INDEX

INTRODUCTION

This service instruction manual is one of a series covering recommended procedures for servicing International Harvester equipment. It is one of the aids for developing students into full-fledged Blue Ribbon servicemen; it is a source of latest information for skilled servicemen; it is a sales help for the dealer who uses service information to point out the superiority of his merchandise.

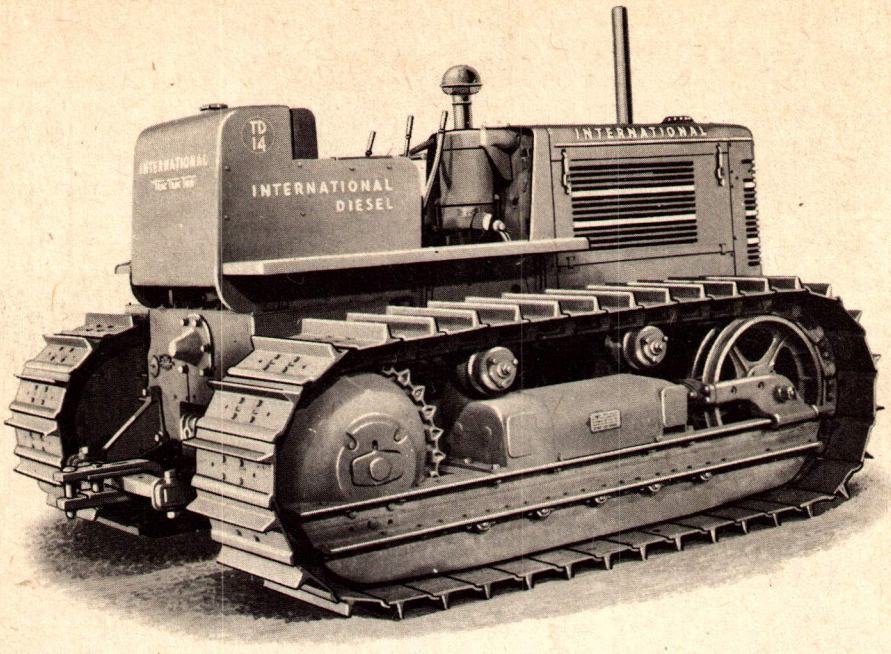
Specifically, this manual is devoted to service information for the T-14 and TD-14 TracTracTors and the UD-14 power unit. It explains the operating principles of the Diesel starting system, 1½" updraft carburetor and governor system used on the T-14 engine, the lubrication system, cooling system, and other units that require an explanation for clear understanding. Adjustments are covered, as well as removal, replacement, disassembly, and reassembly procedures where considered necessary.

Service charts for engines and chassis are located in the center spread of the book. These will be found especially useful to the skilled servicemen who desire pertinent information and not details. The complete Table of Contents and Index on Page 1 provides a ready reference for desired information.

General Specifications

Models	T-14	TD-14	UD-14
APPROXIMATE CAPACITIES (U.S. MEASURE)			
Fuel Tank, Gal.	45	45	1
Starting Fuel Tank, Gal.	--	1-1/2	1-1/2
Water Cooling System, Gal.	19	20	18
Crankcase Oil Pan, Qt.	16	16	16
Transmission, Gal.	6	6-1/2	--
Sprocket Drive Cases (Each Side) Pt.	5	5	--
Air Cleaner Oil Cup, Pt.	5-1/2	5-1/2	5-1/2
Fuel Injection Pump (Bosch) Pt.	--	3/8	3/8
Fuel Injection Pump (I.H.) Pt.	--	--	1/2
ENGINE (TYPE)	CARBURETED	DIESEL	DIESEL
Cylinders	4	4	4
Cylinders And Sleeves, Type	Wet Sleeve	Wet Sleeve	Wet Sleeve
Bore And Stroke, Inches	4-3/4 x 6-1/2	4-3/4 x 6-1/2	4-3/4 x 6-1/2
Engine Speed (Governed) (Maximum Load) R.P.M.	1350	1350	1350
Magneto, Fixed Spark, (c.c. Rotation)	I.H.C. - H-4	I.H.C. - H-4	I.H.C. - H-4
Spark Plug Gap, Inches	.028 TO .032	.035 TO .040	.035 TO .040
Valve Clearance (Engine Hot) Inches	.017	.018	.018
Carburetor (Updraft), Inches	Zenith - 1-1/2	Starting only	Starting only
CLUTCH ENGINE			
Type	Over-Center	Over-Center	Over-Center
Size, Inches	15	15	14
TRANSMISSION SPEEDS			
Six Speeds Forward - M.P.H. Low	1-1/2	1-1/2	
Six Speeds Forward - M.P.H. Second	2-1/8	2	
Six Speeds Forward - M.P.H. Third	2-1/2	2-1/2	
Six Speeds Forward - M.P.H. Fourth	3-3/8	3-3/8	
Six Speeds Forward - M.P.H. Fifth	4-3/4	4-3/4	
Six Speeds Forward - M.P.H. High	5-3/4	5-3/4	
Two Speeds Reverse - M.P.H. Low - Reverse	1-1/2	1-1/2	
Two Speeds Reverse - M.P.H. Hi - Reverse	3-3/8	3-3/8	
BELT PULLEY ATTACHMENT (SPECIAL)			
Pulley Speed, R.P.M., (Governed Full Load)	844	844	
Belt Speed - 12-1/4 in., Ft. Per Minute	2595	2595	
Pulley Speed - R.P.M. (Governed Full Load)			1350
Belt Speed - 12 in., Ft. Per Minute			4241
POWER TAKE-OFF ATTACHMENT (SPECIAL)			
Shaft Speed, R.P.M.	1350	1350	
Spline Diameter (STD. Hitch)	1-3/4	1-3/4	
TRACTRACTORS			
Ground Contact Length, inches	78-5/8	78-1/4	
Tread (Standard) inches	56	56	
Tread (Wide)	74	74	
Track Shoe Width, inches	16	16	
BRAKES			
External Contracting On Drums	Yes	Yes	
(Foot Operated) Diameter, inches	17	17	
DRAWBAR			
Type	Flat Bar	Flat Bar	
Drawbar Height Above Ground Level, inches	13-1/2	13-5/8	
Swinging Drawbar Lateral Hitch Positions Each Side Of Centerline, inches	13-1/2	13-1/2	

T-14 and TD-14 TRACTRACTORS



ILLUST. 1. TD-14 DIESEL ENGINE TRACTRACTOR.

These two TracTracTors are the same with the exception of the engine—the T-14 having the carbureted engine for operating on gasoline and the TD-14 having the Diesel engine. Both engines have a 4-3/4" bore and 6-1/2" stroke. They are four-cylinder, valve-in-head design with replaceable, wet-type cylinder sleeves. The TD-14 Diesel engine features the famous International starting system whereby the engine starts as a conventional gasoline engine and after a minute or two of operation is converted to the Diesel cycle as a full Diesel engine.

A strong, well ribbed and braced engine block forms a rugged housing for the working parts of the engine. Wide ribs running the full length of the engine provide added reinforcement, while the crankshaft bearing supports are strengthened and rigidly trussed by multiple ribs. Five main bearings are used.

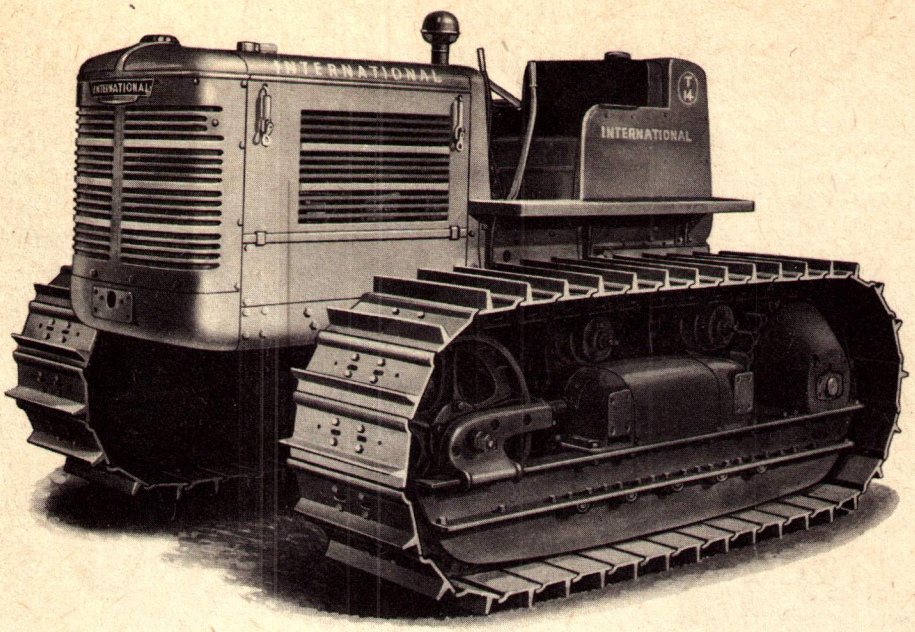
Crankshafts are Tocco-hardened, providing file-hard bearing surfaces. Cylinder sleeves are cast individually, heat-treated, machined on the outside, and machined, honed, and polished on the inside. This precision manufacturing assures uniform thickness of cylinder walls, proper cooling, minimum friction and wear, and long engine life. Cylinder sleeves and pistons come in matched sets and should be installed as such.

Full-pressure lubrication is provided by a double-stage, gear-type oil pump. The auxiliary set of gears in the pump returns the oil in the forward end of the pan to the sump when the tractor is working at extreme angles of tilt. A baffle in the oil pan retains the oil in the sump. Here the "Float-o" oil screen picks up the oil which is pumped by the main oil pump gears to the lubricating system. Two Motor Improvement P-20 renewable-type lubricating oil filters are used on the TD-14 engine and one is used on the T-14 engine.

The water in the cooling system is circulated by an impeller-type pump with a full-floating shaft driven from the fan belt pulley. This pulley is mounted on two ball bearings which carry the belt load. When the engine is started, water is circulated through the engine only. As the engine warms up, a thermostatically controlled valve opens, permitting the water to travel through the radiator. This design makes it possible for the engine to warm up quickly and also maintains the most efficient water temperatures in the engine after it has warmed up.

Chassis features are identical on both models.

A 15" single dry-disc, hand-operated over-center-type engine clutch is used.



ILLUST. 2. T-14 CARBURETED ENGINE TRACTRACTOR.

The clutch is cam-actuated. The operating mechanism includes a release fork, thrust bearing, sleeve, and connecting links. The clutch release mechanism has a clutch brake which facilitates fast shifting of the transmission gears. The clutch can be readily removed through the top of the main frame without disturbing the engine or transmission.

Six forward and two reverse speeds are provided by the transmission. The Hi-Lo shifting feature makes the two ranges of speeds possible. All transmission shafts are mounted in the main frame on ball and roller bearings which are encased in bearing cages.

Two 15" multiple dry-disc steering clutches mounted to the sprocket-drive pinion shafts are manually released. (TD-14's up to and including TDF-796 were equipped with power actuators.) Wide band-type steering brakes contract on the steering clutch drums. The brakes are simple, easily adjusted, and readily accessible. Bands can be removed for relining through hand holes in the bottom of the main frame.

The track frame and stabilizer construction used on International TracTracTors assures positive track alignment. Track frames are mounted on the pivot shaft by ball-and-socket joints which prevent twisting and leverage strains on the pivot shaft. Tracks are held in alignment at the front by the roller stabilizer which ties the tracks together but permits up and down movement. The heavy diagonal braces mounted on the pivot shaft are fastened about midway to each track frame. These braces keep the tracks from tilting, thus assuring proper vertical alignment.

All moving parts, from the engine clutch through the transmission to the drive sprockets, are mounted in ball bearings encased in bearing cages. Spring-loaded oil seals are generously used to keep out dirt and water, and to seal in the lubricants. Felt washers are also used in several places in addition to the oil seals.

The chassis serial numbers on the "14" Series TracTracTors start with TDF-501 and run consecutively. The T-14 TracTracTor, with the carbureted engine, has the prefix "TF". The serial number of the first T-14 TracTracTor is TF-2814. The first serial number of the first Diesel engine used in the TD-14 is TDFM-501. The serial number of the first carbureted engine used in the T-14 is TFM-501. No attempt is made to have the chassis number and the engine serial number correspond.

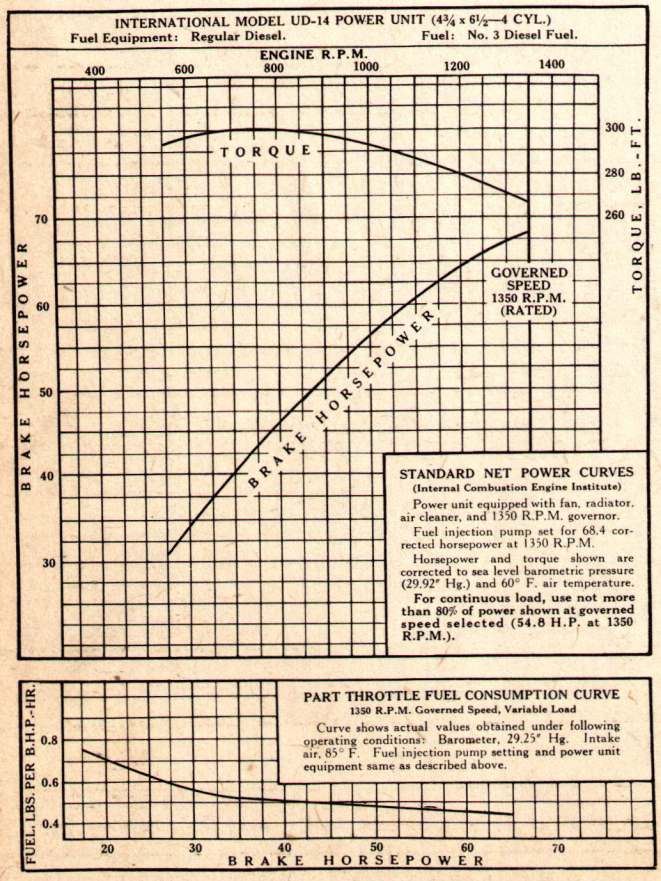
Units such as the injection pump and magneto have their own serial numbers. When reporting on a tractor, in addition to giving the tractor serial number, always be sure to furnish the serial number of all units referred to in the report.

UD-14 DIESEL POWER UNIT

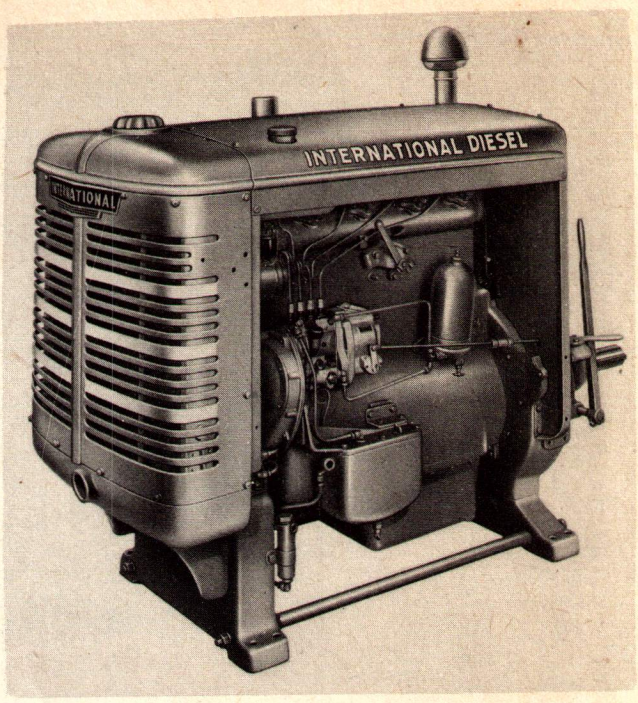
The UD-14 power unit has a 4-3/4" x 6-1/2" bore and stroke engine developing 71 h.p. at 1350 r.p.m. Performance curves on Illust. 3, give the horse power developed at various speeds, the torque, and fuel consumption. It is recommended that 900 r.p.m. be the minimum operating load speed. The UD-14 power unit is manufactured complete at Milwaukee Works.

The serial number of the first UD-14 power unit built is UDF-501. The serial number is stamped on the name plate attached to the flywheel housing. The engine serial number is stamped on the side of the engine crankcase. Both the power unit serial number and engine serial number should be given when making a service report.

In keeping with the standards of International power unit construction, the UD-14 is composed of eight basic units, each of which can be furnished independently and assembled conveniently to the unit not so equipped, without interfering with units already assembled. The eight



ILLUST. 3. UD-14 DIESEL POWER UNIT PERFORMANCE CURVE.



ILLUST. 4. UD-14 DIESEL POWER UNIT.

units are: 1. Basic engine; 2. Foot-type base; 3. Radiator and connections; 4. Air cleaner and connections; 5. Instrument housing and engine controls; 6. Clutch and controls; 7. Engine hood sheet and rear support; 8. Fuel tanks and connections.

The foot-type base must be used when either the radiator or fuel tank is used, since the radiator lower water tank, fuel supply pump, and strainer are attached to the front support.

The fuel supply pump for Diesel engines (Power Unit) is covered in Service Bulletin #S-3797A-1758 (Parts Common). Magneto service is covered completely in Serviceman's Guide, Manual No. 1, Form CHS-27. Engine specifications appear on pages 7 to 11. The details of service operations follow the specifications. The face of the flywheel housing is S.A.E. No. 1.

The starting fuel tank on the UD-14 is mounted on the upper radiator tank under the hood. When the radiator is not used, the tank is mounted on the rear of the cylinder head. The oil pressure gauge is contained in the instrument housing on top of the flywheel housing together with the temperature gauge. The engine governor control is conveniently located on the left side of the flywheel housing. The air cleaner is mounted on the rear side of the rear hood sheet.

ENGINE – SPECIFICATIONS

	Carbureted	Diesel
Bore and Stroke	4-3/4 x 6-1/2	4-3/4 x 6-1/2
Cylinders, No.	4	4
Cylinders, Type	Wet Sleeve	Wet Sleeve
Displacement, Cu. In. per rev.	460.7	460.7
Governed R.P.M.	1350	1350
High Idle Speed	1485	1500
Governed Low Idle Speed	900	425
Piston Speed, F.P.M. @ 1350 R.P.M.	1463	1463
Compression Pressure (Approximate lbs. per sq. in. @ 1350 R.P.M.)	111	465
Compression-Ratio	5.00 to 1	13.67 to 1
Fuel	Gasoline	Diesel Fuel
Tractor Belt Horse Power	64	64
Power Unit Horse Power	----------	68-1/2

IGNITION SYSTEM

Type	Continuous	Starting Only
Magneto Grounding Switch	Push Button	Automatic
Magneto, Mfg. and Model	I.H.C. H-4	I.H.C. H-4
Rotation	Counter-Clockwise	Counter-Clocksiwe
Breaker Point Gap, In.	.013	.013
Spark Advance	35°	15°
Impulse Coupling Advance	T.D.C.	T.D.C.
Magneto Gear, Helical	27 Teeth	27 Teeth
Drive Gear	Camshaft	Camshaft
Spark Plug, Size	7/8"-18-15/16" Hex.	7/8"-18-15/16" Hex.
Spark Plug, Gap, In.	.020-.025"	.035-.040"
Firing Order	1-3-4-2	1-3-4-2

CARBURETOR

Type	1-1/2" Up-Draft	3/4" Up-Draft
Model	Zenith 62-BIR-12	I.H.C. F-8
Fuel Level below Throttle Body	27/32 - 29/32"	13/32 - 7/16"
External Adjustments	Idle and High Speed	None
Fuel Supply	Fuel Pump	Gravity

LUBRICATION

	Carbureted	Diesel
Capacity U.S. Quarts	16	16
Full Pressure System	Yes	Yes
Oil Filter	P-20	P-20 (Dual)
Oil Pressure, lbs.	60-70	60-70
Oil Pressure, Valve	In Purolator Base	In Purolator Base

OIL PRESSURE VALVE REGULATING SPRING

Free Length	3-39/64"	3-39/64"
Test (Maximum Pressure)	38.2 Lbs. @ 2-3/32"	38.2 Lbs. @ 2-3/32"

PISTON ASSEMBLY

Piston Material	Grey Iron	Aluminum or Grey Iron
Clearance (at Bottom of Skirt)	.0045" - .0055"	.008"
"GO" Gauge (1/2" wide)	.0045"	.006"
Light Pull	4-6 Lbs.	2-4 Lbs.
"No Go" Gauge (1/2" wide)	.0055"	.008"
Tight Pull	11-14 Lbs.	11-14 Lbs.

PISTON RINGS

Total Required		4	6
Compression		3	4
Oil Control		1	2
Width, 1st Compression		.1548"	.1235"
Width, 2nd Compression		.1548"	.1235"
Width, 3rd Compression		.1548"	.1235"
Width, 4th Compression		-	.1235"
Width, Oil Control		.2488"	.2488"
Gap	Compression Rings	.010-.020"	.010-.020"
	Bottom Compression & Oil Control	.010-.018"	.010-.018"
Clearance in Groove, 1st Compression		.004"	.0045"
Clearance in Groove, 2nd		.003"	.0035"
Clearance in Groove, 3rd, 4th & Oil Control		.003"	.003"

PISTON PIN

Type	Full Floating	Full Floating
Retainers	Snap Rings	Snap Rings
Length	4.105"	4.105"
Diameter	1.6250-1.6253"	1.6250-1.6253"
Clearance in Rod Bushing	.0006-.0009"	.0006-.0009"
Clearance in Piston Bore (Tight for aluminum pistons. Loose for grey iron pistons).	.0001-.0003"	.0001-.0003"

ENGINE — SPECIFICATIONS

CONNECTING ROD		
	Carbureted	Diesel
Length (Center to Center)	13-1/4"	13-1/4"
Crank Pin Diameter	3.2480-3.2485"	3.2480-3.2485"
Bearing Material	Copper Lead, Steel Back	Copper Lead, Steel Back
Bearings, Length (Total)	2-1/16"	2-1/16"
Bearings, Running Clearance	.003-.004"	.003-.004"
Rod, End Clearance	.005-.012"	.005-.012"
Bolts, Torque, Ft.-Lbs.	70	70
CRANKSHAFT (Bearings)		
Main Bearing Journal, Diameter	3.2480" to 3.2485"	3.2480" to 3.2485"
Number	5	5
Material	Babbit, Steel Back, Precision	Copper Lead, Steel Back, Precision
Total Length, Front	1-27/32"	1-29/32"
Total Length, Intermediate	1-3/4"	1-3/4"
Total Length, Center Thrust (Flange Type)	2-3/8"	2.368-2.370"
Total Length, Center Thrust (Washer Type)	-	2.317-2.337"
Total Length, Rear	2-11/16"	2.677-2.687"
Running Clearance	.003-.004"	.003-.004"
End Clearance	.008-.012"	.006-.014"
CAMSHAFT		
Bearings, Number	3	3
Bearing Material	Babbit Lined, Steel Back	Babbit Lined, Steel Back
Bearing Journal Diameter, Front	2.618-2.619"	2.618-2.619"
Bearing Journal Diameter, Center	2.368-2.369"	2.368-2.369"
Bearing Journal Diameter, Rear	1.7475-1.7485"	1.7475-1.7485"
Running Clearance	.0015-.0035"	.0015-.0035"
Bearing Length, Front	2-1/16"	2-1/16"
Bearing Length, Center	2"	2"
Bearing Length, Rear	2-3/16"	2-3/16"
End Clearance	.005-.011"	.005-.011"
Service Bushings	Reamed to Size	Reamed to Size
Camshaft Drive	Helical Gear	Helical Gear
Number of Teeth in Gear	54	54
Pressure Lubricated	Yes	Yes

VALVES		
	Carbureted	Diesel
Tappet Clearance, Hot	.017"	.018"
Valve Spring, Free Length	2-7/8"	2-7/8"
Valve Spring, Test	50-56 lbs. at 2-1/2"	50-56 Lbs. at 2-1/2"
Valve Lever Shaft, Diameter	.9660-.9665"	.9660-.9665"
Valve Lever Clearance in Bushing	.0015-.0020"	.0015-.0020"
Valve Lever Bushing, Length	1-1/4"	1-1/4"
Valve Lever Service Bushing	Must be reamed to size	
Valve Lever Spacer, Intermediate, Length	1-5/32"	1-5/32"
Valve Lever Spacer, End, Length	--------	23/32"
INTAKE VALVES		
Material	MD-3140 Steel	MD-3140 Steel
Head Diameter	2-5/32"	2"
Port Diameter	1-15/16"	1-3/4"
Lift	1/2"	1/2"
Valve Opens	5° after TDC	10° before TDC
Valve Closes	41° after LDC	25° after LDC
Seat Width	5/64"	3/32"
Seat Angle	45°	45°
Stem Diameter	.4315"	.4325"
Stem Clearance in Guide	.002-.004"	.002-.004"
EXHAUST VALVES		
Material	Silchrome "XCR"	Silchrome No. 2
Head Diameter	1-31/32"	1-3/4"
Port Diameter	1-3/4"	1-1/2"
Lift	1/2"	1/2"
Valve Opens	42° before LDC	43° before LDC
Valve Closes	10° after TDC	10° after TDC
Seat Width	3/32"	3/32"
Seat Angle	45°	45°
Seat Insert (Assembled with side marked "M" out)	Exhaust only	----------
Stem Diameter	.4315	.4315"
Stem Clearance in Guide	.003-.005"	.003-.005"

ENGINE—SPECIFICATIONS

STARTING VALVES		
	Carbureted	Diesel
Material	--------	Silchrome No.2
Head Diameter	--------	1-9/32"
Stem Diameter	--------	.3715"
Seat Width	--------	3/64"
Seat Angle	--------	45°
Stem Clearance in Guide	--------	.0025"
Clearance between cam roller and retainer	--------	.060-.080"

NUT AND BOLT TORQUE DATA (Ft. - Lbs. Torque)		
Cyl. Head	190	190
Conn. Rod	70	70
Main Bearing	150	150
Flywheel	150	150
Manifold Nut to Stud	65	75
Nozzle Body to Stud	--------	45
Nozzle Fitting Nozzle to Body	--------	90
Nozzle Retainer Cap Screws	--------	20

TYPES OF FUEL INJECTION PUMPS	Normal Governed Engine Speed R.P.M.	Governed Fast Idle Speed R.P.M.	Low Idle Speed R.P.M.
Bosch "A" Pump: TD-14 Original Gearing (Effective TDF-501 to TDF-1676)	1300	1410	425
Bosch "A" Pump: TD-14 (Effective TDFM-1676 to TDFM-2812) UD-14 (Effective UDFM-501 to UDFM-2784)	1350	1465	425
Bosch "K" Pump (furnished for service): TD-14 Original Gearing UD-14 Operating @ 1300 R.P.M.	1300	1445	425
Bosch "K" Pump: TD-14 (Effective on TDFM-2812) UD-14 (Effective on UDFM-2784)	1350	1500	425
IHC Single Plunger Pump: TD-14 (Effective on TDFM-5268) UD-14 (Effective on UDFM-4721)	1350	1500	425

STARTING SYSTEM – DIESEL ENGINES

Operation

The "14" Series Diesel engine, like all International Diesel engines, has the exclusive feature of starting on gasoline like a regular spark-ignition engine. This is accomplished by means of a starting mechanism which controls four starting valves in the engine head, two butterfly valves and a magneto grounding switch in the dual intake manifold, and a shut-off valve in the carburetor.

To start the engine as a conventional gasoline, spark-ignition engine, the operator moves the speed-control lever all the way to the off position. This prevents the fuel injection pump from delivering fuel to the nozzles even though the pump is running. Then the compression-release lever is pulled back until jaw "B" in Illust. 5, locks with latch "A".

Pulling the compression release lever back accomplishes four things:

1. It opens four starting valves (1) Illust. 5, thereby enlarging combustion chamber (2) by auxiliary chamber (3) in which spark plug (4) is located. This reduces the compression ratio to that of a conventional gasoline engine, or about 6.4 to 1.

2. It closes the two butterfly valves (5), shutting off the Diesel air intake passageway. The intake air then must pass down through the carburetor, around a disc-type air valve (8), Illust. 18, and then through the small high velocity passages in the manifold to the intake ports in the cylinder head. The air-gasoline mixture enters a cylinder on the suction stroke of the piston, is compressed on the upward stroke and ignited by the spark plug in the low-compression chamber (3) on the power stroke.

3. It connects the magneto electrical circuit by opening the magneto grounding switch located in the front end of the intake manifold. (See insert 7, upper left corner, Illust. 5).

4. It releases needle valve (4), Illust. 18, in the carburetor fuel bowl by turning cam (2), Illust. 18, allowing the needle to be actuated by the float.

The engine is then started in the normal way by hand cranking or with an electric starter which can be had as a special attachment. After the engine has operated on gasoline for about a minute the operator pushes the compression-release lever all the way forward, and the engine governor control lever is moved to the operating position at the same time. The engine then runs as a full Diesel.

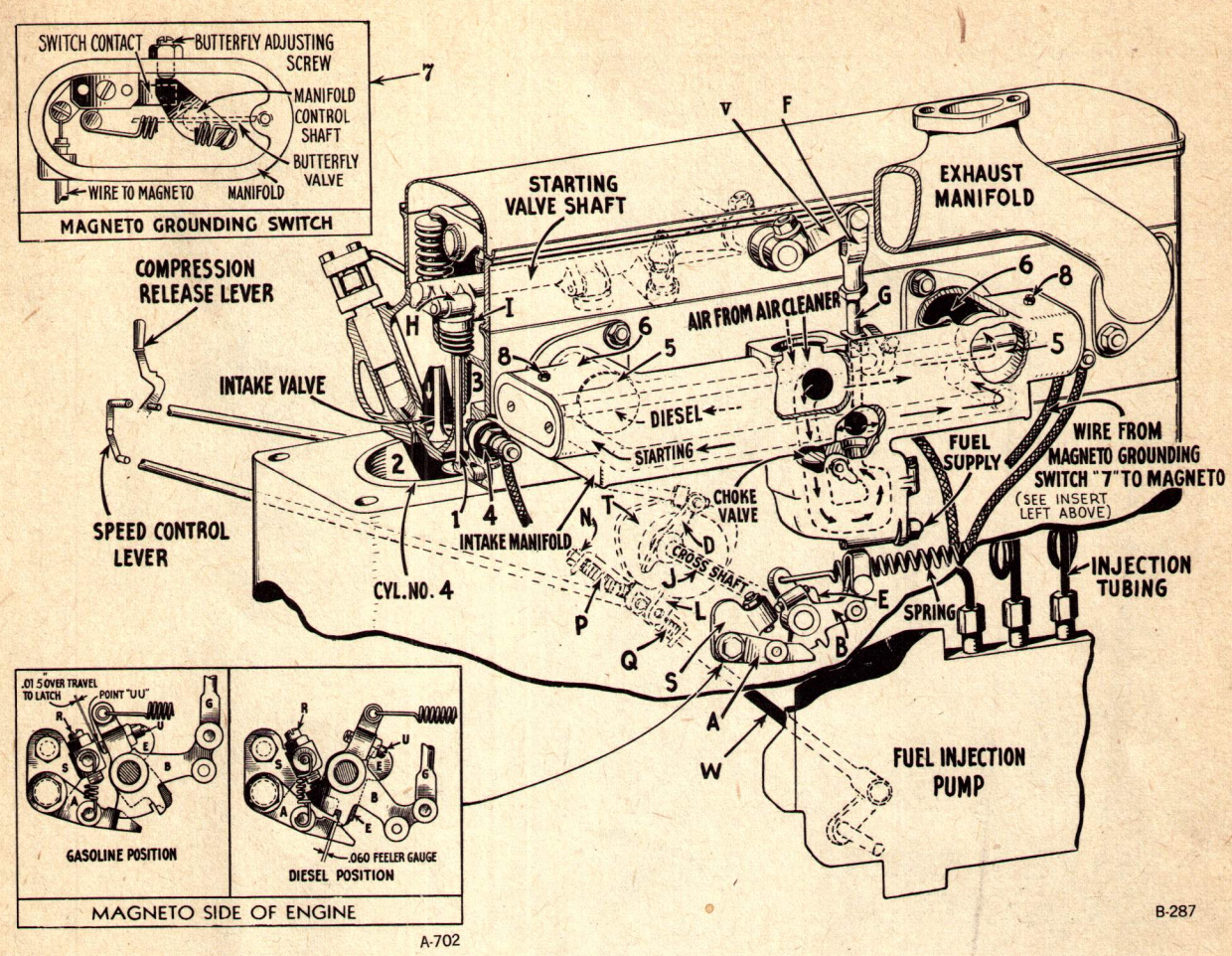
Raising the compression-release lever depresses latch "A", Illusts. 5 and 6, causing it to release jaw "B". Jaw "B" is actuated by a return spring which causes it to turn, pulling down rod "G". This movement opens butterfly valves (5), closes starting valves (1), locks the carburetor needle valve (4), Illust. 18, on its seat and closes the magneto grounding switch (7), Illust. 5. While the engine operates on the Diesel cycle, the carburetor, magneto, spark plugs, and low compression chambers do not function.

The TD-14 TracTracTor Diesel engine is equipped with a governor friction control (see the cross-section drawing shown in the insert in Illust. 6) which is part of the starting mechanism. It is located on the cross shaft "J" just below bracket "T". Its purpose is to prevent any play in the control linkage from interfering with speed regulation and also holds the governor control lever "K" at the speed selected.

The friction control consists of lever "L" which can turn freely on cross shaft "J". Brake friction is applied on the lever by a spring-loaded retainer acting on two friction discs with a stationary disc in between. Lever "L" has two arms-one connecting to the governor control rod "W" and the other to the speed-control lever rod. The shape of lever "L" is such that it will contact lever "D", which is connected to the compression-release lever, if the throttle is opened when the engine is operating on gasoline. This is a reminder to convert to the Diesel cycle before opening the throttle.

Adjustment

Have all the controls, levers, etc. that make up the starting mechanism assembled in place on the engine. Disconnect yoke "F", Illust. 6 from lever "V" and remove the valve cover. Levers "E" and "D" are the only ones rigidly attach-



ILLUST. 5. SCHEMATIC DRAWING OF DIESEL ENGINE STARTING SYSTEM.

ed to cross shaft "J". The cross shaft should have a .030" end play and turn freely in bracket "T". (If the intake manifold is removed from the engine, the starting mechanism can be adjusted with less interference).

A. Set starting mechanism for Diesel operation:

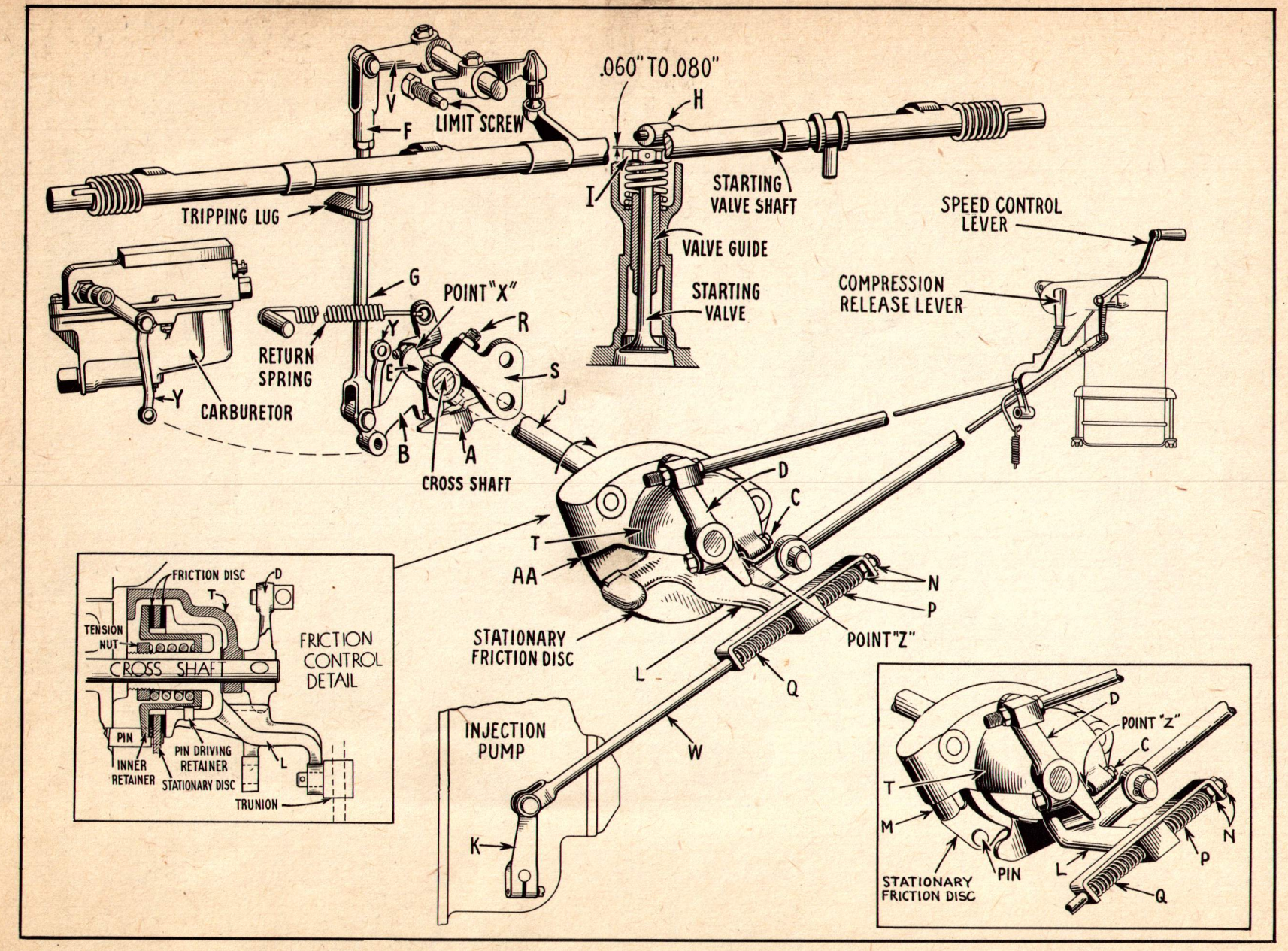
1. Adjust screw "R" until .060" exists between jaw "B" and latch "A". (See lower left insert, Illust. 5).

2. Adjust yoke "F", Illust. 5, on rod "G" so that when it is connected to lever "V" there will be a minimum clearance between the starting valve shaft roller "H" and spring retainer "I" of .060" over the closest valve.

   There should be no greater clearance than .080" over any of the other valves. If it is impossible to adjust the valve clearances on all four valves within the limits of .060" to .080", check the rollers for wear and the roller shaft for twist. Lock yoke "F" with the lock nut. Rotate the cross shaft with the compression-release lever until lever "E" contacts the pick-up face on jaw "B" at point "X", Illust. 6. Now adjust set screw "C" on the pump side to give .100" between the set screw "C" and lever "D" at point "Z"

B. Set starting mechanism for gasoline starting:

1. Adjust set screw "U", Illust. 5, in jaw "B" to .015" between set screw "U" and lever "S" at the point "UU". If the set screw has a rounded point it would be well to file a flat spot on lever "S" where the set screw contacted, and change the set screw to a flat type. Later model engines are equipped with flat-type set screws.



ILLUST. 6. SCHEMATIC DRAWING OF "14" SERIES DIESEL ENGINE STARTING MECHANISM. FRICTION CONTROL DETAIL DRAWING IN LOWER LEFT INSERT. FRICTION CONTROL USED ON TRACTRACTORS BEFORE TDFM-5268 SHOWN IN LOWER RIGHT INSERT.

2. If the intake manifold has been removed it should now be assembled in place and connect link "Y", Illust. 6, to the carburetor lever.

C. Start the engine and run as a Diesel:

(TD-14 Engines with Bosch "A" and "K" Pumps) before TDFM-5268. (See insert in lower right corner, Illust. 6).

1. Retard the throttle until the finger on "L" just contacts plunger "M".

2. Adjust nuts "N" on rod "W" until springs "P" and "Q" are of equal length, and the engine runs at low idle speed.

3. Move the speed control lever to the extreme pump shut-off position; adjust the yoke on the speed control rod until plunger "M" is compressed to 3/32" from the boss in stop bracket "T".

4. Operate the engine at full throttle. Adjust the speed control lever stop screw so spring "P" is compressed but not compressed solid.

(TD-14 engines with I.H.C. single-plunger pump or Bosch "K" Pump) TDFM-5268 and after (see Illust. 6).

1. Retard the speed control lever until the poppet in lever "L" locates in a countersunk hole in the stationary friction disc: this is the low idle speed position.

2. Adjust nuts "N" on rod "W" until springs "P" and "Q" are of equal length, and the engine runs at low idle speed.

3. Move the speed control lever to the extreme shut-off position. Adjust the yoke on the speed control rod so that lever "L" just contacts bracket "T" at point "AA".

4. Operate the engine at full throttle. Adjust the speed control lever stop screw so spring "P" is compressed but not compressed solid.

