINGS ON BRAKE SHAFT

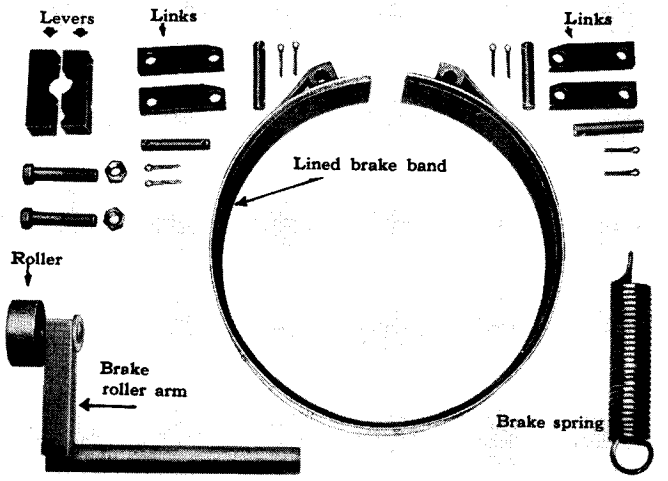
Remove the cotter pin from castellated nut, and then remove the nut. Loosen the brake roller arm clamp screw, and remove brake roller arm from the brake shaft. Then drive brake shaft out through back of gear case. One bearing cone will come out with shaft. Remove the dust seals, bearing cups, and remaining bearing cone from gear case.



(NOTE: These bearings are packed in grease, and when re-assembling, it should be made certain that the bearing tube is filled with the recommended lubricant. Refer to lubrication instructions.)

MODELS WITHOUT ROLLER BEARINGS ON BRAKE SHAFT

Remove clamp blocks from the end of the brake shaft, and then slide brake shaft out of gear case.

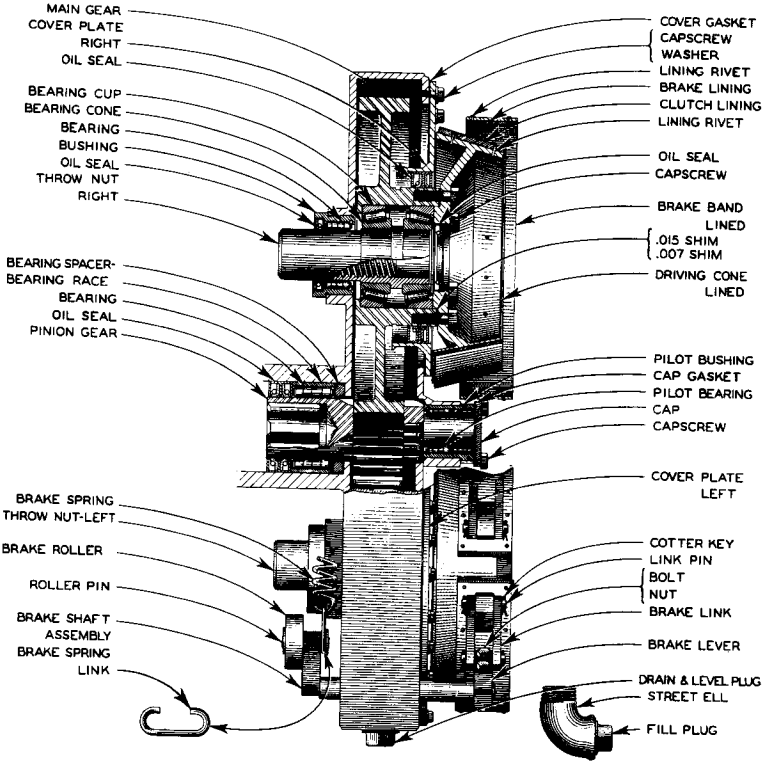


ASSEMBLING A POWER CONTROL UNIT

The procedure for assembling a Power Control Unit is simply the reverse of that for disassembling a Power Control Unit. (Refer to Disassembling Instructions.)

