

Operator's Manual



INSTALLING INSTRUCTIONS

INTERNATIONAL

P-29

Rear Mounted Cable Power Control Winch

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Ave.

Chicago 1, Illinois, U.S.A.

It is the policy of International Harvester Company to improve its products whenever it is possible and practical to do so. We reserve the right to make changes or add improvements at any time without incurring any obligation to make such changes on equipment sold previously.

(EXPORT)
PACKING LIST

INTERNATIONAL HARVESTER COMPANY
CHICAGO, ILLINOIS

TYPE OF MACHINE: P-29 WINCH WITH 9215-HRA

PAGE NO. 1

SERIAL NO. _____

SALES ORDER NUMBER _____

CUSTOMER'S ORDER NO. _____

BOX NO.	DIMENSIONS	GROSS WT.	NET WT.	GROSS KILOS	NET KILOS
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1-COMPLETE P-29 WINCH

MANUFACTURES NO. _____

2-WELDED CONTROL LEVERS 1-275463 WITH 2-H.S. CAPSCREWS 1/2" X 1-1/4" N.C. & L.W. 4-SPECIAL H.S. CAPSCREWS 5/8" X 2" N.F. AND 4-5/8" SHAKEPROOF LOCK WASHERS #1228 ASSM.

2-HANDLE & SHAFT ASSEMBLY 1-275464

1-P.T.O. SHAFT 1-276897

1-WINCH ADAPTER 229469-A 229469

1-BRACE L.H. 228925-B 228925

1-BRACE & SHEAVE BRACKET 1-228957

1-VELLUMOID GASKET .010 THICK 1-285868

1-VELLUMOID GASKET 1/32" THICK 1-298040

1-CENTERING PLATE 271690-A 271690

1-THRUST WASHER 1-400527

2-SPEC. 1/2" ROPE SOCKET WEDGES 292207-A 292207

9-STUDS 5/8" DIA. X 2-7/8" LG. 3-298706

10-H.S. CAPSCREWS 5/8" X 2-1/4" N.F.

4-H.S. CAPSCREWS 1-1/4" X 2-3/4" N.F.

9-5/8" NUTS N.F.

19-5/8" LOCK WASHERS

4-1-1/4" LOCK WASHERS

H. L. LENNERT

SIGNED: _____

DATE: _____

(DOMESTIC)
PACKING LIST

INTERNATIONAL HARVESTER COMPANY
CHICAGO, ILLINOIS

TYPE OF MACHINE: P-29 WINCH WITH 9215-HRA

PAGE NO. 1

SERIAL NO. P29-653

SALES ORDER NO. TE-3045

SHIPPED TO: H. S. Chastain Co
Decatur, Ill

CUSTOMER'S ORDER NO.

✓ COMPLETE P-29 WINCH

MANUFACTURES NO. 2783

2-WELDED CONTROL LEVERS 1-275463 WITH 2-H.S. CAPSCREWS 1/2" X 1-1/4"
N.C. 7 L.W. 4-SPECIAL H.S. CAPSCREWS 5/8" X 2" N.F. & 4-5/8" SHAKE-
PROOF LOCK WASHERS #1228 ASSEMBLED 2-HANDLE 7 SHAFT ASSEMBLY 1-275464
ANCHORED TO WINCH.

BOX NO. 1 ✓

1-P.T.O. SHAFT 1-276897
1-WINCH ADAPTER 229469-A 229469
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9-5/8" LOCK WASHERS
4-1-1/4" LOCK WASHERS

H. L. LENNERT

SIGNED: [Signature]

DATE: 5-4-54

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INTRODUCTION

Note: This is a preliminary manual and is to be used only until the regular Operator's Manual is available. Illustrations shown are not necessarily of the latest type of equipment. This manual contains installation, operation, maintenance, and repair instructions for the P-29 Rear Mounted Cable Power Control Winch.

The instructions contained in this manual are for the information and guidance of operators and servicemen who are responsible for operating, overhauling, and servicing the P-29 Rear Mounted Cable Power Control Winch.

This manual provides the operator and serviceman with a fast, convenient reference to information on installation, operation, maintenance, and repairs as well as descriptions of the major units.

No serviceman can afford to guarantee a repair job that is not serviced with IH parts. No owner should be satisfied with other than IH parts.

For the correct service parts to be used, always refer to the Parts Catalog for the P-29 Rear Mounted Cable Power Control Winch.

The illustrations and text in this manual are of general application to the P-29 Winch and may not show your equipment accurately in all details.

When requesting information or ordering parts for your equipment, always state the model and serial number shown on the name plate.

The terms "right" and "left" as used in this manual refer to the right and left of the operator as he sits in the tractor seat and faces the radiator of the tractor.

The illustrations in this manual are numbered to correspond with the pages on which they appear. For example, *Illusts. 7 and 7A are on page 7.*

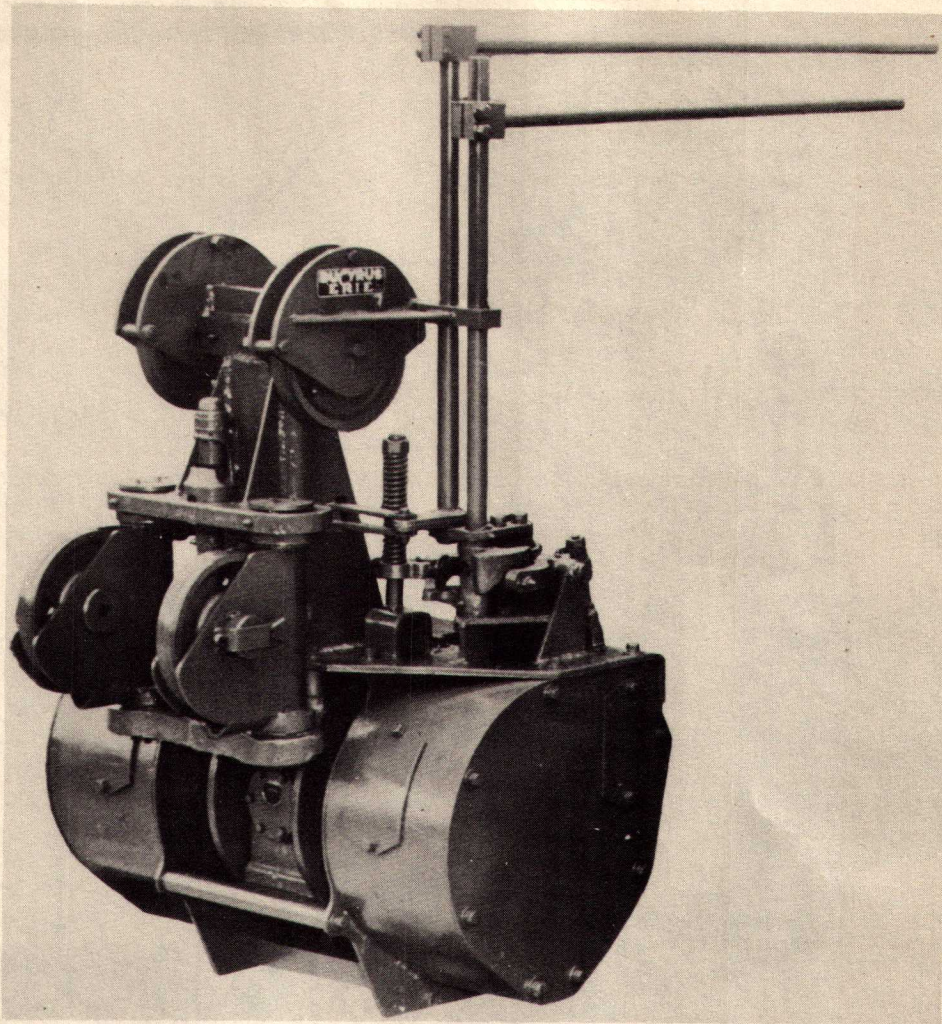
DESCRIPTION

SPECIFICATIONS

Number of cable drums	2
Cable drum length (each drum)	4 in.
Cable drum diameter	10 in.
Cable drum flange diameter	17-5/8 in.
Sheave diameter	10 in. pitch dia.
Number of oil seals	5
Bearings	Antifriction
Planetary and brake drum diameter	17-5/8 in.
Friction lining width	4 in.
Total gear reduction	10.00:1
Cable capacity - 1/2 in. cable (each drum)	230 ft.
Cable capacity - 9/16 in. cable (each drum)	180 ft.
Line speed (first layer - based on 1,350 r.p.m. power take-off shaft)	370 ft./min.
Rated line pull-first layer	7,000 lbs.
Approximate weight with brake and planetary covers	2,300 lbs.

Specifications are subject to change without notice.

DESCRIPTION



Illust. 3
P-29 Winch (right rear view).

GENERAL DESCRIPTION

See Illusts. 3, 4, and 5.

The P-29 Rear Mounted Power Control Winch is designed for use with International TD-18A and TD-24 Crawler Tractors to operate cable scrapers, cable bullgraders, and other allied tractor equipment.

