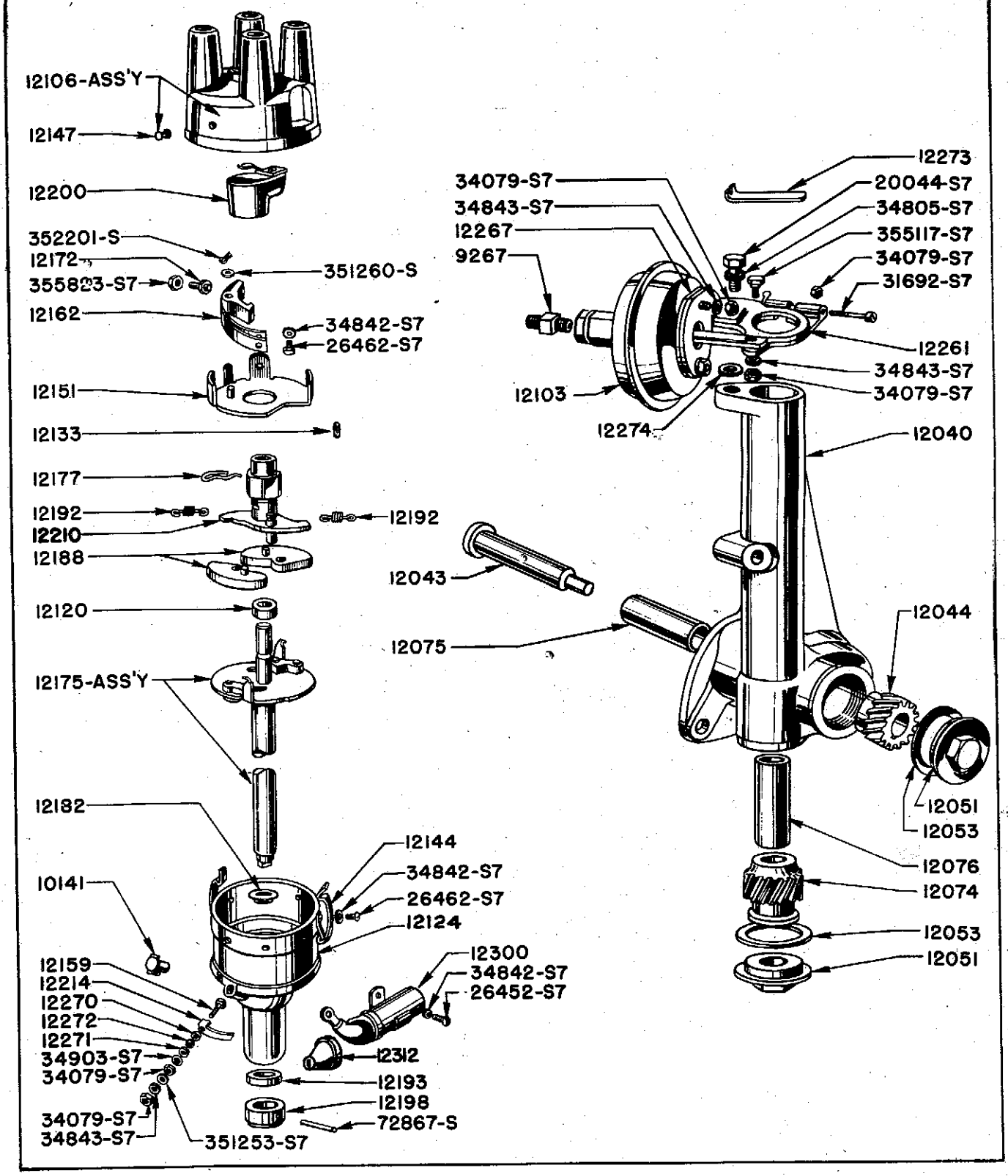


Basic numbers only shown on illustration. Order by Part Numbers shown in list of parts.