However, in assembling a Unit, the following precautions should be taken:

1. Install new oil seals each time that the Unit is assembled.
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, around the inner circumference of the seal, thus working the leather.
3. Use shim stock, if necessary, as a guide to prevent damaging leather or turning it backwards when installing oil seals.
4. Make certain that oil seals with double leather are in-



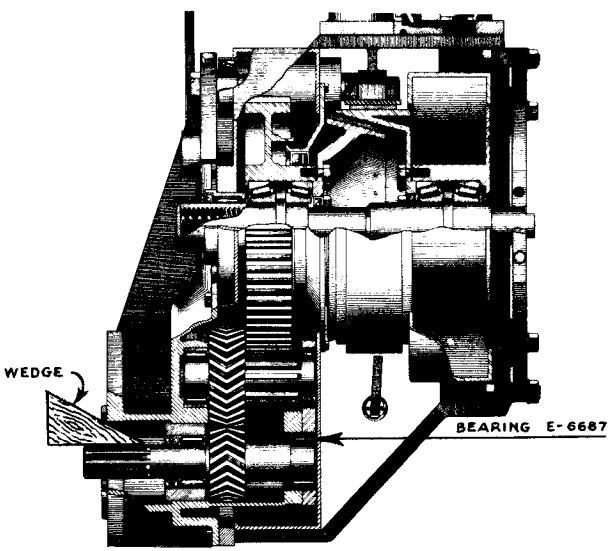
stalled with heavy leather turned toward oil compartment.

5. Install gaskets wherever gaskets were removed in disassembly.
6. Replace all working parts that are worn excessively.
7. Examine bearings before re-installing. Use none that might have become brinnelled or excessively worn.
8. Replace bearing cups when replacing bearing cones, and vice-versa.
9. Wire the heads of capscrews together wherever capscrews were found to be wired during disassembly.
10. Install lockwashers in all positions where lockwashers were removed.
11. Clutch throw-nuts and drum shafts come with either left or right hand threads. Make certain that the correct drum shaft and throw-nut are installed when assembling. In all rear single drum Power Control Units, the drum shaft and throw-nut have a right hand thread. In all front single drum Power Control Units, the drum shaft and throw nut have a left hand thread. In rear double-drum Units, the left hand drum shaft and throw-nut have a left hand thread; and the right shaft and throw-nut have a right hand thread.

    In four drum Units, the drum shafts and throw-nuts are threaded as follows—left, right, left and then right—reading from the left drum to the right.

    (A right hand thread is the type normally used, such as on bolts, nuts, capscrews, etc.)
12. When installing a pinion, do not force pinion into pilot bearings. It can usually be installed without difficulty by rotating the pinion while installing.
13. Expand main gear bearings by heating in hot oil, if possible, and press onto clutch throw nut while still in this hot, expanded condition.
14. Keep all parts clean and free from foreign particles during assembly.
15. Check main gear bearing adjustment during assembly—don't wait until Unit is completely assembled and then tear down again. This adjustment can be checked after the driving cone has been installed on the gear. (Refer to Main Gear Bearing adjustment instructions.)

16. Fill cable drum approximately 2/3 full of the recommended grease when assembling. Do not fill over 2/3 full or grease leakage may result. (Refer to lubrication instructions.)
17. When installing clutch driving cone on main gear, it is advisible to insert two ½" stud bolts in opposite capscrew holes in the gear hub, to serve similar to dowel pins, over which to slide the driving cone, 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.
18. When attaching a Model T Power Control Unit neck assembly to the main case assembly, provisions must be made to prevent the roller bearing, number E-6687, from falling out of place. 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 as shown in the illustration. This wedge puts a load on the bearing and holds it in place. After the neck is assembled, the bearing thrust is taken by the case which holds the bearing in place, and the wedge can be removed. (It will be necessary to install the spline shaft on the pinion and wedge against it on long neck structures where the pinion does not protrude.)



MOUNTING INSTRUCTIONS

MOUNTING REAR POWER CONTROL UNITS

The installation of a rear Power Control Unit on a tractor is comparatively simple, and requires few instructions.