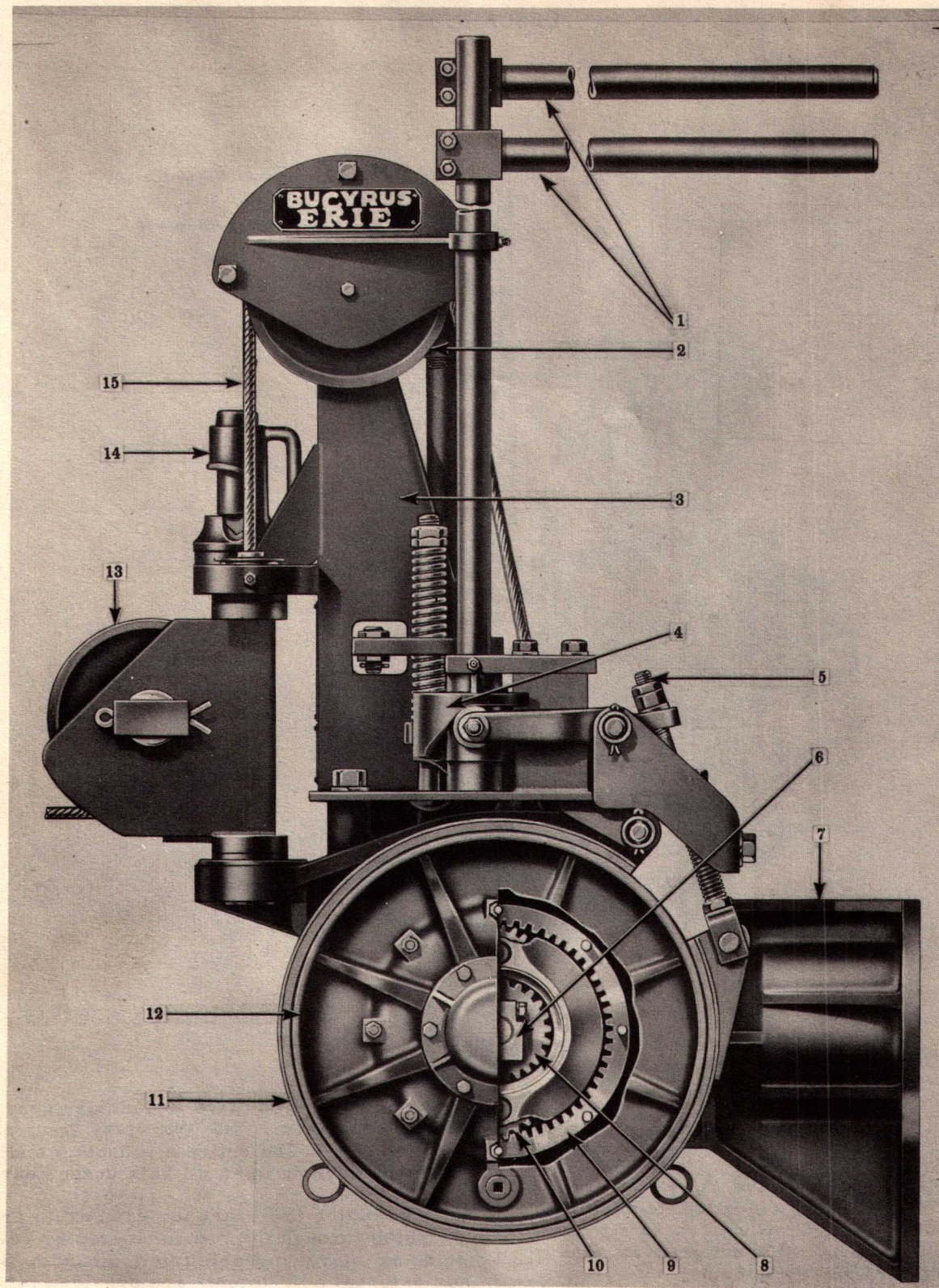
The P-29 is a planetary type winch designed for two line control. Basically it consists of a gear case which carries two cable drums with the operating mechanism, and a control bracket which supports the control levers and cams. The drive mechanism consists of a bevel pin-

ion and gear which drive a planetary gear system in each drum. See "Operating Principle" on page 6. The entire mechanism and all bearings operate in an oil bath in the gear case.

The clutch and brake for each drum are operated through the control levers by reversible and interchangeable friction bands. Simple external adjustments are provided for clutch and brake bands.

Note: Covers are provided to protect brake and planetary bands and drums from dirt and weather.

DESCRIPTION

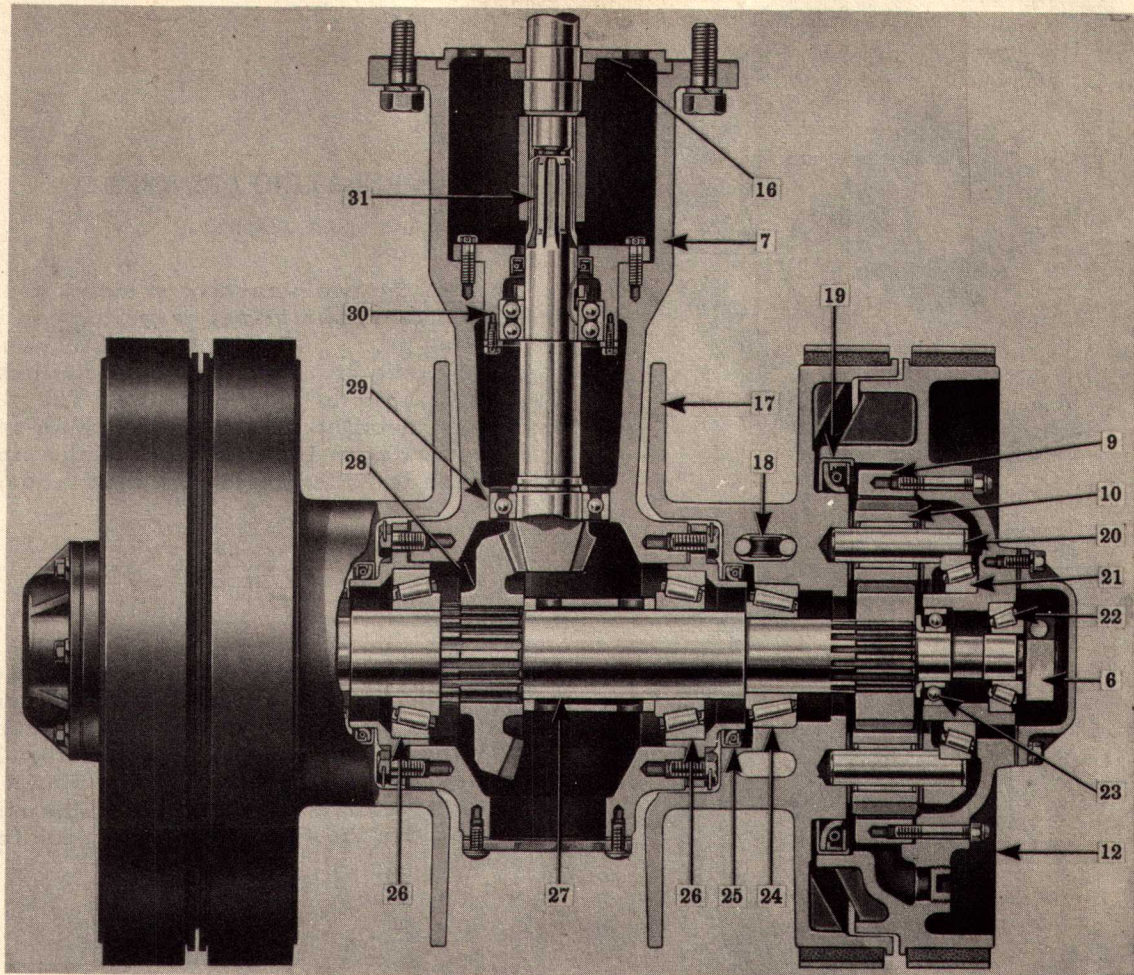


Illustr. 4

Section through side of P-25 Winch, general construction of P-29 is similar.
(For details, refer to the Parts Catalog.)

See page 5 for Index to Reference Numbers.

DESCRIPTION



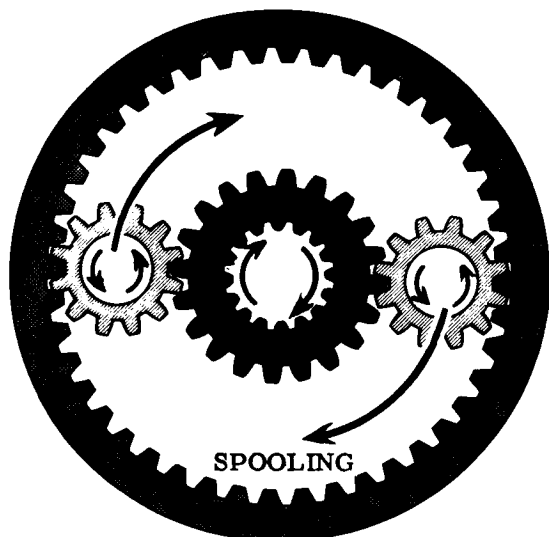
Illust. 5

Section through top of P-25 Winch, general construction of P-29 is similar.
(For details, refer to the Parts Catalog.)

Index to Reference Numbers shown in Illusts. 4 and 5.

Ref. No.	Description	Ref. No.	Description
1	Hand levers.	17	Drum and brake housing.
2	Guide sheave.	18	Rope anchor.
3	Control bracket.	19	Clutch housing oil seal.
4	Operating cam.	20	Planet pinion pin.
5	Release spring rod.	21	Drum and brake housing bearing.
6	Main shaft nut.	22	Clutch housing bearing.
7	Gear case.	23	Clutch housing bearing.
8	Sun pinion.	24	Drum and brake housing bearing.
9	Ring gear.	25	Drum and brake housing oil seal.
10	Planet pinion.	26	Main shaft bearings.
11	Clutch and brake bands.	27	Main shaft.
12	Clutch housing.	28	Bevel gear.
13	Fairlead sheave.	29	Intermediate shaft bearing (inner).
14	Cable cutter.	30	Intermediate shaft bearing (outer).
15	Cable.	31	Intermediate shaft and pinion.
16	Centering plate.		

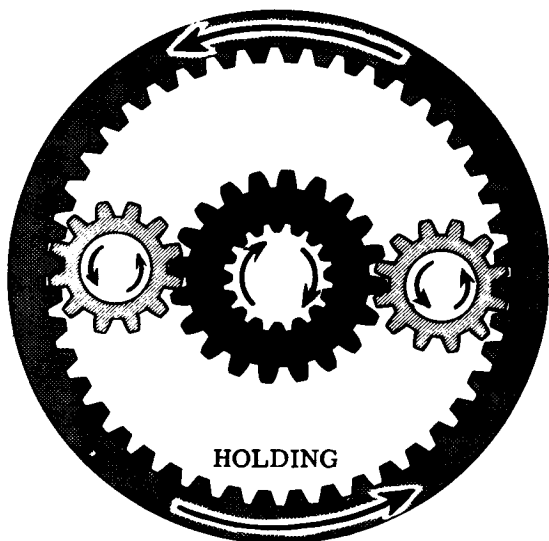
DESCRIPTION



OPERATING PRINCIPLE

See Illust. 6.

Each of the two planetary systems consists of the sun gear, two planet gears, and an internal ring gear. *See Illust. 4.* The sun gear is keyed to the drive shaft through splines and meshes with the two planet gears. The planet gears are installed on pins in the cable drum and mesh with the internal teeth of the ring gear which is bolted inside the clutch housing.

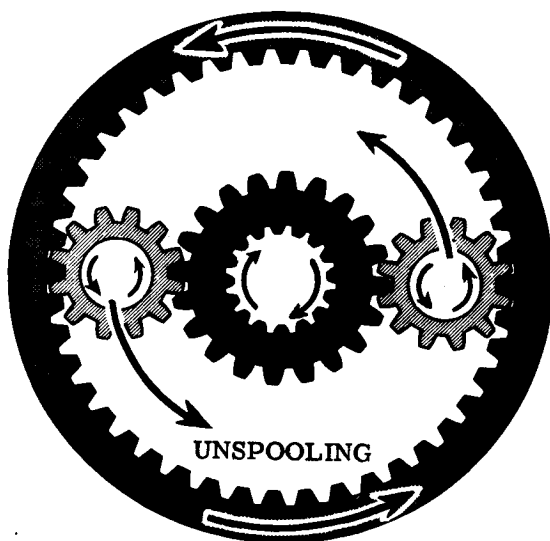


Spooling

The sun gear rotates whenever the tractor power take-off shaft is in operation. When the friction band is applied to the clutch housing, the housing and ring gear cannot rotate. The stationary ring gear forces the two planet gears to travel around the inside of the ring gear and drive the cable drum in a spooling direction.