(UD-14 Power Unit)

The power unit engine does not have the governor friction control located on the cross shaft. It is a separate unit and attached to the flywheel housing, Illust. 23. The governor controls used with the "A" and "K" Bosch pumps (before UDFM-4719) were not equipped for locating the low idle speed. Later units have a spring-actuated poppet in the control lever which locates in a countersunk hole provided in the control bracket when the engine operates at the low idle speed. An adjustable yoke is used on the governor control rod to vary its length to obtain the proper low idle speed. Two stop screws are provided in the governor control lever body to regulate its travel either in full-load position or stop position.

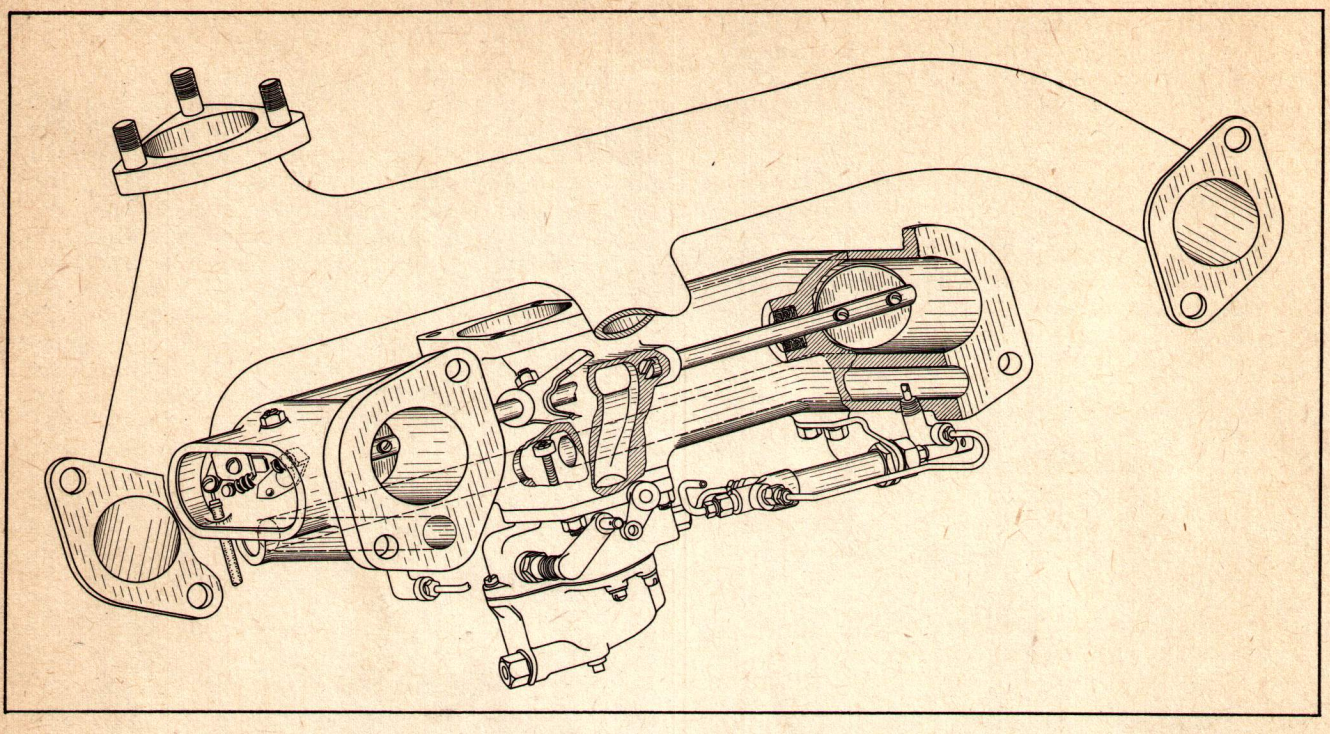
Manifolds

Diesel:

The intake manifold on the Diesel engines are of the dual type. A small, high-velocity passageway is used during the starting operation only and a large passageway is used when operating on Diesel. Two butterfly valves in the large passage way close it when the engine is on the gasoline cycle. An automatic switch in the front of the manifold grounds out the magneto when the engine is switched from gasoline to Diesel. The lever and springs at the ends of the valve shaft provide an over-center action and hold the valves securely in the open or closed position.

To remove the manifold, take off the cover from the front end of the manifold and remove the wire from the grounding switch; shut off the gasoline and disconnect the gasoline pipe at the carburetor; take out the cotter key and disconnect the choke control; take off the primer control; take out four capscrews at the air intake flange; take out the pin and remove the carburetor control link "Y", Illust. 6, from the carburetor; and remove two nuts at each intake port flange. When replacing the manifold, be sure all gaskets are in good condition and that the holes in the gasket line up with the holes in the manifold at both the cylinder head and carburetor.

Butterfly valves can be removed after they are tripped to the closed position and the two screws in each are taken out. Turn the shaft to the open position and withdraw the valves. Remove the nut and taper pin from the yoke on the valve shaft and pull the shafts from the manifold. Dust or air seals for the shafts are assembled with the lips facing each other.



ILLUST. 7. DIESEL ENGINE INTAKE MANIFOLD AS SEEN WHEN LOOKING FROM THE CENTER OF THE ENGINE TOWARD THE MANIFOLD. FRONT OF ENGINE IS AT LEFT.

When replacing the valves, the 12° stamp should be on the top side facing the intake port. Remove any burrs from slots in the shaft to avoid damaging the angular edges on valves. Turn the shafts to the closed position, insert the screws, center the valves, and then tighten the screws. Maximum clearance between the valves and the manifold should be .0015", using a 1/8" wide feeler gauge for not over 1/3 of circumference for best performance of the starting carburetor. Upset the threaded end of the screws after tightening. Effective with TDFM-2402 and UDFM-2272, shakeproof lockwashers under round-head screws are used; do not upset the threads.

The control lever on the valve shaft locates with a taper pin and groove in the forward shaft. The forward shaft drives and connects the rear shaft by a tongued and slotted connection. The control lever is assembled with the flat side down. Valves should be adjusted to a horizontal position for Diesel operation to prevent any restriction of air flow. Adjustment is made by loosening the lock nut and turning the butterfly adjusting screws (8) Illust. 5, located on top of each end of the manifold. Set screws contact the valve shafts inside the manifold end chambers. Do not change the adjustment after the manifold is assembled to the engine. The over-center springs hold the valves in the open or closed position.

The magneto grounding switch inside the chamber at the front of the manifold consists of an insulated terminal plate that contacts with the lever on the end of the control shaft to make a ground connection when in the Diesel position (see insert (7) Illust. 5). Bend the thong of the terminal plate to make good contact. Check spark plugs while the engine is running on the Diesel cycle to determine whether the switch grounds the magneto. There should be no spark. As the tripping lug moves up, the over-center action snaps the switch to the open position for gasoline operation.

A manually operated, plunger-type primer is located on the underside of the manifold, permitting the operator to force a slug of gasoline into the small air passage to aid in starting a cold engine.

Carbureted:

The manifold on the carbureted engine is a combination intake and exhaust manifold. As the engine is designed to operate on gasoline only, adjustments on the intake manifold are not necessary.

Manifold gaskets, particularly for the intake, should be in good condition and nuts drawn to 65 ft.-lbs. with a torque wrench. Entrance of dirt through the intake gaskets will naturally shorten the life of the pistons and cause excessive oil consumption.

AIR CLEANER

The Donaldson 9" oil-washed air cleaner is used on the "14" Series engines. The air intake is provided with a screen to prevent large particles such as leaves, chaff, etc., from entering the air cleaner. Air passes through the screen, down the intake pipe into the oil cup, and up through the screens and pipe to the intake manifold. The sudden reversal of direction of air flow as it passes through the oil separates a large portion of dust, which settles to the bottom of the cup. As the air passes through the oil it is thoroughly mixed and carries part of the oil as a mist up through the crimped screen element. As the oil mist hits the screen elements it returns to the oil cup and carries the dirt with it.

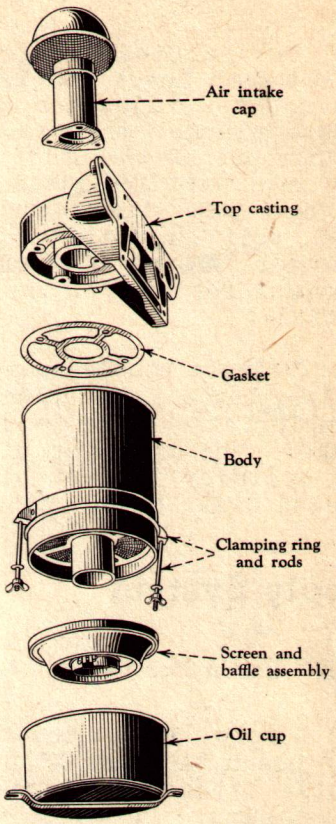
The oil cup must be removed, cleaned and refilled with oil at intervals depending upon the dust conditions under which the unit operates. Screens should be washed with kerosene. Joints, rubber connections, etc., should be air tight to prevent entrance of dust particles.

Proper functioning of the air cleaner is important to obtain maximum power and long life from an engine. A restricted air cleaner will cause a loss of power. Follow instructions in the Owner's Manual for cleaning the air cleaner and connecting parts.

A collector-type pre-cleaner (59331-D) can be attached to the air cleaner intake on all "14" Series engines when operating in extremely dusty conditions.

A breather pipe which ventilates the valve housing (Diesel) and the valve housing and governor (carbureted) is connected to the air cleaner. On the carbureted engine the breather pipe leads from the governor housing into the front end of the cylinder head. A drilled passage leads to the top of the cylinder head inside the valve cover. A pipe extends from this opening, up and across the valve mechanism to a similarly drilled passage in the rear of the cylinder head. This pipe has a hole drilled in it to ventilate the valve mechanism. The breather pipe leads from the rear of the cylinder head to the air cleaner.

On the Diesel engine the breather pipe leads from the valve housing to the air cleaner. A pipe leads down the air intake pipe of the air cleaner at the point of connection between the breather pipe and air cleaner.



ILLUST. 8. EXPLODED VIEW OF TD-14 AIR CLEANER.

FOLLOW THESE SAFETY RULES

The practice of safety in a service station is of utmost importance to the dealer, the individual serviceman, and to his fellow workers. The following safety cautions are suggested for your protection:

Never smoke in the service station where fire possibility is present.

Gasoline is dangerous as a cleansing agent because of fire; use non-inflammable solutions.

Wear goggles when performing welding, grinding, or chipping operations.

Rivet busting is dangerous; drill out rivet heads and then use a punch for removing the remaining portion.

Never work under heavy machines unless they are firmly supported.

Exercise every caution when engines are being operated in the service station; carbon monoxide is deadly.

Have a number of fire extinguishers located around the service station where they can be readily reached when needed.

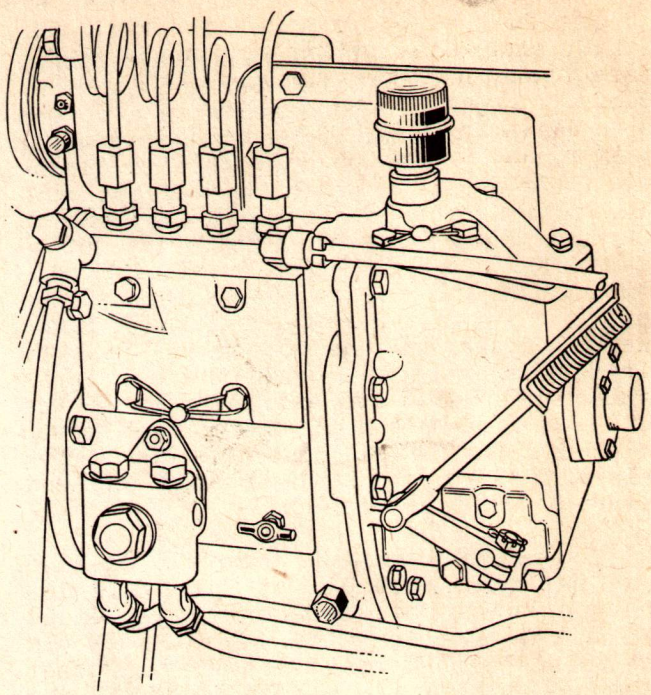
Always give immediate and proper first aid to all injuries even though considered minor.

FUEL INJECTION SYSTEM

Fuel Injection Pumps

The "14" Series Diesel engines have been equipped with Bosch models "A" and "K" flange-mounted injection pumps and I.H.C. single plunger injection pumps. The serial numbers of the units on which these pumps were used are listed on Page 11. All of these pumps are constant-stroke, cam-actuated, solid injection type. Both the Bosch models "A" and "K" pumps have a separate plunger for each of the four injection nozzles.

The I.H.C. single plunger pump, as the name indicates, has a single plunger which makes a pumping stroke for every piston power stroke. The transfer of fuel to the proper cylinder is controlled by a valve-operated distributor unit.

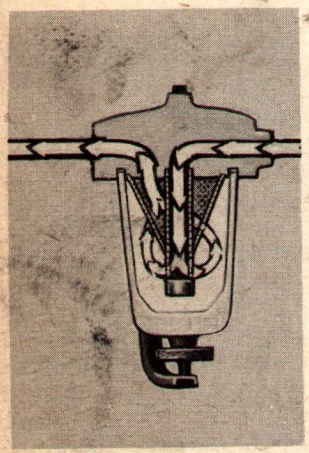


ILLUST. 11. BOSCH "K" INJECTION PUMP.

Fuel Supply System

"A" and "K" Bosch Pumps:

The fuel supply pump is mounted on the side of the Bosch "A" and "K" pumps. It is a variable-stroke, self-regulating, plunger-type pump. On the TD-14 Trac-TracTor the fuel from the supply tank

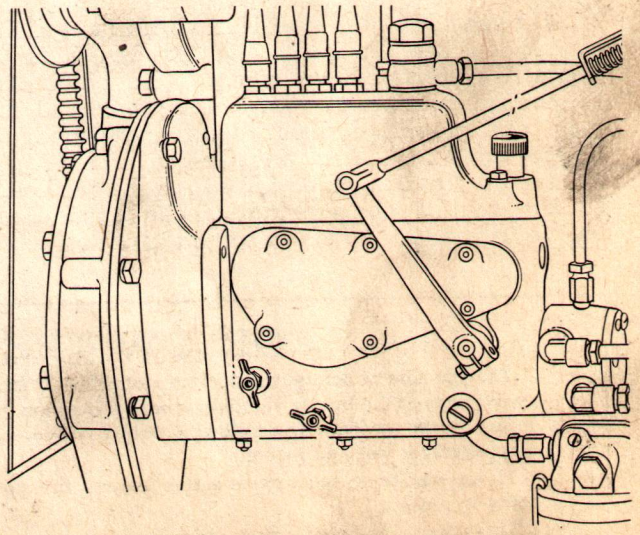


ILLUST. 9. DIESEL FUEL WATER TRAP.

ILLUST. 10. DIESEL FUEL FILTER.

passes through a water trap, Illust. 9, then it is pumped by the supply pump through an absorption-type metal and cloth element fuel filter, Illust. 10. From here it goes to the supply chamber in the injection pump. A check valve maintains a pressure of 7 to 8 lbs. per square inch in the supply chamber; all fuel delivered by the supply pump in excess of that used by the injection pump is returned to the fuel tank through a separate pipe. With this arrangement, fuel is continually being recirculated through the fuel filter.

In the event the fuel supply and return pipes on the TracTracTor show wear at the point of loop cross-over, this can be eliminated by slightly spreading the loop, to prevent contact.



ILLUST. 12. I.H.C. SINGLE PLUNGER INJECTION PUMP.

I. H. C. Single Plunger Pump:

The fuel supply system used with the I.H.C. single plunger injection pump differs from the system used with the Bosch pumps, in that it includes two filters and both a primary and a scavenging pump. The primary and scavenging pumps are identical constant-mesh gear types which are attached to the rear of the injection pump. Drive is accomplished through a coupling directly off the rear end of the governor shaft.

On the TD-14 TracTracTor the fuel from the supply tank passes through a water trap, then through an auxiliary fuel filter to the primary pump. The primary pump forces the fuel through the final filter to the injection pump inlet fitting. The scavenger pump returns the surplus fuel from the injection pump back to the supply tank.

Neither the auxiliary fuel filter or final fuel filter elements can be cleaned, they must be renewed; therefore the only time they should be disturbed is when replacing.

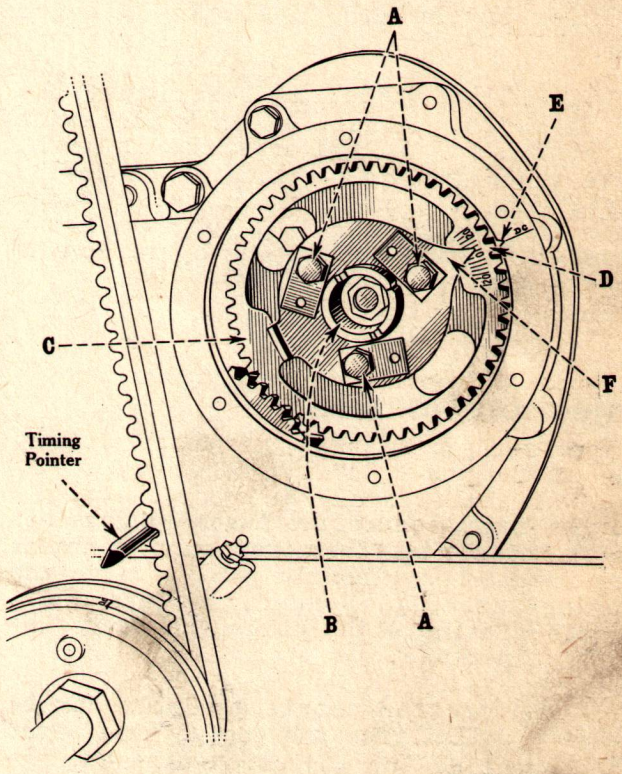
Timing Injection Pumps

All fuel injection pumps are timed the same to the "14" Series Diesel engines. To time an injection pump to an engine with the crankcase front cover in place and the fuel pump gear cover removed as shown in Illust. 13, crank the engine until the No. 1 cylinder is at top dead center of the compression stroke. This position can be determined by setting the starting mechanism on the gasoline cycle, removing the No. 1 spark plug, placing the thumb over the opening and cranking the engine slowly until an outward pressure is felt. Continue cranking slowly until the notch marked "DC" on the fan drive pulley is in line with the timing pointer in the front crankcase cover.

Check the pump gasket to be sure it is clean, and assemble the pump in place on the engine. Place the injection pump gear "C" on the drive hub "B" so that the chamfered tooth "D" on the gear lines up with the "DC" mark on the front cover at "E", which is located at the right side of the opening above the center.

Turn the injection pump gear hub "B" so that the groove on the side of the hub and the groove on the face of the injection pump gear line up. Place the timing pointer "F" on the hub with the pointer at a position 1 to 1-1/2 points to the left (retard) of 0° for Bosch "A" and "K" pumps, and at a position 2-1/2 to 3 points to the left (retard) of 0° for the I.H.C. single plunger pump. (These are generally the positions for best operation.) Bolt the hub, gear, and pointer together with capscrews "A" in this position.

Replace the fuel pump gear cover. Reconnect controls, fuel lines and injection lines. Replace the spark plug and connect the wire.



ILLUST. 13. TIMING FUEL INJECTION PUMP TO ENGINE.

Whenever the high-pressure tubing is to be disconnected from the fuel injection pump, use two wrenches; one to loosen the pipe fitting and the other to prevent possible turning of the discharge fitting on the pump. Always place caps over the pump discharge fittings when the tubing is removed to prevent possible entrance of dirt.

Effective with TDFM-5124 TracTracTors the "SI" (start of injection) mark on the fan drive pulley has been removed. The timing can be rechecked by the port closing method. Disconnect the outlet pipe on a Bosch "A" or "K" pump and connect in its place a pump or overhead tank of fuel so that a pressure of 7 or 8 pounds per square inch is developed. On the I.H.C. single plunger pump it is only necessary that the pump be thoroughly primed with fuel and no air in the system.

Remove the injection pipe from the No. 1 plunger (also remove the delivery valve from a Bosch "A" or "K" pump). Now turn the engine slowly until the fuel ceases to flow from a Bosch pump or begins to rise in the discharge fitting of the I.H.C. single plunger pump. Note the point on the fan drive pulley opposite the pointer and measure the distance from this point to the "DC" mark on the pulley. If the pump is properly timed, this distance should be 2 inches before the "DC" mark reaches the timing pointer on the Bosch pumps, and approximately 1-1/2 inches before the "DC" mark reaches the timing pointer on the I.H.C. single plunger pump.

If this distance is less, move the pointer "F", Illust. 13 in a clockwise direction and if the distance is more, move the pointer in a counter-clockwise direction. The engine is correctly timed when the engine speed is maximum for a fixed load, and the engine operation is smooth with a clean exhaust.

Injection Nozzles

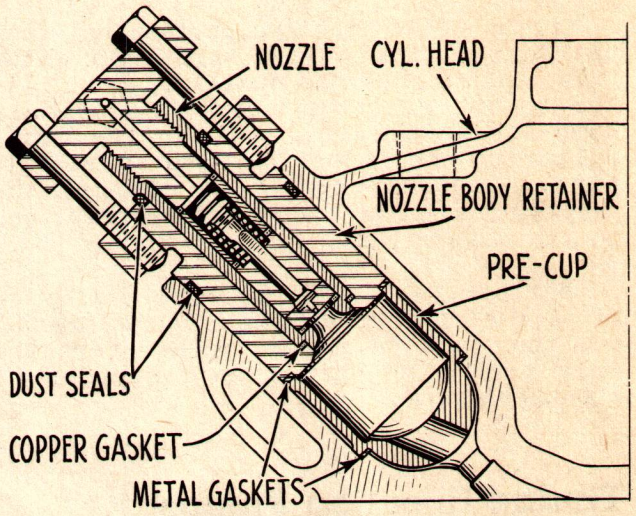
The injection nozzle assembly consists of the nozzle body retainer which contains the nozzle body, nozzle plate, valve and spring assembly, spacer, gaskets and a nozzle fitting which holds the parts securely in place.

The injection nozzle assembly can be readily pulled from the engine head after disconnecting the injection pipe and removing two stud nuts. Take out capscrews in nozzle fitting and pull injection nozzle from nozzle body retainer for disassembly. Under no circumstances should the valve and spring assembly be taken apart unless a hydraulic test pump SE-905-A is available for testing when the nozzle is reassembled. Check the length of the nozzle spring before disassembling; it will make reassembling to the proper tension easier. The correct pressure of the assembled spring is 34 to 35 pounds.

When replacing the nozzle body spacer, be sure it is assembled with the word "Up" toward the top of the cylinder head. Inspect all gaskets and use new gaskets, when the old ones look doubtful.

Check the nozzle for opening pressures with a hydraulic test pump SE-905-A as follows: leakage past the nozzle valve at 700 lbs. per square inch pressure should not exceed 5 drops per minute. Nozzle valves must be set to open at 700 lbs. per square inch.

Effective on TDFM-2488 and UDFM-2343, the injection nozzles have a counterbore and a groove added to the nozzle body retainers to accomodate dust seals. When assembling these dust seals, apply a light coating of soap solution (such as used to assemble wet sleeve rubber rings) to the seal and roll it onto the nozzle body retainer and insert the assembly in place.



ILLUST. 14. CROSS-SECTION OF INJECTION NOZZLE.

If a smoky exhaust condition exists in one cylinder it can be traced by opening, successively, the fuel bleeder screw in each nozzle. The clearing of smoke on opening any one bleeder screw indicates a leaky injection valve in that nozzle. This is particularly true of a light exhaust condition. Dirty nozzles or poor fuel will cause a light or dark blue smoke.

A leaky nozzle valve, improper timing of the injection pump, poor fuel, and insufficient air are several of the causes for a heavy brown or black exhaust smoke. A knocking condition confined to one cylinder very often is caused by a leaky nozzle valve, a dirty fuel delivery valve, broken delivery valve spring, sticky or warped intake or exhaust valves, and a defective cylinder head gasket. Water in the fuel, sticky nozzle valves, or poor fuel will result in a general knocking condition of an erratic or intermittent nature.

The above are a few of the causes of knocking or a rough running engine some of which are traceable to the injection system; however, do not be too hasty to blame the injection pump until all other mechanical portions of the engine have been thoroughly checked.

CARBURETORS

T-14 Carburetor

The Zenith 62 Series, 1-1/2" updraft carburetor is used on the T-14 TracTracTor engine. This carburetor has a main venturi (1), Illust. 15 which measures the volume of air that passes through to the engine. A secondary venturi (3) also located in the air stream causes a zone of greatest suction into which the main jet (2) is discharged. The main jet (2), often referred to as "high speed jet", exerts its principal influence at the higher engine speeds.

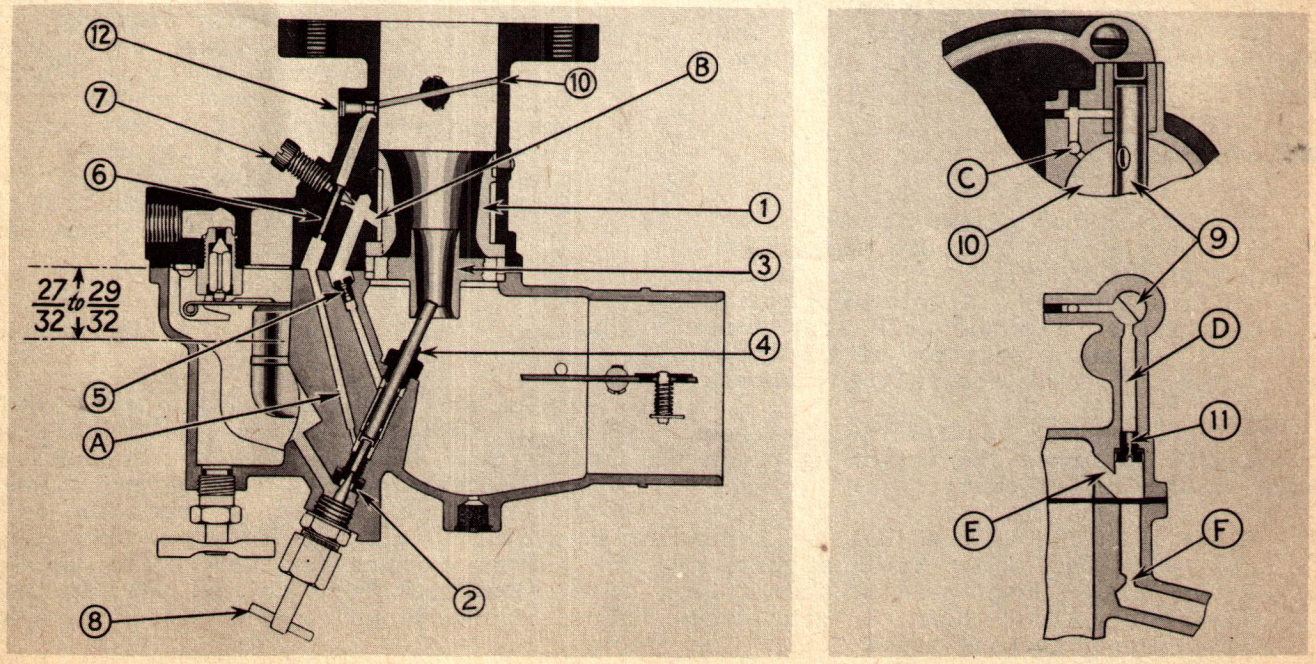
The main jet (2) determines the maximum amount of fuel which may be obtained for high-speed operations. The main jet adjustment (8) reduces this amount if it is turned toward its seat.

Compensating System:

The metering vacuum in the venturi does not increase in direct proportion to the increase in engine speed or velocity of air through the venturi. Doubling the engine speed or doubling the velocity of air in the venturi would more than double the vacuum in the venturi. This means that more fuel would be drawn from the main discharge nozzle for the same amount of air, or the fuel to air mixture would be richer. To compensate for this condition, air is admitted to the main discharge jet (4) through the well vent (5). The mixture delivered through the main discharge jet may be made richer by either decreasing the size of the main discharge jet or by decreasing the size of well vent. Conversely the mixture may be made leaner by either decreasing the size of the main discharge jet or by increasing the size of the well vent.

Idling System:

The idling system consists of the idling jet (6) and the idle adjusting needle (7). The idling jet (6) receives its fuel from the main jet (2) through channel "A". The fuel is metered through the idling jet (6) and is mixed with air which is admitted, from behind the venturi (1), through channel "B". The idle adjusting needle (7) controls the amount of air which is admitted to the idling system. The idling system functions only at idling and low speeds. At these speeds the throttling plate (10) is almost closed and there is



ILLUST. 15. (LEFT) SECTIONAL VIEW OF T-14 CARBURETOR. (RIGHT) SECTIONAL VIEW OF CARBURETOR ECONOMIZER. 1 - VENTURI. 2 - MAIN JET. 3 - SECONDARY VENTURI. 4 - DISCHARGE JET. 5 - WELL VENT. 6 - IDLING JET. 7 - IDLE ADJUSTING SCREW. 8 - MAIN FUEL ADJUSTING SCREW. 9 - THROTTLE SHAFT. 10 - THROTTLE PLATE. 11 - ECONOMIZER JET. 12 - PRIMING PLUG. ALL LETTERS INDICATE CHANNEL PASSAGEWAYS.

a very strong suction past the edge of the throttle plate. This suction draws the mixture of fuel and air from the idling jet (6) which discharges into the air stream through the priming plug (12).

Economizer System:

To develop full power, a certain mixture of fuel and air is required. Under part load, a leaner mixture may be used and operating costs reduced. In this carburetor, regulation is automatically controlled by the position of the throttle shaft (9), Illust. 15. This shaft is shown in the throttle closed position. In this position no suction is transmitted to the fuel bowl, because channel opening "C" is located below the throttle plate (10), thus permitting a full flow of fuel through the idling system.

When the throttle is opened sufficiently to bring the throttle plate (10) just below the channel "C", approximately 1/4 open, a strong suction acts through the channels "D" and "E" thus holding back the fuel in the bowl and causing a lean mixture through the part throttle operation. The suction is controlled by the economizer jet (11). The bowl ventilation from the intake of the carburetor is restricted at "F", thus preventing bowl ventilation from overcoming the suction from channels "C" and "D".

For full power operation, at wide open throttle, this suction is cut off, due to the position of the slot in the throttle shaft, and permits the full flow of fuel necessary for full throttle.

Adjustments:

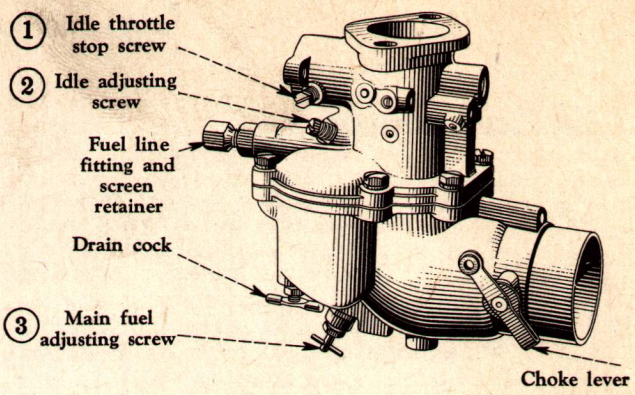
There are three places for adjustment on the carburetor. They are the idle adjusting screw (2), Illust. 16 and the main fuel adjusting screw (3) which control the fuel, and the idle throttle stop screw (1) which sets the position of the throttle butterfly valve for idling purposes.

In the event the adjustments have been radically disturbed the following procedure should be followed:

1. Close both the idle adjusting screw (2) and the main fuel adjusting screw (3). Then turn the main fuel adjusting screw open 5 turns and idle the adjusting screw open 1 to 1-1/2 turns.

2. Main fuel adjustment: Start the engine and run for about 20 minutes with the governor control hand lever fully advanced (until engine is hot). Turn the main fuel adjusting screw (3) in until the engine starts to miss or operate unsteadily, then unscrew it to a point where the engine runs steady. Check this adjustment with the engine under load to make certain you have secured the most satisfactory operation and maximum power. For best operation and minimum dilution, keep the adjustment as lean as possible. Turn the screw clockwise for lean and counterclockwise for rich load mixture.

3. Idle fuel adjustment: Fully retard the governor control lever. Adjust the idle throttle stop screw (1) to give a slight increase in the idle speed. Turn the idle fuel adjusting screw (2) in or out as required to give the smoothest idle with the highest speed (turn the idle fuel adjusting screw clockwise for rich and counterclockwise for lean mixture). Adjust the idle throttle stop screw (1) to give the desired idle speed. This speed should not be set so slowly that the impulse coupling trips continually.



ILLUST. 16. T-14 TRACTRACTOR CARBURETOR ADJUSTMENTS.

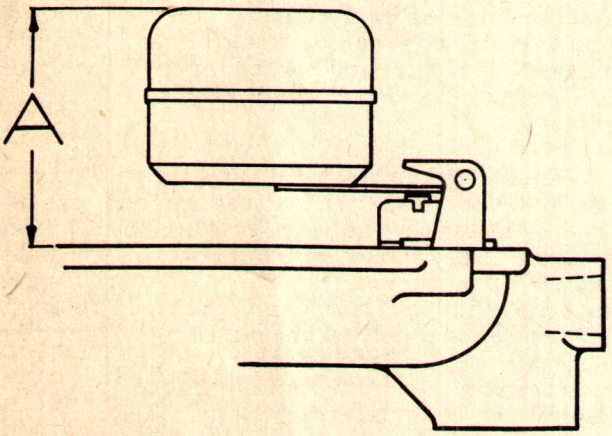
Service:

There are two servicing operations which are important on the 1-1/2" updraft carburetor. The first is to thoroughly clean the carburetor of a gummy substance which sometimes accumulates when the engine stands idle for a period of time with fuel in the carburetor. The second operation is to check the gasoline level in the carburetor bowl and correct it if necessary.

If the carburetor needs cleaning of the gummy substance, it is advisable to completely dismantle it and clean with "acetone". If the gum is still soft a

50-50 solution of Benzol and Alcohol is an effective solvent.

With the carburetor removed from the engine it can be taken apart by taking out six cap screws. Thoroughly clean all internal surfaces with the cleaning solution, using air if available to blow out the passages. The float and fuel valve will be freed after pulling out the float axle. Check the fuel valve and seat to determine wear. If the valve needs replacing, replace the seat also; never one or the other. Service parts are sold as pairs only. After replacing, hold the assembly with the float facing up. In this position the distance from the face of the throttle body to the top of the float should be 1-9/16" to 1-21/32" as shown by "A", Illust. 17. Check this distance on both halves of the float. If this distance is off slightly, very carefully bend the float lever or change the thickness of the fuel valve seat washer. Take care not to loosen any soldered connections when bending the float lever.



ILLUST. 17. FLOAT MEASUREMENT.

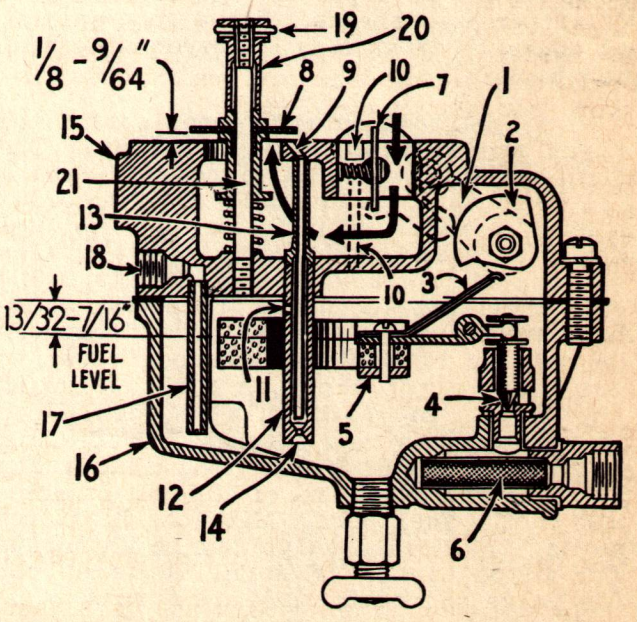
The fuel level in the bowl can be readily checked as outlined in Service Bulletin #S-3140-A1405, using a 1/4" I.D. rubber hose, 5/16" O.D. glass tube, wire support and a half union #12556-C. Connect this measuring device to the tapped hole in the bottom of the bowl after removing the drain cock. Use a small fuel tank with a shut-off valve and 6 to 7 feet of rubber tubing connecting the tank to the carburetor fuel inlet. Provisions should be made to vary the height of the tank above the carburetor needle valve seat.

With the fuel level in the small tank 6 feet above the float valve, the fuel level in the bowl should be 27/32" to 29/32" below the surface of the throttle body. Be sure the carburetor is level when checking.

"14" Series Diesel Carburetor
(Starting only)

A dual manifold carburetor is used on all "14" Series Diesel engines. As outlined under the "Diesel Starting System" and as shown in Illust. 6, link "Y" connects the carburetor locking lever (1), Illust. 18, to the starting mechanism.

When the starting mechanism is in the Diesel operating position, lever (1) is down, causing cam (2) to contact spring (3) holding needle valve (4) against its seat. In the starting position, lever (1) is raised, causing cam (2) to rotate, taking it out of contact with spring (3). This allows float (5) to drop, and lifts needle valve (4) from its seat. Gasoline must pass through the filter screen (6) before entering the needle valve assembly. When the fuel level is 13/32" to 7/16" from the top of the float chamber, the float (5) will have raised far enough to hold needle valve (4) on its seat and shut off the fuel supply. As fuel is used, the float maintains level by opening and closing the needle valve.



ILLUST. 18. CROSS-CUT DRAWING OF "14" SERIES DIESEL ENGINE STARTING CARBURETOR. 1 - LEVER. 2 - CAM. 3 - FLOAT SPRING. 4 - NEEDLE VALVE. 5 - CORK FLOAT. 6 - SCREEN. 7 - STARTING SHUTTER. 8 - AIR VALVE. 9 - NOZZLE DISCHARGE. 10 - DRILLED PASSAGE. 11 - AIR BLEED HOLE. 12 - METERING WELL. 13 - NOZZLE. 14 - JET. 15 - BODY. 16 - FUEL BOWL. 17 - FUEL INLET TUBE. 18 - TAPPED HOLE. 19 - COTTER. 20 - AIR VALVE COLLAR. 21 - AIR VALVE GUIDE.

Illust. 18 shows a cross-section of the dual manifold carburetor; the exploded view is given in the parts list.

With the manifold valves in the gasoline starting position, the air from the air cleaner is drawn down past the choke valve (7), as shown by heavy arrows in Illust. 18, across and up around the air valve (8) and draws the fuel mixture through discharge nozzle (9). The mixture is carried through the small diameter passage in the manifold to the intake ports.

Drilled passage (10), shown with dotted lines, equalizes air pressure in the fuel bowl for air bleed (11). The air bleed is located in the side of metering well (12). As the engine picks up speed, the fuel level in the well is lowered. When it is lowered below the bottom of nozzle (13), air will be drawn from the air bleed and gasoline from jet (14), providing proper mixture ratio for constant idling speed.

Service and Adjustments:

When removing the carburetor, disconnect the following: the link "Y" Illust. 6, from the float locking lever (1), Illust. 18, the dash choke control from the choke lever, the clip from the drip-hole tube, the gasoline supply line, and remove four nuts from the manifold studs. The carburetor body (15) and fuel bowl (16) assemblies may be separated by removing five fillister-head screws. Use a good gasket; it normally extends 1/32" beyond the bowl and body.

The fuel bowl assembly consists of the float assembly and fuel strainer. The fuel strainer is easily removed. Spring (3) on float (5) is normally 1/4" to 5/16" above the surface of the bowl. The fuel level is normally 13/32" to 7/16" below the top of the bowl; the float is 9/32" with the float loose and the needle valve held firmly on its seat. The float can be removed by applying a screwdriver to the float pivot screw on the outside of the bowl. The pivot pin is pressed in the pivot screw and extends 1-7/32" from the head of the screw. The spacer for piloting the other end of the pin is pressed in the fuel bowl. With the float removed, the needle valve may be withdrawn for inspection. If worn, replace both the valve and seat; they are furnished in pairs only as service parts. Thickness of the gasket below the cage may be varied to change the fuel level. If the lever on the float is bent to change the level, remove the float from the pivot pin first to avoid bending the pivot pin.

As a cleaning solvent, use a solution of 50-50 alcohol and benzol or a pure solution of acetone.

The supply tube (17) for the primer extends down into the fuel bowl and may be easily unscrewed from the body (15) for cleaning. The slot in the end of the tube is .028" to .040". The primer can be attached at the tapped hole (18) adjacent to the drip tube.

The metering well (12) and nozzle (13) assembly is easily removed for cleaning by applying a thin screwdriver to the .045" to .049" slot in the bottom end. When replacing, after cleaning, be sure the upper end of nozzle (13) enters the hole in the top surface of the body (15). The opening (9) should be clean.

Air valve (8) should be 1/8" to 9/64" open at all times. Remove cotter key (19) at the top of the air valve collar (20) and rotate the collar to give the proper opening. The spring at the bottom of the air valve maintains the valve in the open position. Be sure the air valve is square with the bore and an equal distance from the top surface of the body all the way around. The valve may be pushed down against body (15) to check the above. Guide (21) should be square with the top surface of the body. If the guide is replaced, the top end should be 1-1/4" above the surface of body (15). On the bottom surface of the body, stake the guide to prevent its turning. The free length of the spring is 9/16" and tests 3 lbs. at 3/8".