TM

MAINTENANCE MANUAL

For

FORD TRUCK
1/4 TON 4 x 4
1941

FOR U.S. GOVERNMENT

Ford Motor Company
DEARBORN, MICHIGAN U.S.A.

TM 10-1101
CHANGE No. 1
AUG. 15, 1941

MAINTENANCE MANUAL

for

Ford TRUCK

¼ TON 4x4
MODEL GP

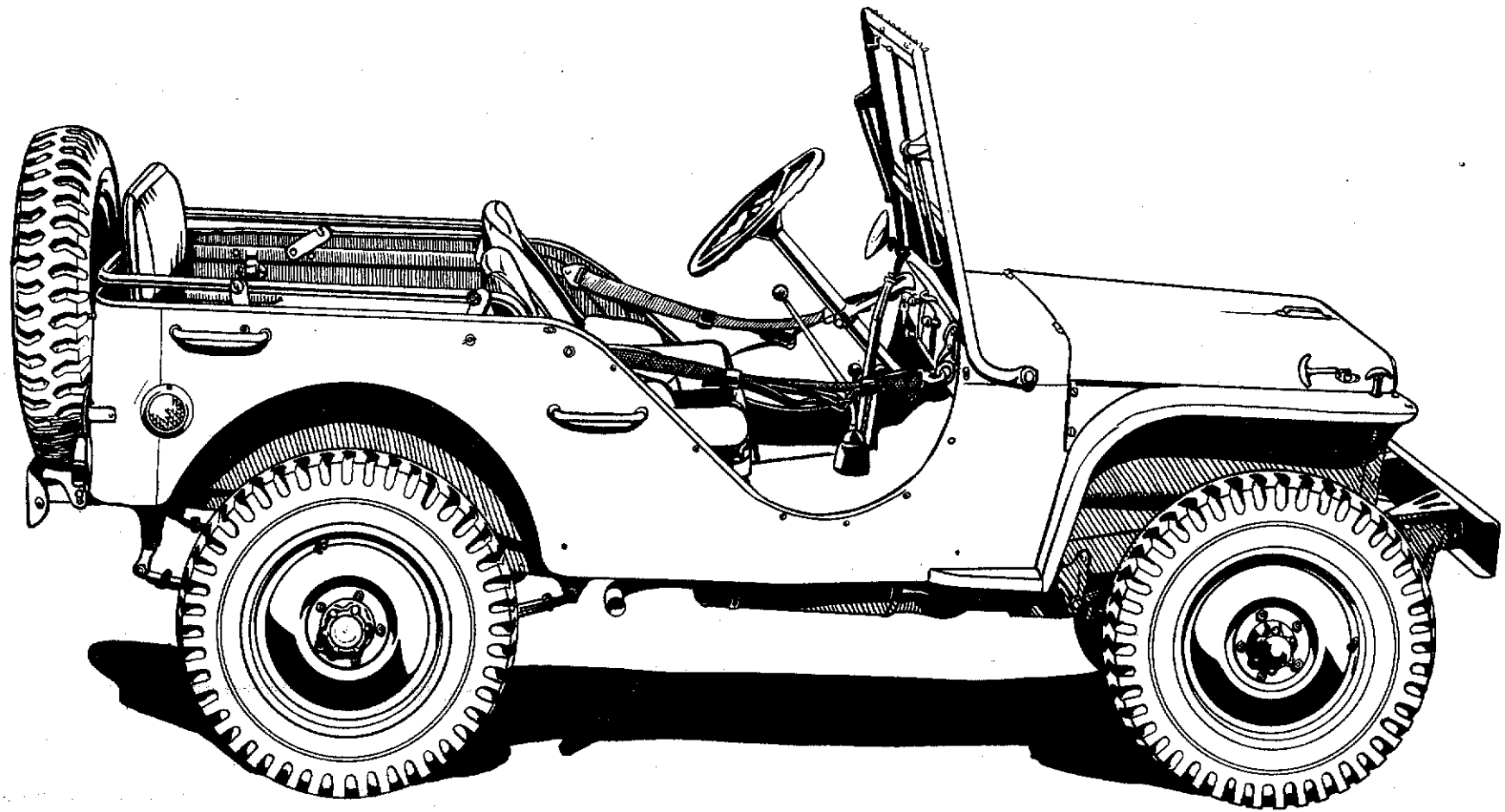
1941

Ford Motor Company

Dearborn, Michigan

SGV TD

Section	Subject
O-1	Operation Tips
O-2	Driver's Instructions
O-3	Lubrication
1000	Wheel and Tires
2000	Brakes
3000	Steering
4000	Front Axle Rear Axle Propeller Shaft
5000	Frame Springs
6000	Engine
7000	Transmission Clutch Transfer Case
8000	Cooling System
9000	Fuel System
10000	Generator Voltage Regulator Battery
11000	Starter
12000	Ignition
13000	Lighting
18000	Shock Absorbers Body



MODEL GP U.S. GOVERNMENT 1/4 TON, 4 WHEEL DRIVE, 80" WHEELBASE RECONNAISSANCE CAR

Identification Plate and Caution Plate Located on Instrument Panel

FOREWORD

This book has been prepared to supply operators and maintenance mechanics with all essential information for insuring the most efficient performance of the Ford 1/4-ton 4 x 4 Reconnaissance cars. Detailed specifications and data concerning manufacturing limits and tolerances will be found in the last section of the book.

In order to simplify the task of locating in the Parts Book any parts which are referred to in the text, the book is laid out in sections which conform to the grouping of the Parts Book. Each section is therefore numbered with the Ford basic number of the particular assembly or part described in that section.

A brief description is given in each section of the operating principles involved in that particular assembly, so the drivers as well as mechanics will have some knowledge as to the functioning of each unit. In addition, detailed instructions for removing and installing parts, effecting necessary adjustments quickly, and properly lubricating all parts, are covered.

Very few special service tools are required for servicing this unit. Such tools as are illustrated or mentioned in this booklet, however, can be secured from K. R. Wilson, Buffalo, New York or, in the case of tools for Axles, Transfer Case and Universal Joints from Hinckley-Meyers Co., Jackson, Michigan.

FORD MOTOR COMPANY
Service Department

OPERATION TIPS