Holding

When the friction band is applied to the brake housing, it holds the cable drum firmly and keeps the loaded cable taut. The planet gears spin on their own axis and cause the ring gear and clutch housing to rotate.



Unspooling

When the friction band is released from the drums, the planet gears and cable drum rotate in the unspooling direction, the ring gear with the clutch housing rotates in the same direction, and the sun gear spins on its axis in the opposite direction.

Illust. 6
Principle of operation.

DESCRIPTION

DETAILED DESCRIPTION

See *Illusts. 4 and 5.*

Gear Case

The gear case is a cast housing which encloses the main shaft and bearings, intermediate shaft and bearings, and the bevel gear and pinion.

Bearings

Heavy-duty tapered roller bearings support the main shaft and the cable drums. The intermediate shaft bearings are heavy-duty ball bearings. The clutch housing rotates on one tapered roller bearing and one single-row ball bearing. Planet gears rotate on straight roller bearings. Main shaft bearings on the gear case are adjusted by shims. One additional simple adjustment on each side takes up bearing play in all planetary tapered bearings. All bearings are lubricated by oil in the gear case.

Oil Seals

Five garter-type oil seals effectively seal the drums and gear case against oil leakage and dirt infiltration.

Drums

Clutch and cable drums are cast with large air cooled surfaces. The drums enclose the planetary gear system.

Brake and Clutch Bands

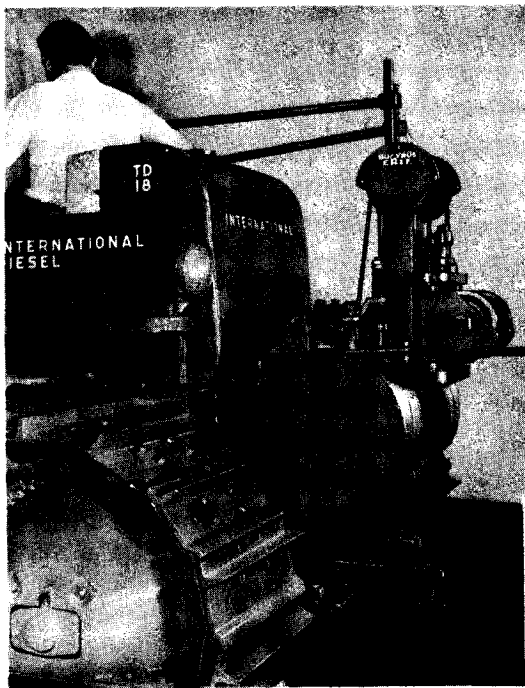
Brake and clutch bands can be turned end-for-end and also interchanged to distribute wear evenly over the entire lining area. The cool, large area friction bands have simple one-point adjustments to compensate for wear.

Controls

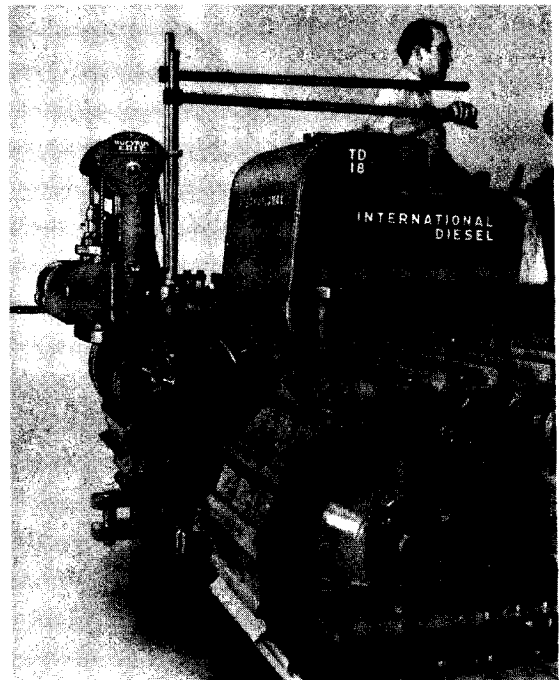
Two adjustable operating levers (one for each cable drum) are rigidly supported by wide spaced double bearings. The hand levers are adjustable vertically and radially to suit the operator's reach.

Sheaves

All four sheaves rotate on needle bearings. Sealing rings on each end of the bearings retain the grease and keep dirt and grit from entering. The fairlead sheaves swing in a 160 degree arc to permit a straight line pull on the cable.



Illust. 7
Winch with planetary covers.



Illust. 7A
Winch without planetary covers.

INSTALLATION

PRELIMINARY INSTRUCTIONS

See *Illust. 8*

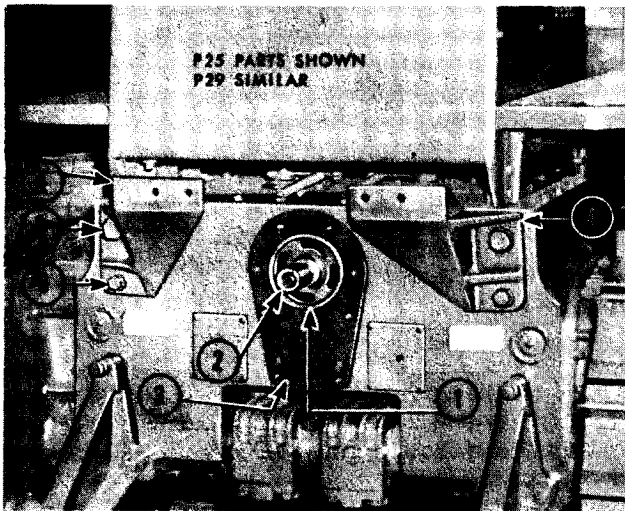
The P-29 Winch for TD-18A and TD-24 Crawler Tractors is shipped on convenient skids with the gear case drained of oil. The following parts are boxed separately: the drive shaft centering plate, drive shaft, gasket, winch braces, control levers, and the necessary bolts and cap screws. *Illust. 8* shows views and lists parts furnished for TD-18A and TD-24 Crawler Tractors.

INSTALLING DRIVE SHAFT AND BRACES

See *Illust. 8*.

Remove the power take-off cover from the rear face of the tractor transmission case. Remove the cork plugs from the two threaded holes in the transmission case below the power take-off cover. Place the gasket on the transmission case. Place the drive shaft centering plate on the drive shaft with the larger outside diameter of the centering plate toward the drive shaft female spline. Insert the drive shaft in the hollow transmission shaft inside of the tractor transmission center shaft with the centering plate.

Remove the cork plugs from the two holes in the upper two corners of the rear face of the tractor transmission case. Mount the winch braces to the tractor using the holes just opened. Do not tighten the bolts until after mounting the winch.



Illust. 8

Mounting parts installed.

- (1) Centering plate installed over gasket. (2) Drive shaft. (3) Gasket. (4) Winch braces. (5) Rod bolt. (6) Cap screw.

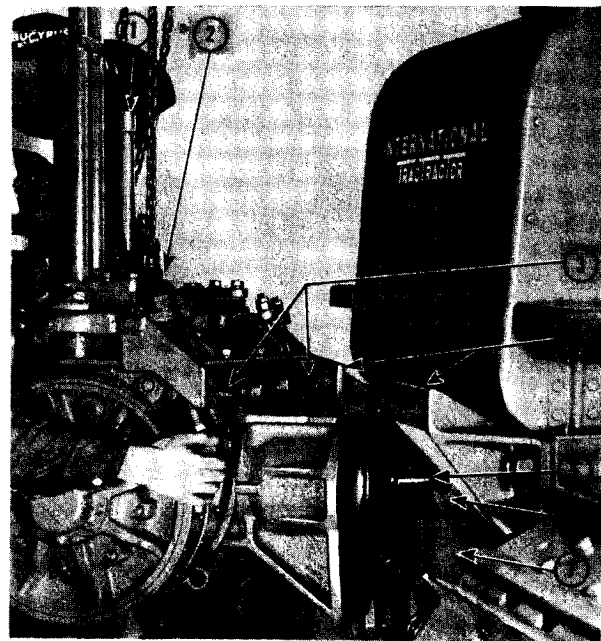
MOUNTING INSTRUCTIONS

See *Illust. 8A*.

Hoist the winch into position and engage the male spline in the winch case with the female spline on the drive shaft projecting from the tractor transmission case. Start the eight cap screws around the winch case mounting surface. Start the four bolts attaching the winch to the winch braces. After starting all attaching cap screws and bolts, tighten firmly.

Place the control levers on the control shaft with the right drum control lever approximately six inches lower than the left drum control lever. Both control levers should extend toward the front of the tractor on a parallel with the right side of the tractor seat. These instructions may be altered for the operator's convenience. Lock the control lever adjusting clamps securely to the control shafts.

Fill the gear case and lubricate the winch as instructed under "Lubrication Instructions" on page 12 before reeving cables on the winch.



Illust. 8A

Installing winch on tractor.

- (1) Oil filler pipe. (2) Lifting bar for chain block. (3) Attaching bolts. (4) Winch braces. (5) Drive shaft. (6) Centering plate. (7) Gasket.

INSTALLATION

CABLES

The P-29 Winch is designed for 1/2-inch or 9/16-inch cable only.

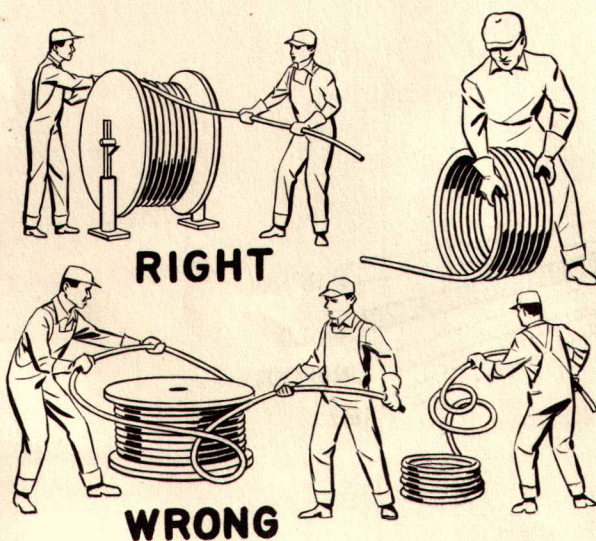
Use 6 x 19, performed, independent wire rope center, improved plow steel, regular right lay wire rope for all cable operated tractor equipment. Best cable life will be obtained from this type cable.

To prevent kinking the cable when removing from a reel, revolve the reel and remove the cable in the same way it was put on the reel. One method of doing this is to put a shaft through the center of the reel and jack it up so the reel will revolve freely. Pull the cable straight ahead, keeping it tight to prevent it loosening on the reel. A board held against one flange may be used as a brake to keep the reel from revolving too fast.

To prevent kinking a cable when uncoiling, remove the ties and roll the coil along the ground so the cable lies straight. There will be no twist or kink in the cable if these instructions are followed. See *Illust. 9*.