To mount a rear Power Control Unit on a tractor, first remove the cover plate from the rear of the tractor transmission case. If the Power Control Unit is to be mounted on a "Caterpillar" D4 Tractor, drain enough oil out of the transmission case to lower the oil level below the cover plate before removing. This oil draining is not required on "Caterpillar" D6, D7 and D8 tractors, since the oil level is ordinarily below the cover plate in these models.

Proceed with the installation by testing spline shaft as follows: (It is necessary to test the spline shaft length because of variation in the relative position of tractor upper transmission shafts, due to adjustment, etc.)

Insert the Power Control Unit spline shaft through the rear of the tractor transmission case, and over the end of the upper transmission shaft, as far as it will go. Place a mark on the spline shaft, flush with the outside of the transmission case. Then pull the shaft out of the tractor and slip the other end onto the pinion in the neck of the Power Control Unit, as far as it will go. Place another mark on the spline shaft, flush with the Power Control Unit face plate. (Not flush with the boss ring.) This mark should overlap the first mark on the spline shaft approximately ⅛" to ¼", to allow for end play of both the Power Control Unit pinion and the transmission shaft. If these marks do not overlap, the spline shaft is too long, and the Power Control Unit should not be mounted without this being corrected, by cutting the required amount off of the male end of the shaft. (On Model T Power Control Units, grind the required amount off the end of the pinion.)

After checking the spline shaft, insert the stud bolts in the rear of the tractor transmission case. (It will be necessary to remove the plugs from the two lower holes before inserting studs.) Install the face plate gasket over the stud bolts. Then, with the spline shaft in place, raise the Power Control Unit into position on the rear of the tractor, slipping the front end of the spline shaft over the tractor upper transmission shaft as the Unit is drawn up against the transmission case. Complete the installation by installing the capscrews, hex nuts, and lockwashers

which secure the Power Control Unit to the tractor. If the Power Control Unit is one of the models that has reinforcing legs extending down to the drawbar bracket, insert the number of shims that are required to fill the space between the top plate of the bracket and the bottom of the legs, and install the mounting bolts. (Make certain that the drawbar bracket is bolted tight to the rear of the tractor before inserting the shims.) If the Unit is mounted on a "Caterpillar" D4 tractor, fill the transmission with oil up to the oil level plug. *Remove the cork from the breather hole in the oil fill plug.*

NOTE: In mounting rear Power Control Units on the latest "Caterpillar" D7 tractors, copper washers are used in place of lock-washers on the two stud-bolts which are the lowest in the bolt circle. This prevents oil seepage around the stud bolts. These two copper washers, one for each stud-bolt, are supplied in the package of mounting bolts. Lockwashers are used with the two bottom face-plate capscrews since the capscrews enter blind holes in the rear of the tractor transmission case.

MOUNTING FRONT POWER CONTROL UNITS

(Not Including Model FTD7)

The following instructions apply to all LeTourneau front Power Control Units (that employ the use of the clutch engaging screw) excepting the Model FTD7.

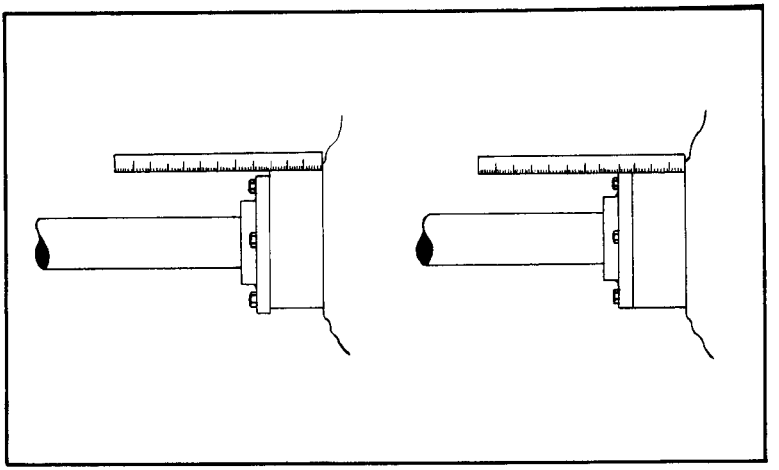
To mount a Power Control Unit on the front of a tractor, follow these instructions:

1. If tractor is equipped with crank-case guard, lower front end of guard.
2. Remove radiator from tractor.
3. Remove capscrews from crankshaft pulley. ("Caterpillar" D4 and D8 Tractors, only.)
4. Install spline shaft on crankshaft pulley (D4 and D8) or gear, (D6 and old D7) sliding end of shaft over the splines on center of pulley.
5. Slip grease retainer over the spline shaft, and secure in position by inserting the grease retainer capscrews. (Excepting on "Caterpillar" D4 Tractors.)

   The grease retainer for the "Caterpillar" D8 Tractor consists of one felt ring and two steel rings which fit over the spline shaft and into the pulley.

   The grease retainer for the "Caterpillar" D6 and the old D7 Tractors consist of a gasket and a round retainer

plate with a grease seal pressed into it, which fits over the spline shaft and is secured to the radiator boss by capscrews. Make certain that the outer circumference of the retainer is in perfect alignment with the radiator boss. If the retainer is not in correct alignment, the radiator will not slide over the boss.



When assembling this retainer, first tighten the six capscrews lightly. Then take a straight edge and hold across first the top and then the side of the radiator boss, as illustrated, and make sure the bearing retainer is flush with the boss. If not, tap the high side with a hammer until flush; and then tighten the six capscrews evenly. The bearing retainer is then in its proper position.

6. Install radiator, allowing spline shaft to extend out through front of radiator.
7. If tractor is equipped with crankcase guard, raise front of guard and install bolts.
8. Insert stud bolts into the four tapped holes in front of radiator.
9. Raise the Power Control Unit into position, sliding the pinion over the end of the spline shaft, as the Unit is moved back against the radiator. The stud bolts will extend out through the corresponding holes in the Power Control Unit mounting brackets.
10. Install lockwashers and nuts on stud bolts and draw up snug.

11. Remove the front plate and cable guard. Remove front pinion bearing retainer capscrews. Then remove front pinion bearing cap and gasket. After having removed bearing retainer cap and gasket, remove front pinion bearings. (This is done in order to check Power Control Unit alignment later during installation.)
12. Then turn nuts up tight on the studs.
13. Install attachment angles on tractor side channels. Bolt tight to tractor.
14. Insert capscrews (bolts on "Caterpillar" D8 Tractor) through holes in power control unit mounting bracket, and into the corresponding holes in the attachment angles. Do not draw the capscrews up tight until later.
15. Install the set screws through the Power Control Unit mounting brackets and tighten them until they just touch the attachment angles.
16. Tighten the attachment capscrews or bolts.
17. Check the Unit to determine whether it is now in correct alignment, as follows:

    Try to re-install the front pinion bearings. If the bearings can be installed without being forced, the Power