The natural inclination of every motor vehicle operator is to take pride in his vehicle, in its accelerating qualities, smoothness of operation and ability to travel further on less fuel. To a great extent, these factors are subject to the control of the vehicle operator and the following paragraphs point out the precautionary measures which should be followed to secure the most satisfactory results.

"BREAKING IN"

Before attempting to start the engine or operate the vehicle, the careful driver will first make sure that there is sufficient water in the radiator and that the oil level in the crankcase is up to the "Full" mark on the dip stick. He will also examine each tire and see that it is brought up to the recommended tire pressure, if there is any indication of one or more of the tires being low. The good driver will also make certain there is an adequate supply of fuel in the tank.

One of the most important factors in the life of a motor vehicle is the care it receives during the first thousand miles of operation. For the first 300 miles, the new unit should not be driven in excess of 25 miles per hour in direct drive. For the next 700 miles it should not be driven in excess of 35 miles per hour. When operated in the lower range provided by the transfer case, new units should never be driven in excess of 15 miles per hour for the first 300 miles or 20 miles per hour up to 1,000 miles. During the so-called "breaking in" period, the temperature indicator should be watched closely and if there is any tendency toward overheating, the operating speed should be reduced.

LUBRICANT

To avoid excessive or premature wear, clean lubricant of correct specifications must be used at the various points indicated on the lubrication chart.

All Ford products are designed to operate smoothly and without sharp knocks, rattles or metallic noises which indicate friction in any of the working parts. All unusual noises should therefore be investigated at once so the necessary corrective measures can be taken before serious damage results. If the noise seems due to an internal mechanical fault, the condition should be reported to a mechanic immediately and operation of the vehicle should be avoided until it has been released by a qualified technician.