Removing cable from a reel or coil without revolving it results in a twist as each turn is taken off. If this twist is not removed and the cable straightened before being placed under tension, a kink is apt to result.

To cut cable, use the handy cable cutter on the winch control bracket shown in *Illust. 4*. Insert the cable in the cutter and cut it by a sharp blow with a hammer.

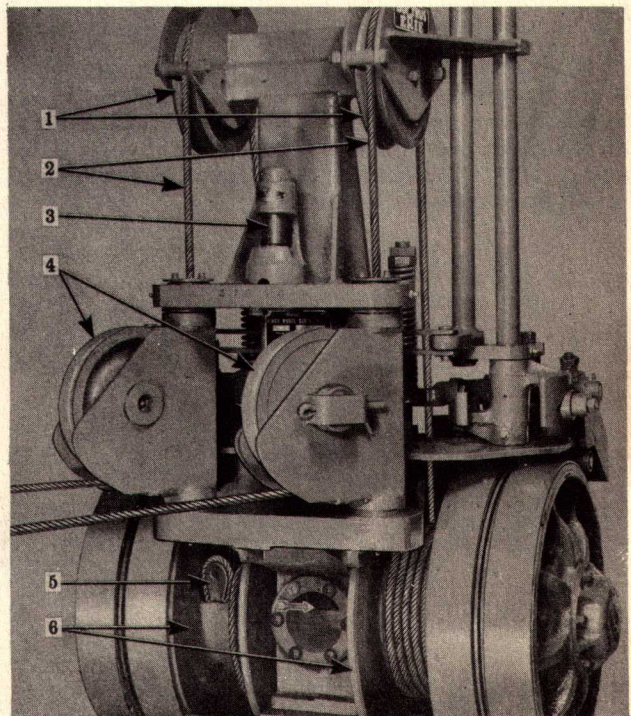


Illust. 9
Removing cable from reel or coil.

Reeving Cable

With the tractor engine turned off, lead the loose end of 1/2 or 9/16-inch cable horizontally around the lower section of the swinging fairlead sheaves, up through the upper hole in the fairlead shaft, up around the sheave in the sheave post, then down through the hole in the deck of the winch to the cable drum. Turn the drum by hand (brake released) until you can run the cable from the underside of the cable drum through the smallest of the two holes in the rope socket. Then turn the drum until the larger hole with eighteen inches of cable extending is accessible. Make a loop, using the eighteen inches of the cable end, placing at least six inches of the cable end back in the large hole of the drum rope socket. Place the rope socket wedge in this loop. Firmly pull the cable from the swinging fairlead sheaves until the loop decreases and the cable is held solid by the rope socket wedge. See *Illust. 9A*.

Note: There are two rope sockets on the drum, facing in opposite directions. When running the cable under the drum into the socket, be sure to enter the cable in the socket having its small opening facing the cable end.



Illust. 9A
Cable reeving view.
(P-25 Winch shown, P-29 is similar.)
(1) Guide sheaves. (2) 1/2-inch cables. (3) Cable anchor. (4) Fairlead sheaves. (5) Cable anchor. (6) Cable drums.

OPERATION

PREPARING THE WINCH FOR OPERATION

Hold

Before operating the winch after it is installed and before starting each shift of operation, check the following:

Check and if necessary add oil to bring the level up to the arrow on the oil level indicator glass. Lubricate all grease fittings. Refer to "Lubrication Instructions" on page 12.

Check operation of the clutch and brake bands and make adjustments if necessary. Refer to "Clutch and Brake Adjustment" on page 12.

Inspect the cable to detect failure of individual strands of wire or other damage which might cause the cable to fail in operation.

CONTROL LEVER POSITIONS

See *Illust. 10*.

Note: Each drum of the power control unit is controlled by a separate operating lever. The lower lever controls spooling and unspooling of the right drum. The upper lever controls the left drum. See *Illust. 3*.

Spool

When either lever is pulled to the left, the clutch housing is held tightly. This permits the planetary gears to drive the cable drum and spool in the cable. The lever moves easily, shifts rapidly, and engages the mechanism in quick, positive action.

When the lever is released, it returns to "hold" position. It should point approximately toward the right corner of the tractor seat at this time. Here the brake drum is automatically held in position.

Unspool

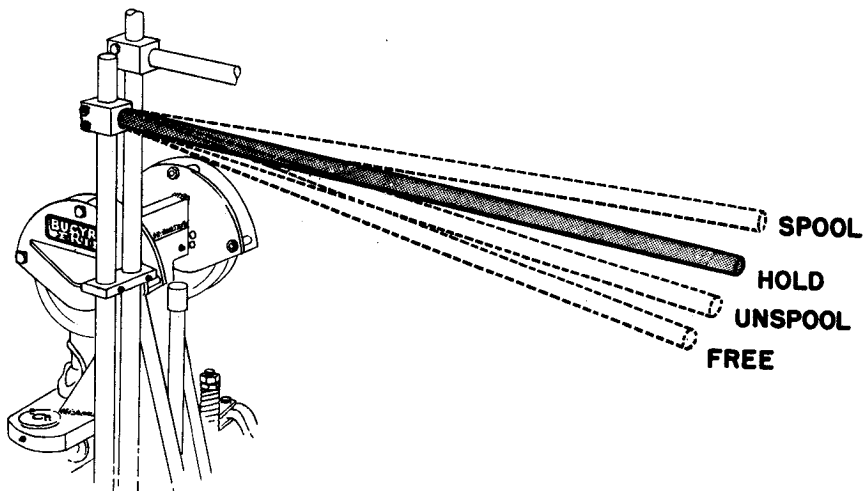
To unspool the cable drum, push the lever to the right. Now the brake drum is free to turn in either direction while the clutch band is released. Line-pull unwinds the cable from the drum.

Free

An extra push of the hand to the right will lock the lever in the unspooling position. When the lever is locked in "free", the brake drum is free to turn in either direction so that the operator may step down from the tractor and, with no assistance, reeve or change the cable on the drum. Always stop the engine during this operation.

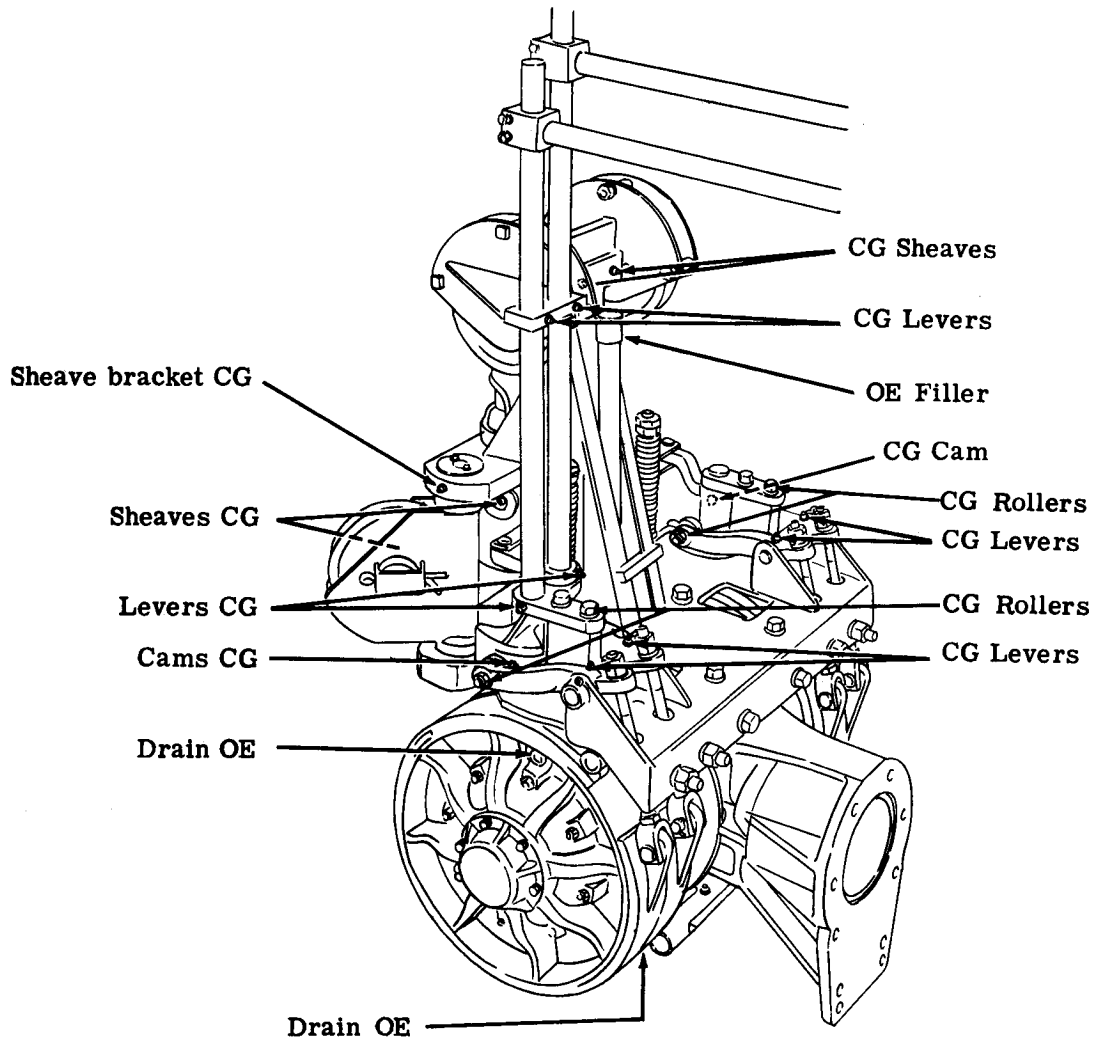
OPERATION

The winch is operated from the tractor power take-off. To use the winch, the tractor engine must be operating and the power take-off engaged. When the winch is not in use, disengaging the power take-off will save unnecessary wear on the winch.



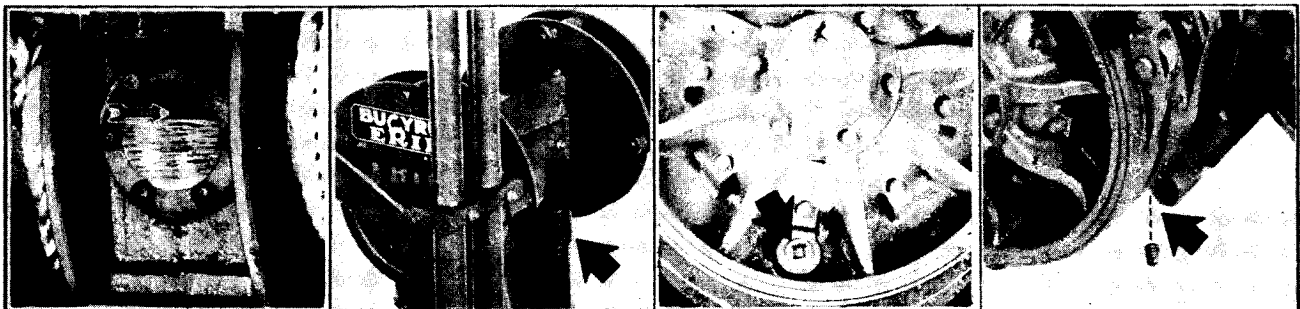
Illust. 10
Control lever positions.