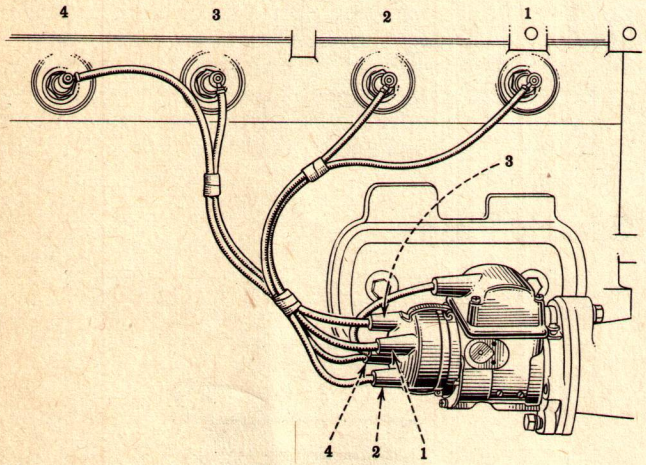
Choke valve (7) is equipped with a spring-loaded air valve to prevent excessive choking. The air valve should open freely. The choke may be removed by taking out two screws in the valve and drawing the shafts from each side. The body is not equipped with bushings for the shafts. Dust seals and retainers are located on each side and should be replaced if not in good condition. Soak the seals in oil before assembling. When replacing the valve, locate it in slots in the ends of the shafts and center it in the opening in the body before drawing up the two screws. The countersunk side of the shafts faces the heads of the screws.

The float locking lever (1) with its shaft assembly, may be removed after taking the nut off the inside end of the shaft, slipping off the cam, and pulling out the shaft, spring, retainer, and two dust washers. If the bearing is worn, it may be replaced by unscrewing it from the body. It is furnished reamed to size as a service part. When replacing the assembly, have lever (1) pointing toward air valve (8); the flat sides of the shaft are then vertical. The cam is then assembled with the large rounded side toward the top of the body as shown in Illust. 18. Replace the nut on the end of the shaft and draw it up tight.

IGNITION

Magneto

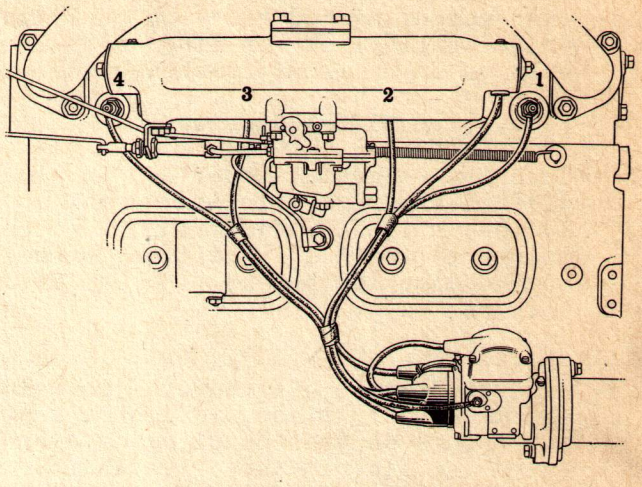
The magneto used on the 14 Series engines is an I.H.C. Model H-4. It has a fixed spark, runs counterclockwise, and is mounted to a drive bracket which is mounted to the crankcase front plate. It includes an impulse coupling for starting purposes that retards the spark 15° when used on the Diesel engine and 35° when used on the carbureted engine. In other words, the impulse coupling will trip at top dead center of the piston on all "14" Series engines. The missing speed of the impulse coupling is approximately 150 r.p.m. The magneto runs at the same speed as the engine crankshaft.



ILLUST. 19. T-14 CARBURETED ENGINE IGNITION WIRING PLAN.

Illustrations 19 and 20 show the wiring plans for Diesel and carbureted magnetos. The firing order 1-3-4-2 proceeds counterclockwise from the spark plug cable socket marked "1" on the distributor cap. The cylinders are numbered consecutively, starting at the radiator end. The magneto turns counterclockwise and so No. 3 is at the top on the engine side of magneto, No. 4 is directly below No. 3; No. 2 is on the outside at the bottom or below No. 1.

The secondary lead-out cable should be removed whenever the engine is being worked on in order to avoid accidental starting. The holes at the bottom of the magneto distributor cap should be open at all times for ventilation. A recommended practice is to clean both the outside and inside surfaces of the distributor cap periodically or when a noticeable amount of dirt has accumulated.



ILLUST. 20. DIESEL ENGINE IGNITION WIRING PLAN.

Carbureted engines are stopped by shorting the primary of the magneto with a push-button switch on the dash of the T-14. Diesel engines, operating as gasoline engines during the starting period, have the magneto automatically shorted through a switch located in the forward end of the manifold when the engine is switched to the Diesel cycle.

Timing Magneto:

The timing of the magneto may be changed a limited amount by loosening the two magneto holding cap screws and swinging the top of the magneto away from the crankcase to advance the spark on the carbureted engine or to retard the spark on the Diesel engine. The point at which the impulse coupling releases can be checked by turning the engine over slowly with the crank and observing the position of the "DC" mark on the fan drive pulley with respect to the timing indicator on the front cover at the moment the impulse coupling releases. The pointer should be on the "DC" mark on the fan drive pulley when the impulse coupling trips.

If the magneto has been removed, proceed as follows to time the magneto to the engine (all "14" Series engines):

1. Remove the cable from the coil cover and distributor cap.
2. On Diesels, convert the engine to the gasoline cycle with the compression release lever.
3. Crank the engine to top dead center for No.1 cylinder on the compression

stroke. The compression stroke can be determined by removing the No. 1 spark plug; placing the thumb over the opening, and cranking the engine until a definite outward pressure is felt. Continue cranking slowly until the notch marked "DC" on the fan drive pulley is in line with the pointer on the front crankcase cover.

4. Remove the distributor cap.

5. Turn the magneto coupling in the direction opposite to its normal rotation until the distributor rotor points to the No. 1 position, marked on the distributor cap (the cap fits only one way).

6. Fasten the magneto loosely to the bracket flange just enough to hold the magneto in place. Be sure that the prongs on the coupling have engaged the slot in the drive shaft.

7. Pull the top of the magneto away from the crankcase as far as possible on the Diesel engine and toward the crankcase as far as possible on the carbureted engine.

8. Next, turn the engine over with the crank one complete revolution and line up the "DC" mark with the pointer (it is now in No. 4 top dead center position).

9. Move the top of the magneto toward the crankcase on the Diesel engine and away from the crankcase on the carbureted engine until the impulse coupling just trips. Tighten the magneto in place.

The engine should now be timed in the proper position. However, if more power can be obtained by doing so, advance or retard the spark by rotating the magneto as previously described until the desired position is attained. A snappy exhaust will indicate correct timing.

Breaker points on the magneto should be carefully set to .013" with the magneto gauge 21438 DBX. For complete details on this adjustment, refer to the manual for magnetos, Form CHS-27.

Magneto Bracket

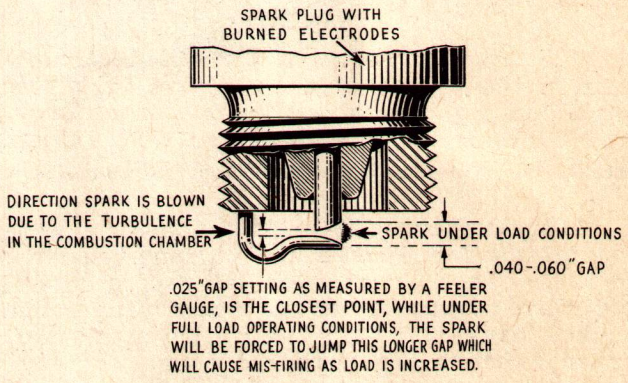
The magneto bracket with its gasket is held to the front plate by four capscrews. The bushing in the bracket is replaceable, babbitt-lined bronze. Running clearance of the shaft is .001" to .003", and the end clearance of the shaft and gear assembly is .003" to .013". The flat side of the gear is assembled against the bracket for end-thrust contact. If the bushing needs replacement, a new one can be pressed in place and reamed to give .001" to .003" clearance for the shaft. When replacing the bushing, the 9/16" holes should be assembled to the front end of the bracket and arranged vertically to coincide with the similar opening in the bracket.

The end of the bushing should be flush with the front face of the bracket.

Particular care must be taken while reaming the bushing to have the bore square with the mounting face of the bracket; if not, the gear will run out causing noisy timing gear train.

The magneto gear can be timed to the camshaft gear without removing the crankcase front cover. Crank the No. 1 piston to top dead center on the compression stroke. Place the bracket on the engine so that the marked tooth on the magneto gear meshes between the two chamfered teeth on the camshaft gear, and bolt the bracket to the front plate.

Spark Plugs



ILLUST. 21. FILE BURNED ELECTRODES EVENLY TO PREVENT ABOVE SPARK CONDITION.

The spark plug gap should be .028" to .032" on carbureted engines and .035" to .040" on Diesel engines. Fouling or sooting of plugs on carbureted engines may be remedied by using hotter (light service) plugs. Burning of electrodes or pre-ignition may be remedied by installing colder (severe service) plugs. Clean and adjust spark plugs at least every 200 to 300 hours of operation. Whenever possible, use the sand-blast cleaning method. When hard starting is encountered, check the spark plug gaps.

GOVERNOR

Friction Controls

On all "14" Series TracTracTors and power units there is a friction device used between the governor control lever and the governor. The purpose of the friction device is to hold the throttle at any position selected, and to eliminate the play in the control linkage from interfering with the speed regulation of the engine.

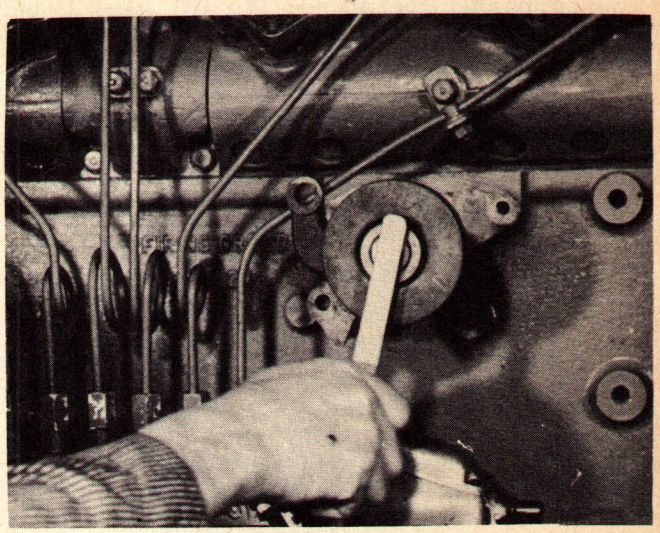
TD-14 TracTracTor:

The friction control on this unit is located on the engine cross shaft just below bracket "T", Illust. 6. (Also see cross-cut drawing of friction control, insert in the same illustration). It consists of two discs of friction material separated by a stationary disc which is anchored to the side of the crankcase. This assembly is sandwiched between the control lever "L", and the spring-loaded inner retainer. Thus lever "L" turns freely on the cross shaft; however, it is held in position by the braking effect of the friction control. Lever "L" connects the governor control rod and the speed control rod.

The friction required to hold the throttle in the position selected can be varied by adjusting the spring compression force. This is done by removing lever "D", Illust. 6, disconnecting rods from lever "L" and three cap screws from bracket "T". The entire assembly will then pull from the cross shaft. Take out plunger "M" and its spring from bracket "T" used on engines below TDFM-5267. Reverse the friction assembly on the cross shaft to make adjustment easy. Using a flat tool with two prongs that fit the two holes provided in the tension nut, turn the nut clockwise to increase spring tension on discs. (See Illust. 22).

Proper tension is obtained when a torque of 120 to 130 inch-pounds is required to turn the stationary disc, with the control lever "L", Illust. 6 held stationary.

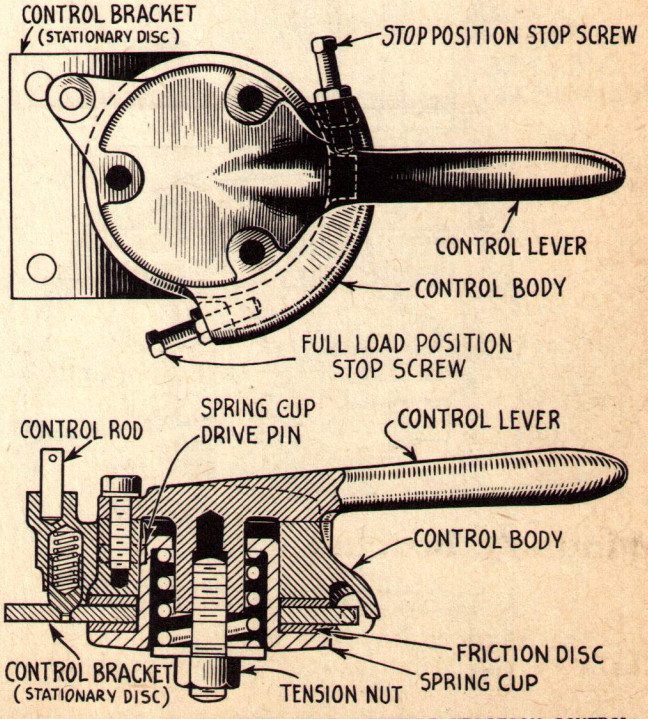
Effective on engines TDFM-5268 and after, a poppet is located in the control lever which slides on the stationary disc and locates in a countersunk hole when in the low idle speed position.



ILLUST. 22. INCREASING SPRING PRESSURE ON GOVERNOR FRICTION CONTROL DISCS.

UD-14 Power Units:

This power unit has a friction control similar to the TD-14 TracTracTor except that it is a separate unit mounted on the flywheel housing. Illust. 23 shows a cross-sectional drawing of this friction control. The spring tension is changed by turning the tension nut at the bottom of the assembly.



ILLUST. 23. UD-14 POWER UNIT GOVERNOR FRICTION CONTROL.

Proper tension is obtained when a torque of 120 to 130 inch-pounds is required to operate the control lever. Effective on power units UDFM-4719 and after, a spring-loaded poppet is located in the hand control lever as shown in Illust. 23, which slides on the stationary plate and locates in a countersunk hole when in the low idle speed position. Power units before UDFM-4719 did not have a poppet in the control lever.

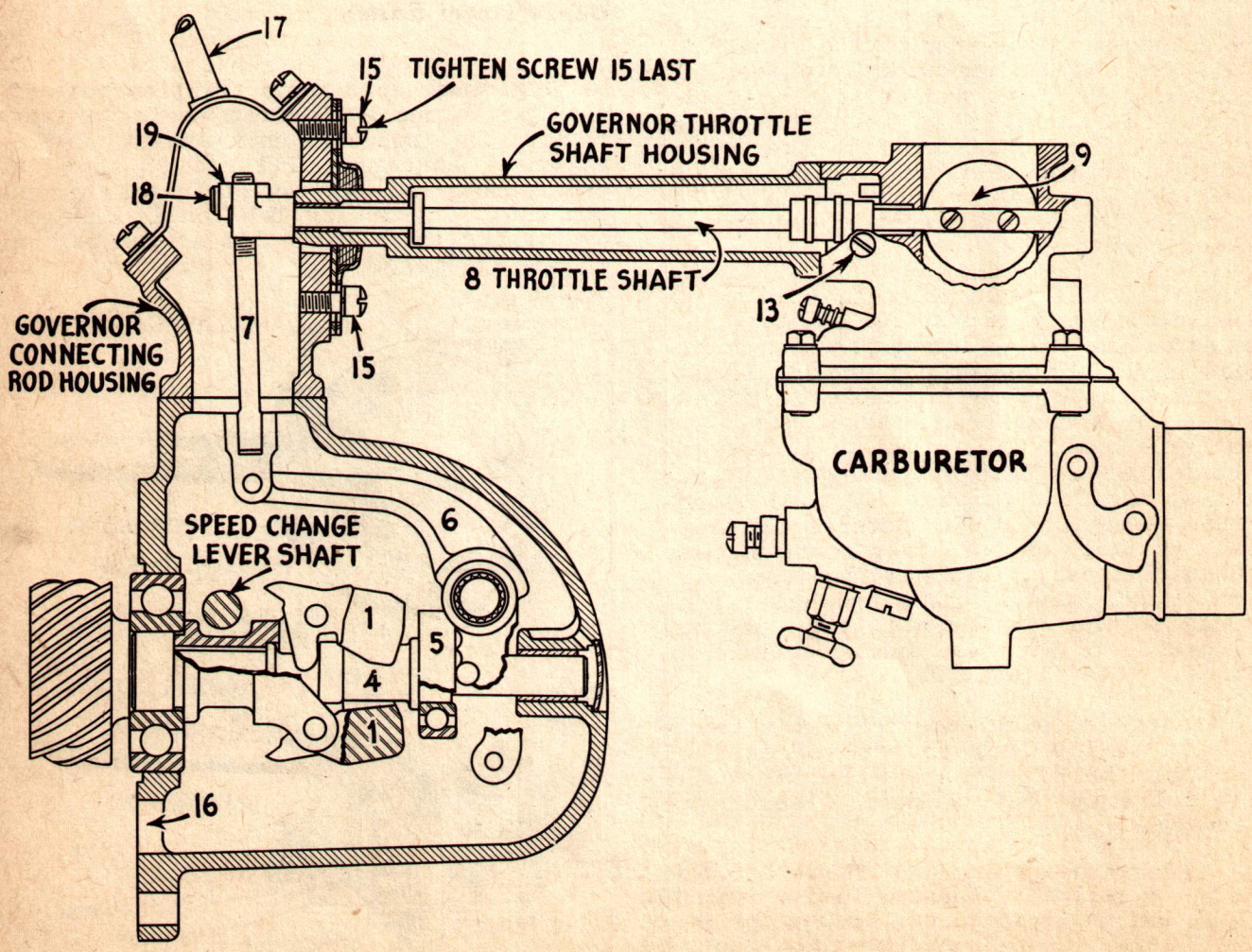
T-14 TracTracTor:

The friction control on the T-14 is a separate unit mounted to the side of the engine. It is similar to the friction controls used on the TD-14 and UD-14. Spring tension is varied by turning a spring retainer at the rear of the assembly. Proper tension is obtained when a torque of 120 to 130 inch-pounds is required to turn the friction control lever.

Governor – Carbureted Engine

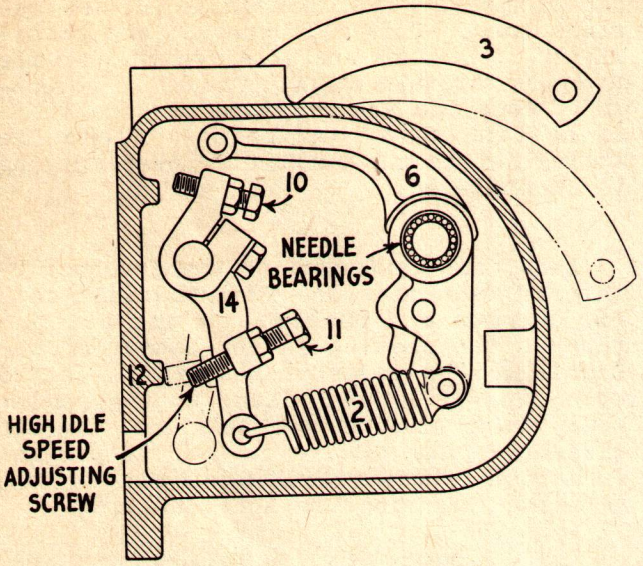
Engine governors are designed to maintain a selected engine speed (R.P.M.) within reasonably constant limits (10%) under varying load conditions by proportioning fuel to the load. The governor used on the T-14 carbureted engine depends upon centrifugal force for its action and consists of a pair of weights (1), Illust. 24, rotating about a shaft driven by the engine and kept from spreading outward by governing spring (2) Illust. 25.

As the engine speed increases, the tension or force of the spring (2) is overcome and the weights move outward until the spring tension is increased to balance their outward action. The more tension on the spring controlled by speed change lever (3), the greater will be the speed of the engine. The motion of the governor weights (1) moving outward is transmitted by sleeve (4) on the governor shaft



ILLUST. 24. CROSS-SECTIONAL DRAWING OF T-14 ENGINE GOVERNOR AND CONTROLS SHOWN IN THE HIGH IDLE SPEED POSITION.

through ball bearing (5), to lever (6), to governor connecting rod (7), and then to throttle shaft (8) which operates butterfly (9).



ILLUST. 25. GOVERNOR ADJUSTING SCREWS AND SPRING PARTS SHOWN IN MEDIUM SPEED POSITION.

When the governor weights are together with tension on governor spring (2) and the engine stopped, the carburetor butterfly should be in a wide open position vertical to the carburetor.

Adjustment: (Refer to Illusts. 24 to 28).

To adjust the governor, remove the cover from the side of the governor housing which gives free access to adjusting screws. The screw (11) controls the maximum high idle speed. The screw (10) limits the travel of lever (14). The maximum high idle speed is defined as the speed at which the engine will run without load with the speed control hand lever in the wide-open position. At this setting (engine stopped), the butterfly valve in the carburetor is in the vertical or wide-open position. The butterfly valve will also be in the same position when the engine is operating under its rated load and at rated r.p.m.

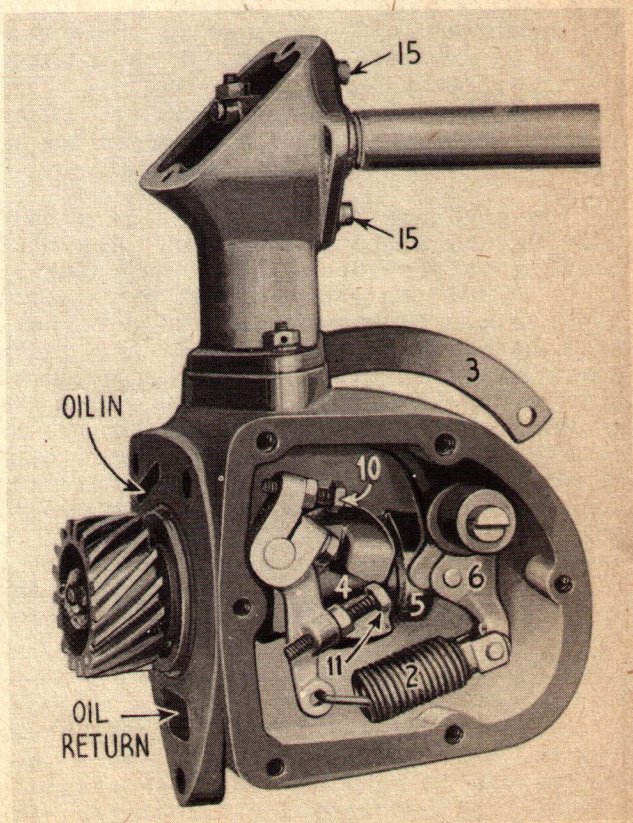
1. When the low idle screw (13) in the carburetor is adjusted for correct low idle speed (450 r.p.m.) the upper stop screw (10) on the governor control lever should be adjusted to touch its stop. At this setting, the governor spring (2) should be free; it will not be possible to set the low idle speed of the engine when screw (10) is adjusted so there is tension in spring (2).

2. Place the speed control lever located on the dash in the wide-open position; make the necessary adjustment in the control linkage so that adjusting screw (11) on speed change lever (14) will contact stop (12).

   The engine high idle speed can be obtained by adjusting screw (11). Turn out to increase the speed to the rated r.p.m.; turn in to decrease it.

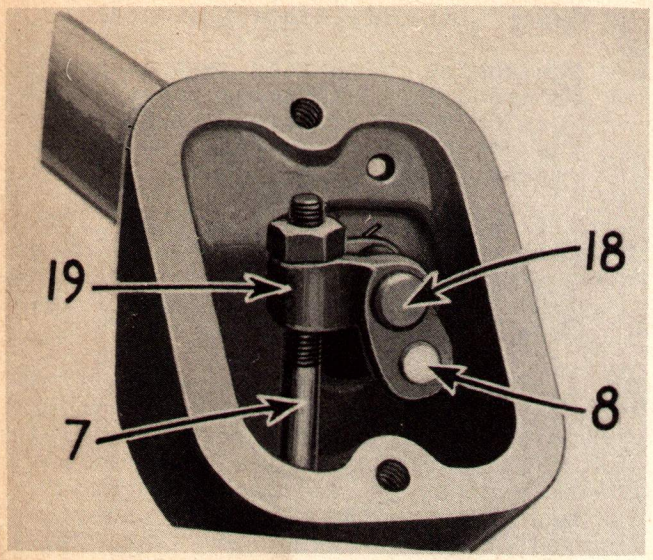
3. The low idle speed (450 r.p.m.) can be obtained by turning screw (13) at the carburetor in or out. If screw (10) is set in too far, the low idle speed cannot be secured.

4. It is very important that the linkage connecting the governor weight movement to the carburetor butterfly be correctly adjusted and not worn excessively. To check this adjustment, remove the governor connecting rod housing cover and ventilating tube (17). Set the speed control lever at the wide-open position and remove pin (18) from the connecting rod adjusting block (19). Pull up the throttle shaft lever (7) and the governor connecting rod adjustment block (19) as far as they will go. With these two parts in this posi-



ILLUST. 26. FORWARD VIEW OF GOVERNOR WITH COVER REMOVED.

tion, pin (18) should slide freely in place. If the pin does not, adjust the governor connecting rod adjusting block.



ILLUST. 27. THROTTLE SHAFT CONNECTION.

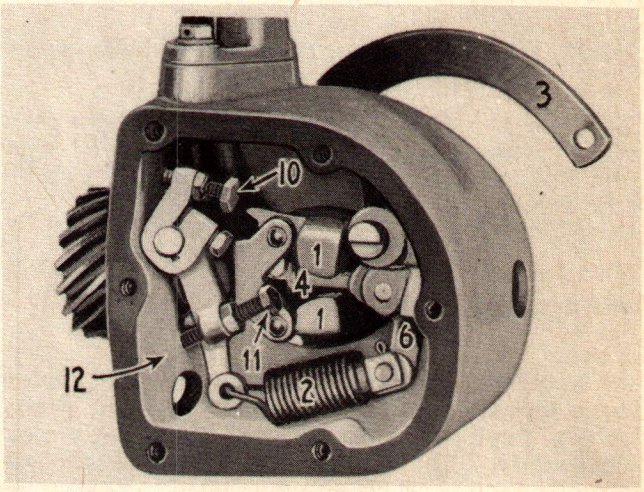
Service:

The governor assembly can be removed from the engine by removing capscrews from the governor housing, removing the ventilating tube (17), Illust. 24, removing capscrews (15), and working the governor throttle shaft housing far enough forward to release the throttle shaft (8) from the coupling to the butterfly valve. There are two screws holding the governor throttle shaft housing to the carburetor.

The governor shaft rotates on a ball bearing and a bronze bushing. The ball bearing is provided with a snap ring so that the bearing can take end thrust from the helical gear driving the governor. Ball bearing (5) on the governor drive shaft should be assembled with the closed side of the bearing away from the shoulder of the shaft. The governor lever (6) is mounted on a needle bearing. This type of construction is used to hold friction to a minimum, which results in a smooth acting governor. All linkages should be checked for play; they should work freely with no excessive play. Excessive play in governor parts will cause rough operation.

When assembling the governor to the engine and carburetor, be sure the tongue and groove of the throttle shaft and butterfly valve shaft are engaged. Loosen screws (15) holding the felt retainer to the connecting rod housing and then replace them. This will prevent any possibility of strains and misalignments in the governor throttle shaft. Check the governor linkage for freeness and be sure there is no binding at any point. Clean the idling jet in the carburetor when surging is encountered.

Lubricant is forced to the governor by intermittent pressure from the lubricating system and returns to the oil pan through the opening in the bottom of the housing. The governor housing is vented by a pipe (17) which leads to the engine head, valve housing, and then into the air cleaner. This venting is used to prevent formation of condensation and rust in the governor and throttle shaft housing.



ILLUST. 28. REAR VIEW OF GOVERNOR WITH COVER REMOVED.

Governor – Diesel Engines

The function of the Diesel governing system is to maintain the engine speed selected by the operator, and automatically proportion fuel to the load. The Diesel governor is an integral part of the fuel injection pump, and is fully enclosed and operates in a bath of oil. It is sealed at the factory after having been carefully adjusted under idling, varying, and full-load conditions.

When installing new oil seals, check to see that the leather is pliable and edges are in good condition to assure a tight fit, preventing oil leakage. Inspect the metal surfaces in contact with the oil seal to make sure they are quite smooth; roughness will cause rapid wear of seal and consequent oil leakage.

COOLING SYSTEM

Operation

A positive, centrifugal pump circulates water in a closed system between the engine block, cylinder head, and radiator. The temperature is controlled by a thermostat, bypass type, set in a casting attached to the front of the cylinder head. The path of water circulation when the engine is cold is from the lower radiator water tank, up through the pump, through the engine block, up to the cylinder head and out into the thermostat assembly, through the thermostat assembly and bypassed back into the pump. Any water escaping into the radiator is made up from the supply in the lower radiator tank. This circulation during the warm-up period prevents the formation of steam pockets.

The thermostat starts to open at 155° on the carbureted engine and at 165° on the Diesel engine. The temperature controls the amount of the opening of the thermostat which in turn, controls the amount of water recirculated through the pump and also the amount of cooler water added from the radiator.

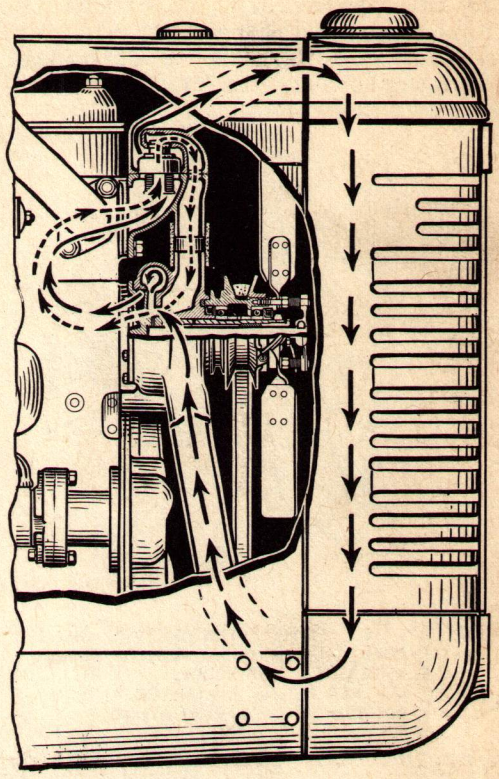
With the thermostat in the wide-open position (175° on the carbureted engine and 190° on the Diesel) the bypass is closed, no water is recirculated through the pump, and the flow is from the cylinder head through the radiator and back to the pump.

Illustration 29 shows the path of the water circulation. The solid lines indicate the path followed through the cooling system if thermostat is open. The dotted lines indicate the flow of the cooling medium during the warm-up period before the thermostat starts to open.

Diesel cylinder heads have the improved jet cooling feature. Water rising from the crankcase to the head is directed by tubes to the area between the valve stems, carrying heat away from the metal surrounding the valve stem guides and valve seats, thereby lowering valve temperatures.

Radiators

All radiators used on the "14" Series TracTracTors and power units are the flat-tube, fin type. The three end tubes on each side of the radiator are blocked and no water circulates through them (Effective on TDF-1456 and UDF-927). Radiator shutters are available as attachments for the "14" Series TracTracTors and power units. The water pump can be removed by taking off the fan housing sheets. Power unit radiators are mounted to the front side of the front engine support. The gasoline starting tank for the Diesel engines is mounted on the rear side of the radiator on all units except the power units not equipped with radiators; then it is mounted at the rear of the cylinder head.



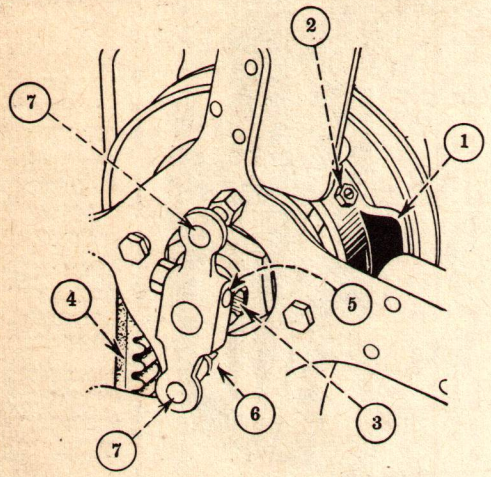
ILLUST. 29. SHORT DOTTED LINES INDICATE PATH OF WATER CIRCULATION DURING ENGINE WARM-UP PERIOD.

Water Pump

The water pump construction is similar to that used on all I.H.C. tractor engines. The fan assembly and drive pulley run on ball bearings mounted on a sleeve which is a press fit in the water pump body. The pump impeller is driven through a full-floating type shaft.

Due to wear after considerable service, the pump may leak at the impeller drive shaft. When this occurs, tighten packing nut (3) Illust. 30, just enough to stop leaking. Use water pump wrench

11858-DA to tighten the nut. After all the adjustment is taken up on the packing nut, it will be necessary to add more packing or, preferably, to remove the old and install new packing (19), Illust. 31. For service the packing is obtainable in split segments 1/4" thick.



ILLUST. 30. FRONT VIEW OF "14" SERIES WATER PUMP. 1 - FAN BELT TENSION ADJUSTING FLANGE. 2 - SET SCREW. 3 - PACKING NUT. 4 - FAN BELT. 5 - DRIVER PIN. 6 - DRIVER. 7 - DRIVING STUDS.

To replace the packing, remove driver pin (5) and driver (6). Unscrew the packing nut (3) and remove the pump body cover (21). Slide out the impeller and shaft for easy removal of the packing.

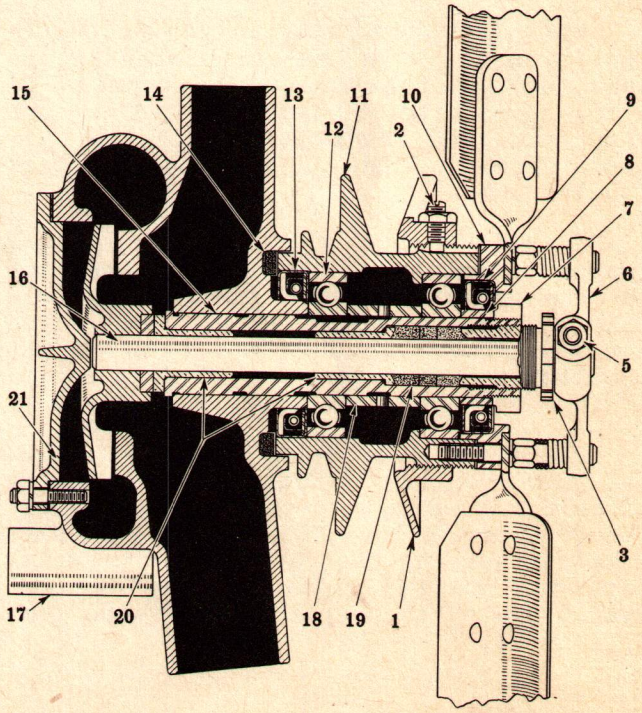
Service:

Remove the fan and parts mentioned above. Next remove the bearing retainer nut (7), Illust. 31, retainer (10), oil seal (9), and lock sleeve (8). Next support the pulley hub (11) in a press and push on the forward end of the sleeve (15) removing the sleeve, body, and rear bearing from the pulley assembly. The front bearing can then be removed from the hub (11). If the adjusting flange (1) has been broken it can be unscrewed from the fixed flange and replaced. The rear oil seal (13) and felt washer (14) can be replaced if necessary; lips of both seals, (9) and (13), face the fan.

Running clearance of the impeller shaft in bushings is .0025" to .0035". When wear is sufficient, bushings (20) can be replaced with service parts reamed to size. Sleeve (15) is a press fit in the pump body (17). The diameter of the hardened shaft (16) is .6215" to .6220".

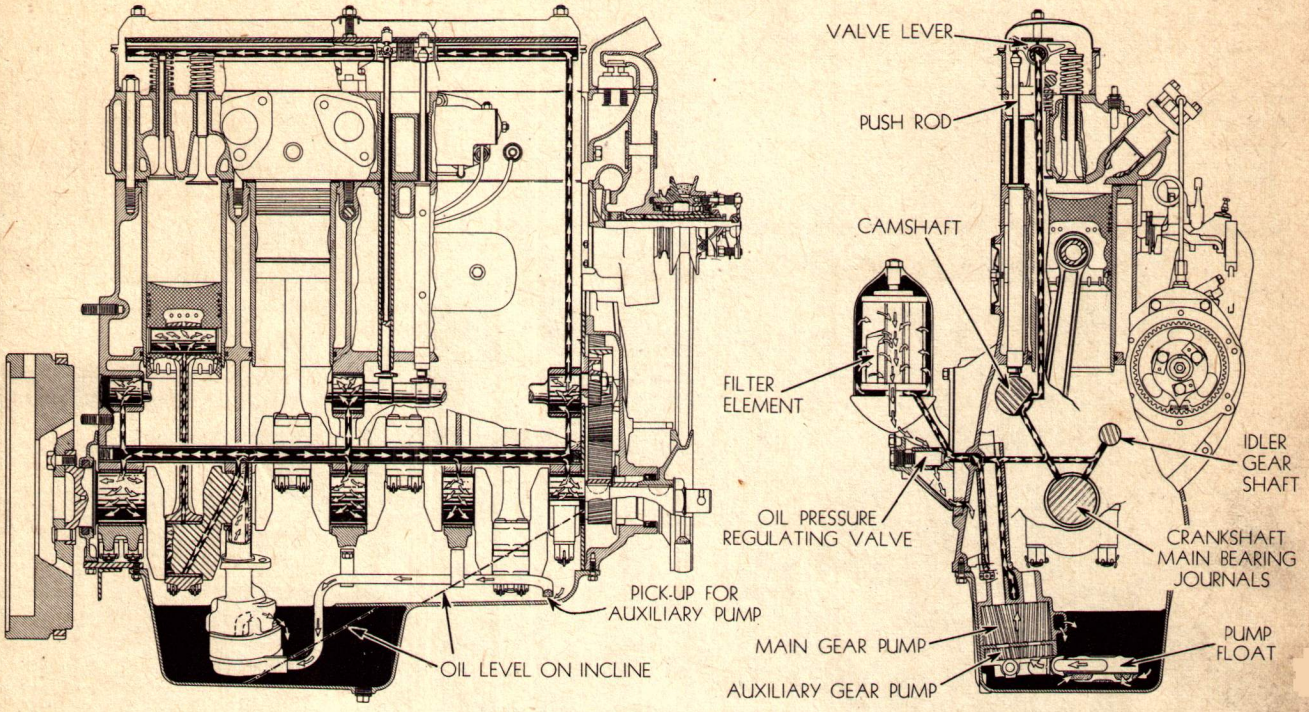
After reassembling the sleeve to the body, put the felt washer (14) in the groove in the body and lubricate it with oil. Next assemble the rear bearing (12) to the hub (11) with the adjusting flange assembled. Then put oil seal (13) in the bore with the lip toward the bearing (12) and the outside edge flush with the end of the hub (11) as shown. Press the hub assembly onto the sleeve and body assembly, supporting the latter under the sleeve. Be sure the bearing is definitely against the pump body. Several spacers (18), welded together, make a good driver for the bearing assembly. Then assemble the outer bearing to the hub (11) and the sleeve (15) with spacer (18) in place. The bearing inner race should be tight against the spacer (18). Assemble the oil seal (9) to the retainer (10) so the lip of the seal will face the fan when installed. Place the lock sleeve (8) on the sleeve (15). The bearing clamping nut (7) can now be assembled. Place the impeller and shaft (16) in the assembly, add packing (19), and assemble the packing nut (3), fan, and remainder of the driver assembly, and the pump cover (21). Holes in the hub (11), retainer (10), and fan will have to be lined up.

Grease the bearings with chassis lubricant before assembling to the hub. The impeller, thrust washer (hardened), and shaft are obtainable only as a complete assembly.



ILLUST. 31. CROSS-SECTION OF "14" SERIES WATER PUMP. 1 - ADJUSTING FLANGE. 2 - SET SCREW. 3 - PACKING GLAND. 5 - PIN. 6 - DRIVER. 7 - NUT. 8 - BEARING LOCK SLEEVE. 9 - OIL SEAL. 10 - BEARING RETAINER. 11 - PULLEY HUB. 12 - BEARING. 13 - OIL SEAL. 14 - FELT WASHER. 15 - SLEEVE. 16 - SHAFT WITH IMPELLER. 17 - BODY. 18 - SPACER. 19 - PACKING. 20 - BUSHINGS. 21 - COVER.

LUBRICATING SYSTEM



ILLUST. 32. INDICATES THE PATH OF LUBRICATING OIL IN "14" SERIES DIESEL ENGINE.