TESTING BRAKES

The brakes should be tested daily soon after starting. Any faulty condition in the hydraulic brake system is readily apparent to the operator at the first application of the brake pedal, and the matter should be reported at once for correction.

FRONT WHEEL ALIGNMENT CHECK

The proper alignment of the front wheels is a most important factor in the steering of the vehicle. If hard steering is noticed, the first thing to check is inflation of the front tires. If the tires are properly inflated and the vehicle tends to wander to the right or left, or the steering wheel shakes (shimmies) when the vehicle is in motion, have a mechanic inspect and make the necessary repairs.

BATTERY INSPECTION

Battery should be inspected frequently and terminal corrosion removed by scraping or using a solution of baking (bicarbonate) soda and water. After the terminals have been cleaned, they should be coated with vaseline or light grease.

ELECTRIC CIRCUIT TERMINALS

All electrical connections must be kept clean and tight. Bear in mind that corroded terminals, also loose and dirty ground connections will cause ultimate failure of the electrical system.

SPARK PLUGS

Check spark plugs frequently for loose connections or broken porcelain which will usually be indicated by that particular cylinder missing fire when the engine is operating under a heavy load or accelerating with a wide open throttle. Faulty spark plugs and wires should be replaced.

AIR CLEANER

Instructions for cleaning the oil bath type air cleaner are given on the decalcomania on the air cleaner. Under extremely dusty conditions, the air cleaner should be cleaned more frequently and refilled with new oil of the same viscosity as is used in the crankcase.

WORKING UNDER VEHICLE

When working under the vehicle, it is inadvisable to depend only upon a jack to support the weight. Use wooden blocks or wooden jack.

REPORTING MECHANICAL FAULTS

Report any mechanical trouble and have it corrected. Temporary repairs should be used only as an expedient.

REVERSING

Reverse as little as possible. Never reverse without sounding the horn and making absolutely sure that the way is clear.

TIRE INFLATION

Proper tire inflation not only produces the greatest number of miles per tire but helps to avoid accidents. Unequally inflated tires result in poor steering, poor braking and excessive side sway on curves.

CHANGING TIRES

When changing tires, one or more of the wheels resting on the ground should be blocked securely with a rock or other suitable object. Do not depend upon the brakes to hold the vehicle while tires are being changed, since there is always the possibility of the brakes being thoughtlessly released.

SPINNING OF WHEELS

Spinning the drive wheels only digs them deeper into mud and snow. Rock the car forward and backward a few inches repeatedly until sufficient traction can be secured.

RACING THE ENGINE

Racing the engine causes excessive strain on the mechanism and premature wear. This is especially bad in cold weather when the engine is cold because the oil is thickened by low temperatures and does not circulate as rapidly as when warm.

ENGINE ACCELERATION

Accelerate gently. Tramping on the accelerator only forces more gasoline into the cylinders than can be effectively used, and under some conditions might result in the engine stalling.

ENGINE IDLING

Permitting the engine to idle for long periods of time not only wastes gasoline, but has a tendency to foul the spark plugs.

ENGINE OVERHEATING

When engine is overheated, cold water should not be poured into the radiator unless the engine is running so that the water pump will circulate and mix the cold water with the hot water before it strikes the cylinder block and head. When engine overheats, always check the fan belt first for slippage. Tighten the belt if it appears to be too loose. Also check the hose connections to see that they are tight.

SKIDDING

When traveling at high rates of speed on a loose gravel road, motor vehicles sometimes sway or skid dangerously. Loose gravel may be thrown under such conditions and injure pedestrians or break windows of passing vehicles. The brakes should be used with caution to bring the vehicle under control. To apply the brakes abruptly while skidding only increases skidding. Concentrate on steering the vehicle in the event a tire should blow out. Then remove the foot from the accelerator and use the brakes with caution.

APPLYING BRAKES

Applying breaks too rapidly results in excessive tire wear. It may also result in a dangerous skid when on wet or icy pavements.