MAINTENANCE LUBRICATION GUIDE



Key to Lubricants	Lowest Anticipated Temperatures			Intervals
	Below +32°F.	+32° to +70°F.	Above +70°F.	
OE - Motor Oil (Capacity - 12 U.S. Qts.)	SAE-30	SAE-40	SAE-50	600 hours
CG - Grease, General Purpose	No. 1	No. 1	No. 1	8 hours

Illust. 11 - Lubrication chart.



Oil level gauge.

Oil filler.

Clutch housing drain.

Gear case drain.

Illust. 11A

MAINTENANCE

LUBRICATION INSTRUCTIONS

See *Illusts. 11 and 11A.*

Fill the winch gear case with the quantity and viscosity oil called for on the instruction plate mounted on the winch and the "Lubrication Chart". See *Illust. 11*. Use only clean, new oil. Check the oil level through the transparent oil gauge after a short operating period. Disengage the master clutch to stop gear rotation when checking the oil. Change the oil in the winch gear case every 600 hours of operation. (12 U.S. quarts required.)

High pressure lubrication fittings are used on this equipment. The winch must be properly lubricated at regular intervals. The winch should be lubricated every time the tractor is lubricated or at the beginning of each shift. Lubricate moving parts without lubrication fittings with an oil can each time the fittings are greased.

CLUTCH AND BRAKE ADJUSTMENT

There are three distinct adjustments to be made to each side of the P-29 Winch in order to achieve correct operation.

Two of these adjustments may be grouped together and will hereafter be referred to as "Routine Adjustments" because they are made as a matter of routine to maintain proper clearances between the cam and the cam rollers.

The third adjustment is the "Brake Holding Spring Adjustment". This is a special adjustment and the need may never arise to change it. It is set at the factory to suit average conditions.

The Routine Adjustments compensate for band wear and must be maintained to provide for proper engagement and release of bands. Incorrect Routine Adjustment will result in the following:

- (1) Clutch cam roller clearance too great -- long control lever travel and difficult clutch engagement.
- (2) Clutch cam roller clearance too small -- incomplete release of clutch which results in damage by overheating of the band and planetary drum.
- (3) Brake cam roller clearance too great -- long control lever travel and incomplete brake release.

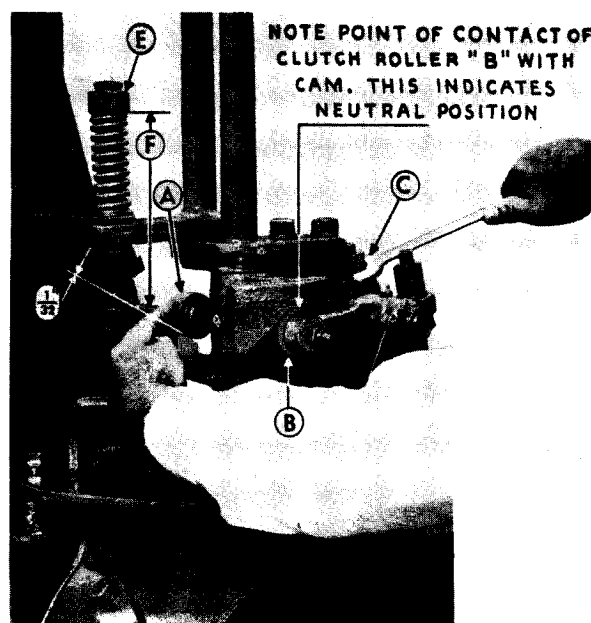
- (4) Brake cam-roller clearance too small or absent--brake holding spring power will be transmitted into the cam, causing it to rotate and partially engage the clutch, resulting in a heating clutch.

WARNING! Before making adjustments, stop the tractor engine or disengage the master clutch.

IMPORTANT! Band linings that are worn to rivet heads or are oil-soaked must be replaced before satisfactory operation can be obtained.

Make certain that the cam and cam rollers are free of dirt and paint.

To Adjust Brake



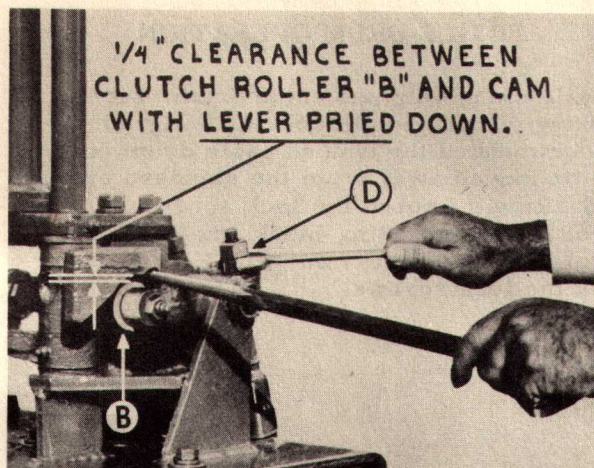
Illust. 12
Brake adjustment.

The following instructions should always be the first step in adjusting the winch. See *Illust. 12*.

1. Loosen the locknut at "C".
2. Adjust the lower nut at "C" until there is approximately 1/32-inch clearance between the slope of the cam track and the brake cam-roller "A". At this time, the cam roller should turn freely with your finger. **IMPORTANT!** The cam must be in neutral position as indicated by the relation of the clutch cam roller "B" to the cam track as shown in *Illust. 12*.
3. Tighten the locknut at "C".

MAINTENANCE

To Adjust Clutch



Illust. 13
Clutch adjustment.

1. Loosen the locknut at "D". See Illust. 13.

IMPORTANT! At this time the cam must be in neutral position as indicated by the relation of the clutch cam roller "B" to the cam track as shown in Illust. 13.

2. Adjust the lower nut at "D" until the clutch roller lever can be pried down to give 1/4-inch clearance between the roller "B" and the cam.
3. Tighten the locknut at "D".

The above procedure completes the "Routine Adjustment".

Brake Holding Spring

The third adjustment is to the brake holding spring. This spring (see "E", Illust. 12) exerts a downward pressure on the rear end of the brake cam-roller lever. This pressure is transmitted through the lever and the reach rod to the brake band and provides the force which holds the brake "On". Tightening or loosening the brake holding spring increases or decreases the holding power of the brake, or, in other words, it regulates the amount of maximum load that the winch will "hold" or support. Never change this adjustment unless--

- A. The brake slips--the winch will not hold its load with the control lever in neutral and the routine adjustments properly made. To correct, tighten the spring as described under "To Adjust Brake Holding Spring".

- B. Excessive effort is required on the part of the operator to release the brake. To correct, loosen the spring as described below.

To Adjust Brake Holding Spring

Refer to "E", in Illust. 12.

Make the "Routine Adjustment", refer to "To Adjust Brake" and "To Adjust Clutch", making sure that clearance exists between the brake roller "A" and the cam.

With the cam in neutral position (as shown in Illust. 12), tighten or loosen the adjusting nut "E" as required one turn at a time. Check and correct the brake cam-roller clearance after each adjustment. Correct adjustment is achieved when the effort required to release the brake is reduced to a minimum while the brake will hold the maximum load encountered without slipping or creeping.

Check and correct the routine adjustment to the brake as this is effected by the holding spring adjustment. **Caution:** Never tighten the brake holding spring so that its exposed length is less than 6-3/4". The factory setting is 7-1/4", which usually fits average conditions. See dimension "F" in Illust. 12.

To Adjust Clutch and Brake Housing Bearings

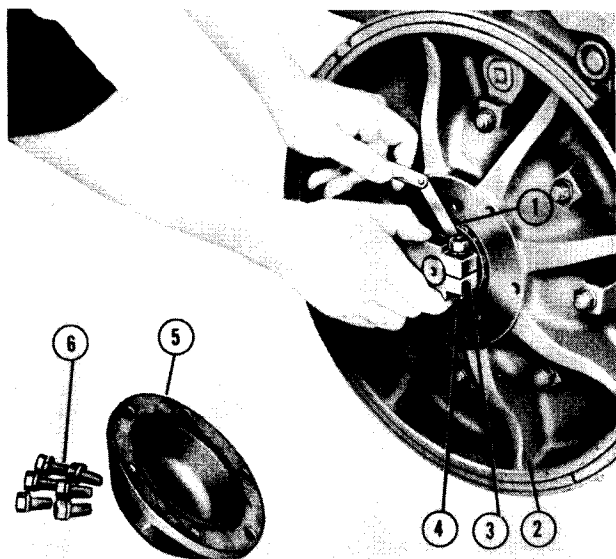
See Illust. 14.

Tighten the adjusting nut to 240-260 ft. lbs. torque. Rotate and tap the planetary housing in four equally spaced places near the hub during the tightening operation. If a torque wrench is not available, tighten the adjusting nut until the bearing drag results in a 40-50 pound pull required to rotate the planetary housing with the brake and clutch bands removed.

Match mark the adjusting nut and shaft and back off the adjusting nut one-quarter of a turn. If necessary tighten or loosen the adjusting nut enough to secure alignment between the hole in the shaft and the nearest slot in the nut; then lock the nut.

Using a puller as shown in Illust. 16A, pull the planetary housing out until the bearing cone is seated tightly against the adjusting nut. Tap the puller screw; then remove the puller and tap the planetary housing toward the gear case to assure freeing the bearings.