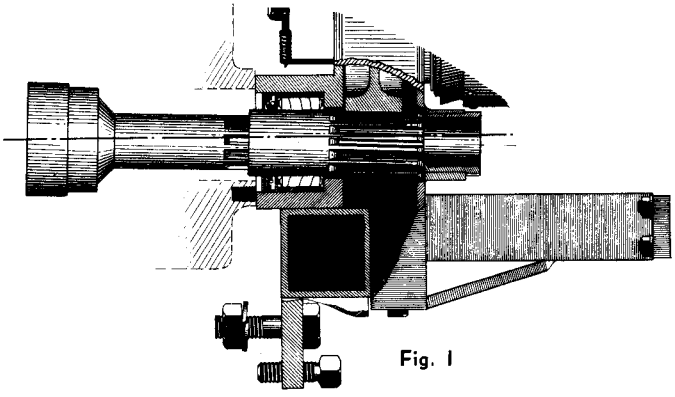


Fig. 1

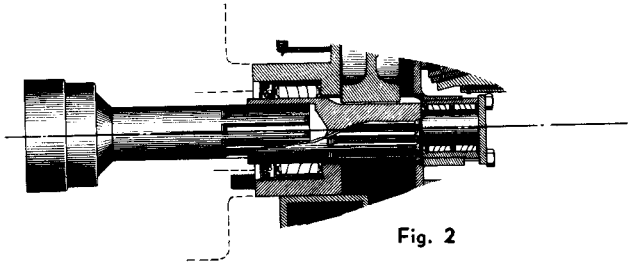


Fig. 2

Control Unit is in the correct alignment with the tractor crankshaft. If force is required to install the bearings, the Power Control Unit is not in alignment (Figure 1) and the mounting bolts should be loosened and the Unit shifted to the position that will allow the bearing to be replaced without force.

The mounting bolts should then again be cinched up tight, holding the Power Control Unit in perfect alignment. (Figure 2.)

18. Install the pinion bearing retainer cap, gasket, etc.
19. Insert wires through drilled heads of set screws, and wire the set screws together to prevent them from loosening.
20. Install deck bearing block and control lever mechanism.
21. If radiator guard is to be installed over Power Control Unit, it may be necessary to remove front plate and cable guard before installing the radiator guard. Then, re-install front plate and cable guard. This procedure is not necessary if the Power Control Unit is equipped with the special heavy duty cable guard.

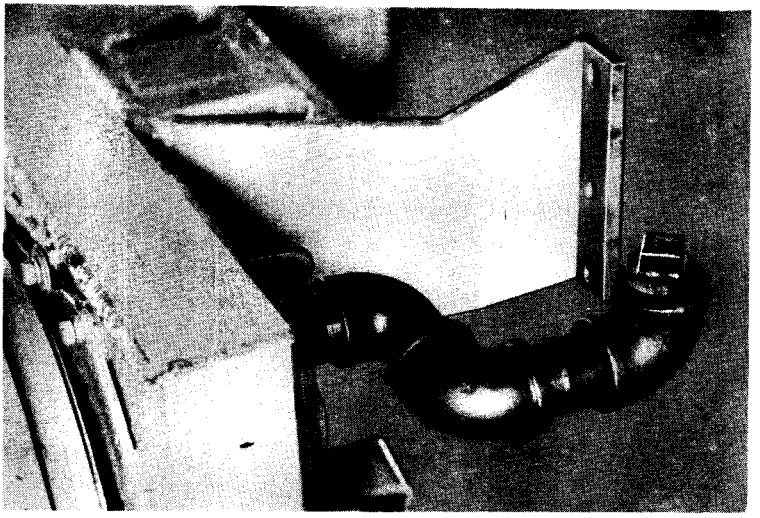
MOUNTING MODEL FTD7 POWER CONTROL UNITS

The Model FTD7 Power Control Unit mounts up underneath the front of the new "Caterpillar" D7 Tractor. The method of mounting this Unit is somewhat different from that of the other front mounted models. The instructions for mounting the Model FTD7 Unit are therefore given below, with the steps in mounting the Unit listed in the order that they should be taken.