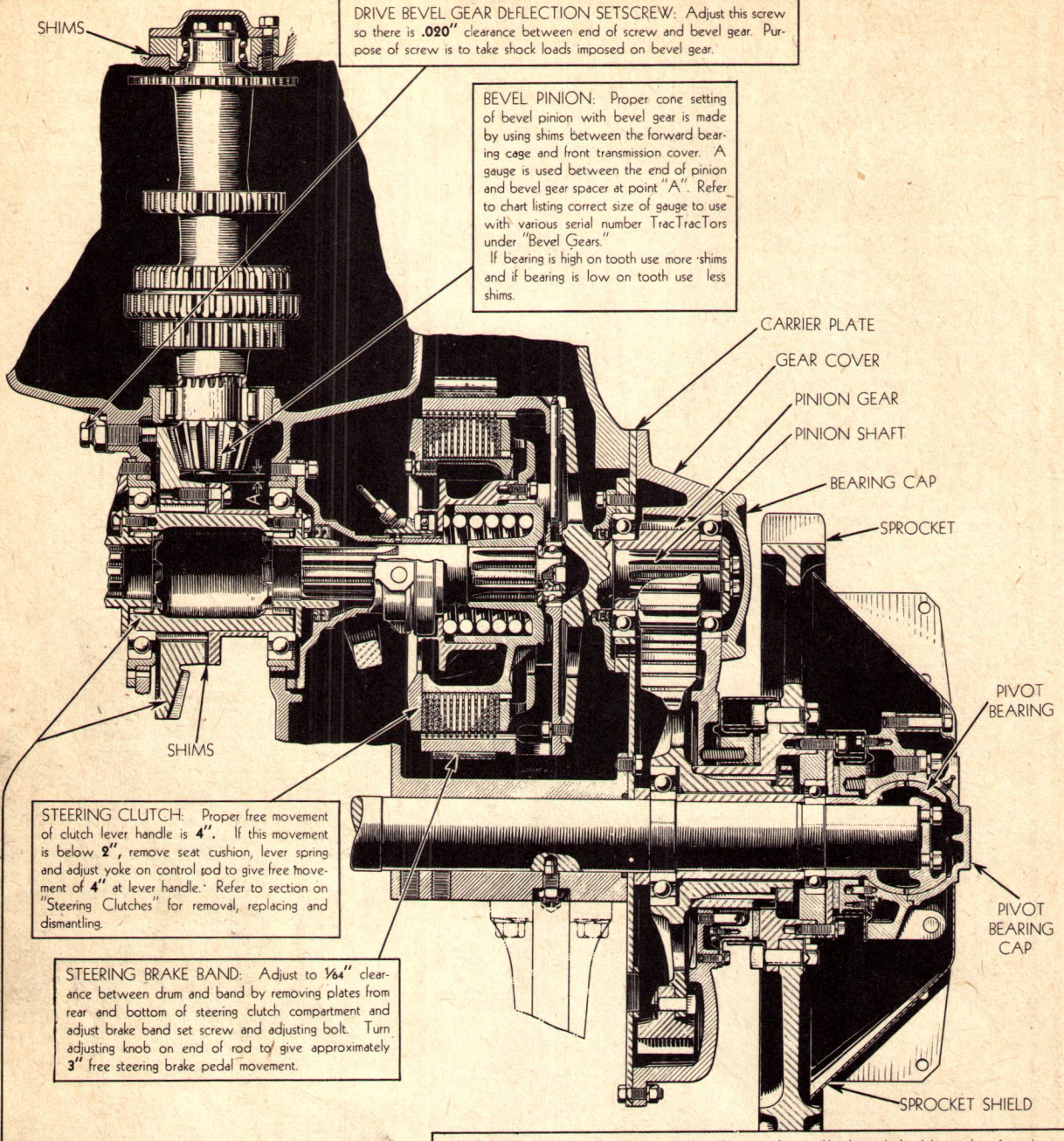
Full force feed to the crankshaft bearings, camshaft bearings, connecting rod bearings, pistons, pins, valve mechanism, and the timing mechanism is used in the "14" Series engines.

The path of the lubricating oil is from the sump, through the "Float-o" oil screen to the pump gears where it is pumped under pressure to the Purolator filter base. A passage leads from the base to the oil filter and is known as a bypass. A portion of the oil is bypassed through the filters, the amount depending upon the cleanliness of the filter element. A pressure relief valve is also located in the filter base. This valve maintains the proper pressure on all bearings and at the same time protects the system and pump mechanism when thick oils caused by severe weather conditions build up high pressures in the oil lines. The oil passed through the filter is returned to the sump the same as the oil that is bypassed by the pressure-relief valve. Oil from the filter base is discharged into the rifle-drilled passages in the crankcase from where it is directed to the main bearings and the camshaft bearings.

Oil from the main bearings passes through drilled passages in the crankshaft to the connecting rod bearings from where it is directed through the drilled passages in the connecting rods to the piston pins and cylinder walls.

Passages lead from the front and center camshaft bearings to the timing gears and valve mechanism, respectively, on the carbureted engine. Notches in the front and center camshaft journals allow the oil to flow from the bearings to the timing gears and valve mechanism with each revolution of the camshaft. On the Diesel engines, a passage leads from the front camshaft bearing to the valve mechanism and a notch in the front camshaft bearing journal meters the oil as described above. The oil is delivered to the valve levers through drilled passages in the valve lever shafts. The oil drains back to the sump through the valve push rod holes in the crankcase, thus lubricating the tappets and cams.

A valve oil pad over the valve levers (Diesel and carbureted) is kept saturated with oil from drilled holes in the top of the valve levers. (Continued on Page 40).



DRIVE BEVEL GEAR DEFLECTION SETSCREW: Adjust this screw so there is **.020"** clearance between end of screw and bevel gear. Purpose of screw is to take shock loads imposed on bevel gear.

BEVEL PINION: Proper cone setting of bevel pinion with bevel gear is made by using shims between the forward bearing cage and front transmission cover. A gauge is used between the end of pinion and bevel gear spacer at point "A". Refer to chart listing correct size of gauge to use with various serial number TracTracTors under "Bevel Gears."

If bearing is high on tooth use more shims and if bearing is low on tooth use less shims.

STEERING CLUTCH: Proper free movement of clutch lever handle is **4"**. If this movement is below **2"**, remove seat cushion, lever spring and adjust yoke on control rod to give free movement of **4"** at lever handle. Refer to section on "Steering Clutches" for removal, replacing and dismantling.

STEERING BRAKE BAND: Adjust to **1/64"** clearance between drum and band by removing plates from rear and bottom of steering clutch compartment and adjust brake band set screw and adjusting bolt. Turn adjusting knob on end of rod to give approximately **3"** free steering brake pedal movement.

DRIVE BEVEL GEAR AND HUB: Install bearing cage and bearing in main frame on deflection screw side. Place drive bevel gear in compartment and insert splined hub through bore into bearing. Assemble coupling and bearing cap. Place spacer on hub and assemble bearing cage, bearing, coupling and bearing cap. Place horseshoe-type shims between gear and spacer and insert cap screws. Gear and pinion should have **.012"** backlash. Add or subtract shims to obtain the desired backlash. Apply red lead or prussian blue to both gears and rotate to observe tooth bearing. Proper setting will show slight toe bearing at center of tooth (top to bottom).

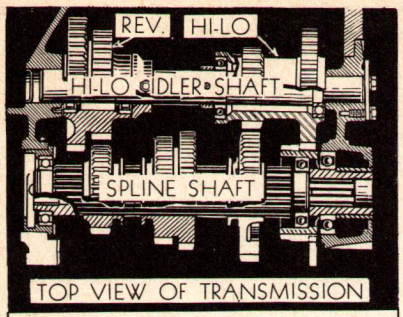
SPROCKET DRIVE: The entire sprocket drive can be readily dismantled while working from the side of the TracTracTor without disturbing the steering clutch. To dismantle, lock the steering brake, take off track chain, jack up tractor and remove track frame. Remove sprocket shield and pivot bearing cap. Take out two cap screws holding pivot bearing to shaft and pull off pivot bearing along with bracket and attached oil seal parts. Next remove bearing cage and bearing using puller cap screws in tapped holes provided for pushing from place. Bend back sprocket nut lock, remove nut with wrench and pry off sprocket which includes labyrinth oil seal and spacer.

Take off pinion shaft bearing cap and bearing washer. Remove cap screws holding gear cover and remove gear cover using puller cap screws in tapped holes for pushing from place. Pinion and gear are now exposed and gear can be pried from shaft. In order to remove pinion it is first necessary to remove steering clutch and take out cap screws holding oil seal retainer. Pinion and inner bearing can then be removed. Remove carrier plate. Reverse the above to reassemble. Both inner and outer pinion bearings were mounted in cages before serial number (standard thread) **TDF-3918.** Above shows latest design.

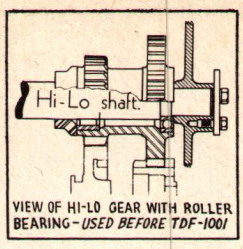
If pinion shaft oil seal needs replacing, it is not necessary to disturb the sprocket drive. Remove track, pinion bearing cap and bearing washer. Remove steering clutch, take out cap screws holding oil seal retainer and remove pinion shaft with oil seal and retainer. Install new seal and reverse disassembling procedure.

B-286

ILLUST. 33. REGULAR TREAD T-14 AND TD-14 TRACTRACTOR FINAL DRIVE SERVICE CHART.



TOP VIEW OF TRANSMISSION



VIEW OF HI-LO GEAR WITH ROLLER BEARING – *USED BEFORE TDF-1001*

TRANSMISSION: To disassemble, drain out oil, remove seat frame, fenders, fuel tank, steering clutch controls, shifter housing assembly, engine clutch cover and engine clutch. Remove from engine clutch compartment the coupling flange and oil seal retainer from upper shaft and bearing retainer and bearing from bevel pinion shaft. Remove washer from end of idler shaft and pull out transmission front cover with aid of puller screws. (TracTracTors before TDF-1001 had a roller bearing in the hi-lo gear instead of ball bearing as shown above to the right. A field change package **5647-D** is available to change from roller bearing to ball bearing design.)

Pull gears from their respective shafts and remove idler shaft as a unit with gears assembled. Remove cap screws from the remaining bearing cages, and pull or pry out spline shaft and bevel pinion shaft. Assemble transmission by reversing above removal procedure.

The forward bearing on the bevel pinion shaft was changed from single row to double row ballbearing effective on **TDF-3853** and up, also from **TDF-3705** to **TDF-3839** inclusive and **TDF-3421** to **TDF-3664** inclusive. This bearing must be installed with shield on transmission side.

FUEL TANK may be removed together with fenders and seat. Capacity, **45** U. S. Gallons.

ENGINE CLUTC
center type. Reac
replaced as a unit v
engine or transmis
clutch, refer to In
manual.

POWER TAKE-OFF (Spec. Feat.) Shaft passes through hollow splined shaft and drives from spline inside transmission driving shaft gear.

GEAR SHIFTER HOUSING can be removed as a unit with gear shifter levers and forks and steering clutch levers all in place.

SEAT

SPLINE SHAFT

BEVEL PINION & SHAFT

CLUTCH B

REV.

2nd & 5th

3rd & 6th

1st & 4th

DRIVE BEVEL GEAR

SHIMS for adjusting bevel gear and bevel pinion cone setting.

TRACK ASSEMBLY: Tracks are interchangeable.

DRAWBAR

PIVOT SHAFT: Locked in position with a dog point setscrew under main frame.

TRACK FRAMES are removable as a complete unit. First remove front stabilizer, then bolts from diagonal brace and from ball socket on pivot shaft.

STEERING CLUTCH RELEASE FORK: Assemble lower bearing cage and bearing into main frame. Assemble link pins to fork, insert cotter pins and bend over the uppermost and lowest cotter pins. Insert fork into main frame, pull out loose link pins, insert links onto collar and into fork, bend over cotters with rod through holes in rear of main frame. For further details, see section on steering clutches.

TRANSMISSION END COVER: Cover removable to facilitate taking out transmission shafts and gears. Cover can be removed through engine clutch cover opening. Use 3–½ x 2¾" cap screws threaded well back to the head, in tapped holes provided, to push end cover loose.

H: **15"**, over- y removed and thout disturbing ion. To adjust tructions in this

MAIN BEARINGS: **5** precision type; vertical running clearance **.003** to **.004"**; end clearance **.006** to **.014"**; thrust taken on center bearing. Bearings can be replaced without removing crankshaft. Replacement crankshaft and bearings are available in **1/32"** undersize. NOTE: When replacing bearing shells, be sure the bearing backs, crankcase and caps are absolutely clean and dry.

Bolt Torque Data (Ft.-Lbs. Torque)	
Cyl. Head	**190**
Conn. Rod	**70**
Flywheel	**150**
Main Brg.	**150**

THERMOSTAT: It is set to open at **165°** and wide open at **190°** F.

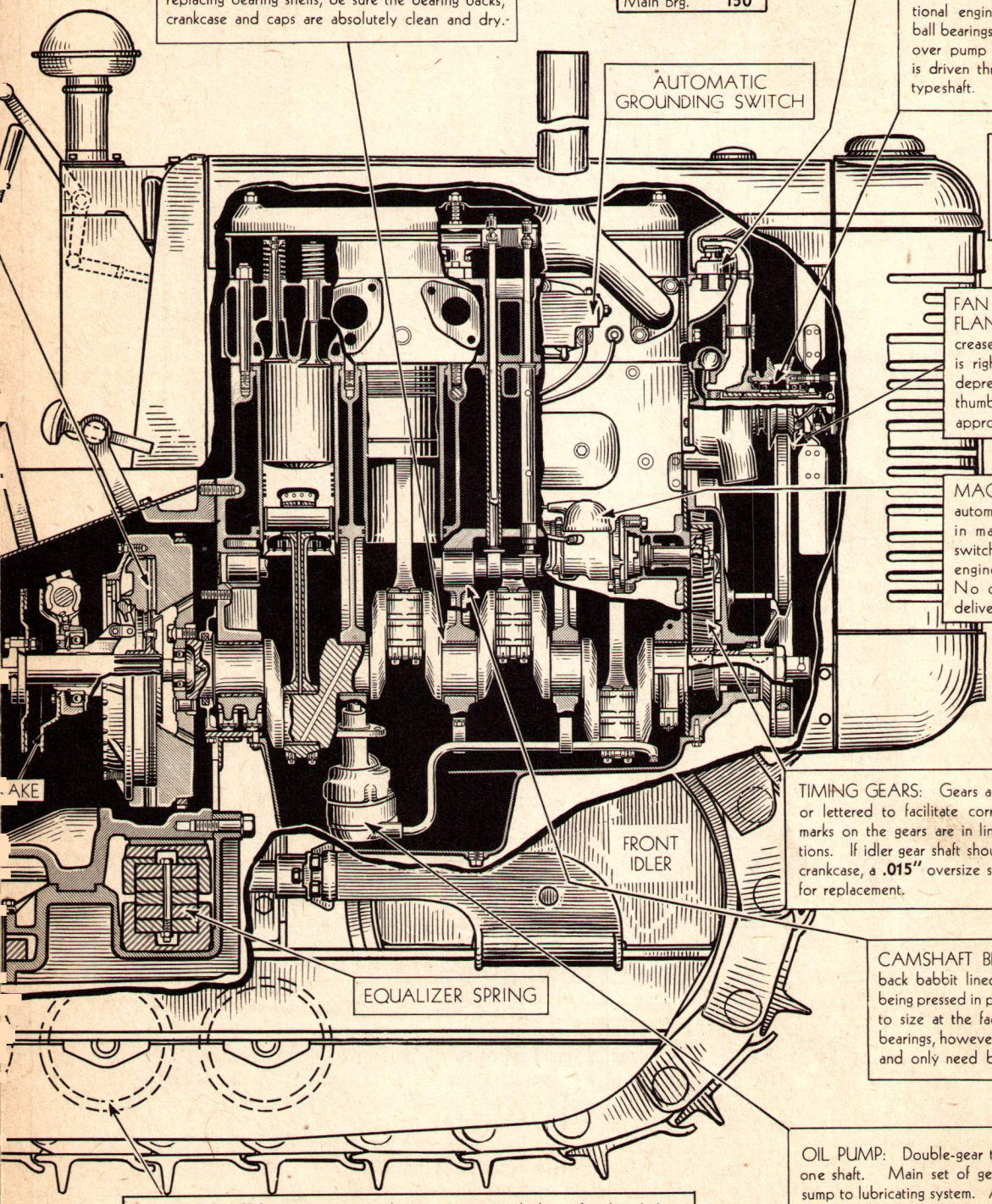
WATER PUMP AND FAN ASSEMBLY is similar in construction to that on all International engines; pulley runs on ball bearings mounted on sleeve over pump shaft, and impeller is driven through a full-floating typeshaft.

AUTOMATIC GROUNDING SWITCH

WATER HOSES: Assembled using same soap solution as with rubber piston sleeve ring.

FAN BELT ADJUSTING FLANGE: Turn in to increase tension. Belt tension is right when belt can be depressed without effort by thumb (between pulleys) approximately **3/4** to **1"**.

MAGNETO: **H-4,** with automatic grounding switch in manifold. Grounding switch can be checked with engine running on Diesel. No current should be delivered to spark plugs.



TIMING GEARS: Gears are all punch-marked or lettered to facilitate correct assembly. The marks on the gears are in line every **64** revolutions. If idler gear shaft should become loose in crankcase, a **.015"** oversize shaft can be secured for replacement.

CAMSHAFT BEARINGS: **3** steel back babbit lined bearings are used, being pressed in place and line reamed to size at the factory. Replacement bearings, however, are finished to size and only need be pressed in place.

OIL PUMP: Double-gear type — driven from one shaft. Main set of gears supplies oil from sump to lubricating system. Auxiliary set of gears pumps oil from front end of pan, preventing oil-pressure failure when unit is operating at extreme angle of tilt, front down. "Floato" oil screen prevents foreign bodies from entering pump and takes clean oil from top of sump.

TRACK ROLLERS are press mounted on cast carriers which are fitted with four bronze bushings. Bushings, reamed to size, are available for repairs. Replace bushings before carriers start to wear. With track roller assembly removed from track frame, remove snap ring from each side, support roller on press and push on shaft, forcing carrier out. Turn over and push remaining carrier out. Replace new carrier bearings and assemble parts in reverse of removing procedure.

STARTING VALVE: Screw spring retainer down to **.240—.250"** from top of cylinder head and insert cotter pin. Guide should be pressed in place so that its top end will be **15/16"** below top of cylinder head.

VALVE-SEAT WIDTH: **3/32"**. Seat must be **.002"** concentric with valve guide bore.

ROCKER ARMS: Running clearance **.0005"** to **.002"**. Shaft diameter **.9960—.9965"**.

VALVE TAPPET CLEARANCE—HOT: **.018"**. Recheck after tightening rocker arm assembly or cylinder head. Method is outlined in the Instruction Book.

EXHAUST MANIFOLD

AIR FROM AIR CLEANER

BUTTERFLY VALVE TRIP YOKE shown in Diesel position.

BUTTERFLY VALVE must fit manifold **.0015"** maximum clearance using **1/8"** wide feeler gauge for not over **1/3** of circumference.

PASSAGE FROM CARBURETOR

SPARK PLUGS: Gap should be set **.035** to **.040"**.

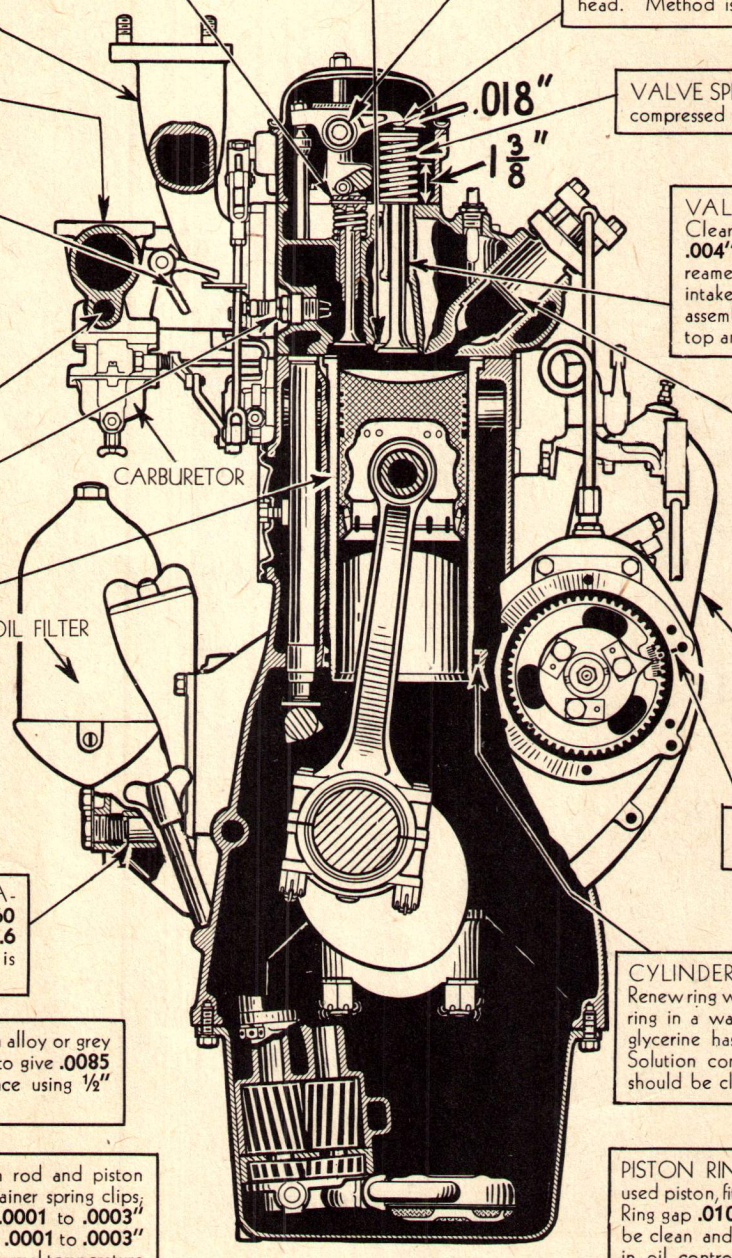
CYL. SLEEVE should fit free in crankcase. Try sleeve before installing packing ring. Pistons and sleeves are stamped with either numbers or letters for identification and must be matched in pairs.

OIL-PRESSURE REGULATING VALVE: Set for **60** lbs. pressure; it should test **30.6** lbs. at **2 3/32"**; free length is **3 3/32"**.

PISTON: **A-132,** aluminum alloy or grey iron, a select fit with sleeve to give **.0085** to **0095";** measured clearance using **1/2"** wide ribbon gauge.

PISTON PIN: Pin floats in rod and piston and is held in piston by retainer spring clips; the fit in piston should be **.0001** to **.0003"** tight for aluminum pistons and **.0001** to **.0003"** loose for cast iron pistons at normal temperature of **70°** F.

CONNECTING ROD: Rod should be straight, free from twist, and parallel with piston; the assembly is replaceable from bottom of engine without removing cylinder head. Cylinder numbers are marked on rod and cap and should be reassembled with markings toward camshaft side of engine. Numbering starts with front of motor. Bearings are steel back, precision type, copper-lead; vertical clearance **.003** to **.004"**. Can be checked with a small piece of virgin lead **.005"** thick or **.003"** brass shim (1/4 x 1 1/4" long.)



VALVE SPRING: Should measure **2 1/2"** when compressed **50** to **56** lbs., free length **2 7/8"**.

VALVE AND VALVE GUIDE: Clearance — intake **.003";** exhaust **.004"**. Valve guides for repairs are reamed to size. Valve stem diameter—intake **.4325";** exhaust **.4315"**. Guide assembled with sharp edge chamfer at top and top shoulder **1 3/8"** above head.

INJECTION NOZZLE can be readily removed by taking out two capscrews shown. Assembly should be clean and free from carbon. Torque data: Fitting in body **90-95** ft. lb., stud nuts **45-50** ft. lb., capscrews **20-25** ft. lbs.

DIESEL FUEL FILTER

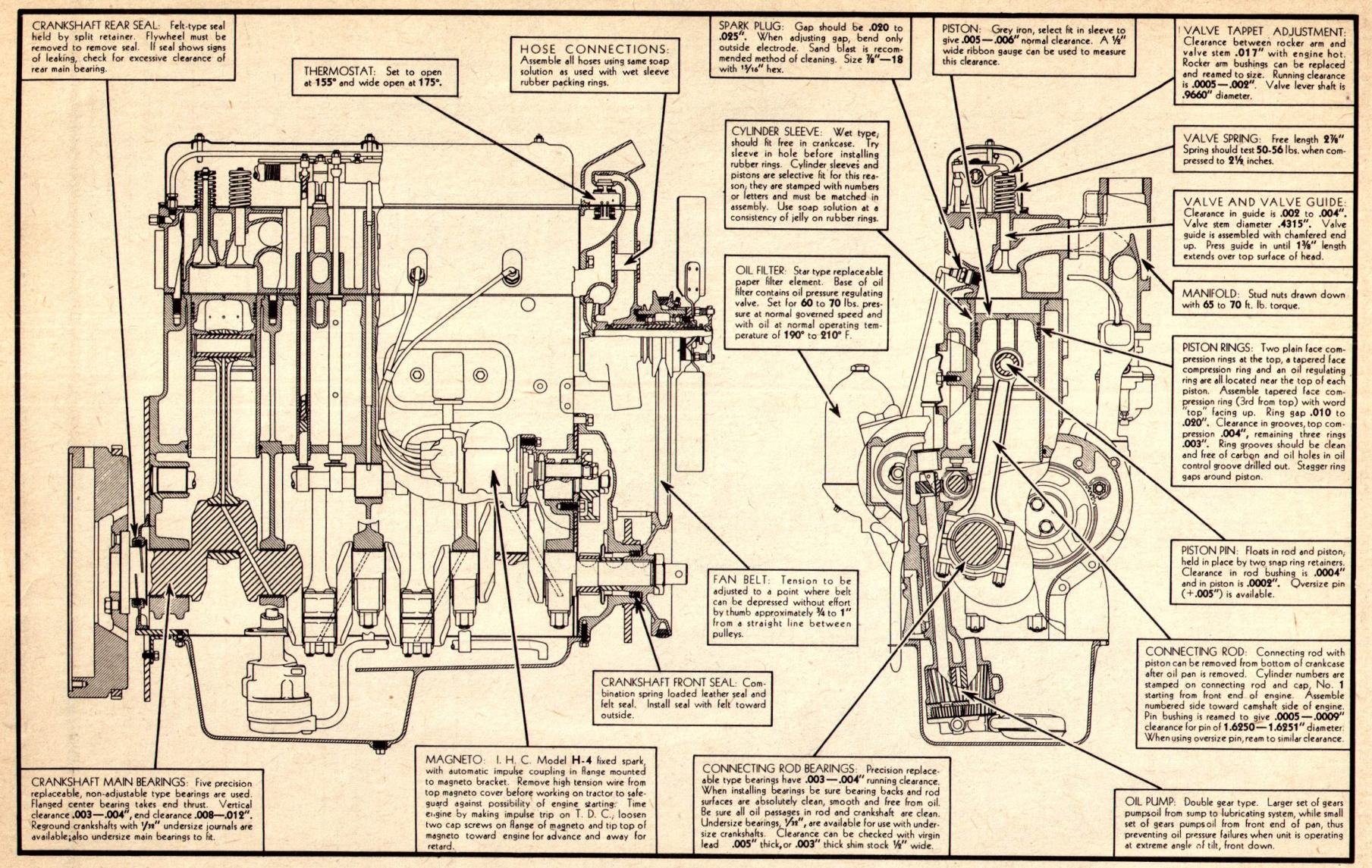
FRONT COVER TIMING MARKS

CYLINDER SLEEVE PACKING RING: Renew ring whenever a sleeve is assembled. Dip ring in a warm soap solution to which a little glycerine has been added, before installing. Solution consistency of light jelly. Grooves should be clean.

PISTON RINGS: When replacing rings on used piston, fit rings to smallest section of sleeve. Ring gap **.010** to **.020"**. Ring grooves should be clean and free from carbon, and oil holes in oil control grooves drilled out. Stagger ring gaps around piston.

BOSCH FUEL-INJECTION PUMP: Fuel injection starts **13°,** theoretically, before T. D. C. on compression stroke and continues for about **26 1/2°**. Inlet port in injection pump plunger barrel is closed **25 1/2°** before T. D. C. by rising plunger. Pressure is built up during the following **12 1/2°** engine rotation or **6 1/4°** pump camshaft rotation.

ILLUST. 35. "14" SERIES DIESEL ENGINE SERVICE CHART.



A-111/6

ILLUST. 36. T-14 CARBURETED ENGINE SERVICE CHART.

SERVICE CHART

DRIVE BEVEL GEAR DEFLECTION SETSCREW: Adjust this screw so there is **.020"** clearance between end of screw and bevel gear. Purpose of screw is to take shock loads imposed on bevel gear.

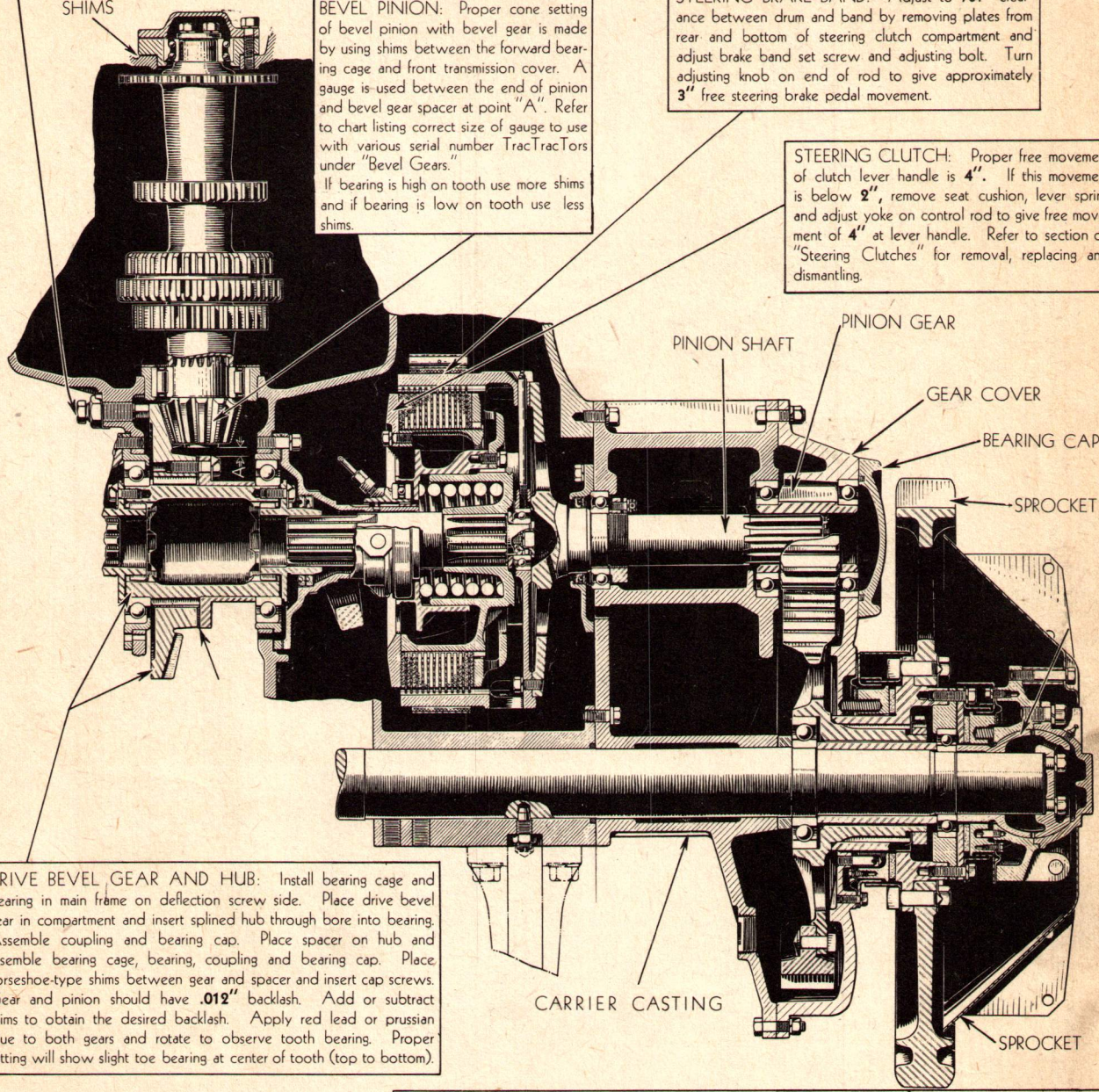
SHIMS

BEVEL PINION: Proper cone setting of bevel pinion with bevel gear is made by using shims between the forward bearing cage and front transmission cover. A gauge is used between the end of pinion and bevel gear spacer at point "A". Refer to chart listing correct size of gauge to use with various serial number TracTracTors under "Bevel Gears."

If bearing is high on tooth use more shims and if bearing is low on tooth use less shims.

STEERING BRAKE BAND: Adjust to **1/64"** clearance between drum and band by removing plates from rear and bottom of steering clutch compartment and adjust brake band set screw and adjusting bolt. Turn adjusting knob on end of rod to give approximately **3"** free steering brake pedal movement.

STEERING CLUTCH: Proper free movement of clutch lever handle is **4".** If this movement is below **2",** remove seat cushion, lever spring and adjust yoke on control rod to give free movement of **4"** at lever handle. Refer to section on "Steering Clutches" for removal, replacing and dismantling.



DRIVE BEVEL GEAR AND HUB: Install bearing cage and bearing in main frame on deflection screw side. Place drive bevel gear in compartment and insert splined hub through bore into bearing. Assemble coupling and bearing cap. Place spacer on hub and assemble bearing cage, bearing, coupling and bearing cap. Place horseshoe-type shims between gear and spacer and insert cap screws. Gear and pinion should have **.012"** backlash. Add or subtract shims to obtain the desired backlash. Apply red lead or prussian blue to both gears and rotate to observe tooth bearing. Proper setting will show slight toe bearing at center of tooth (top to bottom).

WIDE TREAD MODEL: The wide tread carrier casting replaces the carrier plate used on the standard TracTracTor. The procedure for disassembling the wide tread sprocket drive is the same as covered on the standard tread TracTracTor under "Sprocket Drive." The pinion on the wide tread model can be removed after the gear cover is removed without disturbing the steering clutch.

Both the inner and outer pinion shaft bearings were mounted in cages before serial number (wide tread) **TDF-3921;** Army **TDF-3364T-4** to **3664T-4** also **TDF-3824T-4** to **3839T-4.** Above drawing shows latest design; with this design it is necessary to remove steering clutch and pinion shaft before carrier casting can be taken off.

On TracTracTors equipped with bearing cages proceed as follows to remove carrier casting: with all parts up to and including the pinion removed, take out outer pinion shaft bearing, remove locking wire, and capscrews from pinion shaft nut. Then remove lock nut with wrench **2388-D** and **11472-D.** If this wrench is not used, the steering clutch must be removed before pinion shaft can be taken out or before carrier can be removed.

B-285

ILLUST. 37. WIDE TREAD T-14 AND TD-14 TRACTRACTOR FINAL DRIVE SERVICE CHART.

Lubricating Oil Pressure

(Continued from Page 33).

The oil pressure is controlled by a plunger-type valve in the Purolator base, set at 60 to 70 lbs. pressure. For the "14" Series engines, the oil regulating spring should test 38.2 lbs. at 2-3/32" while the free length is 3-39/64".

The pressure valve is located in a bored passageway in the Purolator base; clearance for the valve is .004" to .006". Be sure the valve works freely and that the spring does not cock the valve in the bore, causing it to seat improperly.

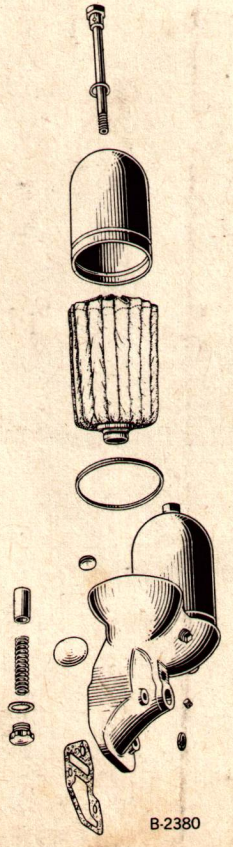
Inasmuch as the valve spring takes a set after continued use, the free length may be somewhat shorter than the dimensions listed in the engine specifications. The best way to check these springs is to load them with the weight specified and measure their length at this load. This load is equivalent to the conditions existing when the valve is in the operating position. Valve springs falling below this standard should be replaced.

Lubricating Oil Filter

One Motor Improvement P-20 renewable paper filter element is used on the carbureted engine, and two are used on the Diesel engines.

They are accessibly located on the right hand side of the engines. A quantity of oil is bypassed from the main circulating system through the cleaning element to the crankcase.

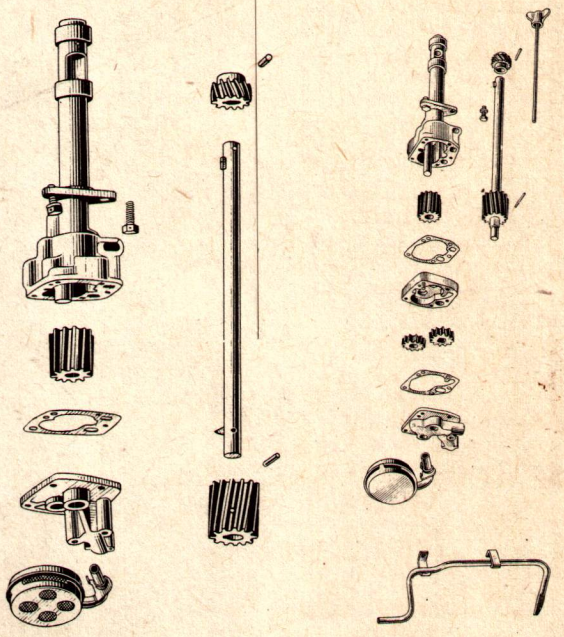
Filter elements should be renewed every time the oil is changed, or oftener if needed. Have the end of the element marked "Top" toward the top of the filter case.



ILLUST. 38. LUBRICATING OIL FILTER (DIESEL).

Lubricating Oil Pump

The oil pump used on the T-14 and TD-14 TracTracTors is the double-gear two-stage type. (See Illust. 39, right). This pump is also used on certain modified power units. The UD-14 power unit uses a single stage oil pump. (See Illust. 39, left). Oil travels up through the body to an opening between the two finished diameters on top of the body where it enters drilled passages in the crankcase.



ILLUST. 39. (LEFT) UD-14 POWER UNIT OIL PUMP. (RIGHT) TRACTRACTOR OIL PUMP.

The drive pinion is keyed and pinned to the drive shaft. The drive gear in the pump body is also keyed and pinned to the shaft. The idler shaft, a press fit in the body, is located with the end of the shaft 17/32" outside the bottom surface of the body. Backlash of the gears can be .004" to .006". The gaskets used between the body and end cover are .006" thick and serve as shims to obtain proper clearances. The end play of the drive shaft when assembled is .004" to .008". A dowel pin in the body locates in the cover.

The idler shaft should be concentric with the body bore and square with the bottom of the gear chamber within .001" at a point on the shaft 2-3/4" from the bottom of the gear chamber. Drive and idler gears should have .006" to .0075" clearance between the body bore and the gear. Use a feeler gauge 1/2" wide to check this clearance, place the gauge

between the gear and body and turn the gear several revolutions. The drive shaft and gears should turn freely when assembled. Lubricate the drive pinion when reassembling a repaired pump to the engine. The "Float-o" oil screen should turn freely in the bottom cover. It takes the cleaner oil from the top of the sump.

The two-stage pump operates the same as the pump described above. The pump is the same except that an auxiliary gear housing replaces the pump gear cover and both the drive shaft and idler shaft extend through this housing. An auxiliary set of gears operates in this housing, pumping the oil from the front of the oil pan and discharging it into the sump when the engine is operating at extreme angles of tilt. The "Float-o" oil screen can then pick up the oil in the sump. A baffle inside the front end of the oil pan helps retain the oil when the front end of the TracTracTor is tilted down.

The idler shaft in the two-stage pump is assembled with the end 2-5/32" from the bottom of the pump body. It must be square with the bottom of the gear chamber, within .002" at a point on the shaft 4" from the bottom of the gear housing. If the oil pipe from the cover to the front of the oil pan becomes loose in the cover, remove it and dip in babbitt. Scrape off the surplus babbitt to secure a tight fit.