MAINTENANCE



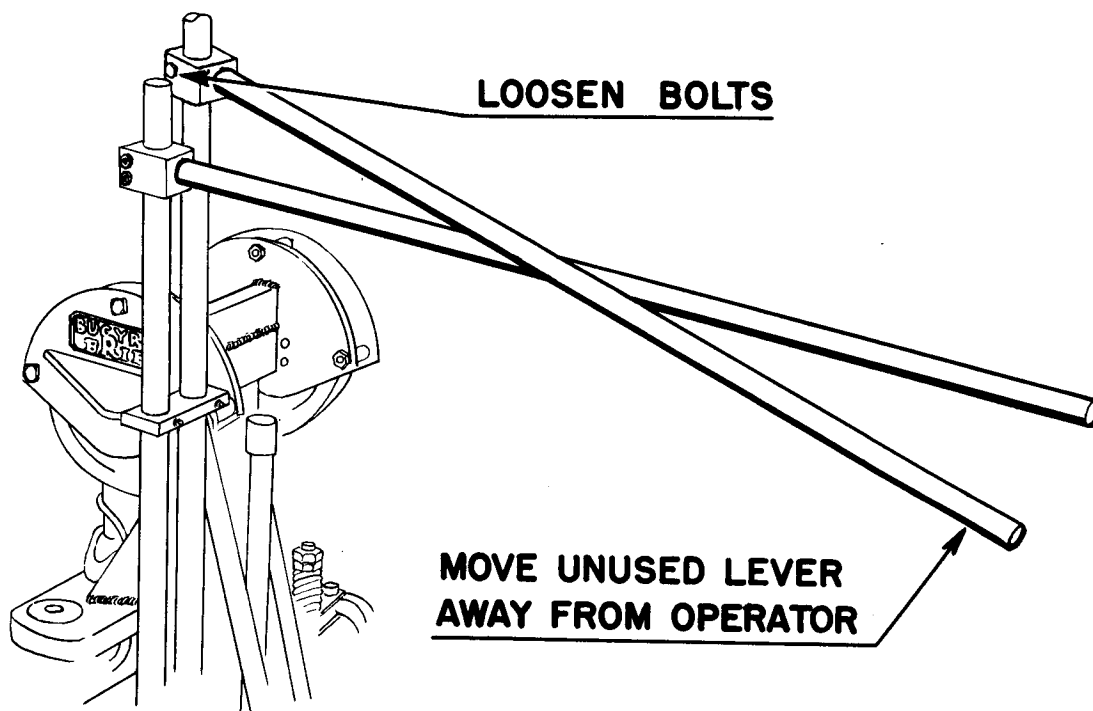
SINGLE DRUM OPERATION

While using only one cable drum, such as operating the cable bulldozer or bullgrader, it is recommended the unused cable drum control lever be moved away from the standard operating position. Loosen the lock screws on the control handle adjusting block and swing the control lever outward (see *Illust. 14A*), then relock the lock screws.

Illust. 14

Adjusting main shaft bearings.

(1) Clearance 0.020 to 0.022-inch. (2) Clutch housing. (3) Adjusting nut. (4) Locking bolt. (5) Cover. (6) Cover screws.



Illust. 14A

Single drum operation lever position.

REPAIR

CLUTCH AND BRAKE BANDS

Removal

Release the tension of the brake and clutch by removing the nuts from the top of each spring rod. Remove the cotter pin and tap out the dead end pin holding the bands to the bottom of the control bracket. Remove the cotter pins and tap out the live end pins which fasten the spring rod yokes to the ends of the bands. Drop the rod and catch the beveled spring seat. Slide the spring from the rod to clean these parts of accumulated dirt. Slide the bands outward off the clutch and brake housing. To remove worn linings, cut off the rivet heads and punch the rivets from the bands.

Installation

The brake and clutch friction bands are fully interchangeable and reversible end-for-end. Each brake or clutch friction band has four sections of lining with a total of 32 rivets required for the entire band.

Rivet four sections of the lining to the inside of each friction band, using eight rivets in each section. The rivet heads must be countersunk on the inside circumference of the lining to prevent scoring the drum as the lining wears.

Slide the assembled clutch and brake bands over the housings, *see Illust. 17*, and revolve the band on the drum until the dead end lug is aligned with the dead end pin hole. Place the band dead end lugs between the anchor plates of the control bracket. Insert the dead end pin through the plates and lugs. Lock the dead end pin with a cotter pin.

Slip the release spring over the spring rod. Guide the threaded end of the rod through the hole in the tapered spring seat. The wider edge of the spring seat faces rearward.

Install the spherical spring rod washers with the bevel down. Add jam nuts and rod nuts, but do not tighten. Attach the yoke end of the rod to the live end of the band with the live end pin. Lock with a cotter pin. Adjust the clutch and brake bands as instructed under "Clutch and Brake Adjustment" on page 12.

SHEAVES

Guide Sheave Replacement

Remove the three bolts and spacers attaching the outer cheek plate to the inner cheek plate. Remove the cap screw from the sheave pin and take off the cheek plate. Slide the sheave, with bearing and seal washers, off the sheave pin. The bearing inner race is pressed on the pin and can be driven off with a drift punch through the two holes provided in each inner cheek plate. Tap the seal washers and bearing out of the sheave.

Before reassembling sheaves, be sure all parts are clean and in good condition. Install the bearing, with a seal washer on each side, in the sheave. The washers are a snug fit and must be tapped into place. Install the bearing inner race on the sheave pin. Drive these parts on the pin with a wood block or brass rod and hammer. Pack the bearing with grease and slip the sheave with bearing over the inner bearing race. Install the outer cheek plate with three bolts, spacers, lock washers, and nuts. Install the cap screw with lock washer in the end of the sheave pin.

Fairlead Sheave Replacement

Removal of fairlead sheave assemblies requires removal of the sheave post assembly from the gear case. Remove the socket screws and washers from the top of each fairlead sheave bearing pin. Remove the cap screws attaching the sheave post to the top of the gear case. Remove the oil filler pipe and lift the sheave post off the gear case. Lift the swivel sheave assemblies out of the gear case bushings.

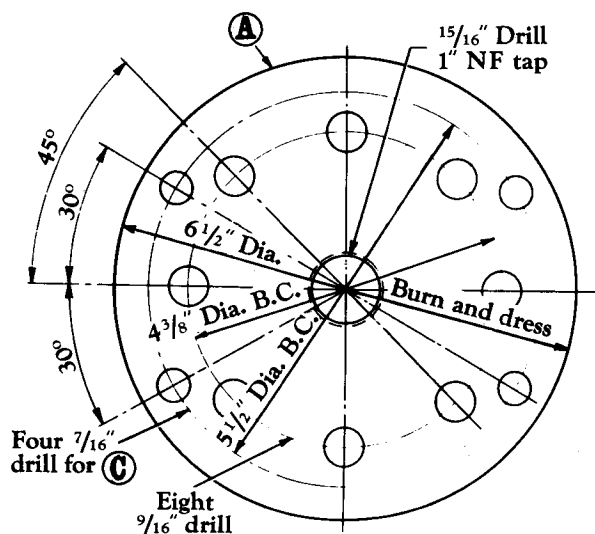
If inspection shows that the upper or lower bushings are worn or damaged and must be replaced, drive out the bushing. Avoid injury to the inside surface of the bearing socket. If the bushing is exceptionally tight, chisel or cut it with a hacksaw to remove.

The sheave may be released from between the fairlead frames by withdrawing the cotter pin from the outer lugs and pulling the sheave pin from the frames. If inspection shows that the roller bearing in the sheave needs a cleaning or is worn or damaged, slide it out after tapping out one of the bearing seal washers.

REPAIR

Install new upper bushings from below and lower bushings from above into the bearing sockets. These bushings have a tight fit and need to be pressed or driven into place. If the bushing is being driven, employ a soft metal header or a wood block to protect the edge of the bushing. Drive until the bushing is solidly seated in the bearing socket.

Be certain that the inside bore of the sheave is entirely clean of sand, dirt, or chipped metal before sliding in the new sheave roller bearing. Pack the bearing with grease and hold the bearing in place by tapping a bearing seal washer into each side of the sheave. Test the action of the roller bearing for easy turning in the sheave. Any indication of sand or grit should be remedied at once with a thorough flushing of all dirt from both sheave and bearing with a grease solvent. Slip the sheave between the sides of the fairlead frame, align it with the sheave pin holes and slide in the pin. Insert a cotter pin downward through the lugs on one side of the frame and through the sheave pin to lock the latter to the frame. The rounded edge of the fairlead is "down". Spread the cotter pin slightly. Use a socket wrench to screw and tighten the lubrication fittings in one end of the pin. When assembling fairleads be sure the sheave pin retainers are facing outward so that the fairleads do not lock together while swinging.



Name of Piece	Piece Mark	Drawing No.	Mat.	Spec. No.	Heat Treat
Pl.—1/2 x 7 x 0'-7"	A	271 574	Std.	1-	Reg.
Cap screw—1 x 3" NF	B	271 574	Stk.	1-	Reg.
Cap screw—3/8 x 2 1/4" NC	C	271 574	Stk.	4-	Reg.

Illust. 16
Puller drawing and specifications.

CLUTCH HOUSING

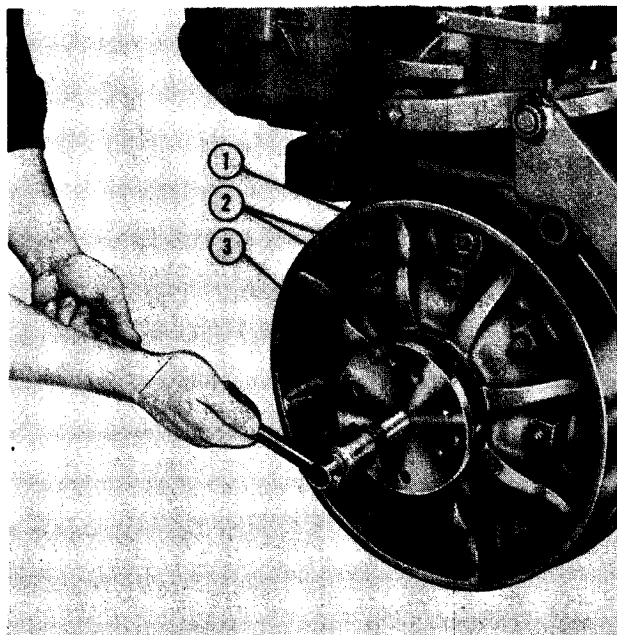
See Illusts. 16A and 17.

Removal

The clutch housings can be removed without removing the winch from the tractor. Remove the clutch band (see "Clutch and Brake Bands" on page 15.) Drain the oil from the clutch housing. Remove the cover and bearing adjusting nut. See Illust. 16A.

A puller, suitable for the P-29 clutch housing is described in Illust. 16 and illustrated in use in Illust. 16A. Remove the clutch housing from the shaft with this puller. As the housing comes off the end of the shaft, remove the bearing cone so it does not drop to the bench or floor. Remove the outer bearing cup with a suitable puller or by carefully tapping it out. The clutch housing is shown removed in Illust. 17.

If it is necessary to remove the ring gear, remove the oil seal, and ring gear stud nuts. Tap the studs with a lead hammer or wood block to force out the gear. The drum outer bearing cone can be removed by screwing jack screws into the tapped holes in the clutch housing provided for this purpose.