STOPPING THE VEHICLE

Come to a gradual stop. Sudden stops, the same as sudden starts, waste gasoline and are dangerous to the passengers.

USE OF CLUTCH

Sudden engagement of the clutch, causing jerky starting or killing the engine, increases the strain on the clutch and other parts involved. Release the clutch pedal slowly so as to insure a gradual contact between clutch plates.

USE OF GEARS

Unnecessary speeding of the vehicle while in the lower gears, practically doubles gasoline consumption. Shift to high gear before 25 miles an hour is reached.

LOW GEAR

Low speed gear ratios are provided for use when the going is heavy. The best driver shifts into these lower ratios when necessary for most efficient vehicle operation. Always descend a hill in the same gear used in ascending it.

COASTING

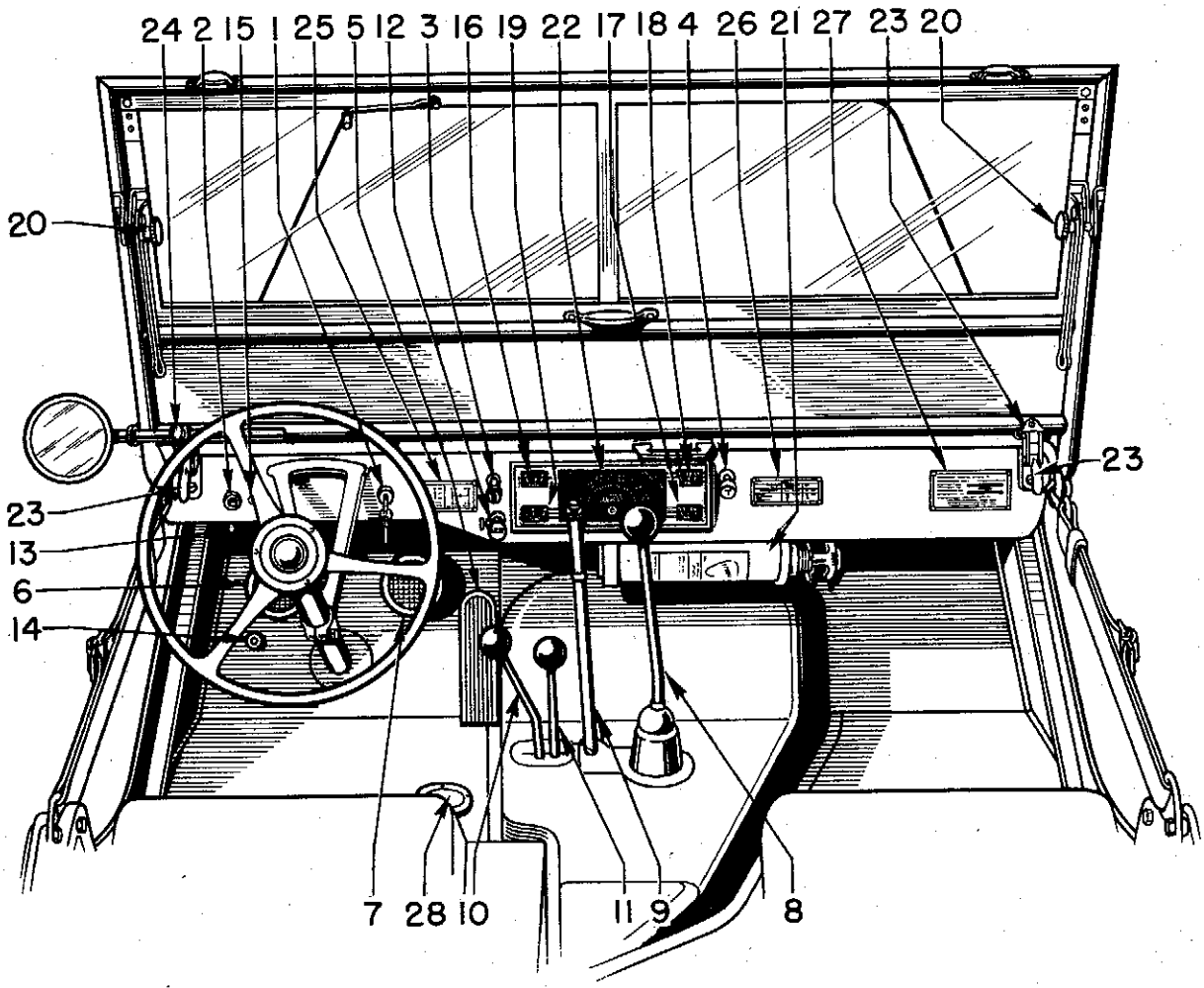
When going down grade, use engine c
pression to assist in maintaining contr
Never disengage the clutch and coast do
This is extremely dangerous when an
foreseen emergency demands prompt stopp
of the vehicle. Using the brakes w
coasting usually results in burnt lini
and, under extreme conditions, might ren
the brakes useless.