CYLINDER HEADS and VALVES

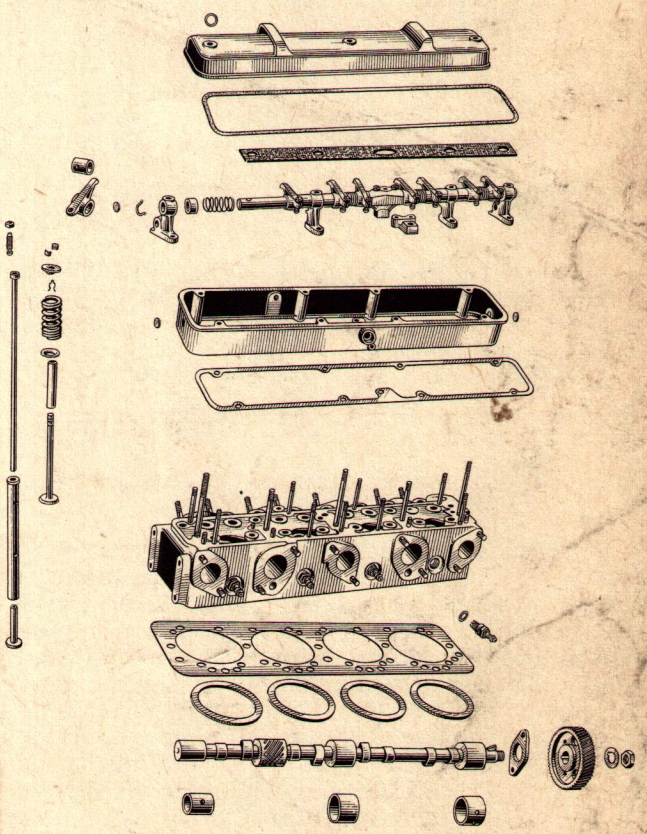
Carbureted Engine

Remove the valve housing, breather tubes, heat indicator connection, valve rocker mechanism, and push rods. Disconnect the spark plug wires, remove capscrews from the thermostat housing, the intake and exhaust manifold with carburetor, complete. Remove the stud nuts and lift off the cylinder head. Valve seat inserts are standard for the exhaust ports; inserts cannot be installed for the intake valves. Refer to specifications on page 10 for dimensions. Use a new gasket and draw down the cylinder head to 190 ft.-lbs. with a torque wrench.

Diesel Engines

Remove the valve cover, valve rocker lubricating felt, the pin from the starting control rod yoke "F", Illust. 6, nuts from the valve rocker assembly (valve rocker assembly, starting valve shaft, and valve housing lift off as a unit) and remove the push rods.

Disconnect the spark plug cables and fuel injection tubing. Place caps on the pump and nozzle fittings to prevent the entrance of dirt. Disconnect the thermostat housing, shut off the gasoline supply, and remove the fuel line from the carburetor. Remove all controls from the carburetor. Take off the cover on the front end of the intake manifold and disconnect the wire from the magneto. Remove cap screws and lift off the intake and exhaust manifold.



ILLUST. 40. CYLINDER HEAD, VALVE MECHANISM, AND CAMSHAFT ASSEMBLY FOR "14" SERIES DIESEL ENGINE.

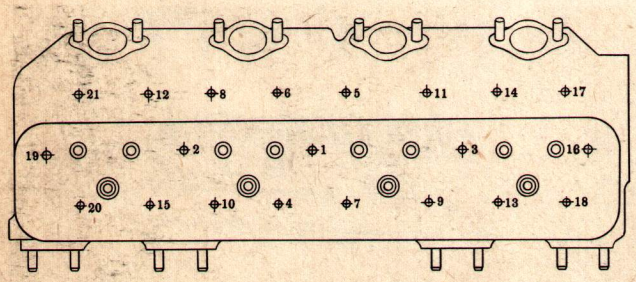
Use a new gasket and gasket rings when replacing the cylinder head; assemble the gasket with the word "TOP" toward the cylinder head. Note: In the event new gasket rings are not available, the old rings should be annealed before they are

used again. These gasket rings, being made of copper, become hardened in use. Annealing restores flexibility, which facilitates maintaining a gas-tight seal. To anneal the rings, heat to a dull red and quench in water.

Refer to Page 12 for the necessary adjustments on the starting system.

Nut and Bolt Torque

It is important that the proper procedure be followed in tightening the nuts on the cylinder head. Incorrect tightening will result in warping of the cylinder head and crankcase, and in gaskets leaking. Following the sequence given in the chart, Illust. 41, tighten the nuts to the specified torque of 190 ft.-lbs. Cylinder head nuts properly tightened to specified torque when the engine is cold need not be re-tightened when the engine is hot.



ILLUST. 41. SEQUENCE FOR TIGHTENING CYLINDER HEAD NUTS - CARBURETED AND DIESEL ENGINES.

Any cylinder head when installed should have its lower surface clean and smooth before placing it on the crankcase. Both the crankcase and gasket should also be clean and smooth. A new cylinder head gasket is always the cheapest investment for trouble-free performance when there is the slightest doubt of the old gasket's condition. The gasket should be of equal thickness throughout. Inspect it for signs of water leakage or gas blow between the perforations.

If an old gasket is used, it is a good policy to grease the gasket on both sides and carefully place it over the studs with the side marked "TOP" facing up or against the cylinder head. Place all cylinder head nuts on the studs and run them on the studs by hand or with a speed wrench. Starting with No. 1 on the chart, Illust. 41, snug up each nut. After easily and uniformly drawing down all the nuts in gradual steps, go over the nuts with torque wrench and again by gradual steps draw them all down to the specified tension. Go back over the nuts according to the sequence on the chart and check once more to see that none of the nuts has loosened in the final tightening. The best procedure may require four or five trips over the nuts from the original placing of the nuts on the studs to the final check.

When tightening main bearing nuts or bolts, start with the center main bearing and proceed to tighten alternately from side to side, working from the center of the crankcase to both ends. When all main bearing cap nuts are tightened properly, the crankshaft should be free to turn easily by hand.

Valves and Valve Mechanism

The cylinder head of the carbureted engine contains the conventional intake and exhaust valves of overhead design. The Diesel engine, in addition, has the starting valves assembled to the head; when open during the starting procedure, they increase the cylinder volume, decrease the compression ratio, and expose the spark plugs for starting.

Valve stem guides are furnished as service parts, reamed to size. The valve guides are pressed in place with the sharp chamfered end up, and 1-3/8" above the finished surface on the cylinder head.

On the carbureted engine, exhaust valve seat inserts only, are available as service parts. When replacing the seat, be sure to assemble the insert with the side marked "M" to the outside. Peen over the cylinder head metal after installing, and grind the seat to specifications given on Page 10. Inserts are .0085" to .011" tight in the cylinder head.

The bushings in the valve levers can be replaced; be sure the hole in the bushing lines up with the hole in the valve lever. The bushings should be reamed to size. The valve lever assembly can be removed as outlined for the cylinder head.

When replacing the valve assembly on the carbureted engines, be sure the oil tube which is part of the shaft oil seal at the center, enters the reamed hole in the cylinder head. This is the source of oil for the valve lever mechanism. Recheck the clearance between the valve levers and valves after retightening the valve mechanism.

After replacing the valve mechanism on the Diesel engine, it is necessary to make one adjustment on the starting mechanism to insure its proper operation. Yoke "F", Illust. 6 must be adjusted to give .060" clearance between the cam roller and the starting-valve retainer. Adjust this clearance on the cam that has the least clearance. Check the clearance on the remaining valves; this clearance must not exceed .080".

Valve tappets can be removed only after the camshaft has been removed from the crankcase. Lubrication of the tappets is provided by splash and the return oil from the valve mechanism.

The carbureted and Diesel engines have valve springs with a free length of 2-7/8", and test 50 to 56 lbs. at 2-1/2".

Starting valve stem guides on the Diesel engines should be assembled with the small end 15/16" below the top of the cylinder head. The valve seat width is 3/64" and the seat angle 45°. The free length of the starting-valve spring is 1-1/2" and tests 26-3/4 lbs. at 1-1/4". The starting-valve retainer is screwed down on the valve stem until it is .240" to .245" above the top surface of the cylinder head.

PISTONS, RODS, SLEEVES, and BEARINGS

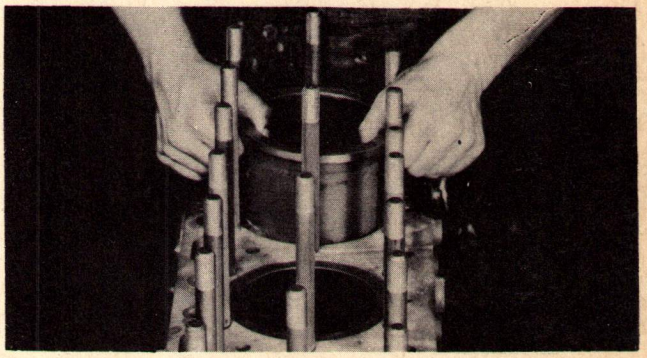
Piston Assembly

The replaceable, wet-type cylinder sleeves used in all "14" Series engines are selectively fitted to the pistons to give the normal measured clearances as listed in specifications on Page 8. The third compression ring from the top (carbureted), and the fourth compression ring (Diesel), are tapered and should be assembled with the word "TOP" toward the top of the piston. The Diesel engine has two oil control rings, one above and one below the piston pin. The carbureted engine has all the rings above the piston pin.

CAUTION: When installing a new set of sleeves and pistons, do not interchange the pistons in the cylinder sleeves or the piston pins between pistons.

When replacing piston rings, stagger the ring gaps around the piston. When installing new rings on a used piston, break the outside upper edge of the top piston ring with a file. Ring grooves should be free from carbon, and the oil holes drilled out. Fit the rings to the smallest section of the sleeve. Bathe the piston in oil before replacing it in the engine.

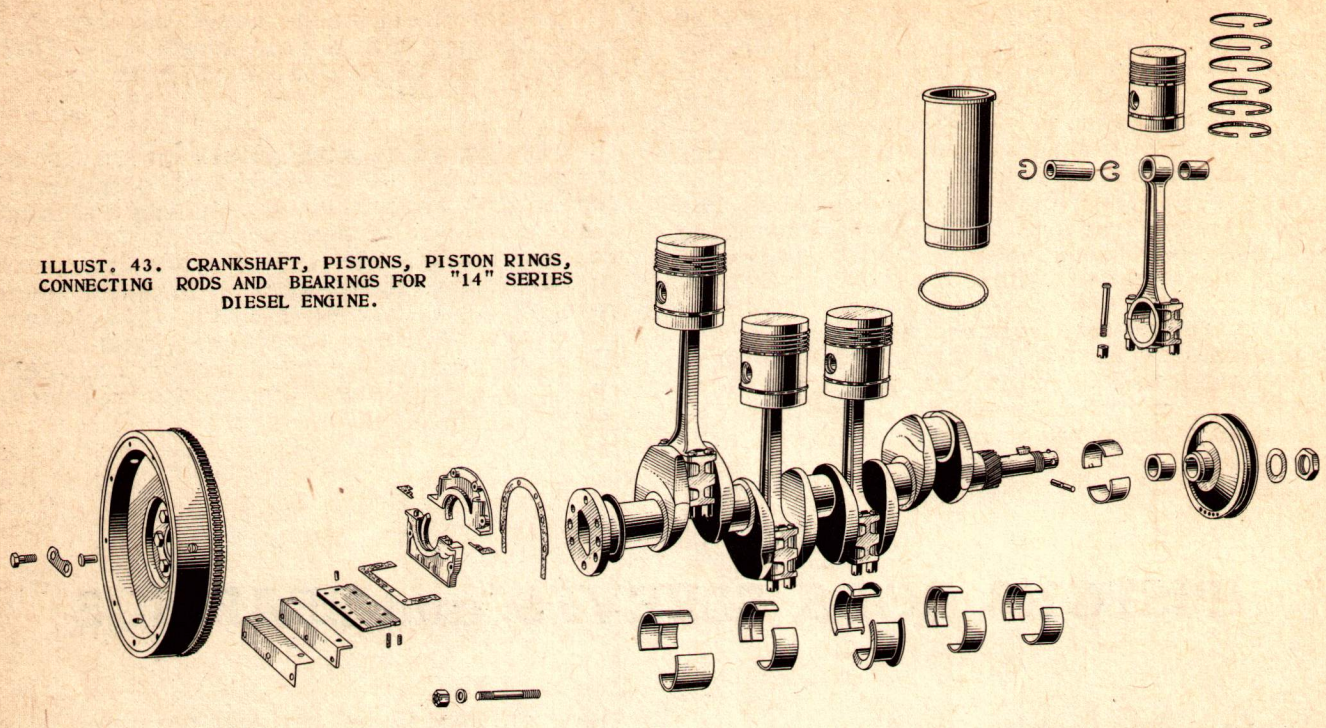
Piston pins are the full-floating type, secured in the piston by snap rings. The piston pins are a hand-press fit. Heating the piston in hot water will facilitate the installation of the piston pin. An oversize piston pin (.005") is available, marked +5 on one end or side. The piston bore should be reamed to size to give the clearances listed in the specifications.



ILLUST. 42. INSTALLING WET-TYPE SLEEVES.

Cylinder Sleeves

The wet-type cylinder sleeves used in the "14" Series engines require no honing or boring after assembly. Standard replacement pistons and sleeves in matched sets are available for service replacement. When assembling sleeves, thoroughly clean the ring grooves in the crankcase. Be sure the sleeves fit free in the crankcase before the sleeves are installed. Make a soap solution (1/2 oz. glycerine to a tablespoon of soap flakes and 1 quart hot water) and dip the rubber rings in it before installing them in the crankcase. Coat the tapered surface of the sleeve with the soap solution and lower the sleeve into the crankcase, taking care that the rubber ring stays in place.



ILLUST. 43. CRANKSHAFT, PISTONS, PISTON RINGS, CONNECTING RODS AND BEARINGS FOR "14" SERIES DIESEL ENGINE.

Connecting Rods

Connecting rods should be straight, free from twist, and parallel with the piston. Cylinder numbers are stamped on the rod and cap; No. 1 starts at the front of the engine. Assemble the numbered side toward the camshaft. Clearance may be checked by placing a .003" brass shim (1/4" x 1-1/2" long) lengthwise between the lower bearing and the crankshaft. If clearance is not excessive, there should be a slight drag when turning the crankshaft with the spark plugs removed.

When installing bearings, be sure the bearing backs and rod surfaces are absolutely clean, smooth, and free from oil. Bearings have a nib to prevent turning in the rod and should be assembled with the nib engaging the milled notch in the rod and cap. Oil the bearing surfaces liberally with clean oil. This assures proper lubrication when the engine is started.

The connecting rods used in the Diesel and carbureted engines are the same in size and material. Bearings are also the same. Four bolts secure the bearing cap to the rod and cotter keys lock the nuts on the bolts. In the event the connecting rod bearings are removed and not replaced with new ones, be sure the bearings are replaced on the journals from which they were removed. Tighten the connecting rod bolts to 70 ft.-lbs. with a torque wrench.

For best results when an engine is reconditioned, and particularly when new sleeves and pistons are installed, the following items should be observed:

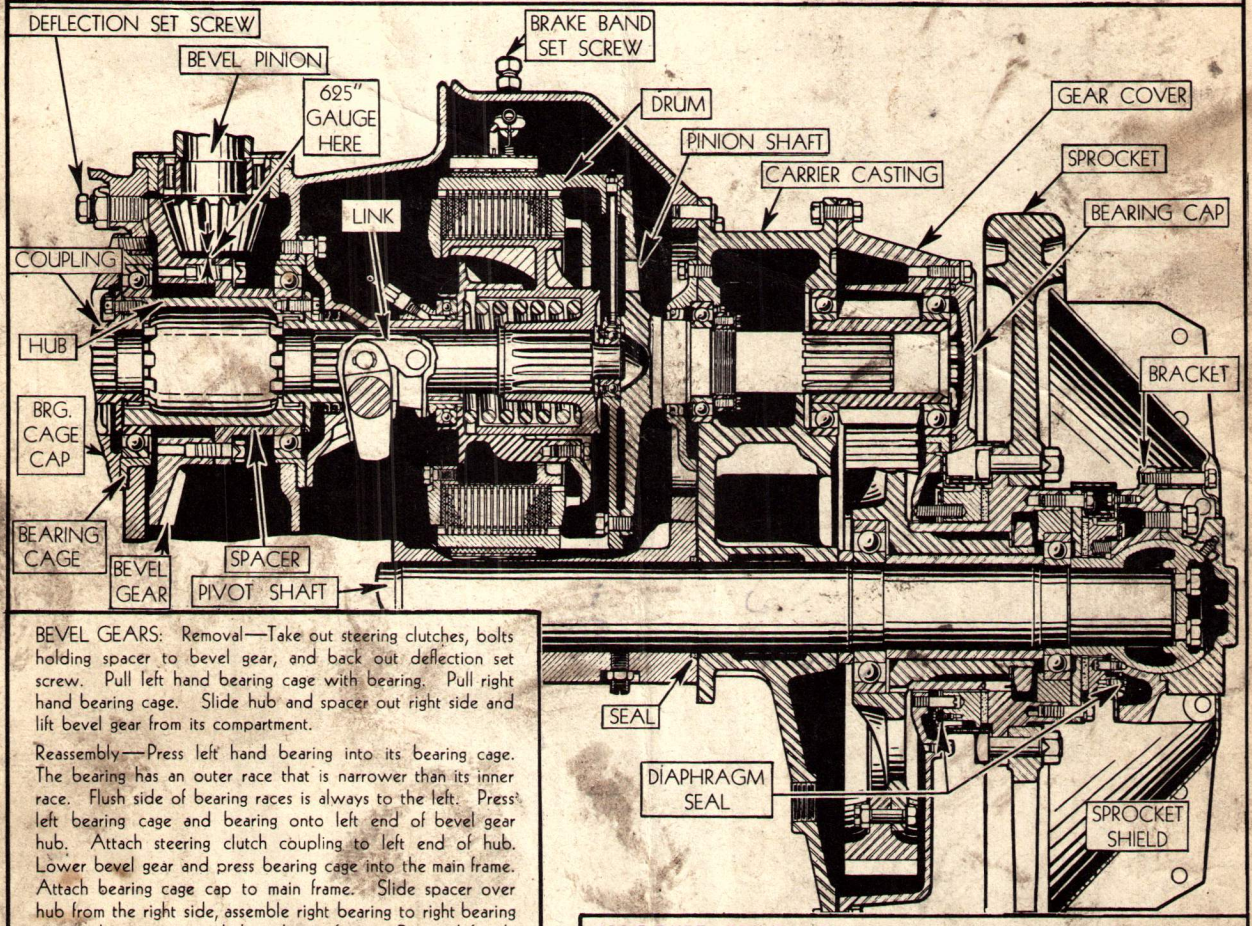
1. Lubricating-oil compartments and passages must be thoroughly cleaned of sludge, dirt, and abrasive material, and the oil filter placed in efficient operating condition. Working parts should be well lubricated at time of assembly.
2. Air cleaner must be placed in efficient operating condition and all connections between cleaner and intake manifold must be air-tight.
3. All engine gaskets must be tight.
4. See that engine is free; start it and when engine is converted to Diesel operation run it at low speed, making sure Diesel fuel system is free of air. Then gradually increase it to maximum idling governed speed; engine must not be run under load. During the break-in period it is recommended that a good quality light oil (S.A.E. 10 or 20) be used, care being taken to inspect oil level frequently and to maintain it at proper height.

SERVICE CHART

STEERING CLUTCHES: Removal—Clear top of main frame of seat, batteries, controls, etc., and lift off main frame cover. Loosen brake band adjuster and remove pin from rear brake band. Remove grease tubes and pins in release fork. Turn release fork, remove links and lift out release fork. Remove capscrews and slide bearing cage cap into the steering clutch. Assemble clutch compressor angle tools (58920-D) to the clutch and compress. Remove capscrews from clutch drum and clutch coupling. Mark drum and pinion flange, pry coupling into bearing cage cap and lift unit out of main frame.

Replacement: Reverse removal procedure. Bearing cage cap gasket should be attached to main frame before installing clutch. Be sure to use a new oil seal in bearing cage cap; lips of leather seal face bevel gears. Be sure socket head screw in clutch shaft is tight. Attach drum to pinion flange with several capscrews before trying to pry clutch coupling into bevel gear hub. Cotter keys in release fork pins may be spread with a long rod inserted through hand holes in rear of main frame. Lubricate bearing cage cap and pins on collar. After completing replacement, adjust hand lever free travel.

Note: The above removal and replacement information refers to the manual type steering clutches which are used on TD-18 TracTracTors after TDR-1440. Servicing information on actuator type steering clutches, which were used on earlier TracTracTors, can be found in the steering clutch section of this manual.



BEVEL GEARS: Removal—Take out steering clutches, bolts holding spacer to bevel gear, and back out deflection set screw. Pull left hand bearing cage with bearing. Pull right hand bearing cage. Slide hub and spacer out right side and lift bevel gear from its compartment.

Reassembly—Press left hand bearing into its bearing cage. The bearing has an outer race that is narrower than its inner race. Flush side of bearing races is always to the left. Press left bearing cage and bearing onto left end of bevel gear hub. Attach steering clutch coupling to left end of hub. Lower bevel gear and press bearing cage into the main frame. Attach bearing cage cap to main frame. Slide spacer over hub from the right side, assemble right bearing to right bearing cage and secure unit to hub and main frame. Be sure left side of bearing is the flush side of the bearing races as shown. Attach right clutch coupling to hub and bearing cage cap to main frame. Insert same number of shims between spacer and bevel gear as were removed at the time of disassembly, or insert shims to give .014" backlash with an new pinion and gear.

When reassembling new pinion, place a .625" thick gauge between the ground surface on bevel gear and the end of the pinion. Then use proper number of shims between bevel pinion bearing cage and transmission front cover to hold the gauge at this point when all bolts are tightened. Be sure backlash of bevel gear is .014" when pinion is held stationary. Now adjust deflection set screw on left side to have .020" clearance between it and back face of bevel gear. Replace steering clutches.

Note: The above information on bevel gears applies to TracTracTors TDR-3585 and up. For information on bevel gears used in earlier TracTracTors refer to the bevel gear section in this manual.

SPROCKET DRIVE: Sprocket Removal—Take off track chain, place jack under tractor, remove track frame from pivot bearing, jack up rear of tractor, and remove sprocket shield and pivot bracket cap. Take off pivot bearing and pivot bracket with diaphragm seal. Remove bearing retainer with dust seal and use puller capscrews to remove sprocket bearing cage and bearing. Service tool SE-1184-2 may be used to turn off sprocket carrier nut. Sprocket can now be pried off. Replacement is the reverse of the foregoing.

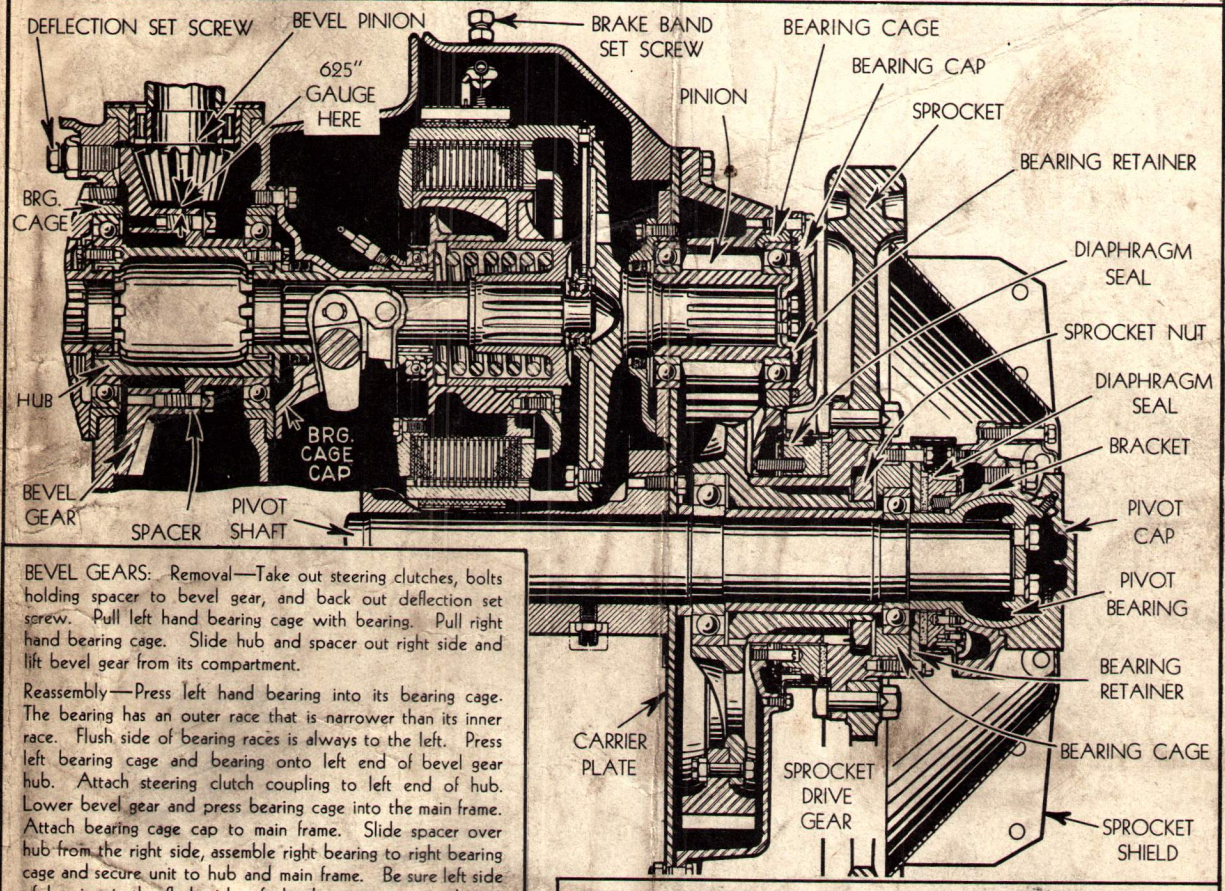
Sprocket Drive Gear Removal: Take off sprocket, as above, and the pinion bearing cap. Use puller capscrews to remove the outer gear housing. Pull sprocket drive gear. Sprocket drive pinion can be pried out. When replacing outer gear housing, have dowel pins in place before tightening bolts.

Sprocket Drive Carrier Removal: Remove sprocket and sprocket drive gear, as above. Take out screws in lock nut on pinion shaft, and take off nut. Lock steering brakes and support clutch drums from below or from above. Use puller capscrews to remove the carrier. Bearing retainer, oil seal and bearing can be removed from the carrier and the sealing ring on the pivot shaft removed from the main frame. Reassembly is the reverse of the removal procedure. Be sure dowel bolts are in place before tightening bolts in the carrier.

STEERING CLUTCHES: Removal—Clear top of main frame of seat, batteries, controls, etc., and lift off main frame cover. Loosen brake band adjuster and remove pin from rear brake band. Remove grease tubes and pins in release fork. Turn release fork, remove links and lift out release fork. Remove capscrews and slide bearing cage cap into the steering clutch. Assemble clutch compressor angle tools (58920-D) to the clutch and compress. Remove capscrews from clutch drum and clutch coupling. Mark drum and pinion flange, pry coupling into bearing cage cap and lift unit out of main frame.

Replacement: Reverse removal procedure. Bearing cage cap gasket should be attached to main frame before installing clutch. Be sure to use a new oil seal in bearing cage cap; lips of leather seal face bevel gears. Be sure socket head screw in clutch shaft is tight. Attach drum to pinion flange with several capscrews before trying to pry clutch coupling into bevel gear hub. Cotter keys in release fork pins may be spread with a long rod inserted through hand holes in rear of main frame. Lubricate bearing cage cap and pins on collar. After completing replacement, adjust hand lever free travel.

Note: The above removal and replacement information refers to the manual type steering clutches which are used on TD-18 TracTracTors after TDR-1440. Servicing information on actuator type steering clutches, which were used on earlier TracTracTors, can be found in the steering clutch section of this manual.



BEVEL GEARS: Removal—Take out steering clutches, bolts holding spacer to bevel gear, and back out deflection set screw. Pull left hand bearing cage with bearing. Pull right hand bearing cage. Slide hub and spacer out right side and lift bevel gear from its compartment.

Reassembly—Press left hand bearing into its bearing cage. The bearing has an outer race that is narrower than its inner race. Flush side of bearing races is always to the left. Press left bearing cage and bearing onto left end of bevel gear hub. Attach steering clutch coupling to left end of hub. Lower bevel gear and press bearing cage into the main frame. Attach bearing cage cap to main frame. Slide spacer over hub from the right side, assemble right bearing to right bearing cage and secure unit to hub and main frame. Be sure left side of bearing is the flush side of the bearing races as shown. Attach right clutch coupling to hub and bearing cage cap to main frame. Insert same number of shims between spacer and bevel gear as were removed at the time of disassembly, or insert shims to give .014" backlash with an new pinion and gear.

When reassembling new pinion, place a .625" thick gauge between the ground surface on bevel gear and the end of the pinion. Then use proper number of shims between bevel pinion bearing cage and transmission front cover to hold the gauge at this point when all bolts are tightened. Be sure backlash of bevel gear is .014" when pinion is held stationary. Now adjust deflection set screw on left side to have .020" clearance between it and back face of bevel gear. Replace steering clutches.

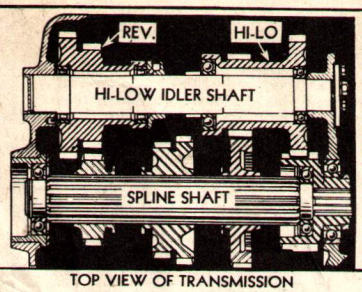
Note: The above information on bevel gears applies to TracTracTors TDR-3585 and up. For information on bevel gears used in earlier TracTracTors refer to the bevel gear section in this manual.

SPROCKET DRIVE: Sprocket Removal—Take off track chain, place jack under tractor, remove track frame from pivot bearing, jack up rear of tractor, and remove sprocket shield and pivot bracket cap. Take off pivot bearing and pivot bracket with diaphragm seal. Remove bearing retainer with dust seal and use puller capscrews to remove sprocket bearing cage and bearing. Service tool SE-1184-2 may be used to turn off sprocket carrier nut. Sprocket can now be pried off. Replacement is the reverse of the foregoing.

Sprocket Drive Gear Removal: Take off sprocket, as above, and the pinion bearing cap. Use puller capscrews to remove the outer gear housing. Pull sprocket drive gear. Sprocket drive pinion can be pried out. When replacing outer gear housing, have dowel pins in place before tightening bolts.

Sprocket Drive Carrier Removal: Remove sprocket and sprocket drive gear, as above. Take out screws in lock nut on pinion shaft, and take off nut. Lock steering brakes and support clutch drums from below or from above. Use puller capscrews to remove the carrier. Bearing retainer, oil seal and bearing can be removed from the carrier and the sealing ring on the pivot shaft removed from the main frame. Reassembly is the reverse of the removal procedure. Be sure dowel bolts are in place before tightening bolts in the carrier.

SERVICE CHART



TOP VIEW OF TRANSMISSION

TRANSMISSION: To disassemble it is necessary to remove the transmission and engine clutch covers. Then disconnect transmission coupling. Next remove bevel pinion and shaft front bearing retainer, retainer washer, and Hi-Lo shaft retainer washer. Pull transmission end cover and remove transmission shafts and gears in the following order: (1) Spline shaft—remove rear bearing snap ring and drive shaft forward out of bearing; (2) Hi-Lo shaft—remove Hi-Lo gear rear bearing retainer bolt and retainer, and push gear backward, and pull out shaft and gears; (3) Bevel pinion and shaft—remove cap screws from rear bearing cage and drive out assembly complete.

Assemble transmission by reversing the above procedure. Bevel gear and pinion should show a toe bearing (toward small end of pinion) with approximately .014" backlash clearance.

GEAR SHIFTER HOUSING: Gear shifter levers and forks and steering clutch levers are all mounted on this housing. Can be removed as a unit.

FUEL TANK: May be removed together with fenders and seat. Capacity, 60 U. S. gallons.

BOLT TENSION DATA (Ft.-Lbs. Torque)	
Cyl. Head	190
Conn. Rod	70
Flywheel	150
Main Brg.	150

TD-18

TRACTRACTOR

SEAT

ENGINE SPEED CONTROL LEVER

STEERING CLUTCH LEVERS

ENGINE CLUTCH LEVER

GEAR SHIFT LEVER

HI-LO SHIFT LEVER

STEERING BRAKE

STEERING CLUTCH RELEASE FORK: Pins connecting release fork and collar shifter link are retained with cotter keys which can be spread, upon replacement in the tractor, by inserting a rod or a long screwdriver through hand holes in rear of main frame.

SPLINE SHAFT

BEVEL PINION & SHAFT

CLUTCH

SHIMS for adjusting gear and bevel pinion

REV.

1st & 4th

2nd & 5th

3rd & 6th

DRAWBAR

SHIMS

TRACK ASSEMBLY: Tracks are interchangeable

TRACK FRAME DIAGONAL BRACE BEARING

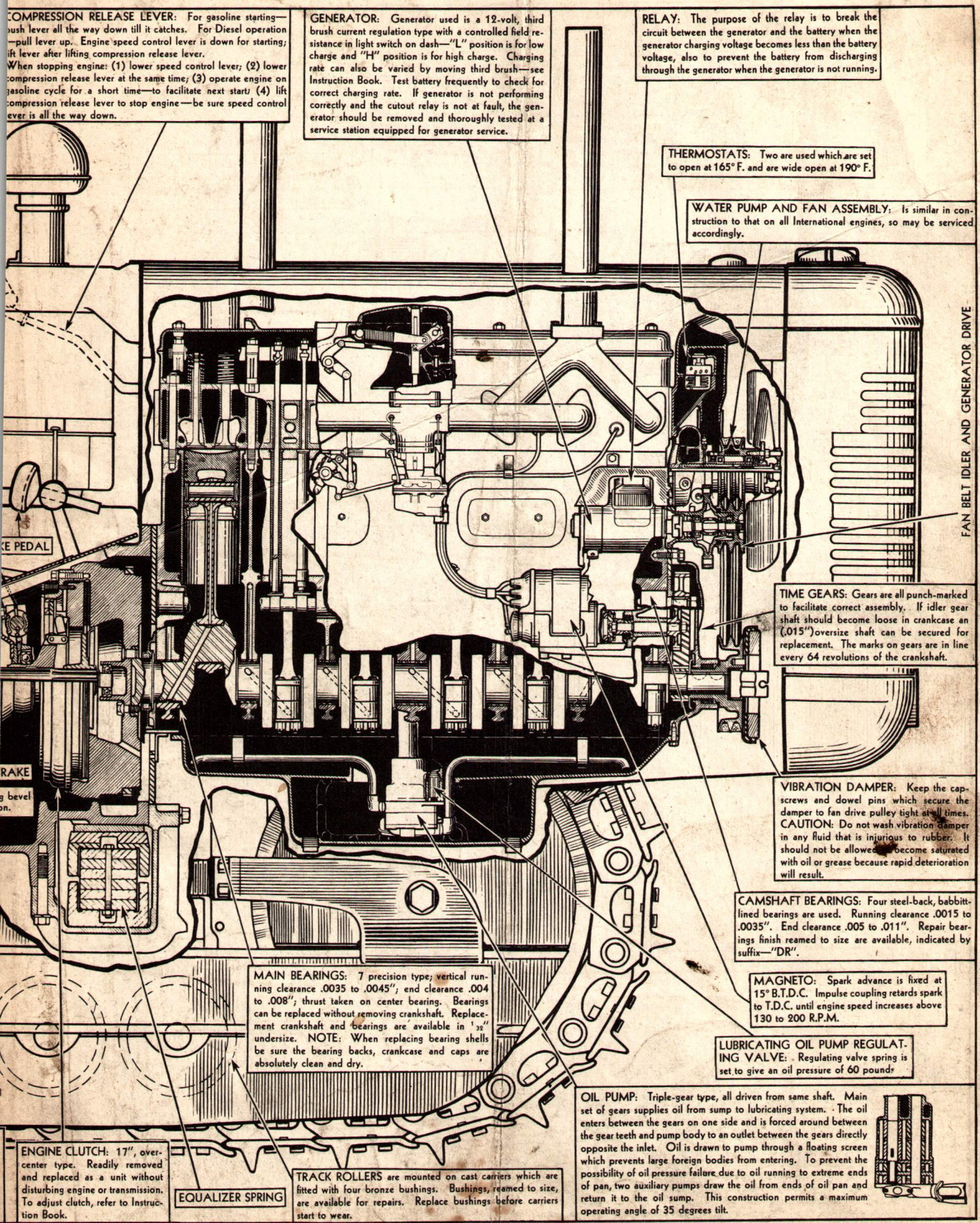
TRACK FRAMES are removable as a complete unit. First remove front stabilizer, then bolts from diagonal brace and from ball socket on pivot shaft.

PIVOT SHAFT: Locked in position with a dog point setscrew under main frame.

TRACK FRAME BRACE

DRIVE BEVEL GEAR

TRANSMISSION END COVER: Cover removable to facilitate taking out transmission shafts and gears. Cover can be removed through engine clutch cover opening. Use 3—½ x 2¾" cap screws threaded well back to the head, in tapped holes provided, to pull end cover loose.



COMPRESSION RELEASE LEVER: For gasoline starting—push lever all the way down till it catches. For Diesel operation—pull lever up. Engine speed control lever is down for starting; lift lever after lifting compression release lever.
When stopping engine: (1) lower speed control lever; (2) lower compression release lever at the same time; (3) operate engine on gasoline cycle for a short time—to facilitate next start; (4) lift compression release lever to stop engine—be sure speed control lever is all the way down.

GENERATOR: Generator used is a 12-volt, third brush current regulation type with a controlled field resistance in light switch on dash—"L" position is for low charge and "H" position is for high charge. Charging rate can also be varied by moving third brush—see Instruction Book. Test battery frequently to check for correct charging rate. If generator is not performing correctly and the cutout relay is not at fault, the generator should be removed and thoroughly tested at a service station equipped for generator service.

RELAY: The purpose of the relay is to break the circuit between the generator and the battery when the generator charging voltage becomes less than the battery voltage, also to prevent the battery from discharging through the generator when the generator is not running.

THERMOSTATS: Two are used which are set to open at 165° F. and are wide open at 190° F.

WATER PUMP AND FAN ASSEMBLY: Is similar in construction to that on all International engines, so may be serviced accordingly.

FAN BELT IDLER AND GENERATOR DRIVE

TIME GEARS: Gears are all punch-marked to facilitate correct assembly. If idler gear shaft should become loose in crankcase an (.015") oversize shaft can be secured for replacement. The marks on gears are in line every 64 revolutions of the crankshaft.

VIBRATION DAMPER: Keep the cap-screws and dowel pins which secure the damper to fan drive pulley tight at all times. **CAUTION:** Do not wash vibration damper in any fluid that is injurious to rubber. It should not be allowed to become saturated with oil or grease because rapid deterioration will result.

CAMSHAFT BEARINGS: Four steel-back, babbitt-lined bearings are used. Running clearance .0015 to .0035". End clearance .005 to .011". Repair bearings finish reamed to size are available, indicated by suffix—"DR".

MAGNETO: Spark advance is fixed at 15° B.T.D.C. Impulse coupling retards spark to T.D.C. until engine speed increases above 130 to 200 R.P.M.

LUBRICATING OIL PUMP REGULATING VALVE: Regulating valve spring is set to give an oil pressure of 60 pounds

MAIN BEARINGS: 7 precision type; vertical running clearance .0035 to .0045"; end clearance .004 to .008"; thrust taken on center bearing. Bearings can be replaced without removing crankshaft. Replacement crankshaft and bearings are available in $\frac{1}{32}$" undersize. NOTE: When replacing bearing shells be sure the bearing backs, crankcase and caps are absolutely clean and dry.