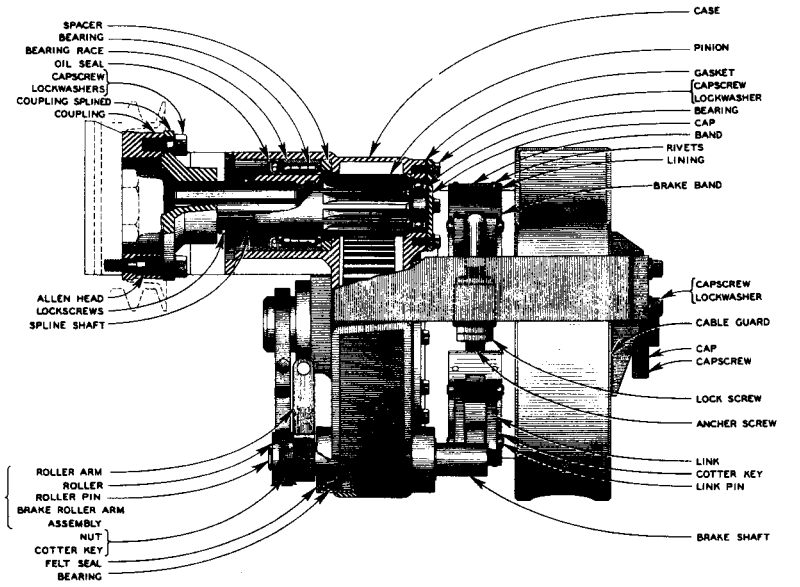
1. If the tractor is equipped with a crankcase guard, remove the guard. If a pull-hook is attached to the guard, remove the pull-hook and set aside for later use.
2. Remove screen from tractor radiator shell.
3. Remove bottom radiator guard.
4. Remove main radiator guard or "shell".
5. Remove all paint and foreign particles from front side of pulley on front end of tractor crankshaft. Use paint remover if necessary. The Power Control Unit spline shaft is adapted to the front of this pulley, and unless all paint is removed from its front surface, the spline shaft may be thrown out of proper alignment.
6. Position the Power Control Unit coupling ring against the front of the pulley, insert the six bolts and tighten the nuts from the back side of the pulley. Draw the bolts

up very tight, in order to make sure that the coupling is in alignment with the pulley.

7. Install the round splined coupling in place on the coupling ring that has just been installed, by raising it into position and installing the capscrews and lockwashers. Turn the pulley to reach all of the capscrews. Draw the capscrews very tight.
8. Insert the two lockscrews in the tapped holes in the spline shaft. (These lockscrews will prevent the shaft from sliding too far into the pinion or too far into the splined coupling.) Slide one end of the spline shaft into the splined coupling, in front of the tractor pulley.
9. Remove the oil fill plug, and remove the cork from the oil fill plug.
10. Turn pipe nipple into oil filler plug hole in P. C. U. case. Then install street ell, standard ell, nipple, and street ell on the original nipple, in the order listed. When completed, this assembly of nipples and ells should extend out from the P. C. U. gear case as illustrated.



11. Install the oil filler plug in the standard ell at the end of this assembly.
12. Bolt "Caterpillar" pull-hook to the LeTourneau crankcase guard, if pull-hook was supplied with tractor. Move crankcase guard in place below the tractor and raise the



FTD7 UNIT

back end of the guard into position, with the three attachment lugs hooked over the "Caterpillar" rear guard. Insert the three capscrews up through the holes in the "Caterpillar" guard, and into the tapped holes in the above mentioned lugs. Allow the front of the guard to hang down until later in the installation.

13. Raise Power Control Unit into position under the front of the tractor. Turn the spline shaft the part of a turn that might be required to line its splines up with the internal splines on the P. C. U. pinion, and then slide the Unit over the spline shaft, back against the front engine support.

14. Line the holes in the Power Control Unit attachment brackets up with the corresponding holes in the front engine support, and install the four capscrews and lockwashers in the top and bottom holes in the two brackets. Do not draw the capscrews up tight.