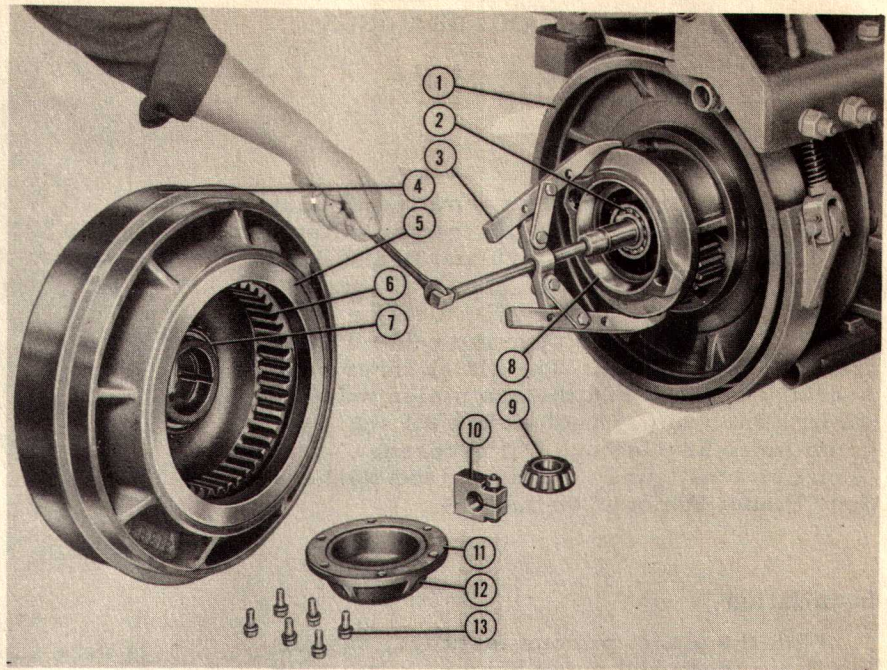


Illust. 16A
Removing clutch housing.
(1) Clutch housing. (2) Ring gear studs and lock nuts. (3) Puller.

REPAIR

Illust. 17
Removing drum.

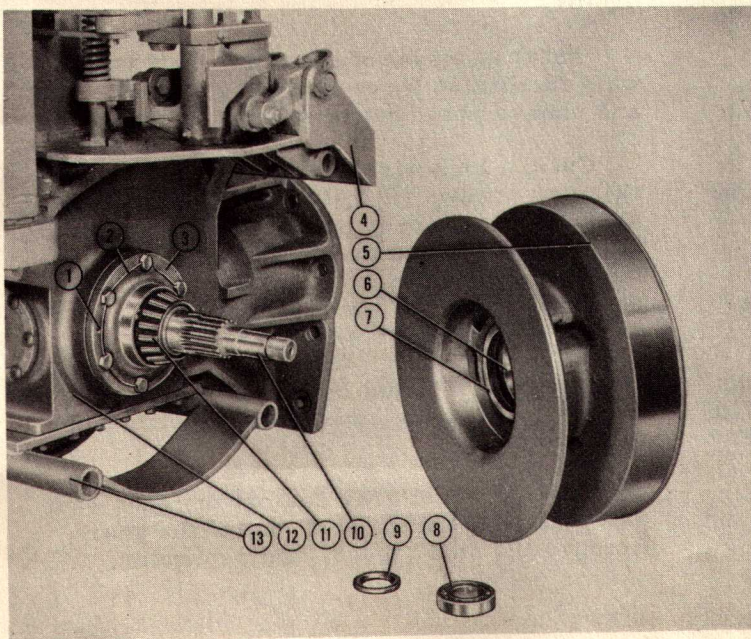
- (1) Drum.
- (2) Clutch inner bearing.
- (3) Puller.
- (4) Clutch housing.
- (5) Oil seal.
- (6) Ring gear.
- (7) Drum outer bearing cone.
- (8) Drum outer bearing cup.
- (9) Clutch outer bearing cone.
- (10) Adjusting nut.
- (11) Cover gasket.
- (12) Cover.
- (13) Cover screws.



Installation

Install the drum outer bearing cone in the clutch housing. With studs and gasket in place, install the ring gear in the clutch housing and secure with lock nuts. Press the oil seal in the housing with the wiping lip pointing toward the ring gear. Press or tap the clutch outer bearing cone into the housing.

Install the clutch housing on the shaft and insert the clutch outer bearing cone. Screw the adjusting nut on the shaft and adjust the bearings. Refer to "Adjustment of Clutch and Brake Housing Bearings" on page 13. Install the cover gasket and cover with cap screws and lock washers. Install the clutch band. See "Clutch and Brake Bands" on page 15.



Illust. 17A
Cable drum removed.

- (1) Jack screw hole.
- (2) Lock wire.
- (3) Bearing retainer.
- (4) Control bracket.
- (5) Cable drum.
- (6) Drum inner bearing cup.
- (7) Oil seal.
- (8) Clutch inner bearing.
- (9) Bearing spacer.
- (10) Main shaft.
- (11) Drum inner bearing cone.
- (12) Gear case.
- (13) Gear case cover.

(P-25 Winch shown. General construction of P-29 is similar. Refer to Parts Catalog for details.)

REPAIR

CABLE DRUM AND BEARINGS

See *Illusts. 17 and 17A.*

Removal

The cable drums can be removed without removing the winch from the tractor. Remove the clutch band, see "Clutch and Brake Bands" on page 15, and the clutch housing. See "Clutch Housing" on page 16. Using a suitable puller, *Illust. 17*, remove the cable drum from the drum shaft. The clutch inner ball bearing, spacer, and the sun pinion will come off with the drum. Remove the oil seal and drum inner bearing cup. If necessary, remove planet pinions, pins, bearings, and washers. See "Planet Pinions" on page 18.

Installation

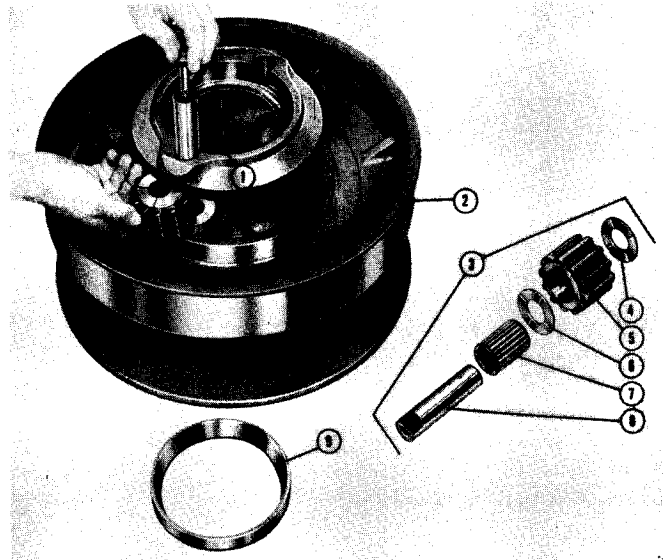
With the planet pinions installed, install the drum inner and outer bearing cups, with the smaller diameter toward the drum and the oil seal with the lip toward the bearing cup. Slide the drum over the shaft until the drum inner bearing cone is tight inside the cup. Insert the sun pinion in the drum on the splined shaft. Slide the ball bearing spacer over the shaft, with the rounded inside shoulder against the sun pinion; then install the clutch inner ball bearing. Install the clutch housing, page 16, and adjust the bearings, see page 13. Install the clutch band, see page 15.

PLANET PINIONS

See *Illust. 18.*

When it is necessary to replace planet pinions, bearings, or washers, remove the clutch band, clutch housing, and cable drum. Remove the drum outer bearing cup. Insert a jack screw (3/8 N.C. with 3-inch thread) in the threaded hole in the end of the planet pinion shaft. Lifting the shaft out of the drum; remove the pinion, bearing, and washers.

Check bearing clearance on the shaft and gear and check the end clearance on washers when installing the planet pinion, bearing, washers, and shaft. Install planet pinion shafts so that the drilled and tapped end, with shoulder for the bearing cup, is exposed. With planet pinions installed, press the drum outer bearing cup into the drum with the smaller diameter toward the drum. Install the drum and clutch housing; then adjust the bearings and install the clutch band.



Illust. 18

Installing planet pinion.

(1) Jack screw. (2) Cable drum. (3) Planet pinion assembly. (4) Washer. (5) Pinion. (6) Washer. (7) Bearing. (8) Shaft. (9) Drum outer bearing cup.

(P-25 Winch shown. General construction of P-29 is similar. Refer to Parts Catalog for details.)

MAIN SHAFT, BEVEL GEAR, AND BEARINGS

See *Illust. 19.*

Removal

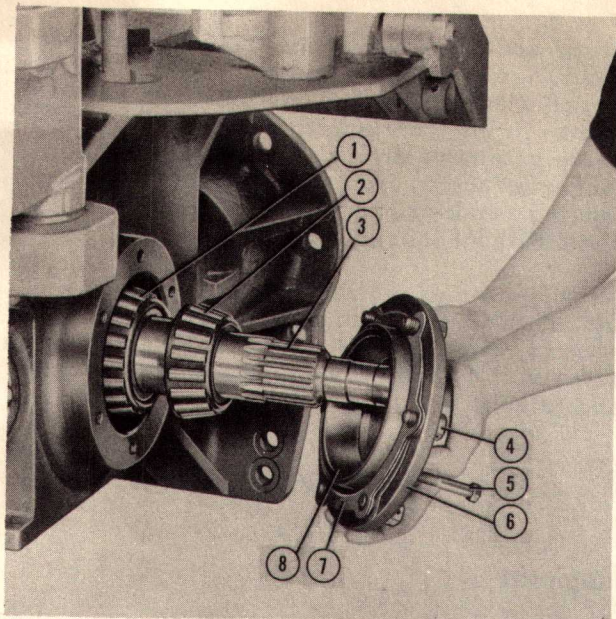
Drain the oil from the gear case and both clutch housings. Remove the clutch and brake bands, clutch housings, and cable drums.

Note: Removal of the main shaft is somewhat facilitated by removing the control deck and sheave post, but this is not essential.

Cut the lock wire and remove the bearing retainer screws (*Illust. 17A*). Insert jack screws in the tapped holes on opposite sides of the retainer and turn in far enough to loosen the retainer so it can be removed. See *Illust. 19*. The main shaft bearing cup and shims will come off with the retainer.

Remove the drum inner bearing cone and main shaft bearing cone from the right side of the shaft.

With the bevel gear against the gear case side, drive the main shaft out of the gear. Remove the shaft, gear, and separator.



Illust. 19

Removing bearing retainer.

(1) Main shaft bearing cone. (2) Drum inner bearing cone. (3) Main shaft. (4) Bearing cap screw. (5) Jack screw. (6) Bearing retainer. (7) Shim. (8) Main shaft bearing cup.

Installation

Clean the gear case and flush out all sludge thoroughly. Dry with compressed air.

Note: For correct rotation, the bevel gear must be on the left side of the gear case, as shown in Illust. 19A.

The intermediate shaft and bevel pinion, and the main shaft bevel gear are furnished only in matched sets. These sets should not be split, for if a pinion from one set is used with a gear from another, the efficiency and length of life of the winch will be impaired. Do not split pinion and gear sets.