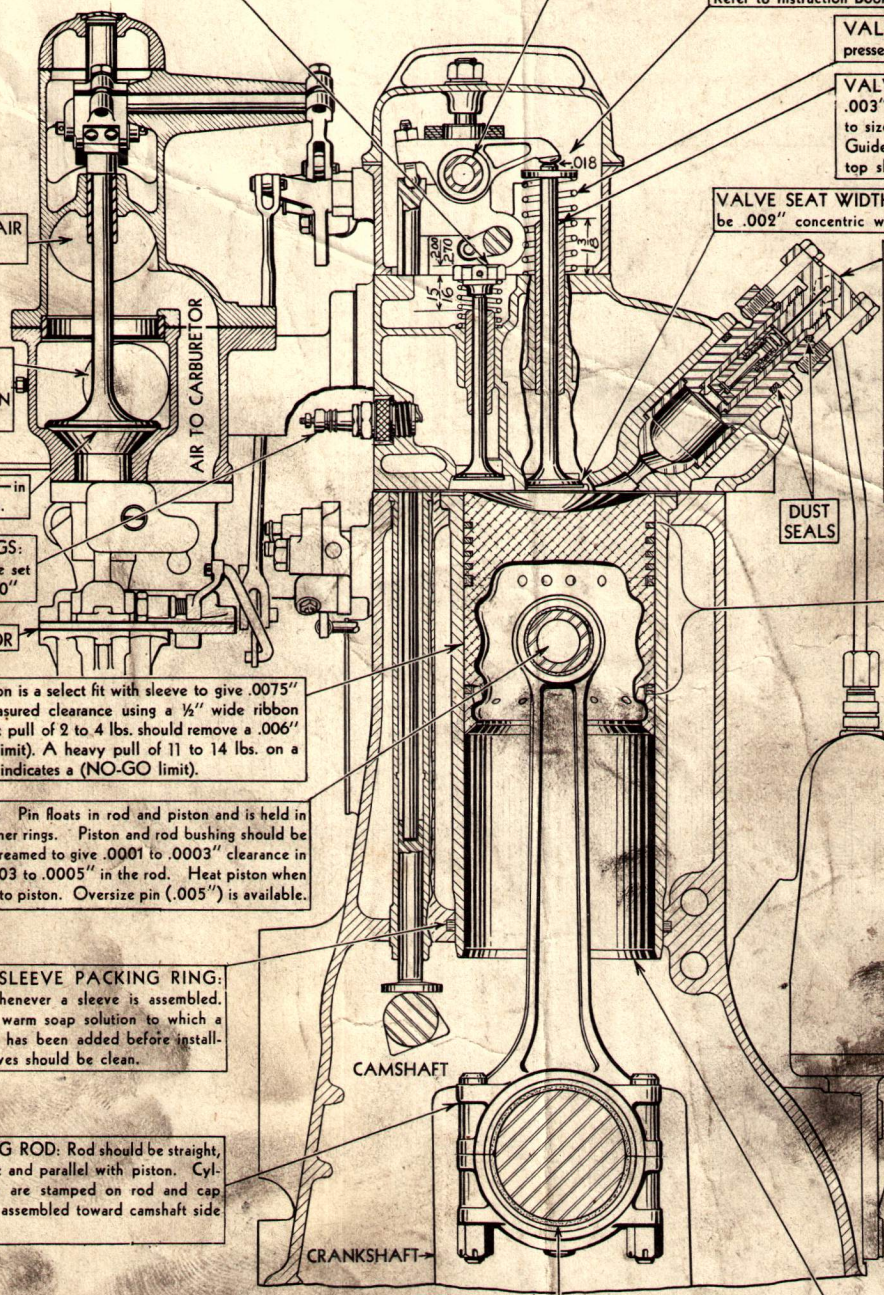
OIL PUMP: Triple-gear type, all driven from same shaft. Main set of gears supplies oil from sump to lubricating system. The oil enters between the gears on one side and is forced around between the gear teeth and pump body to an outlet between the gears directly opposite the inlet. Oil is drawn to pump through a floating screen which prevents large foreign bodies from entering. To prevent the possibility of oil pressure failure due to oil running to extreme ends of pan, two auxiliary pumps draw the oil from ends of oil pan and return it to the oil sump. This construction permits a maximum operating angle of 35 degrees tilt.

ENGINE CLUTCH: 17", over-center type. Readily removed and replaced as a unit without disturbing engine or transmission. To adjust clutch, refer to Instruction Book.

EQUALIZER SPRING

TRACK ROLLERS are mounted on cast carriers which are fitted with four bronze bushings. Bushings, reamed to size, are available for repairs. Replace bushings before carriers start to wear.

SERVICE CHART



STARTING VALVE: Screw spring retainer down to dimension shown and insert cotter pin.

ROCKER ARMS: Running clearance .0014". Bushing Dia.,.967 to .968".

VALVE TAPPET CLEARANCE—HOT: .018". Recheck after tightening rocker arm assembly or cylinder head. Refer to Instruction Book to set valves.

VALVE SPRING: Should measure 2½" when compressed to 50 to 56 lbs. Spring free length is 2⅞".

VALVE AND VALUE GUIDE: Clearance—intake .003"; exhaust .004"; valve guides for repairs are reamed to size. Valve stem dia.—intake .4315"; exhaust .4325". Guide assembled with sharp-edged chamfer at top, and top should be 1⅜" above head.

VALVE SEAT WIDTH: 3/32." Seat must be .002" concentric with valve guide bore.

FROM AIR CLEANER

PASSAGE TO COMBUSTION CHAMBER

AIR VALVE—in Diesel position.

SPARK PLUGS: Gap should be set .035 to .040"

CARBURETOR

INJECTION NOZZLE can be readily removed by taking out two capscrews shown. Assembly should be clean and free of carbon. To clean nozzle, unscrew nozzle fitting from nozzle body. Before disassembling nozzle valve it is advisable to check the length of each valve spring to assure reassembling it to the original length. Correct pressure of assembled springs should be 34 to 35 pounds.

Nozzle should be checked with hydraulic test pump SE-905-A for correct opening pressure as follows: leakage past valve at 700 lb. per sq. in. pressure should not exceed 5 drops per minute. Valve should be set to open at 700 lb. per sq. in. pressure.

DUST SEALS

PISTON RINGS: When reringing a used piston, fit rings to smallest section of sleeve. Ring gap .010 to .020". Ring clearance in groove: top compression .005"; 2nd comp. .004"; 3rd & 4th .003"; two oil control rings .002". Ring grooves should be clean and free from carbon and the oil holes in oil control grooves drilled out. Stagger ring gaps around piston.

PISTON: Piston is a select fit with sleeve to give .0075" to .0085" measured clearance using a ½" wide ribbon gauge. A light pull of 2 to 4 lbs. should remove a .006" ribbon (GO limit). A heavy pull of 11 to 14 lbs. on a .008" ribbon indicates a (NO-GO limit).

PISTON PIN: Pin floats in rod and piston and is held in piston by retainer rings. Piston and rod bushing should be burnished and reamed to give .0001 to .0003" clearance in piston and .0003 to .0005" in the rod. Heat piston when assembling pin to piston. Oversize pin (.005") is available.

BOSCH FUEL INJECTION PUMP:

Fuel injection starts 4° before T.D.C. on compression stroke. "SI" mark on flywheel (19° before T.D.C.) is point at which inlet port in pump plunger barrel is closed by rising plunger. Actual injection into cylinder occurs approximately 15° later. Point of injection can be advanced or retarded by changing relative position of adjuster and timing coupling at the drive end of injection pump. The slots in coupling allow advance or retard of 14° on the flywheel. When replacing pump, turn engine to "SI" mark for No. 1 cylinder, place coupling on drive shaft, set pump "SI" mark even with groove in face of pump and fasten all parts at this setting. Move governor control lever on serrations of shaft for full travel of throttle.

CYLINDER SLEEVE PACKING RING: Renew ring whenever a sleeve is assembled. Dip ring in a warm soap solution to which a little glycerine has been added before installing it. Grooves should be clean.

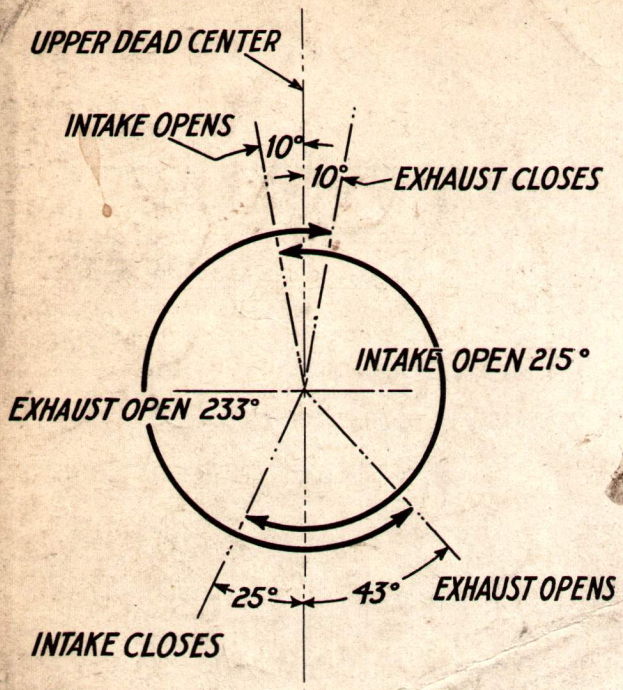
CONNECTING ROD: Rod should be straight, free from twist and parallel with piston. Cylinder numbers are stamped on rod and cap and should be assembled toward camshaft side of engine.

Piston and connecting-rod assembly may be removed and replaced from bottom of engine without removing head. If assemblies are removed be sure to install them in the same relative position; rods and crankcase are numbered to facilitate assembly.

CONNECTING-ROD BEARINGS: Precision type; vertical running clearance .003 to .004". Replacement crankshaft and bearings are available in 1/32" undersize. NOTE: When assembling bearing shells be sure the bearing backs and rods are absolutely clean and dry.

CYLINDER SLEEVE: Sleeve should fit free in crankcase. Try sleeve before installing packing ring.

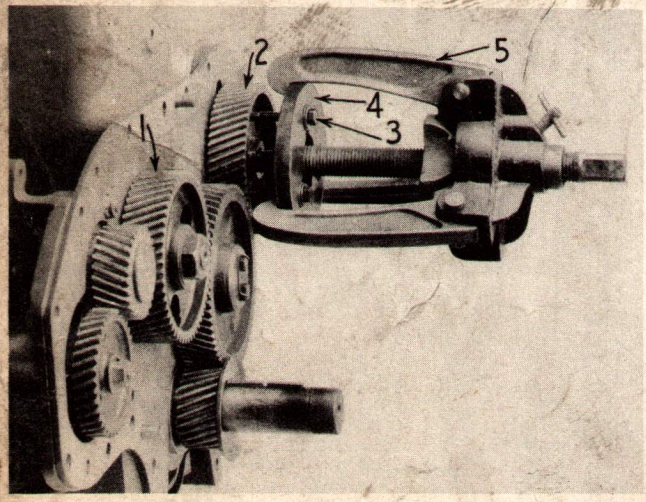
"18" SERIES DIESEL ENGINE SERVICE CHART.



ILLUST. 57. "18" SERIES DIESEL ENGINE VALVE TIMING DIAGRAM.

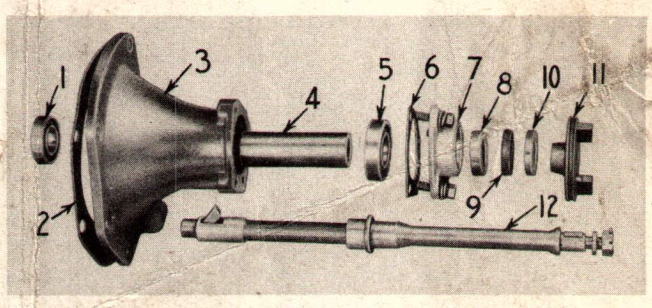
Injection Pump Drive Shaft Assembly

To remove the injection pump drive shaft assembly it is first necessary to remove the drive gear. This gear is equipped with tapped holes for attaching a puller. (See Illust. 58). Remove the injection pump and cap screws holding the drive shaft housing, and the complete assembly can be lifted from place.



ILLUST. 58. REMOVING INJECTION PUMP DRIVING GEAR. 1 - CAMSHAFT GEAR. 2 - INJECTION PUMP DRIVE GEAR. 3 - CAP SCREWS (3/8" -16 N.C. x 2-1/2" LONG). 4 - PULLER PLATE (SE-662-A). 5 - GREB WHEEL PULLER (SE-624).

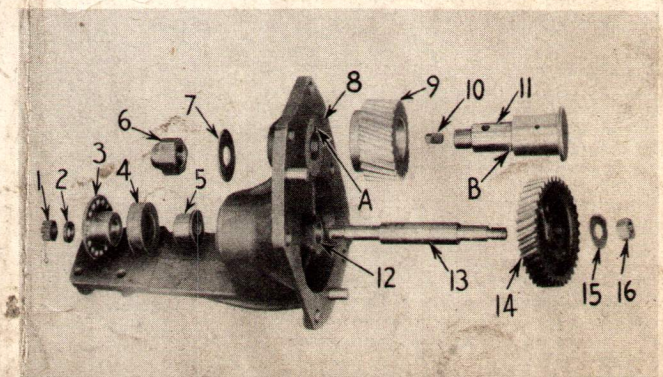
To disassemble the assembly take out the three cap screws holding the drive housing cap and the entire shaft assembly can be removed by forcing it out in the direction of the cap end. The drive flange can be pulled from the shaft after removing its slotted nut. Inspect the oil seal and felt washer and install a new felt and seal if they are found defective. The oil seal should be installed with its leather lip facing in towards the drive housing.



ILLUST. 59. EXPLODED VIEW OF INJECTION PUMP DRIVE HOUSING ASSEMBLY. 1 - INJECTION PUMP DRIVE BEARING, FRONT. 2 - DRIVE HOUSING GASKET. 3 - INJECTION PUMP DRIVE HOUSING. 4 - DRIVE SHAFT SPACER. 5 - DRIVE BEARING, REAR. 6 - DRIVE HOUSING CAP GASKET. 7 - DRIVE HOUSING CAP. 8 - OIL SEAL. 9 - FELT WASHER. 10 - FELT RETAINER. 11 - DRIVE SHAFT FLANGE. 12 - INJECTION PUMP DRIVE SHAFT.

Magneto Drive Shaft Assembly

The magneto drive gear runs on an idler gear which in turn is driven by the camshaft gear. The magneto bracket is a unit assembly and can be removed without taking off the engine front cover. Two dowel pins locate the housing in place. With the assembly removed from the engine, it can be readily disassembled as shown in Illust. 60. The idler gear and drive shaft are lubricated by force-feed through drilled passages from the main lubricating system. Care must be taken to see that the oil hole in both the idler gear shaft (11), and drive shaft bushing (12), registers with the drilled passage in the magneto bracket. Pin "B" must be in slot "A" when the idler gear shaft is assembled correctly. Oil seal (4) is assembled with the lip facing in.



ILLUST. 60. EXPLODED VIEW OF MAGNETO BRACKET ASSEMBLY. 1 - MAGNETO COUPLING NUT. 2 - WASHER. 3 - MAGNETO COUPLING. 4 - OIL SEAL. 5 - SPACER. 6 - SHAFT NUT. 7 - SHAFT LOCK WASHER. 8 - MAGNETO BRACKET. 9 - IDLER GEAR. 10 - PLUG. 11 - IDLER GEAR SHAFT. 12 - BUSHING. 13 - DRIVE SHAFT. 14 - DRIVE GEAR. 15 - LOCK WASHER. 16 - DRIVE GEAR NUT.

CRANKSHAFT, MAIN BEARINGS, CAMSHAFT, and TIMING GEARS

Crankshaft

The crankshafts in the "14" Series engines have Tocco-hardened bearing journals and are drilled for pressure lubrication of the connecting rod bearings. Each bearing cap carries a number which corresponds to a number stamped on the camshaft side of the engine on the surface where the oil pan joins the crankcase. The main bearings can be readily removed without taking the crankshaft out of the crankcase. When replacing the main bearing caps, tighten the nuts to 150 ft.-lbs. with a torque wrench.

Replacement crankshafts, with bearings to match, are available in 1/32" undersize. The crankshaft is easily removed when the engine is removed from the tractor or power unit. Remove the front cover as described on Page 46. Remove the bolts from the flywheel and pull it from the crankshaft. Remove the oil pan, rear oil seal retainer plate and rear oil seal; disconnect the connecting rods, remove the oil pump, and the main bearing caps. Be sure the bearing caps, bearings, crankshaft journals, and crankcase are absolutely clean and dry when the parts are being replaced.

Crankshaft oil seals are provided at the front and rear ends of the engine. The front seal is a combination felt and leather seal, located in the crankcase front cover; assemble with felt toward the front of the engine.

The rear oil seal is the split type; the flywheel must be removed to replace the oil seal. When oil leaks behind the flywheel, check the fit of the welch plug at the end of the camshaft, replace the felt seal, and check the rear bearing for excessive wear.

Main Bearings

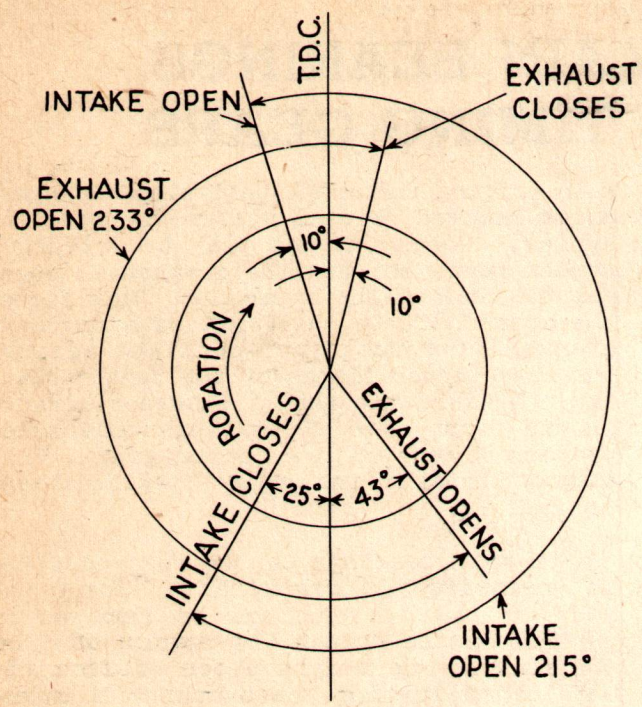
Main bearings are not adjustable. When clearances are excessive, replacement is necessary. Clearance may be checked by placing a .003" brass shim for the Diesel or a .002" brass shim for the carbureted engine, (1/4" wide x 1-1/2" long) lengthwise between the bearing and the crankshaft. If clearance is not excessive, there should be a slight drag when turning the crankshaft with the spark plugs removed (Diesel set on the gasoline cycle). Check the end play by driving a wooden wedge between the crankshaft cheek and the rear of the crankcase. This forces the crankshaft to the front with the rear crankshaft thrust surface tight against the rear thrust flange of the center bearing. Measure the thrust flange clearance on the front side of the upper and lower bearing flange with a feeler gauge. End play is shown in the engine specifications on Page 9.

The main bearings can be removed without removing the crankshaft. The upper half of the bearing can be removed by pushing on the end of the bearing without the nib, using a thin piece of flexible metal, and turning the crankshaft in the direction of removal. When replacing, rotate the crankshaft so the nib of the bearing enters last. Bearing backs, crankcase bore, and cap bore should be absolutely clean and dry when replacing the bearings.

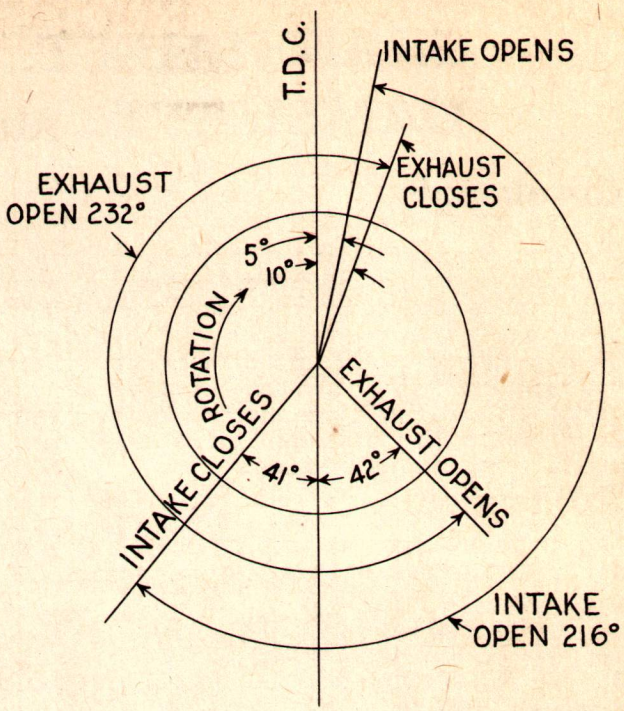
A new type of crankshaft center bearing, consisting of the bearing and two split thrust washers, replaces the center bearing which was provided with a flange to take the thrust of the crankshaft. This new center bearing became effective on TDFM-3667 and UDFM-3571. The thrust washers are located by a notch in the outer edge of the washers which engage dowel pins in the thrust surfaces of the bearing cap. In the event the bearings are removed for inspection and replaced, be careful not to interchange the center and front main bearings. Since the lengths of these two bearings are the same, this mistake could easily be made.

Camshaft

The camshaft in the "14" Series engines operates on three steel-back, babbitt-lined bearings. For sizes and running clearances see the specifications on Page 9. For replacement, these bearings are furnished reamed to size. To replace the bearings it is necessary to have the flywheel and rear engine support, or the flywheel housing removed from the crankcase in order to remove the welch plug which closes the camshaft boss at the rear of the crankcase. On the carbureted engine, press the bearings into the crankcase until they are flush with the bosses.



ILLUST. 44. "14" SERIES DIESEL ENGINE VALVE TIMING.



ILLUST. 45. T-14 CARBURETED ENGINE VALVE TIMING.

On the Diesel engine, the rear bearing is pressed into the boss until it is within 1/8" of the end of the boss inside the crankcase. Be sure the oil holes in the bearings are aligned with the holes in the crankcase. The camshaft is held in place by a thrust plate which is located between the front camshaft bearing journal and the camshaft gear. The thrust plate is attached to the engine by two cap screws. To insert or remove these cap screws, turn the camshaft gear (idler gear removed) until the holes line up with the cap screws. When reassembling the camshaft, check the gear to see that it runs true with the front plate. Misalignment will result in a noisy timing gear train.

The slot in the center camshaft bearing journal (carbureted) and the front camshaft bearing journal (Diesel) allows oil to flow to the valve mechanism with each revolution of the camshaft. On each revolution the notch serves as a passage from the oil line that lubricates the camshaft bearing to an oil passage that leads to the valve mechanism. The notch in the front camshaft bearing journal on the carbureted engine permits oil to pass in order to lubricate the timing gears.

The valve tappets can be removed only after the camshaft has been removed from the crankcase. For timing the engine when replacing the camshaft see "Timing Gears".

Timing Gears

With the crankcase front cover removed, the timing gear train is accessible. When replacing the camshaft (idler gear removed), first mesh the marked tooth on the magneto gear with the corresponding marked groove on the camshaft gear. Next replace the idler gear so that corresponding letters on the crankshaft gear and camshaft gear (carbureted) and pump drive (Diesel) match with the letters on the idler gear. The idler gear shaft on the Diesel engine can be removed by taking off the nut inside the crankcase which secures it to the crankcase. A pin in the end of the shaft locates it in the crankcase. The idler gear shaft on the carbureted engine can be removed by taking out the two cap screws which secure it to the crankcase. A dowel locates the shaft on the crankcase.

Crankcase Front Cover

With the engine removed from the unit, the crankcase front cover can be removed after taking out the cranking pin in the crankshaft, removing the nut and nut lock, pulling the fan drive pulley, and removing two keys from the crankshaft and the bolts around the front cover.

On the Diesel engines, a small cover on the left front side permits the removal and timing of the injection pump as outlined on Page 19.

ENGINE CLUTCH

The over-center type 15" clutch is used with all "14" Series engines. This clutch is so designed that it requires a minimum of attention. When servicing is necessary, it can be done with little disturbance to adjacent or surrounding parts.

The clutch release mechanism on the TracTracTors is furnished with a clutch brake which aids in faster shifting of transmission gears.

Adjustment

The clutch is fully engaged when the hand lever is pulled back all the way on the T-14 and TD-14 TracTracTors and when the lever is pushed forward all the way on the UD-14 power unit. The reason for this is that the release fork and shaft are located above the clutch thrust bearing on the TracTracTors and below the thrust bearing on the power unit.

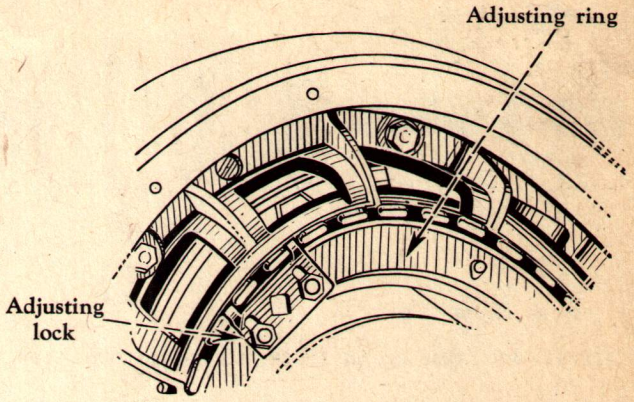
When the clutch is fully engaged, a definite over-center cam action is felt. Adjustment is necessary when a noticeable slippage is taking place with the engine operating under load.

1. To adjust the clutch, remove the clutch inspection cover in front of the steering clutch levers on the TracTracTors or the hand hole cover on top of the clutch housing on the power unit.

2. Loosen the two nuts holding the adjusting ring lock and slide the lock to disengage it from notches in the back plate, see Illust. 46. (Earlier clutches have a spring-actuated lock).

3. Place the clutch hand lever in the disengaged position. Turn the adjusting ring in a clockwise direction, moving it one notch, or possibly two notches at the most at any one time. Place the clutch hand lever in the engaged position to determine if the over-center engagement is felt.

   If the adjustment has been made as described above, and the cams are so tight that you do not get full over-center engagement, then the adjusting ring should be backed off one notch (in a counter-clockwise direction).



ILLUST. 46. ENGINE CLUTCH ADJUSTMENT.

   For satisfactory operation of the clutch, do not have the clutch adjusted so tight that this full over-center engagement is not easily secured.

4. When correct clutch adjustment is obtained, be sure to engage the adjusting lock and tighten in place. Then replace the inspection cover or hand hole cover.

   The adjustment is correct when considerable (not excessive) pressure is felt when engaging the clutch with the hand lever and when a definite over-center cam engagement is felt.

Removal and Replacement

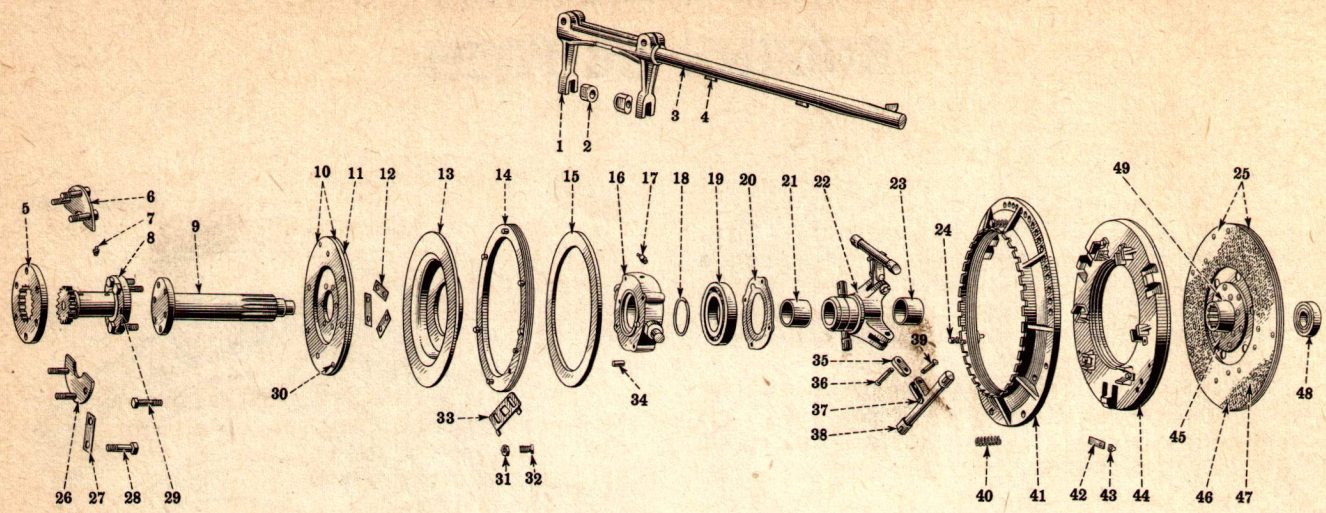
T-14 and TD-14 TracTracTors:

The engine clutch can be removed through the top of main frame without disturbing the engine or transmission. The clutch however must be removed before the transmission can be removed.

1. Remove the oil cup from the bottom of the air cleaner, lock the brake pedals forward, and tie back the steering clutch levers for additional clearance.

2. Remove the engine clutch cover after taking out cap screws that hold it in place.

3. Engage the clutch and remove nuts from coupling bolts (29) Illust. 47 on the clutch side of the brake fric-



ILLUST. 47. TRACTRACTOR ENGINE CLUTCH EXPLODED VIEW. POWER UNIT ENGINE CLUTCH DOES NOT INCLUDE FRICTION BRAKE.

tion disc (11). Turn the engine over with the hand crank to make all nuts accessible.

4. Remove nuts from bolts (28) at the rear of the clutch coupling (8). These nuts are all made accessible by turning coupling (8) with the clutch disengaged. Take out bolts which release coupling washers (6) and (26).

5. Remove bolts (29) from the front end of coupling (8) which permits removal of the coupling.

6. Loosen bolt in the hand lever and two in the release fork (1). With a bar placed through the hole provided in the left underside sheet, drive the hand lever off shaft (3) and remove the key. (Caution should be taken not to damage the shaft bushing with the key when driving the lever off).

7. Drive the release shaft (3) out until the keys clear the release fork (1). Then rotate the shaft one-half turn and remove the keys. Pull the shaft all the way out and lift out the release fork (1). Remove the bushings.

8. Remove cap screws from the back plate (41).

9. With the help of a pinch bar, pry out the clutch shaft (9) to clear the pilot bearing (48).

10. The entire engine clutch unit can be lifted out.

11. The pilot bearing can be removed with the use of a puller.

Replace the engine clutch unit by reversing the above removal procedure. Be sure release pin bushings (2) are installed so that the flanged side faces the carrier (16). Also be sure carrier (16) is installed with lubricator or fitting (17) on the top side. Adjust the engine clutch if necessary as outlined under "Adjustment".

UD-14 Power Unit:

Remove the clutch housing assembly which includes the clutch shaft, clutch lever, lever shaft, and yoke. The clutch can then be removed by taking out cap screws holding it to the flywheel. Replace the clutch unit by reversing the removal procedure.

Disassembly (All "14" Series Clutches)

1. With the clutch unit removed from the TracTracTor or power unit, slide the driven member assembly (47), Illust. 47 from shaft (9) and remove the shaft with the brake disc (11). (When the clutch unit is removed from the flywheel on the UD-14 power unit the driven member assembly will be freed).

2. Loosen the two nuts holding lock (33), move to the disengaged position, and tighten. Unscrew the adjusting ring (14), and lift out the ring plate (15).

3. Unscrew three nuts and remove springs (40) and bolts (24), thus disengaging the pressure plate (44) from the back plate (41). If any of these

show discoloration from heat, they should be replaced.

4. Remove pins (36) and (39) releasing camshaft (38) and link (35). If any of these parts show wear they should be replaced.

5. Remove cap screws from plate (20). Pull the bearing carrier (16) with the brake disc (13) from the bearing (19).

6. Remove the snap ring (18) and pull the bearing (19) from the sleeve (22). Bushings (21) and (23) are replaceable; they are furnished to size and need only be pressed in place until the ends of the bushings are flush with the ends of the sleeve. Running clearance between the shaft and bushings is .001" to .005".

Assemble the clutch by reversing the disassembly procedure. To facilitate final adjustment of the clutch, screw in the adjusting ring (14) until the distance from the front face of the pressure plate (44) to the front face of the back plate (41) is 1-5/32".

If clutch facings (25) show considerable wear or roughness, or are oil soaked, they should be replaced. Be sure all rivets are countersunk. If pressure plate (44) shows heat checks, scored or warped, replace with a new plate.

TRANSMISSION

As shown in Illust. 48, the line of power from the engine is through the flywheel and clutch, the clutch, transmission, and bevel gears to the sprockets on each side of the TracTracTor.

The transmission is of the selective spur-gear type, having six forward speeds and two reverse. A gear-shift lever permits shifting to three forward speeds and one reverse, then by shifting a Hi-Lo lever from low to high position, this speed range can be repeated at a higher speed. Gears are mounted on three shafts which are supported in the main frame.

Power is transmitted from the engine clutch through a shaft, coupling, and driving flange to the driving shaft gear in the transmission. The driving flange is splined to the driving shaft gear and they turn in two ball bearings. The spline shaft revolves in two ball bearings - one located in the driving shaft gear and the other in a bearing cage.

The Hi-Lo and reverse gear shaft is stationary, being supported by the main frame at one end and the transmission end cover at the other. The idler gear revolves on two roller bearings and the Hi-Lo gear on a roller bearing and a ball bearing.

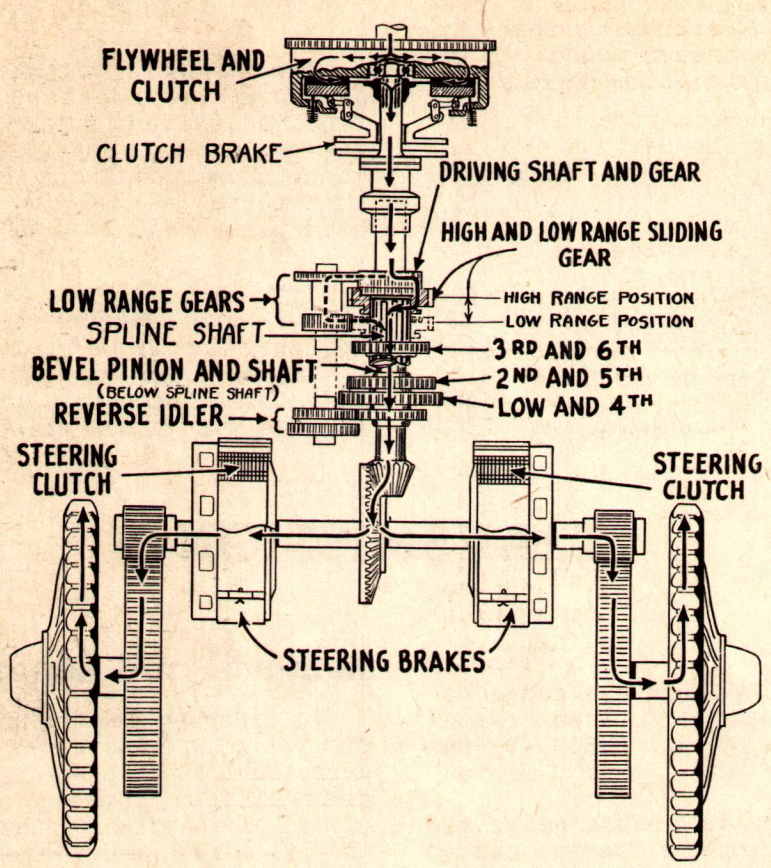
The bevel pinion and shaft revolve on a straight roller bearing in a bearing cage next to the pinion; a ball bearing at the opposite end takes up end thrust and its cage is shimmed from the transmission end cover for cone setting of the bevel pinion.

Removal and Replacement

To disassemble the transmission, drain out the oil, remove the seat frame, fenders, fuel tank, steering clutch controls, gear-shifter housing assembly, engine clutch compartment, the coupling flange and oil seal retainer from the upper shaft, and the bearing retainer and bearing from bevel pinion shaft, using puller cap screws to aid in removing. Also remove the retainer and washer from the end of the idler shaft. Remove the transmission end cover. Use three capscrews 1/2" x 2-3/4" with threads extending well back toward the screw head for pushing the cover from place.

Pull gears from their respective shafts and remove the idler shaft as a unit with the gears assembled. Remove cap screws from the remaining bearing cages and pull or pry out the spline shaft and bevel pinion shaft.

Before replacing the transmission, thoroughly clean all parts and the inside of the case. Use all new gaskets; carefully check oil seals and replace with new wherever doubtful. Assemble the transmission by reversing the foregoing removal procedure. With the bevel pinion shaft installed, arrange shims at the front bearing cage for tooth bearing, and shims between the bevel gear and spacer for .012" back lash as described under "Bevel Gears". Place all shifter rail forks in neutral position and the shifting gears also, prior to assembling the shifter housing in place on transmission.



ILLUST. 48. LINE OF POWER THROUGH A "14" SERIES TRACTRACTOR.

BEVEL GEAR and PINION

When assembling the drive bevel gear to the main frame of the TracTracTor, this is the procedure:

1. Secure the left-hand bearing cage with the bearing and gasket to the main frame. This bearing cage is cupped and the bearing can be inserted from only one side. The bearing has a wider inner race; the flush side of the bearing is always to the left and is assembled as shown in the service chart.

2. Secure the left steering clutch bearing cap with capscrews to the main frame.

3. Lower the drive bevel gear into the compartment and slide the hub into the drive bevel gear from the right steering clutch compartment. Continue to drive the hub into the left-hand bearing.

4. Slide the spacer over the hub and attach it loosely to the bevel gear with special cap screws after placing a few shims between the spacer and the hub of the drive bevel gear. The cap screws are tightened when adjustment is made.

5. Remove the left-hand bearing cap and attach the steering clutch coupling to the hub and reassemble the bearing cap with its gasket.

6. Assemble the right-hand bearing cage to the main frame with the gasket in place.

7. Assemble the right-hand bearing to the bevel gear hub and the bearing cage. The flush side of the bearing is toward the bevel gear.

8. Assemble the steering clutch coupling and bearing cap to the right side.

9. The transmission can be assembled and the pinion set for proper tooth contact by using the gauge or red-lead method as outlined under "Adjustment". The proper method of adjustment should be followed closely.

10. Steering clutches may be installed after removing the bearing cap and coupling.

Adjustment

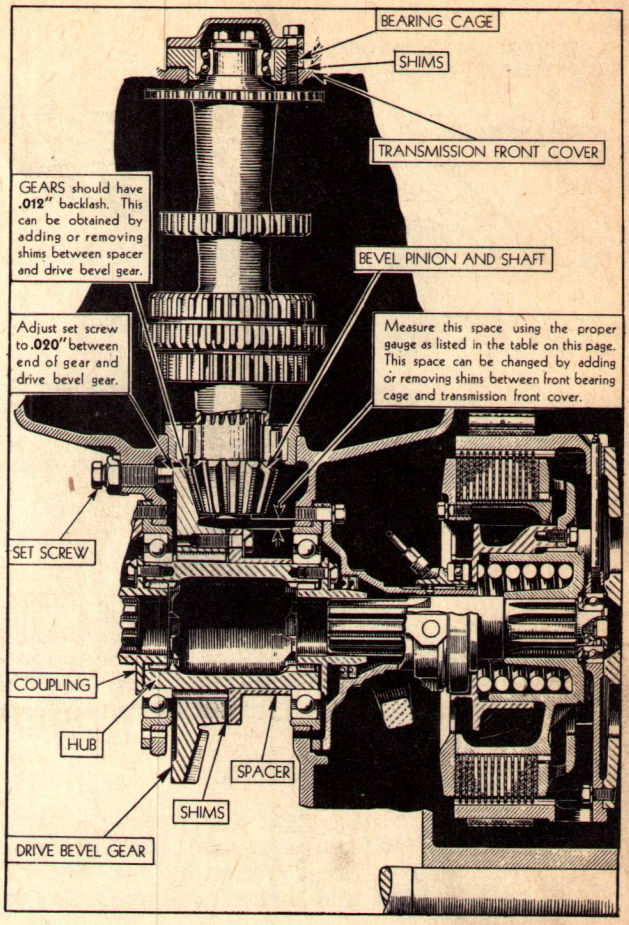
To obtain quiet operation and maximum life, the bevel gear and pinion must be properly adjusted to each other. For service, this involves mainly two operations - (1) Set the gears for proper tooth contact; (2) Set the gears for proper backlash or running clearance. Both are important but the first should be given the most serious consideration.

Serial No.	Gauge	Method
Up to TDF-1126	No Gauge	Red lead the gear and rotate for tooth contact.
TDF-1126 to TDF-2295	.375" Gauge	Use gauge between spacer (53675-D) and end of pinion.
TDF-2295 to TDF-3855	.375" Gauge	Use gauge between hub of gear and end of pinion.
TDF-3855 and up - Also U.S. Army Tractors TDF-3347-T4 to TDF-3664-T4, TDF-3721-T4 to TDF-3839-T4	.625" Gauge	Use gauge between hub of gear and end of pinion.

NOTE: *Gauge specifications are approximate and proper spacing may vary plus or minus several thousandths according to the subject gears. However, late production gears bear a stamping indicating the exact spacing.*

1. On tractors up to TDF-1126 (Includes Actuator Construction up to TDF-796), the bevel gears are adjusted by the red-lead method entirely. The shape of the back face of the drive bevel gear makes it difficult to set the back faces flush for the initial setting.

(a) Arrange the shims at the bearing cage in the transmission front cover so that the pinion is centered on the teeth of the drive bevel gear. Tighten the bolts in the bearing cage.



ILLUST. 49. ADJUSTMENT OF DRIVE BEVEL GEAR AND BEVEL PINION. (TOP VIEW DRAWING).

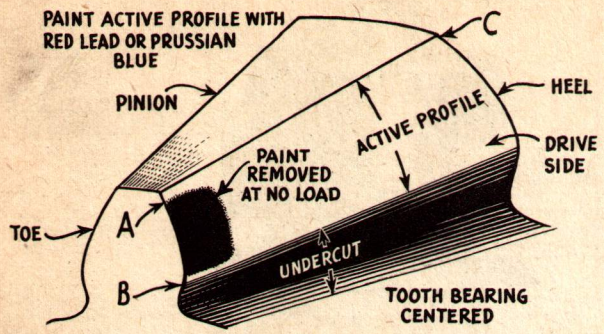
(b) Paint the teeth of the pinion with red lead. A mixture of powdered red lead and oil makes an excellent painting material when applied with a stencil brush. Prussian blue may also be used.

(c) Adjust shims between the drive bevel gear and spacer to give .012" backlash. Hold the pinion or shaft and rock the gear to obtain the back lash.

(d) Revolve the gears, using the pinion as the driver. Compare the tooth bearing (paint removed) with Illustrations 50, 51 and 52. Do not be concerned with the length of the tooth bearing but note its position up and down on the tooth.