15. Insert the two dowel pins through the two center holes in the attachment brackets, and into the corresponding holes in the front engine support. Then draw the four capscrews up tight.
16. Insert a sufficient number of shims between the two support arms (which extend out from either side of the Power Control Unit case) and the channels of the tractor frame, to fill any space that there might be between the two. Insert the two bolts up through the bolt hole in each arm, and up through the shims and the two channels. Slip lockwashers and nuts over the ends of the bolts and tighten the nuts.
17. Next install the control mechanism, by first installing the control lever deck plate. The deck plate mounts over the front inspection plate on the tractor deck, or platform. Remove the four capscrews which hold the inspection plate in position. Then disconnect the tractor throttle rod and lower the deck plate into place, lining up the capscrew holes in the deck plate with those in the inspection plate. Insert the four longer capscrews (which are supplied with the Power Control Unit) in the four holes, and turn them down tight, thus securing the deck plate in position.
18. Install the control lever on the deck plate, by inserting the hinge pin and cotter keys. (Make sure that the bend in the lever is turned to the side that will permit the lever to be moved forward without hitting the tractor pedal.)
19. Extend the flexible control cable down along the side of the tractor engine, between the fuel injection pumps and the engine block. Slip the upper end of the flexible cable through the clamp on the deck plate. (The flexible cable is alike at both ends.)
20. Install clevis on upper end of flexible cable by turning it onto the threads at the end of the cable, for a distance of 5/16 inches.
21. Turn flexible cable in the clamp until the grease fitting is facing upward, and force the collar on end of flexible cable back through the deck-plate clamp. Tighten clamp.
22. Insert clevis pin through clevis and hole in control lever, and install the cotter keys in each end of pin.
23. Re-connect tractor throttle rod.
24. Extend the front end of the flexible control cable down

through the clamp on the Power Control Unit, and tighten the clamp on the flexible cable.

25. Install clevis on front end of flexible cable. Insert pin through holes in clevis and hole in arm on brake cam. Install the cotter keys in each end of pin.
26. Check the clevis adjustment, to determine whether the required amount of free travel is provided at both ends of the flexible cable. To do this, move the control lever forward far enough to throw the Power Control Unit brake cam into the "lock-out" position. If the cam will not move far enough to reach the "lock-out" position, the clevis at the upper end of the control cable is turned up too far on the end of flexible cable, and should be backed off enough to give the necessary amount of throw. The position of the clevis at the lower end of the flexible cable should be such that sufficient throw is provided when the control lever is moved to the rear, to allow complete engagement of the clutch.
27. Install radiator shell on tractor. Make sure that bottom of shell doesn't rest on Power Control Unit brake band.
28. Install front guard up under Power Control Unit. If crankcase guard is used, the Power Control Unit guard and front end of crankcase guard must be raised together. Install the bolts and lockwashers.
29. Test Power Control Unit, making any adjustments which might be necessary. (Refer to Adjustment Instructions.)

TROUBLE LOCATION CHART

• BRAKE SLIPPAGE

Brake spring tension may not be adjusted tight enough. (Refer to brake adjustment instructions).

Brake lining may be oily or greasy (if woven lining being used.)

Brake shaft bearings may be adjusted too tight—on all models thus equipped. (Refer to brake adjustment instructions.)

The brake spring may have lost its tension from age, necessitating replacement.

The brake lining may have out-worn its usefulness.

The brake band may have become improperly formed to fit the brake drum through accident, etc.—

The brake roller may be incorrectly positioned against the brake cam. (Refer to brake adjustment instructions.)

• BRAKE WON'T RELEASE

Brake roller might be incorrectly positioned against brake cam. (Refer to brake adjustment instructions.)

Main gear and clutch driving cone spacing may be incorrect, thereby affecting the movement of the control lever and brake cam. (Refer to clutch adjustment instructions.)

Brake roller arm may be slipping on brake shaft, or brake lever arm slipping on opposite end of brake shaft, depending upon the model of Power Control Unit.

• CLUTCH SLIPPAGE

Clutch facing may be oil soaked. (If woven lining being used.)

Control lever may be clamped too far in on clutch throwout nut, preventing full clutch engagement. (Refer to clutch adjustment instructions.)

Main gear may be improperly spaced inside the gear case, preventing full clutch engagement. (Refer to clutch adjustment instructions.)

Main gear bearings might be in loose adjustment.

Cable drum bearings may be in loose adjustment.

Clutch facing may be loose on driving cone.

TROUBLE LOCATION CHART

Clutch facing may have been installed eccentric on driving cone.

- **SPONGY CLUTCH**

Main gear bearings may be in loose adjustment. (Refer to Main Gear Bearing adjustment instructions.)