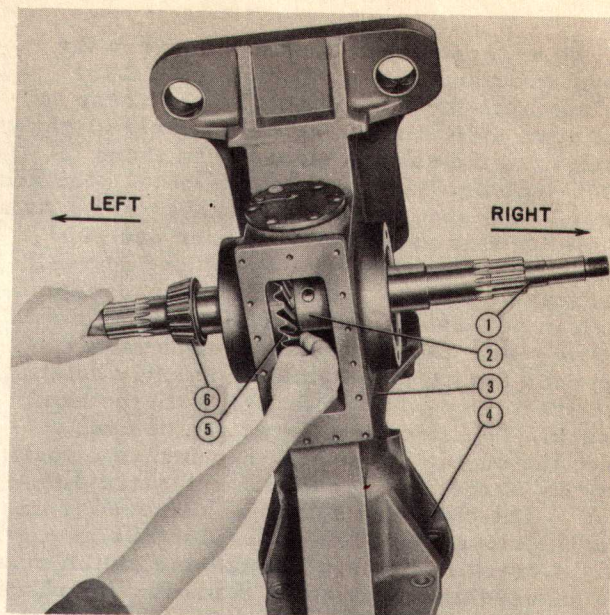
Before installing or replacing the bevel pinion and bevel gear, check to assure that the set number etched on the pinion face and the number on the rim of the bevel gear are identical.

MAIN SHAFT BEARING ADJUSTMENT

Adjustment with Winch Mounted on Tractor

A dial indicator is required for this adjustment.

Assemble the bevel gear, separator, main shaft with bearings in the gear case with the bevel gear on the left side of the pinion. In-



Illust. 19A

Installing main shaft.

(1) Shaft. (2) Separator. (3) Gear case (bottom view). (4) Tractor end. (5) Bevel gear. (6) Drum inner bearing cone.

stall the right-hand bearing retainer (with bearing cup) tightly, but without shims. Next, start the left-hand bearing retainer (with bearing cup), but without shims, drawing the cap screws up evenly and gradually until end-to-end movement of the main shaft has just been removed. Using a feeler gauge, determine the amount of gap between the retainer flange and gear case. At the same time check the trueness of the retainer with gear case by inserting a feeler gauge at several points around the flange. Remove the retainer and add sufficient shims plus approximately .007-inch to fill the gap. Reinstall the retainer and tighten. With the dial indicator bearing against some shoulder on the shaft, check end-to-end movement of the shaft by prying first one way, then the other. Add or subtract shims to produce .005-inch end-to-end movement by prying as measured with the dial indicator. To check adjustments, remove .005 to .007-inch of shims, reinstall the bearing retainer tightly, and drive the retainer with a wood block toward the gear case. With the dial indicator check to see whether driving the retainer has produced looseness of shaft. If so, continue to drive retainers and remove shims until all looseness has been eliminated. Now add sufficient shims to regain the .005 inch end-to-end movement as measured with a dial indicator.

REPAIR

To secure proper backlash between the bevel gear and pinion, gradually shift the shims from the left side of the gear case to the right side, tightening the retainers tightly each time the shift is made, until there is .005-inch backlash between the bevel gear and pinion as measured at the tightest point. As a guide for this procedure, shifting one .003-inch shim from the left side to the right will decrease backlash .002-inch. Measure backlash in at least four different places on the bevel gear. Secure the several positions between the gear and pinion by slowly rotating the tractor engine, preferably with the hand crank. The electric starter can be used to turn the engine and winch, but accurate positioning of the bevel gear is much more difficult. The coil wire should be removed from the distributor to prevent accidental starting of the tractor engine. The master clutch must be engaged and the tractor transmission placed in neutral.

Backlash can be measured with a feeler gauge or with a dial indicator. When using a dial indicator, the indicator should be provided with an extension and the button placed against the center of a tooth and the line of the indicator extension should be parallel with a tangent drawn from that tooth. The backlash can then be read directly from the indicator by rocking the bevel gear back and forth against the pinion.

Adjustment with Winch Removed from Tractor

With the winch off the tractor and the pinion shaft assembly removed from the gear case, assemble the main shaft, bevel gear, separator, and bearings to the gear case, with the bevel gear on the left side of the gear case. Install the right bearing retainer (with bearing cup) tightly but without shims. Next, start the left-hand bearing cup (without shims), drawing the cap screws up evenly and gradually until a definite drag is felt when rotating the shaft by hand. Using a feeler gauge, determine the amount of gap between the bearing retainer flange and gear case. At the same time check the trueness of the retainer with the gear case by inserting a feeler gauge at several points around the flange. Remove the retainer and add sufficient shims to fill the gap. Reinstall the retainer and tighten. Add or subtract shims so that the shaft can be rotated easily by hand but no looseness is felt. In order to check adjustments, remove .002 or .003-inch of shims, retighten the retainer to produce a

drag, and drive the retainers (using a wood block) toward the gear case. Rotate the shaft to see whether driving has loosened adjustment. If so, continue to remove shims and drive retainers until the adjustment is no longer affected. Add sufficient shims after driving retainers to gain free rotation of the shaft without looseness.

When the gears are properly adjusted, install the cover with the gasket and cap screws, and tighten. Install the cable drums and clutch housings; then adjust the bearings and friction bands.

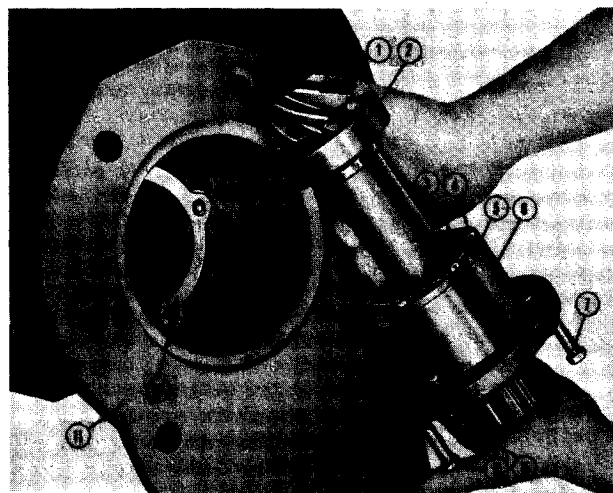
BEVEL PINION AND SHAFT

See Illust. 20.

Removal

When the bevel pinion and shaft are to be removed, remove the winch assembly from the tractor. See "Mounting Instructions" on page 8.

Remove the lock plate and bearing cage cap screws attaching the assembly to the winch. Insert jack screws (3/8-inch N.C. with 3-inch thread) in the tapped holes on opposite sides of the bearing retainer and thread in until the assembly can be lifted out of the gear case.



Illust. 20

Installing intermediate shaft.

- (1) Bevel pinion and shaft. (2) Inner bearing.
- (3) Lock wire. (4) Retaining ring cap screw.
- (5) Retaining ring. (6) Outer bearing retainer.
- (7) Jack screw. (8) Bearing retainer cap screw.
- (9) Jack screw. (10) Shims. (11) Gear case.

REPAIR

Disassembly

Disassemble the intermediate shaft as follows:

Cut the lock wire and remove the four cap screws holding the outer bearing retaining ring to the bearing retainer.

Tap the intermediate shaft from the bearing retainer. Tap gently to prevent damaging the shaft splines.

Bend the tongue of the serrated lock washer away from the bearing lock nut. Loosen and remove the lock nut with either a spanner wrench or punch and hammer. Lift the lock washer off the end of the shaft.

Remove the double-row ball bearing from the shaft. Lift the inner bearing snap ring and press the inner bearing off the shaft.

Examine the teeth of the pinion for cracks, excessive wear, nicks, burrs, or other damage. Remove the oil seal from the cage and replace if worn or damaged.

Reassembly

The intermediate shaft bevel pinion and main shaft bevel gear are furnished only in matched sets. These sets should not be split; for, if a pinion from one set is used with a gear from another, the efficiency and length of life of the pinion will be impaired. Do not split pinion and gear sets. Before installing or replacing the intermediate pinion and main bevel gear, check to assure that the set number etched on the pinion face and the number on the rim of the bevel gear are identical.

Install the inner bearing on the shaft solidly against the pinion. Slide the inner bearing snap ring over the shaft. Press on the outer (double-row) bearing to seat against the shoulder.

Place the serrated lock washer over the shaft and align the inner key in the washer with the keyway in the threads of the shaft.

Place the lock nut with the bevel side toward the lock washer on the threads of the shaft. Tighten fully with a spanner wrench, or tighten with a drift in the slots of the lock nut. Bend one tab end of the lock washer up to engage one of the four slots in the lock nut. Install the oil seal in the bearing retainer with the lip toward the inside.

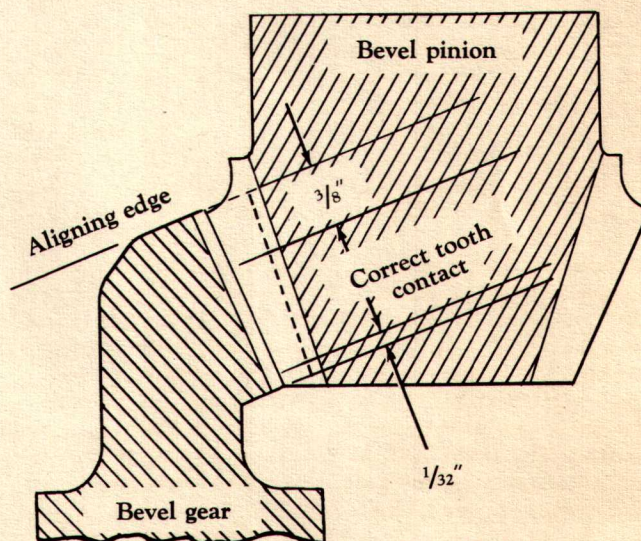
Insert the splined end of the shaft into the end of the pinion bearing retainer that has

four cap screw holes. Press the shaft into the bearing retainer until the outer bearing is seated solidly in place.

Slide the outer bearing retaining ring up to the retainer and match the holes, attach with four cap screws and lock with lock wire.

Installation

Insert the bevel pinion and shaft assembly in the gear case. Add or remove enough shims from both the main shaft bearing retainers and bevel pinion shaft retainer in such a way that the bevel gear and bevel pinion are in position with the gear edges aligned as shown in *in Illust. 21*. Remove most of the backlash by moving the bevel gear toward the bevel pinion. Shift the shims to do this. Keep enough backlash so the gears can be rotated without binding. With the cap screws in the bearing retainers tight, apply bearing bluing (very thin) to the teeth and check tooth contact. Try to secure tooth contact at the small end of the bevel pinion as shown in *in Illust. 21*. Changes in tooth contact are accomplished by adding or removing shims between the bevel pinion shaft retainer and gear case. After establishing proper tooth contact, move the bevel gear away from the bevel pinion to secure proper backlash. You should be able to place a 0.005-inch feeler gauge between all teeth. This will indicate proper backlash. All teeth should have 0.005-inch backlash, though the amount on some teeth may be more.



Check tooth contact by applying bluing.

Keep tooth contact at least $\frac{3}{8}$ -inch from large end of bevel pinion and $\frac{1}{32}$ -inch from small end of bevel pinion.

Illust. 21
Tooth contact diagram.

MEMORANDUM



A Careful Operator

IS THE BEST INSURANCE
AGAINST AN ACCIDENT

—National Safety Council.