(e) If the tooth bearing on the pinion is high, as in Illustration 51, add a shim at the pinion bearing cage to move the pinion out.

(f) If the tooth bearing on the pinion is low, as in Illustration 52, remove a shim at the pinion bearing cage to move the pinion in.

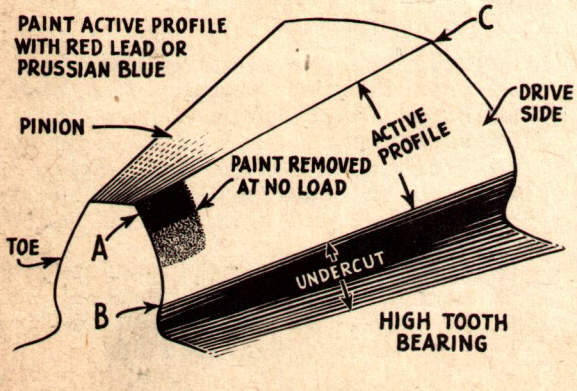


ILLUST. 50. THIS TOOTH BEARING IS PREFERRED WHEN GEARS ARE NOT UNDER LOAD. GEARS SHOULD OPERATE QUIETLY WITH THIS SETTING, CENTERED BETWEEN "A" AND "B". BOTH PINION AND GEAR SHOULD HAVE SIMILAR TOOTH BEARING WHEN GEARS ARE PROPERLY ADJUSTED.

(g) After each change of shims, re-check the backlash and change shims if necessary. Then repaint the pinion and check the tooth bearing for position up and down on the tooth.

(h) After setting gears properly, turn in the deflection set screw for .020" clearance between the end of the screw and back of bevel drive gear.

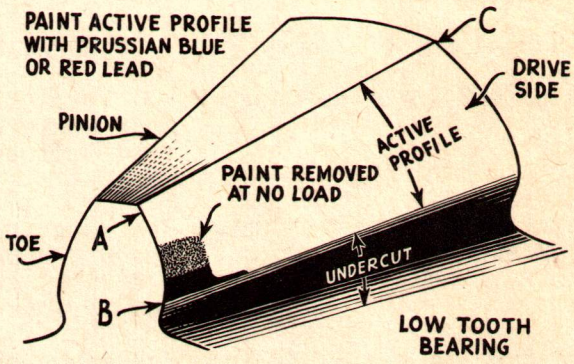
2. On tractors TDF-1126 to TDF-2295, use a .375" gauge between the end of the pinion and spacer #53675-DA as shown in Illustration 49. The gauge can be made of 3/8" keystock, 3/8" drill stock, or any object about 6" long measuring .375".



ILLUST. 51. THIS IS THE RESULT OF SETTING THE PINION TOO FAR IN. IT IS A HIGH TOOTH BEARING ON THE PINION (NO LOAD). IT IS ALSO A "TOE BEARING" BUT IT IS NOT CENTERED. TO CORRECT THIS BEARING, MOVE THE PINION OUT, AND THEN MOVE THE DRIVE GEAR IN FOR PROPER BACKLASH, IF NECESSARY.

(a) Place the .375" gauge between the toe end of the bevel pinion shaft and the large diameter of the bevel gear spacer (refer to Illustration 49). This assumes that the bevel gear is completely assembled as previously described but with cap screws for shim adjustment of the bevel gear left loose.

(b) With the pinion held firmly against the gauge and spacer, insert the proper number of shims between the bevel pinion bearing cage and the transmission front cover. The shims will hold the gauge in place after drawing the cap screws tight.



ILLUST. 52. THIS IS THE RESULT OF SETTING THE PINION TOO FAR OUT. IT IS A LOW TOOTH BEARING ON THE PINION (NO LOAD). IT IS ALSO A "TOE BEARING" BUT IT IS NOT CENTERED. TO CORRECT THIS BEARING, MOVE THE PINION IN AND THEN MOVE THE RING GEAR OUT FOR PROPER BACKLASH, IF NECESSARY.

(c) Now adjust the shims between the bevel gear and spacer to obtain .012" backlash. There is apt to be a slight run-out present in both the bevel gear hub and the bevel gear. Do not make the settings at the tightest point or at the loosest point but at a point half-way between the two.

(d) As an extra check, use the red lead (or Prussian Blue) method. In some cases it may be necessary to vary the .375" setting slightly.

(e) As the last operation, set the bevel gear deflection screw to .020" clearance between the end of the screw and the drive bevel gear.

3. On tractors TDF-2295 to TDF-3855, use a .375" gauge as just outlined, but use the gauge between the machined surface on the hub of the drive bevel gear and the end of the pinion. This surface is to the left of the spacer.

4. On tractors TDF-3855 and up, and on the U.S. Army tractors listed, use a .625" gauge for setting the bevel gears. These tractors have a shorter pinion and as a result require a thicker gauge. Use the gauge in the same way as for tractors TDF-2295 to TDF-3855. The gauge fits between the hub of the gear and the end of the pinion. Backlash for these gears is also .012".

If the gears falling into this group are checked with the red-lead method, the shape of the tooth bearing will be somewhat different than that appearing on earlier models, but when teeth are properly adjusted, the tooth bearing will be centered up and down on the tooth of the pinion.

STEERING CLUTCHES and BRAKES

Steering Clutches

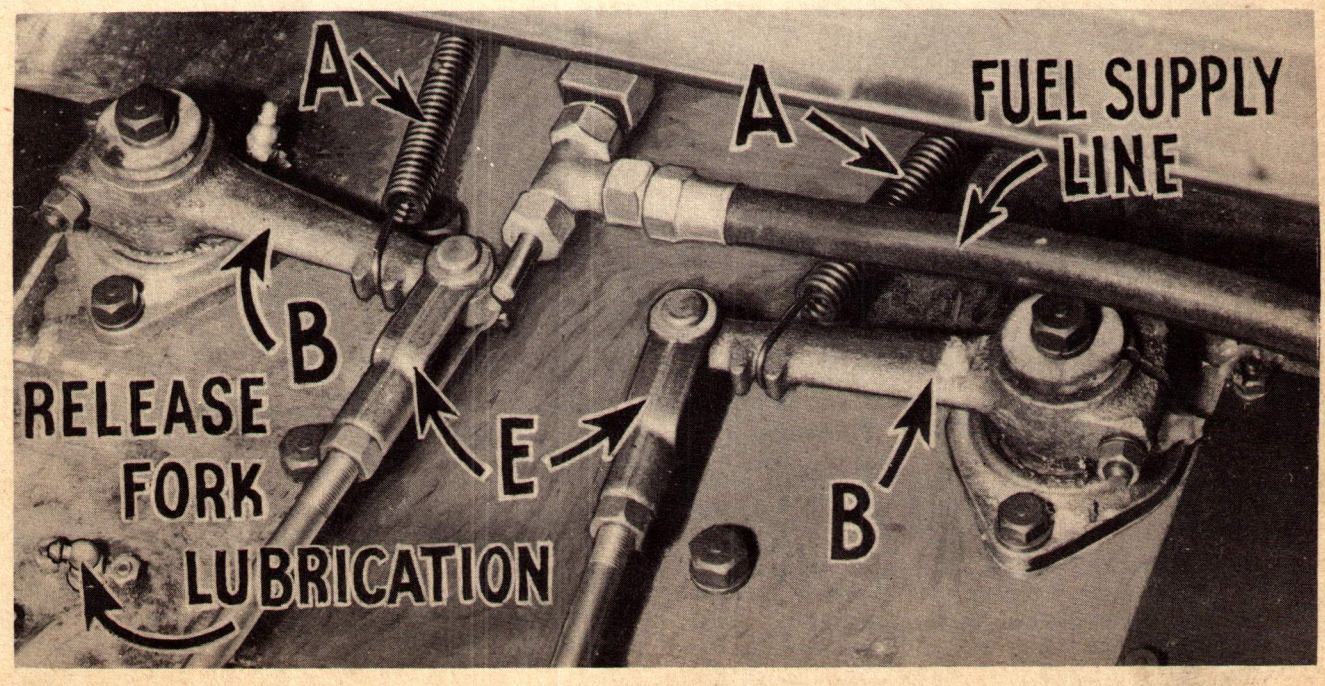
Power from the transmission is transferred through the bevel pinion and bevel gear through a steering clutch on each side to the sprocket drive gears. When both steering clutches are engaged, power is transmitted equally to each track. By disengaging one clutch, all the power is applied to one track. If one steering clutch is disengaged and its steering brake is applied, the TracTracTor pivots on its track. Disengaging both steering clutches at the same time or disengaging the engine clutch stops the TracTracTor.

Adjustment:

Illust. 53 shows the place where an adjustment to steering clutches can be made on the manual release type. Adjustment should be made if the steering clutch slips or the steering clutch hand lever free movement is reduced below 2", measured at the handle of the lever.

Remove the seat cushion and then remove spring "A" from the release lever "B". Adjust yoke "E" to give proper free movement, or 4" at the handle of the lever.

When the above adjustment no longer satisfies, remove yoke "E" and spring "A" before removing the release lever "B". The lever "B" should be replaced after rotating it one tooth to the rear on the splined shaft. Set yoke "E" for the proper hand lever movement. Subsequent adjustments can be made with yoke "E" as described above.

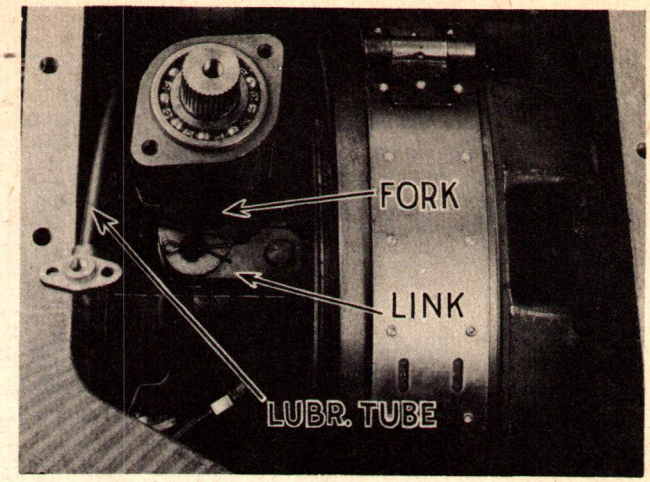


ILLUST. 53. STEERING CLUTCH ADJUSTERS.

Removal:

Clutches can be removed as a complete assembly, without disturbing the bevel gear or sprocket drive. To remove clutches proceed as follows:

1. Drain oil from transmission.
2. Remove the seat frame, fenders, fuel tank assembly and battery box (if used), being sure to disconnect fuel lines and electric wiring.
3. Remove from the main frame cover: the gear shifter housing, steering clutch control, oil fittings, and shifter fork upper bearing retainer cap.
4. Remove the main frame cover (2 dowels).
5. Pull cotter keys from the pins in the fork.
6. Lift the fork, remove the links, and pull out the fork.
7. Remove the cap screw in the bottom of the main frame holding the lower fork bearing retainer and remove the bearing, retainer, and oil lubricator as one assembly.
8. Remove the flexible lubricator.
9. Remove the upper rear brake joint pin and fold the bands out of the way. Back off the brake band set screw "E", Illust. 56.
10. Remove the screws from the bearing cage and slide the unit into the steering clutch.
11. Remove two diametrically opposite cap screws from the hub plate and assemble the compressor tool 5969-DA with long cap screws 42958-D so that the tool contacts the pins of the release collar. Turn in the cap screws so there is clearance to remove the coupling cap screws.
12. Remove the cap screws from the clutch shaft coupling.
13. Cap screws attaching the steering clutch to the sprocket drive pinion shaft flange should be removed. The clutch must be rotated to remove all cap screws. Mark the relative position of the drum and flange so that grease passages and cap screw holes will be in line when reassembling; the drum fits on the flange only one way.
14. Put a sling on the clutch drum, push the clutch shaft coupling into the drum, and pry the clutch drum from the flange and lift the drum from compartment.



ILLUST. 54. STEERING CLUTCH RELEASE FORK (L.H.) WITH CONNECTING LINK.

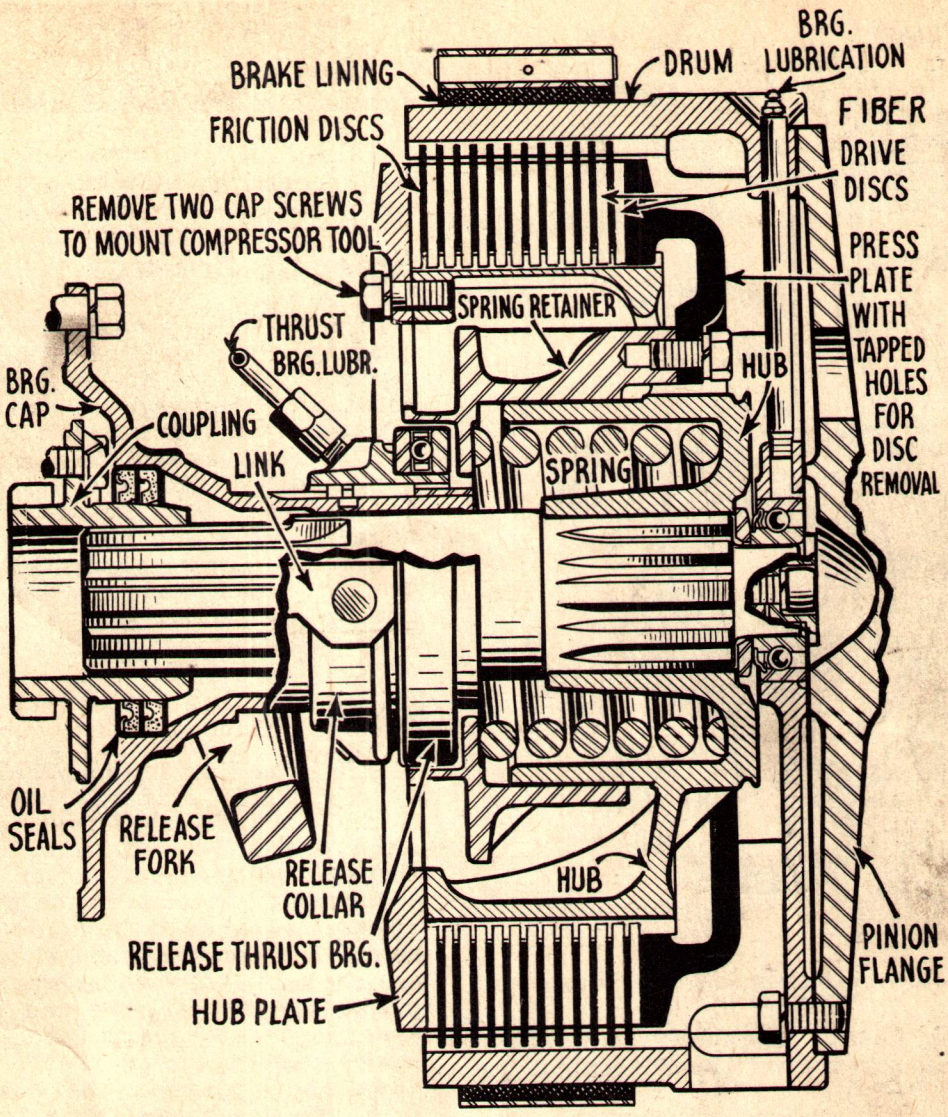
Replacement:

Replacement of the clutches is nearly the reverse of the above. The bearing cap gasket should be attached to the main frame before replacing; it is more easily protected from damage by doing so. Compress the clutch as far as possible. Be sure the Allen-head bolt in back of the steering clutch is tight. This bolt keeps the inner bearing race tight against the hub.

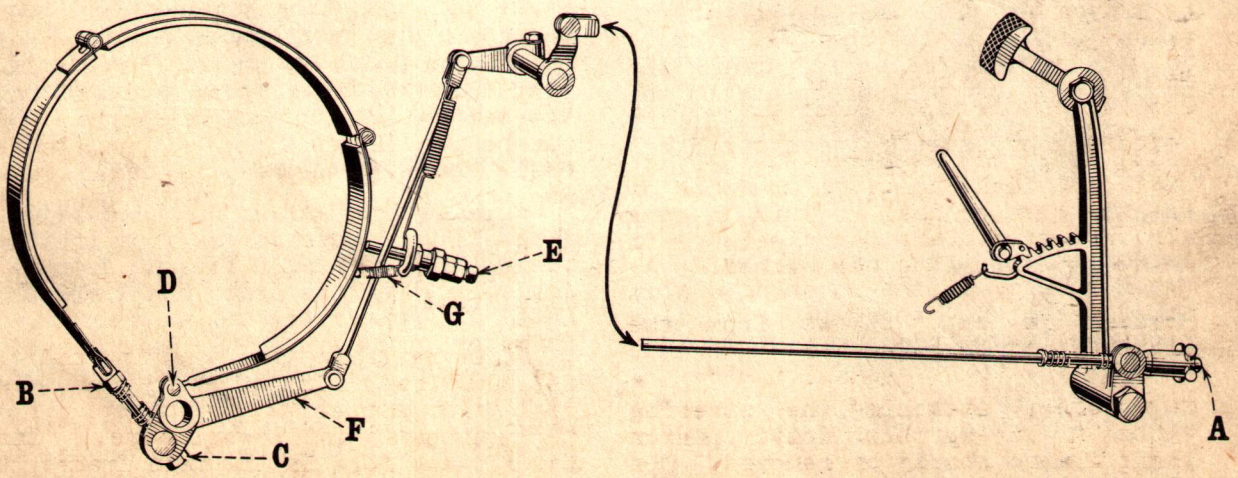
Use several cap screws to draw the steering clutch onto the flange of the sprocket pinion drive before centering the clutch shaft coupling. Pry the coupling into the bevel gear hub and insert the six 1-1/8" special cap screws. They can be identified by round punch mark on their heads. The bearing cap fits only one way; the oil drain is on the bottom.

Place the release fork bearing retainer with the oil tube in the bottom of the main frame.

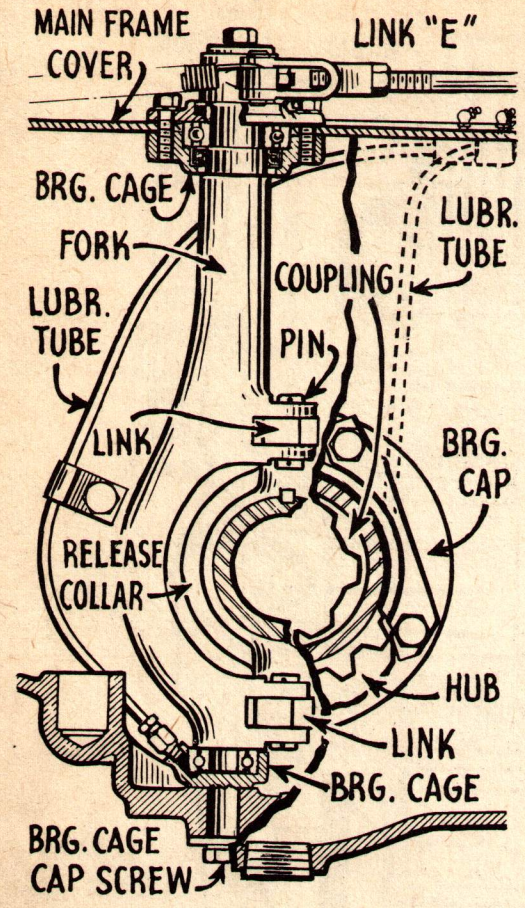
After replacing the steering clutches, assemble both link pins to the release fork with cotter keys, but spread only the uppermost and lowest keys. Insert the release fork in the main frame. Then assemble links to the collar pins and yoke pins, removing the unspread keys. Be sure the release fork and bearing are



ILLUST. 55. CROSS-SECTIONAL DRAWING OF STEERING CLUTCH WITH IMPORTANT PARTS IDENTIFIED.



ILLUST. 56. STEERING-BRAKE BAND AND FOOT-PEDAL CONTROL LINKAGE.



ILLUST. 57. SIDE VIEW OF STEERING-CLUTCH RELEASE-FORK MOUNTING.

all the way down. Tighten the bearing retainer set screw from the bottom of the main frame.

Continue reversal of steering clutch removal instructions.

The bevel gear drives the spline, the spline drives the hub, and the hub drives the fiber discs. As the control lever is pulled, the release collar is pushing the spring retainer and pressure plate to the right, Illust. 55, compressing the spring and releasing pressure between the fiber and steel discs.

Disassembly:

1. Assemble the 1/2" cap screws (between spokes in the steering clutch drum) into the three tapped holes provided in the steering clutch pressure plate, compressing the spring.
2. Remove the compressor tool.
3. Remove the four remaining cap screws from the steering clutch hub and plate and remove the plate.
4. The 13 friction discs and the 12 driving discs can now be removed.

Reverse the above procedure to reassemble the steering clutch.

Starting with TDF-721, pressure-plate cap screws are dowel bolts 54968-D and are located in reamed holes.

Steering Brakes

The steering brakes are simple and exceedingly accessible. They are external contracting band brakes, operating on the outside of the steering clutch drums. Each brake is controlled independently by a foot pedal on each side of the TracTrac-Tor. Both pedals are adjustable to suit the operator; each can be locked by latches accessible to operator. They are used for short turns, completely stopping one track. Brake bands can be relined by removing them from the bottom of the main frame without disturbing any other part of the TracTracTor.

Adjustment:

The steering brake pedals should have approximately 3 inches of free movement. A minor adjustment can be made by turning hand wheel "A", Illust. 56, until all threads are used up. After the hand wheel adjustment has been taken up, further adjustments should be made at the brake band. Loosen the hand wheel until about an inch of thread is engaged. Remove plates from the rear and bottom of the steering clutch compartment. Adjust the brake-band set screw "E" to give 1/64" clearance between the steering clutch drum and the brake lining at that point. Lock the set screw. Loosen jam nut "B" and turn the brake-band adjusting bolt "C" until 1/64" clearance is secured between the steering clutch drum and the brake lining. Lock jam nut "E", replace covers, and adjust hand wheel "A" to give 3" of free pedal movement. The lining allows approximately three adjustments of brake band.

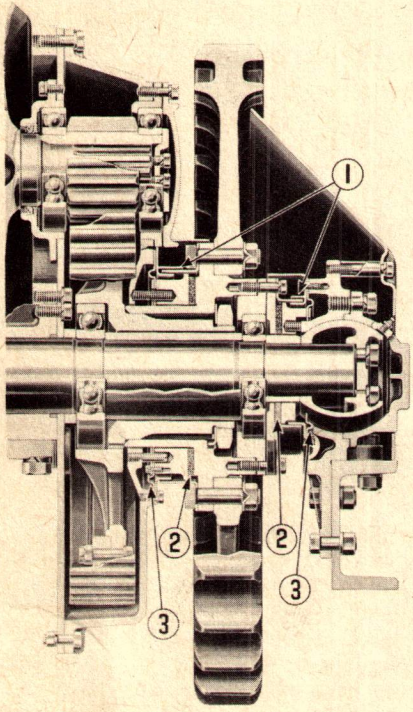
Renewing Brake Lining:

Release tension on the hand adjusting wheel "A". Remove covers from the bottom and rear of the main frame. Remove the set screw from the brake shaft far enough into the main frame so as to remove it from the pivot arm "F". Back up the adjusting set screw "E", unhook spring "G" from the brake band; remove pin "D"; remove the brake-band adjusting bolt "C" and pull the brake band from around drum. Reline the bands. Replace them by reversing the above procedure and make adjustments as outlined under that heading.

SPROCKET DRIVE and TRACK ASSEMBLY

Sprocket Drive

The sprocket drive gear and drive sprocket are both ball-bearing mounted on the stationary pivot shaft. Bearings are sealed with two labyrinth bracket seals and two self-adjusting, floating-diaphragm type seals. Sprocket drive gears are reversible, thereby utilizing both sides of the gear teeth. Refer to Page 50 for line of power and details.



ILLUST. 58. A SECTION THROUGH THE FINAL DRIVE SHOWING SPROCKET PINION AND GEAR, THE OIL-TIGHT HOUSING AND MULTIPLE OIL SEALS. 1 - THE LABYRINTH SEALS. 2 - THE HEAVY LEATHER WASHERS. 3 - THE DIAPHRAGM SEALS.

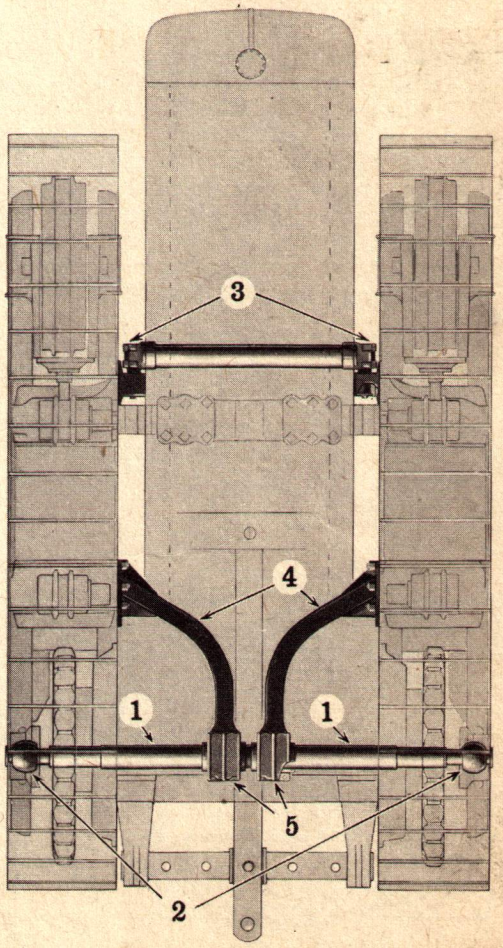
Effective on TracTracTors serial numbers TDF-3356-T-4 to 3664-T-4 and TDF-3762-T-4 to 3839-T-4 inclusive (all Army tractors), and on regular TD-14 serial TDF-3887 and up, the sprocket drive pinions and sprocket drive gears are changed, incorporating a 22° pressure angle on teeth instead of 20° angle. All new gears are marked 22° for identification. Gears so marked must never be meshed with gears that are not correspondingly marked.

Sprockets

Sprockets are heat treated steel castings having 27 teeth, 30.425" pitch diameter, and 7 pitch teeth. The TracTracTor's weight is carried on the track rollers, relieving the sprockets of this. Sprockets are reversible; that is, they can be taken off, reversed, and placed on the same side thereby utilizing both sides of the teeth.

Track Frame

The front idlers, track idlers and track rollers are secured to heavy, welded, steel channel constructed track frames. Each track is free to oscillate vertically independent of the other; they are pivoted by a ball-and-socket on the ends of the pivot shaft. This feature prevents leverage strains being imposed on the pivot shaft due to slight lateral movement of the track frame. The equalizer spring contacts the track frames. Roller-type stabilizers maintain track spacing. A roller is secured to the track frame and the guide is fastened to the main frame side channels. The heavy steel diagonal



ILLUST. 59. TRACK STABILIZER CONSTRUCTION OF THE T-14 AND TD-14 TRACTRACTORS. 1 - PIVOT SHAFT. 2 - BALL-AND-SOCKET JOINTS. 3 - FRONT STABILIZER. 4 - DIAGONAL BRACES. 5 - DIAGONAL BRACE BEARINGS.

braces are mounted on bearings at the center of the pivot shaft. They keep the track frames in upright position and allow vertical oscillation.

To remove track frames: take off the track chain; jack up the tractor; take off the sprocket shield, pivot cap and bracket, front stabilizer roller guide, and bolts in the diagonal brace at the pivot shaft. To reassemble, reverse this procedure.

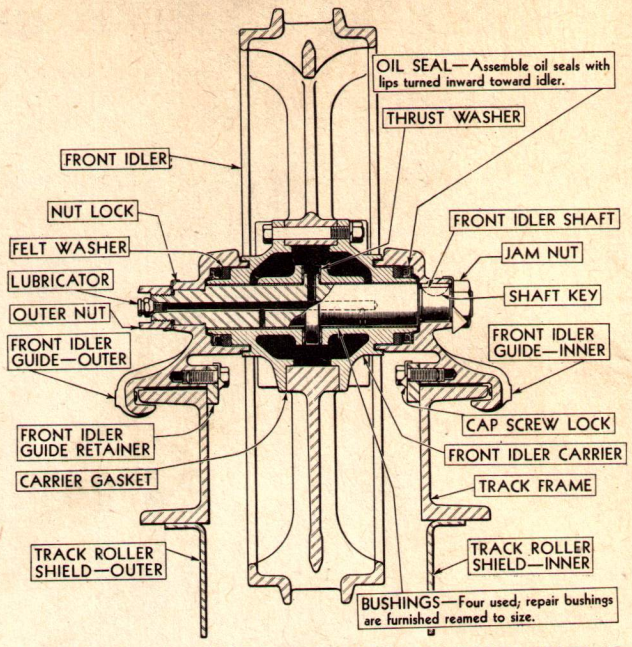
Illust. 59 shows the location of the diagonal braces, pivot shaft, ball and sockets, and front stabilizer. It is best to remove cap screws from the diagonal brace bearing blocks when repair necessitates removal of the track frame. The TracTracTor must be jacked up on one side to do this. To remove the equalizer spring it is necessary to remove the track frame on one side.

Front Idlers

Self-cleaning, open-type, steel-cast front idlers are slide-mounted to the track frames. The overall diameter of the idler is 27-1/8". All tension on the track is adjustable at the idler sliding mount. Two heavy coil springs on either side are part of the release mechanism. They permit the idler to recoil under shock but exert no tension on the track when in normal operating position.

The idler carrier is equipped with bronze bushings which rotate on a heat-treated steel shaft and are triple sealed with dirt deflectors, felt washers and a spring-loaded leather seal (lips turned inward). Service bushings are furnished reamed to size.

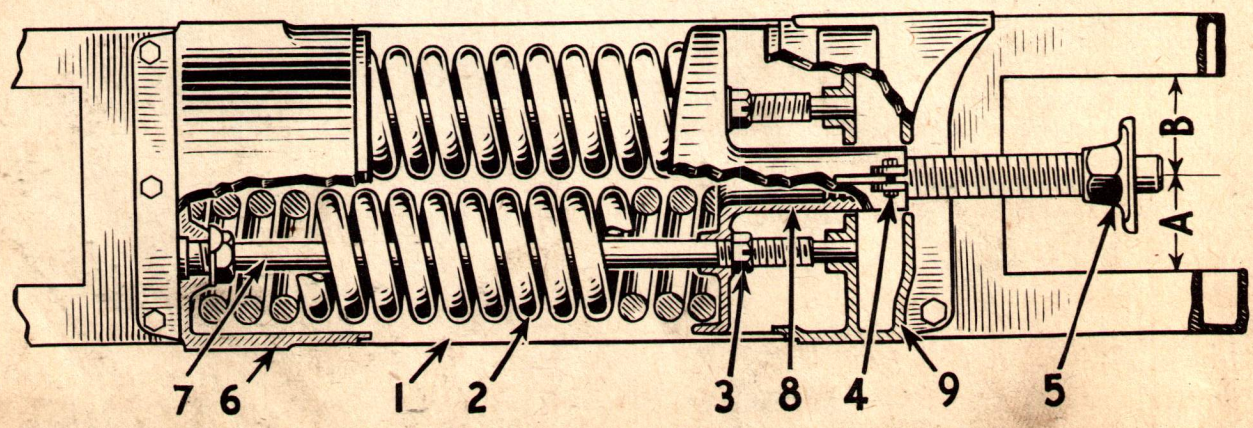
FRONT IDLER ASSEMBLY (RIGHT HAND)



ILLUST. 60. CROSS-SECTION DRAWING OF FRONT IDLER ASSEMBLY.

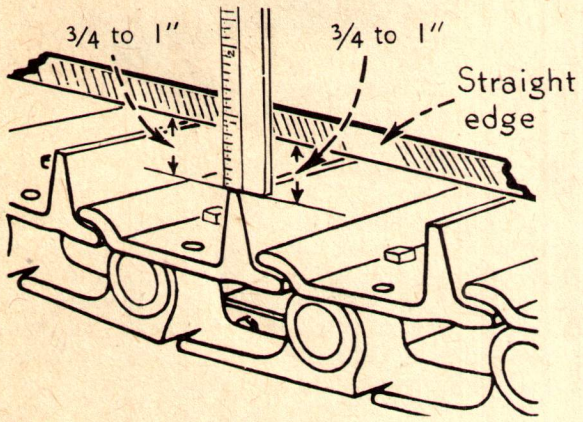
Illust. 61 shows the parts included in the recoil assembly and point of the track adjustment (5). The maximum forward adjustment with this rod is 3-1/2" and maximum adjustment to the rear is also 3-1/2". When all forward adjustment is used a new track should be installed.

The spring adjusting rods (7) are obtainable as service parts. They are locked in retainers (6) which are fastened to track frame (1) by capscrews. Springs (2) are held by the front retainer (8) and compressed by turning down nut (3) until a cotter key can be inserted in the hole in the rod. The dimensions "A" and "B" should be equal to prevent the front idler from cocking, thereby causing the tractor to creep. The front guide (9)



ILLUST. 61. TRACK FRAME AND RECOIL SPRINGS. 1 - TRACK FRAME. 2 - RECOIL SPRING. 3 - SLOTTED NUT. 4 - LOCKING BOLT. 5 - ADJUSTING NUT. 6 - REAR SPRING RETAINER. 7 - ADJUSTING ROD. 8 - FRONT SPRING RETAINER. 9 - GUIDE.

pilots the adjusting rods to hold proper alignment. Bolt (4) is loosened before adjusting the front idler by turning at (5) after cap screws are removed from (5). Track tension should only be sufficient to allow it to sag or have 3/4" to 1" clearance, Illust. 62, between a straight edge laid across the three shoe tops (between idlers) and the tip of the center shoe.

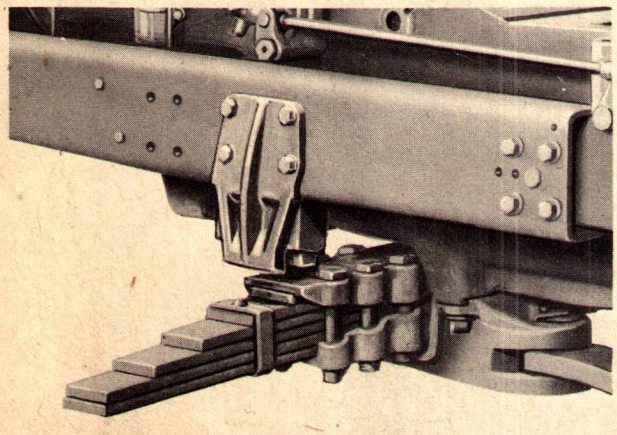


ILLUST. 62. MEASURING TRACK TENSION.

Equalizer Spring

The equalizer spring consists of six silico-manganese, saddle-mounted leaves designed to cushion the main frame from shock and strain.

Illust. 63 shows the equalizer spring and attaching point of drawbar. The track



ILLUST. 63. EQUALIZER SPRING AND ATTACHING POINT OF DRAWBAR.

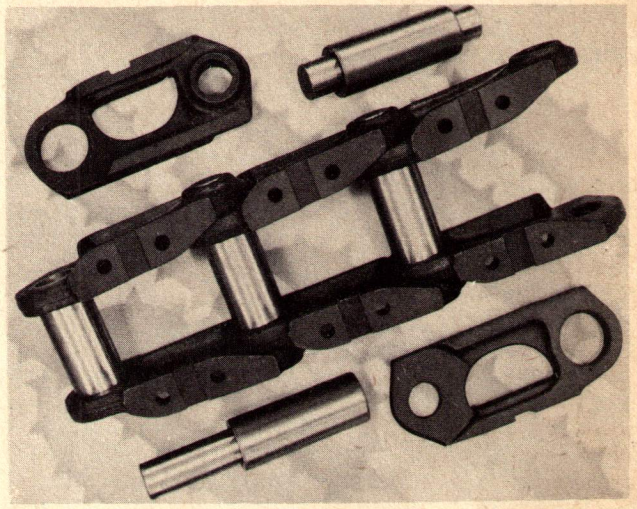
frame should be removed from one side; then remove bolts and the drawbar pin.

The ends of the spring ride on hardened pads inserted in the recoil spring guide.

Track Frame Pivot

The track-frame pivot is stationary in the main frame. It is 3-1/2" in diameter, and extends from side to side to the pivot bearing for the track.

Track Chain

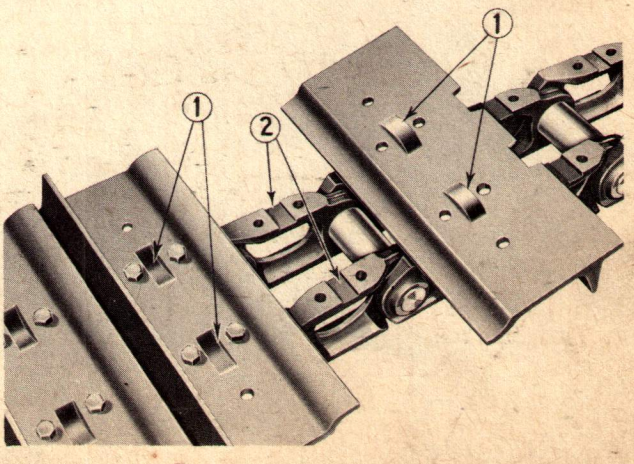


ILLUST. 64. TRACK, TRACK LINKS, PINS, AND BUSHINGS.

The track links are drop-forged, heat-treated steel. Track pins and bushings are machined, carburized, hardened steel, forced into links under great pressure. Pins move freely in the bushings but the ends are a press fit in the track links. Left and right hand tracks are interchangeable. The master pin is easily removed to remove track.

Track Shoes

Standard equipment includes 72 heat-treated, rolled-section and keyed, grouser-type, track shoes. Regular tread and wide tread TracTracTors have 16" track shoes as standard equipment. Shoes are keyed and



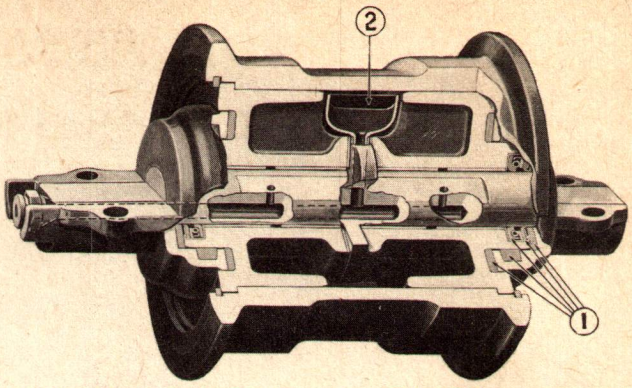
ILLUST. 65. SHOES ARE HELD TO TRACKS BY CAP SCREWS AND KEYS. 1 - KEYS. 2 - KEYWAYS.

fastened to track links by four (each shoe) #59 -9/16"-18 N.F. hex. hd. cap screws. Illust. 65 shows the milled slots (2) into which keys on the shoes fit, assuring a permanent fastening. Two 25/32" holes are provided in each shoe for attaching auxiliary shoes. All shoes are heat treated. See Page 62 for track shoes available.

Track Rollers

Five track rollers on each side carry the weight of the TracTracTor. Rollers are heat-treated, steel forgings fitted with special alloy carriers bushed with four bronze bushings which rotate on heat-treated steel shafts.

Service bushings are reamed to size. Effective dirt sealing is secured at each end of the rollers by three individual felt washers and a spring-loaded, double leather seal with the lips of the seal turned out. Rollers are gravity-lubricated at low turning speeds and pressure-lubricated at high speeds.



ILLUST. 66. TRACK ROLLER. 1 - FIVE SEALS. 2 - OIL SCUPPER.

Track Idlers

The upper section of the track between the sprocket and front idler is supported by two grey-iron idlers with chilled outer faces (increased hardness) mounted on brackets extending upward from the track frame. The idlers revolve on heat-treated replaceable steel shafts which are locked in the bracket with a bolt. A felt washer and spring-loaded leather seal with the lip turned away from the idler provide a dust-proof seal.