Cable drum bearings may be in loose adjustment. (Refer to cable drum bearing adjustment instructions.)

Clutch facing may have been installed loose on driving cone.

Clutch facing may have been installed eccentric on driving cone.

An improper, non-standard facing may have been installed on driving cone.

- **CLUTCH CHATTERING**

Main gear bearings may be in loose adjustment. (Refer to Main Gear Bearing adjustment instructions.)

Cable drum bearings may be in loose adjustment. (Refer to Cable Drum Bearing adjustment instructions.)

Clutch facing may be oil soaked (If woven lining being used.)

There may be high spots on surface of clutch facing.

Clutch facing may have been installed eccentric.

There may be dirt or foreign matter between driving cone and driven cone.

- **CLUTCH WON'T ENGAGE**

Control lever may be clamped too far in on clutch throw nut. (Refer to clutch adjustment instructions.)

The main gear may be improperly spaced inside the gear case. (Refer to clutch adjustment instructions.)

- **CLUTCH WON'T RELEASE**

The clutch driving cone may be adjusted too close to the driven cone. (Refer to clutch adjustment instructions.)

Main gear bearings may be in a loose adjustment. (Refer to Main Gear Bearing adjustment instructions.)

Cable drum bearings may be in a loose adjustment. (Refer to cable drum bearing adjustment instructions.)

Main gear may be incorrectly spaced inside gear case. (Refer to clutch adjustment instructions.)

Clutch facing may be loose on driving cone.

TROUBLE LOCATION CHART

● CLUTCH WON'T HOLD ADJUSTMENT

Drum shaft may be turning in clamp at rear plate.

Control lever may be slipping on clutch throw nut.

Brake roller arm may be slipping on brake shaft, or brake lever arm slipping on opposite end of brake shaft, depending upon the model of Power Control Unit.

● OVERHEATING

Operator may not be engaging and disengaging clutch firmly and quickly. (Refer to operating instructions.)

Brake may be slipping. (Refer to causes of brake slippage listed above.)

Clutch may be slipping. (Refer to causes of clutch slippage listed above.)

Clutch may be dragging. (Refer to causes of clutch dragging listed above.)

Clutch may be giving spongy clutch action. (Refer to causes of spongy clutch listed above.)

Clutch may be chattering. (Refer to causes of chattering clutch listed above.)

● OIL SEAL LEAKAGE

Power Control Unit may be overheating and thereby burning or hardening oil seal leather. (For causes of overheating, refer to discussion above.)

A pressure may have been built up inside the gear case, because of air vent, or "breather hole", in oil fill plug being stopped up. Cork may not have been removed from vent in oil fill plug when Power Control Unit was delivered.

Too much grease may have been inserted in cable drum. (Refer to lubrication instructions.)

Lubricants may not be those which are recommended. (Refer to lubrication instructions.)

Main gear bearing adjustment may be loose. (Refer to Main Gear bearing adjustment instructions.)

Cable drum bearing adjustment may be loose. (Refer to Cable Drum bearing adjustment instructions.)

Oil seals may have been damaged during assembly.

TROUBLE LOCATION CHART

Double leather oil seals may have been incorrectly installed with thin leather turned toward oil compartment.

● EXCESSIVE THROW OF CONTROL LEVER REQUIRED TO ENGAGE CLUTCH

Clutch driving cone may be spaced too far from driven cone. (Refer to clutch adjustment instructions.)

Main gear bearings may be in loose adjustment. (Refer to main gear bearing adjustment instructions.)

Cable drum bearings may be in loose adjustment. (Refer to main gear bearing adjustment instructions.)

The threads on the drum shaft and clutch throw nut may have become worn, causing an excessive amount of play between the threads. The greater amount of wear usually comes on the threads on the drum shaft. This can be corrected by replacing the worn drum shaft or worn clutch throw-nut.

● DOUBLE-DECK SHEAVE BEARING TROUBLES

The tapered roller bearings may become Brinelled or grooved because of loose adjustment, or service past normal life.

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