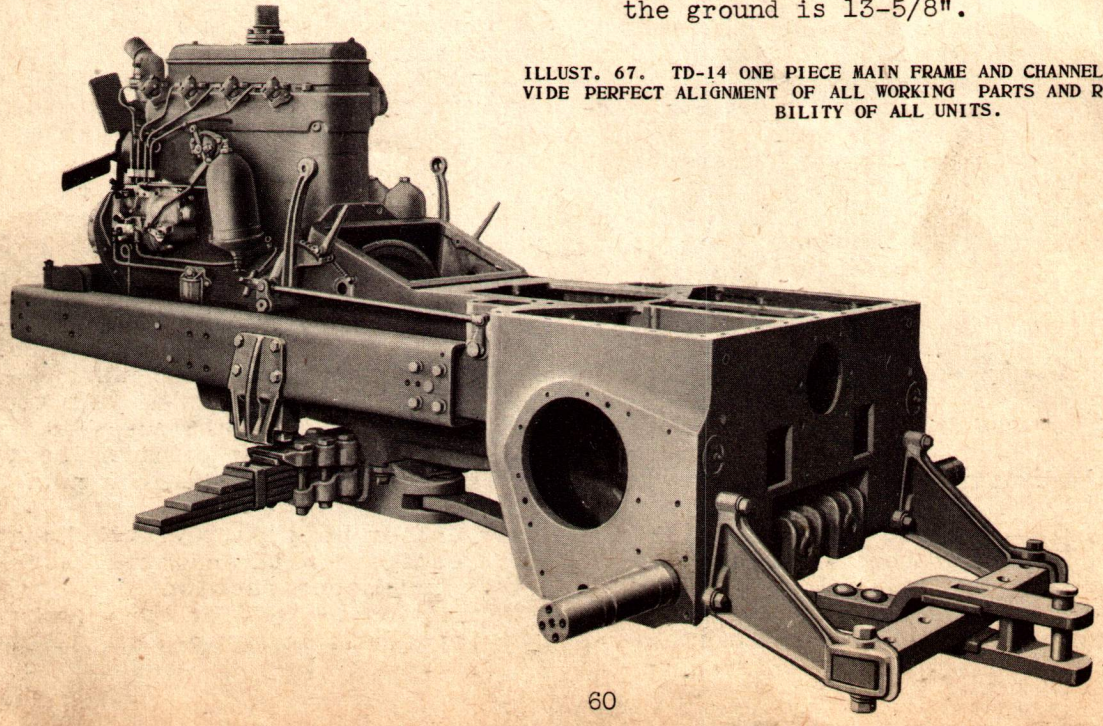
MAIN FRAME and DRAWBAR

Main Frame

The rear engine support plate is bolted directly to the one-piece main frame; heavy steel channels secured to the main frame support the front end of the engine and radiator.

Drawbar

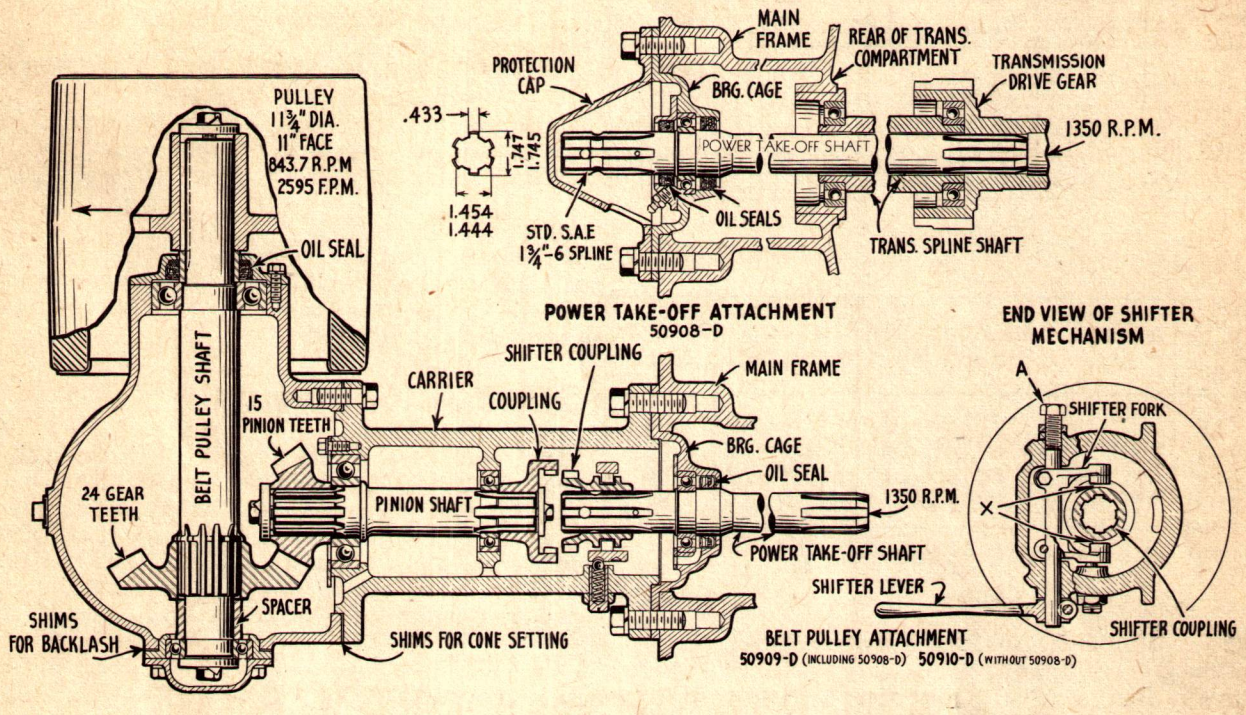
The drawbar is the swinging type, pivoted well forward on the main frame. Wearing plates are provided between the drawbar and the crossbar. Lateral swing each side of center is 27" and the height above the ground is 13-5/8".



ILLUST. 67. TD-14 ONE PIECE MAIN FRAME AND CHANNEL MEMBERS PROVIDE PERFECT ALIGNMENT OF ALL WORKING PARTS AND READY ACCESSIBILITY OF ALL UNITS.

ATTACHMENTS

T-14 and TD-14 TracTracTors



ILLUST. 68. BELT PULLEY AND POWER TAKE-OFF ATTACHMENT.

Power Take-Off

A power take-off attachment 50908-D can be furnished. It includes a shaft which extends through the upper spline shaft of the transmission. One end fits a spline in the transmission drive shaft gear. The other end runs in a ball bearing and bearing cage mounted in the rear of the main frame. The power take-off operates at the engine speed of 1,350 r.p.m.

If a reduced speed power take-off is needed, a gear-reduction unit can be obtained. These are listed in the attachment table.

A front power take-off coupling is also available as an attachment for furnishing power from the front end of the engine. This consists of a special fan pulley to which the coupling is secured.

Belt Pulley

A belt pulley attachment is available. The belt pulley unit drives from the power take-off shaft through a set of bevel gears. The pulley can be shifted to the left or right of the tractor center line; by doing so the direction of pulley rotation is reversed. The pulley rotates at 843.7 r.p.m. The regular pulley furnished is 11-3/4" diameter and has an 11" face. Belt speed is 2,595 feet per minute. Other sizes of pulleys can be obtained if needed.

Adjustments:

The shifter fork should be installed with equal clearances between the shifter coupling and the shifter fork bushings at points "X". Adjusting screw "A" changes these clearances. Turn the adjusting screw to the right until the fork bushing strikes the shifter coupling; then turn the screw to the left, counting the number of turns, until the screw just turns free of the shaft. Turn the screw to the right one-half the number of turns counted and lock in place with the lock nut.

Earlier belt pulley attachments were not equipped with adjusting screws "A"; with this construction it is necessary to position the shifter lever on the shifter fork shaft to get proper clearances at "X".

Track Shoes

Shoe Size, Inches	Square Corner Track Shoes		Clipped Corner Track Shoes	
	Att. No.	Shoe No.	Att. No.	Shoe No.
14	51086-DC	51073-DC	51093-DC	51079-DC
16	51087-DC	49766-DC	51094-DC	51080-DC
18	51088-DC	51074-DC	51095-DC	51081-DC
*20	51090-DC	51076-DC	51097-DC	51083-DC
*22	51092-DC	51078-DC	51099-DC	51085-DC

Staggered Lug Ice Grouser and Snow Shoes

Shoe Size, Inches	Attach. No.	Center Lug Shoe No.	End Lug Shoe No.	No. of Each
14	57191-DA	57183-DA	57184-DA	36
16	57192-DA	57185-DA	57186-DA	36
18	57193-DA	57187-DA	57188-DA	36
*20	57194-DA	57189-DA	57190-DA	36

* For use on wide tread only.

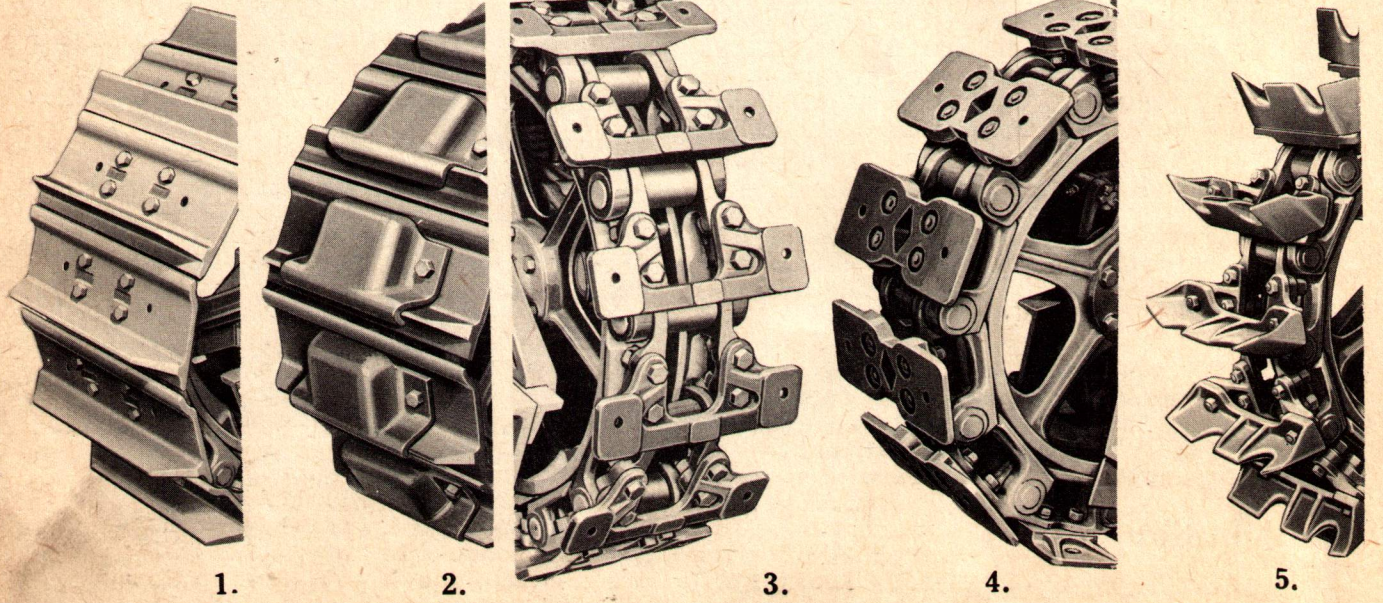
Street Plate (For Standard & Wide Tread) (36 Shoes).....57633-D
Street Plate (For Standard & Wide Tread) (72 Shoes).....57634-D
(Individual Shoes - 57641-D)
Skeleton Flat Shoe (Attach directly to track chain).....57635-D
(Individual Shoe - 8781-D)
Universal Flat Shoe (16" only)...57637-D
(Attach directly to track chain) (Individual Shoe - 8780-D)

Staggered Lug Ice Grouser (15")
(72 Shoes) (36 each).....57638-D
(End Lug Shoe 8782-D, Center Lug Shoe 8783-D)
(Shoes can be applied on Standard Rolled Section, Skeleton Flat, and Universal Flat Shoes)
Westeeco "V"-Type Ice Grouser Shoes (14-3/4") (72).....57639-D
(Individual Shoe - 57636-D)
(Shoes can be applied on Standard Rolled section, Skeleton Flat, and Universal Flat Shoes)

NOTE: Ice Grouser Shoes in the table are of the rolled-section type while the two types above are steel cast. Refer to the illustrations below.

Other Attachments

Air Pipe Extension (Factory).....58456-D
Belt Pulley (includes 50908-D)
(For "14" Series not equipped with power take-off).....50909-D
Belt Pulley (without 50908-D)
(For "14" Series equipped with power take-off).....50910-D
Crankcase Guard.....50890-D
Cutaway Sprocket.....57614-D
Electric Starting (T and TD-14)..54045-D
Exhaust Muffler.....50918-D
Fan and Gen. Drive Pulley.....8023-DX
Front Bumper.....50855-D
Front Idler Shield.....50840-D
Front Power Take-Off Coupling (TD-14).....51270-D
Front Pull Hook (For Crankcase Guard).....42902-D



ILLUST. 69. 1 - STANDARD OVERLAPPING SHOES, ROLLED SECTION TYPE WITH CLIPPED CORNERS. 2 - STREET PLATES. 3 - SKELETON FLAT SHOES. 4 - UNIVERSAL FLAT SHOES. 5 - "V"-TYPE ICE GROUSERS.

Heavy Duty Track Roller Shield...53997-D
Heat Indicator (Regular with Radiator Shutter).....50773-D
High Hitch Drawbar.....57226-D
Hood Side Door.....50915-D
Hour Meter.....53670-D
Odometer.....59345-D
Power Take-Off.....50908-D
Power Take-Off, Reduced Speed Type:
325 R.P.M.....57114-D
665 R.P.M.....57115-D
867 R.P.M.....57116-D
Radiator Guard.....50875-D
Radiator Guard and Front Bumper..50876-D
Radiator Shutter.....50854-D
Rear Panels for Skeleton Cab (Factory or Extra).....
Reverse Flow Fan.....60130-D
Rigid Track Frame.....59552-D
Skeleton Cab (Factory or Extra)..
Spark Arrester.....56064-D
Sprocket Rock Deflector.....54120-D
Steering Clutch (Bi-Metallic Friction Disc).....61904-D
Three-man Enclosed Cab, including 3-Man Seat (Factory or Extra)..
Track Chain (Less Shoes).....54139-DA
2-3/4 and 6-1/8 M.P.H. (Transmission) (3rd and 6th gear)....56191-D
Windshield only for Skeleton Cab (Factory or Extra).....

Electric Lighting:

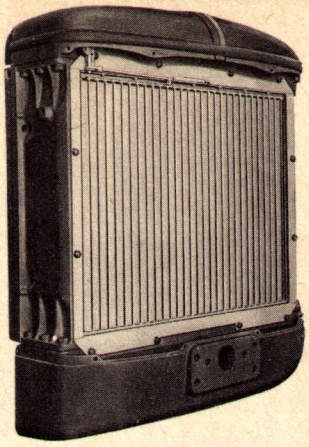
Two Head, One Rear Lamp.....54046-D
Two Head, One Rear Lamp (For T.T.T. with Bulldozer)..54047-D
Two Head, One Tail Lamp.....54048-D
Two Head, One Tail Lamp (For T.T.T. with Bulldozer)..54049-D

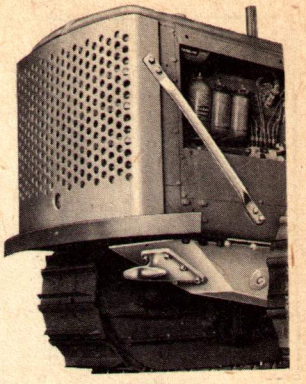
Electric Starting & Lighting:

Two Head, One Rear Lamp.....54052-D
Two Head, One Rear Lamp (For T.T.T. with Bulldozer)..54053-D
Two Head, One Rear Lamp.....54054-D
Two Head, One Rear Lamp (For T.T.T. with Bulldozer)..54055-D

UD-14 Power Unit

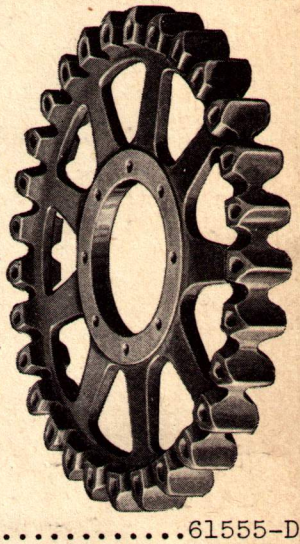
Clutch, Twin-Disc No. B111HP1, at factory
Doors, Hood Side.....59213-D
Fan, Reverse Flow, at factory....60130-D
Hour Meter, for 1400 R.P.M. Engines at factory.....53670-D
Muffler, Exhaust at factory.....61023-D
Radiator Shutter at factory.....60342-D
Shaft, Direct Connection Stub at factory.....57921-D
Shaft, Extended with Outboard Bearing.....59272-D
Shut-off, Automatic Oil Pressure and Water Temperature, for Power Units UDF1914 and below.....60384-D
Shut-off, Automatic Oil Pressure and Water Temperature, for Power Units UDF1915 and up.....61232-D





ILLUST. 70. (ABOVE) RADIATOR SHUTTER.

ILLUST. 71. (ABOVE, RIGHT) RADIATOR GUARD, FRONT BUMPER, CRANKCASE GUARD, AND FRONT PULL HOOK.



ILLUST. 72. (RIGHT) CUTAWAY SPROCKET.

Slide Rails.....61555-D
Sub-base, for use with 59272-D...59275-D
Tools.....55155-D

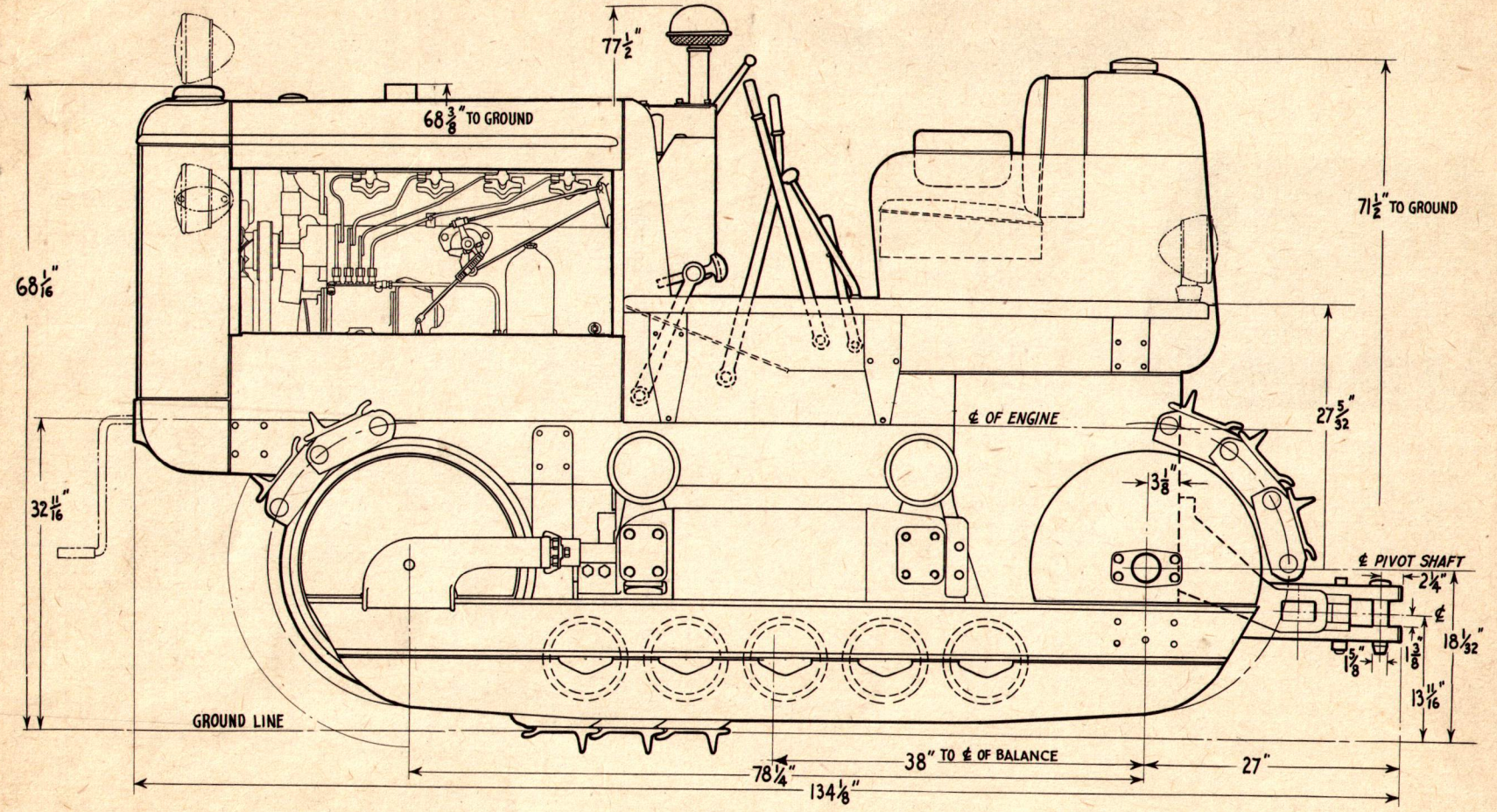
Electrical Equipment:

Electric Starting, (less batteries).....58226-D
Electric Starting, (with batteries).....59864-D

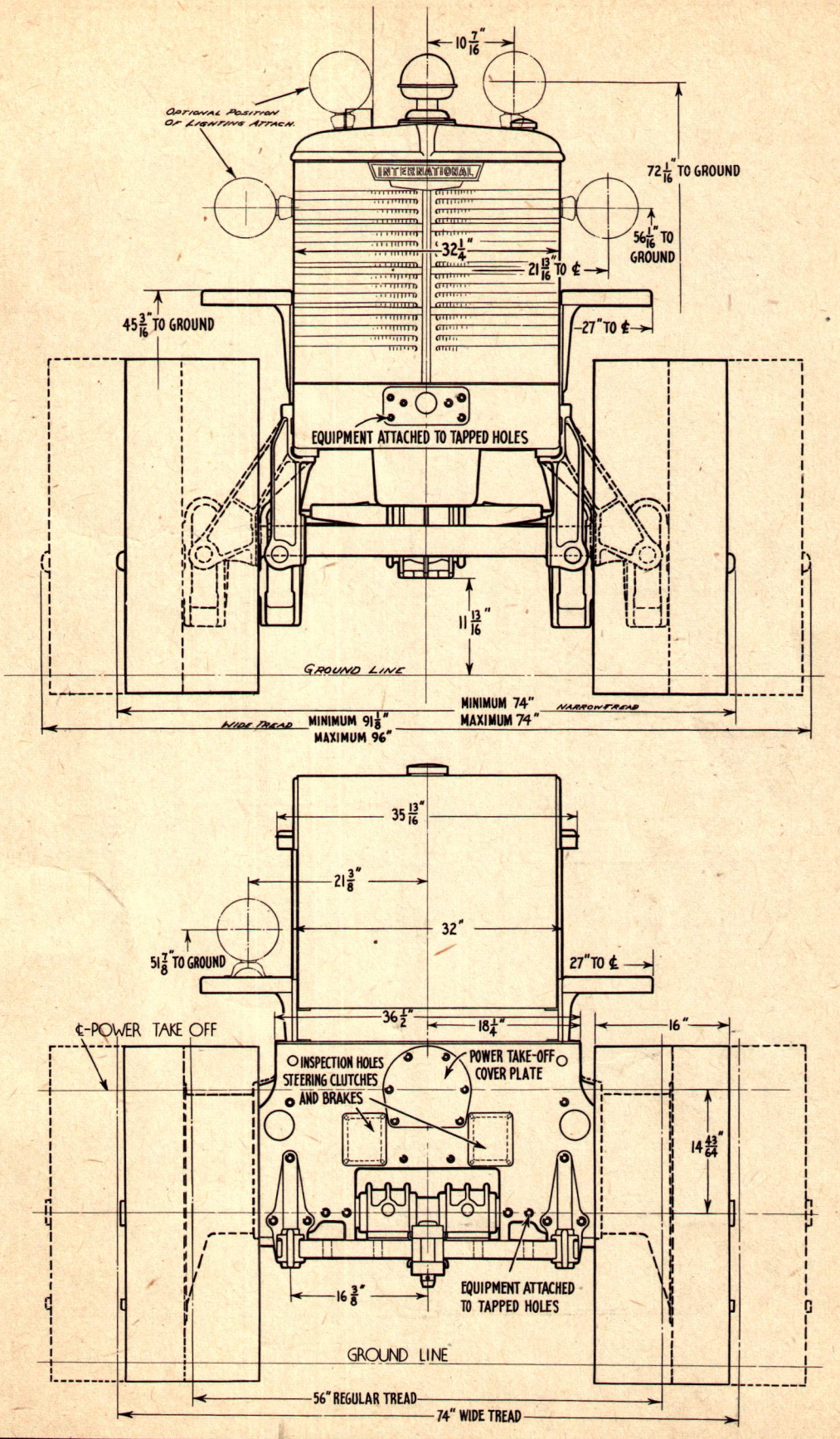
NOTE: Power Unit must be equipped with Instrument Housing and Engine Controls to install starting attachments.

Transmissions and Gear Reductions:

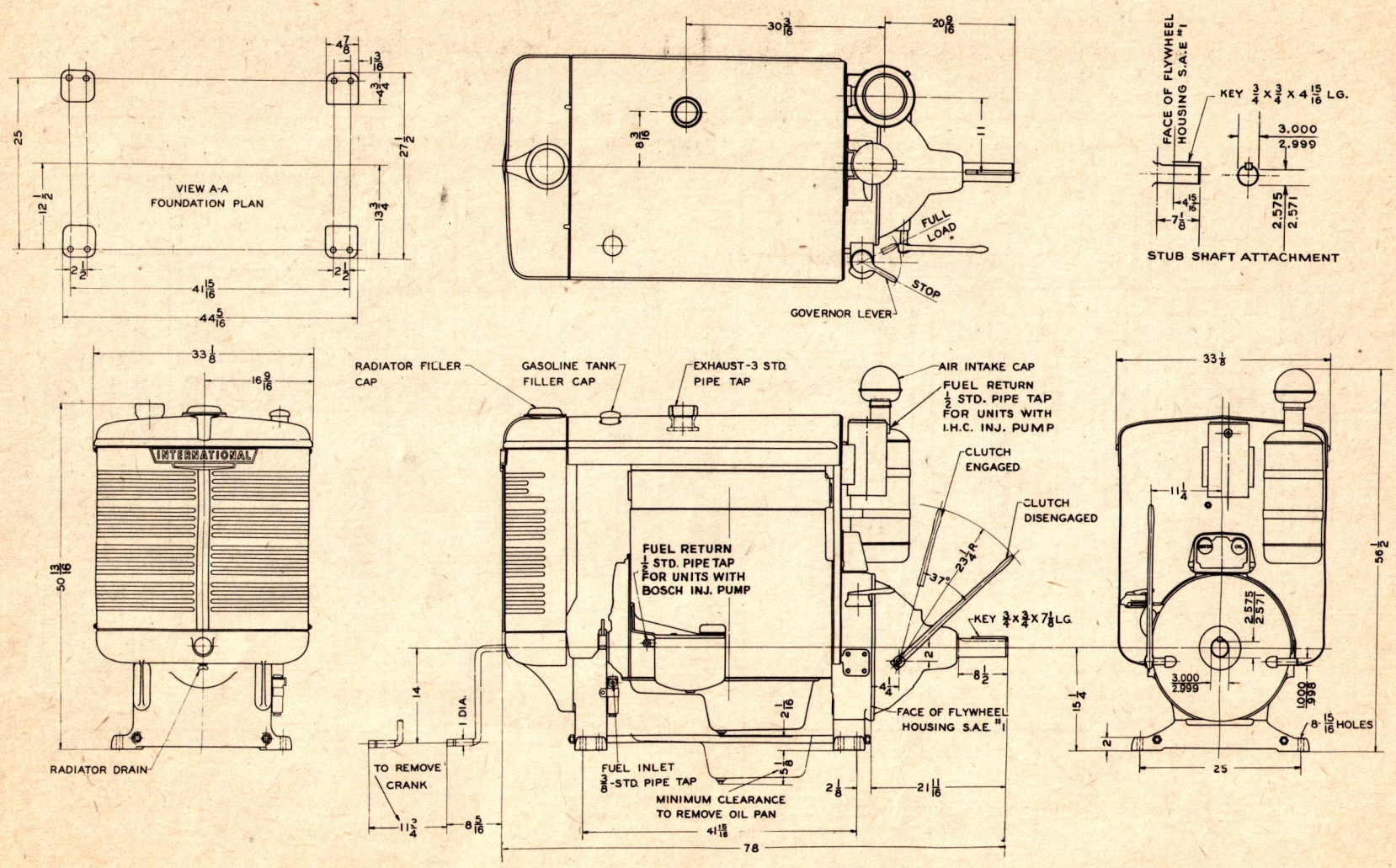
Transmission, complete with clutch. Engine Rotation Speeds 8.98 to 1, 4.81 to 1, 3.34 to 1, 1.79 to 1, 1 to 1. Anti-Engine Rotation Speeds 8.98 to 1, 3.34 to 1, at factory.....62043-D
Transmission, complete with clutch for field application.....62043-D
Twin-Disc 3 to 1 Engine Rotation Reduction Gear B111E3RG1
Twin-Disc 4 to 1 Engine Rotation Reduction Gear B111E4RG1
Twin-Disc 2 to 1 Anti-Engine Rotation Reduction Gear B111A2RG1
Twin-Disc 3 to 1 Anti-Engine Rotation Reduction Gear B111A3RG1
Twin-Disc 4 to 1 Anti-Engine Rotation Reduction Gear B111A4RG1



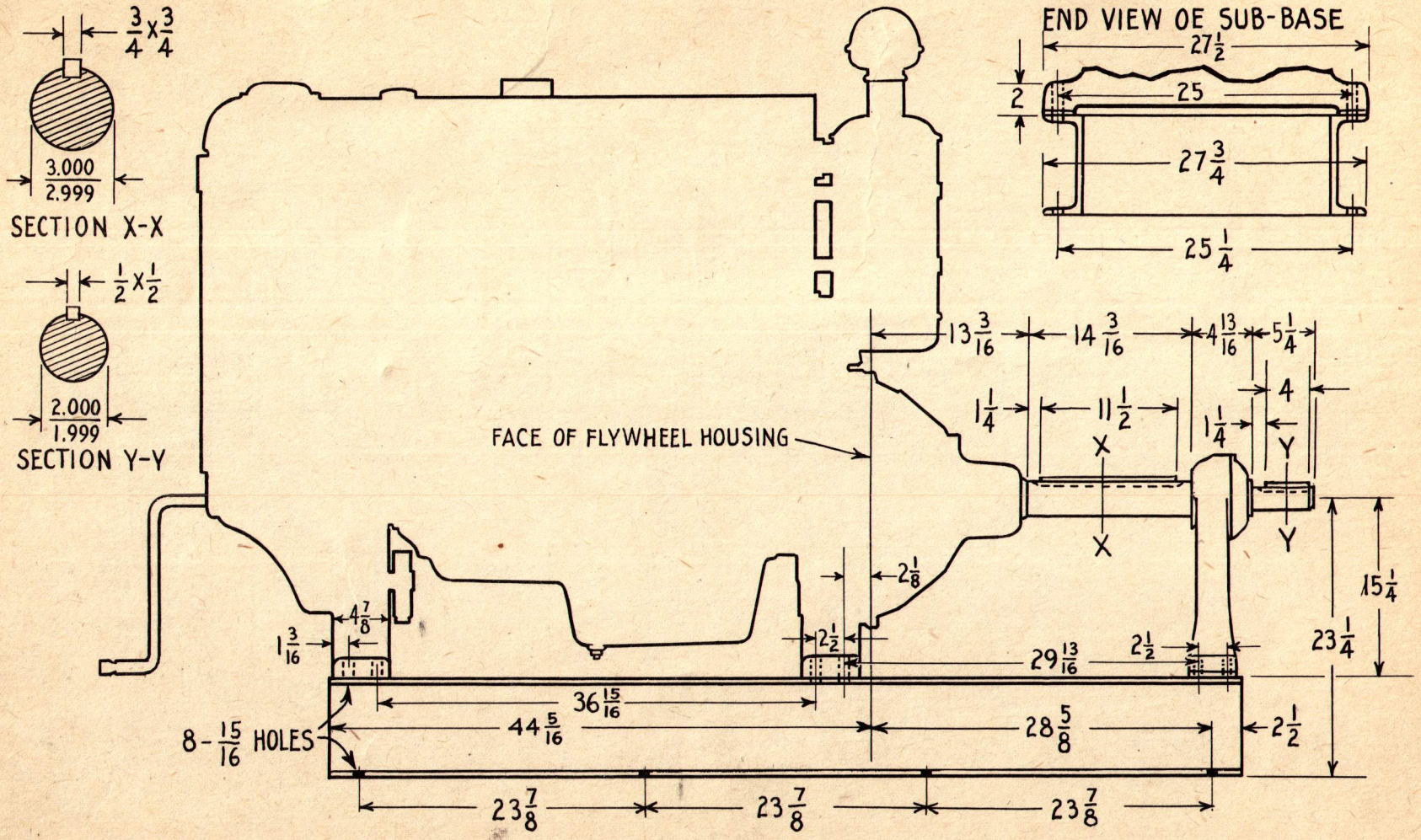
ILLUST. 73. DIMENSIONAL DRAWING OF TD-14 TRACTRACTOR.



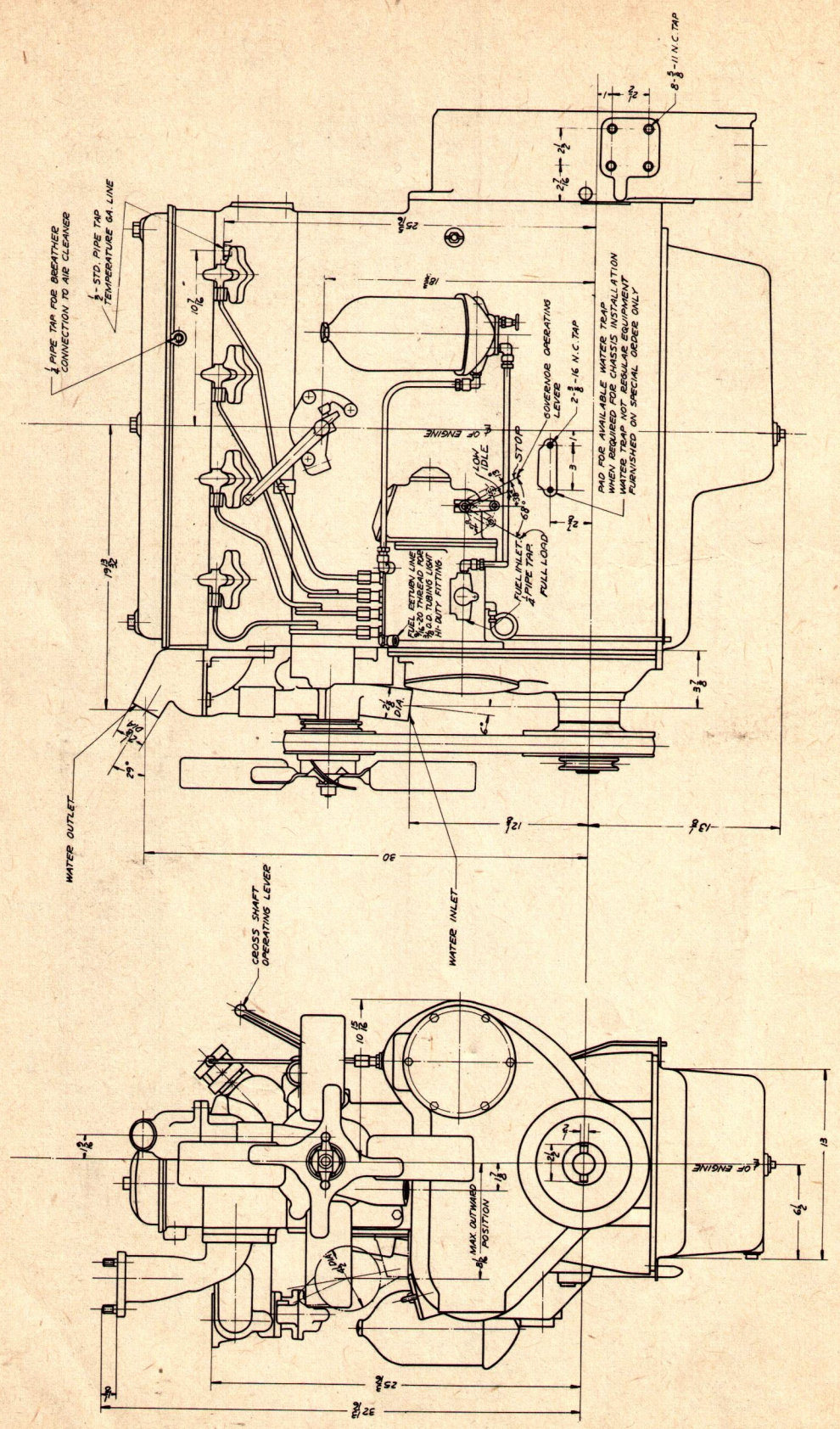
ILLUST. 74. DIMENSIONAL DRAWING OF TD-14 TRACTRACTOR SHOWING FRONT AND REAR VIEW, BOTH REGULAR AND WIDE TREAD MODELS.



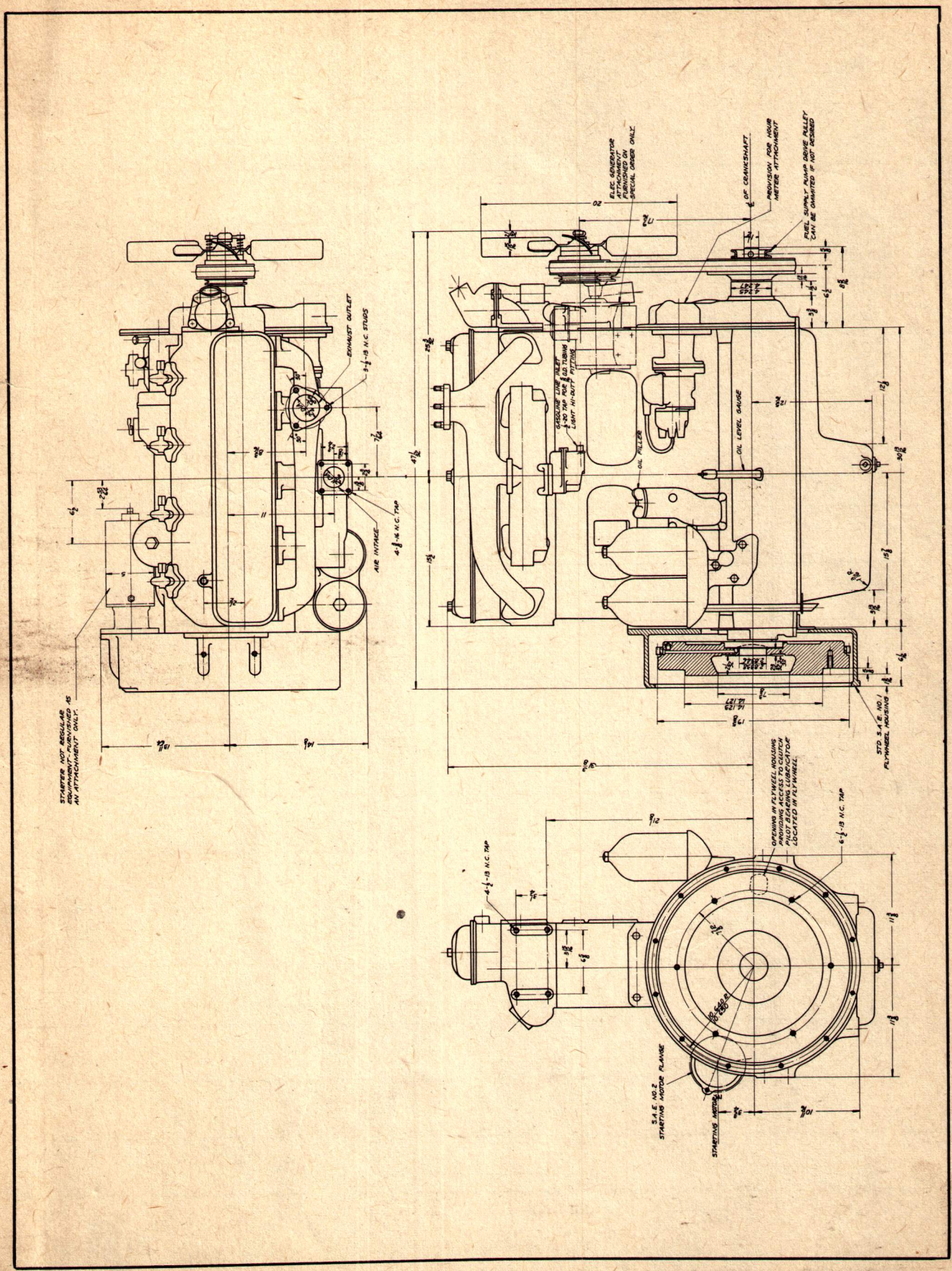
ILLUST. 75. DIMENSIONAL DRAWING OF UD-14 POWER UNIT.



ILLUST. 76. UD-14 POWER UNIT SUB-BASE DIMENSIONAL DRAWING FOR EXTENDED SHAFT AND OUTBOARD BEARING.



ILLUST. 77. DIMENSIONAL DRAWING OF 4-3/4" x 6-1/2", 4-CYLINDER DIESEL ENGINE USED IN THE UD-14 POWER UNIT.



ILLUST. 78. DIMENSIONAL DRAWING OF 4-3/4" x 6-1/2", 4-CYLINDER DIESEL ENGINE USED IN THE UD-14 POWER UNIT

ADDITIONAL SERVICING INFORMATION

The following space is set aside to enable the serviceman to keep this Service Manual up to date. By listing briefly the information from Service Bulletins covering machine changes, improvements and new service pointers, the story will always be up to date and in a workable condition.

SERVICE BULLETIN NO.	MACHINE	SUBJECT	INFORMATION