FIRE

A gasoline or oil fire in a motor vehi
must be handled quickly to avoid seri
damage. In the event of such a fire, t
off the ignition and light switches i
mediately. Use the fire extinguisher
quickly as possible to extinguish the flam
If in the engine compartment, avoid ra
ing the hood unless it is impossible
get at the flames in any other manner.
no fire extinguisher is available, smot
the flames with a tarpaulin, blanket, co
sand, dirt or other similar material.

ABUSE AND NEGLECTS

Abuse and neglect of the vehicle e
trusted to you will always result in p
mature repairs. Your efficiency as a driv
can be effectively measured by the co
of repairs made and charged to the vehic



Instruments and Controls - Fig. 2

1. Ignition Switch
2. Starter Button
3. Carburetor Choke
4. Hand Throttle
5. Accelerator
6. Clutch Pedal
7. Brake Pedal
8. Transmission Shift Lever
9. Emergency Brake Lever
10. Front Axle Drive Lever
11. Transfer Case Auxiliary Range Lever
12. Light Switch
13. Instrument Panel Light Switch
14. Light Beam Control Switch
15. Beam Indicator
16. Fuel Gauge
17. Ammeter
18. Oil Gauge
19. Temperature Gauge
20. Windshield Swing Arm Nuts
21. Fire Extinguisher
22. Speedometer
23. Windshield Latches
24. Rear View Mirror
25. Gear Shift Plate
26. Caution Plate
27. Nomenclature Plate
28. Brake Master Cylinder Cover

OPERATING THE VEHICLE

(Driver's Instructions)

Before attempting to operate any motor vehicle with which the operator is not familiar, it is imperative that he familiarize himself with all the various controls. In general the Ford light Reconnaissance and Command car is operated and controlled in exactly the same manner as Ford commercial cars. The main point of difference, however, is that the unit is equipped with four-wheel drive, as well as an under drive to provide more power at the wheels when the unit is operated in mud, deep sand or on steep grades. This necessitates the addition of two extra shift levers, the use of which will be described in detail in the following pages.

All of the controls and instruments are illustrated in Figure 1. It will be observed that each item has been numbered so as to assist the reader in locating the various items as they are described in the following paragraphs:

IGNITION SWITCH No. 1 is located on the dash slightly to the right of the steering column. Turning the switch to the right closes the ignition circuit so that current will flow to the ignition coil and distributor. Turning the switch to the left breaks the circuit and will stop the engine.

STARTER BUTTON No. 2 is located at the lower left corner of the instrument panel. When this button is pressed in, current is supplied to the magnetic starter switch which in turn closes the circuit to the starter motor.

CARBURETOR CHOKE No. 3 is the control button in the center of the instrument panel to the left of the instrument group. When this control button is pulled out, it reduces the amount of air going through the carburetor and thus provides a richer mixture. When the engine is warm, it is not necessary to pull out the choke button, in fact, this control should only be used when the weather is sufficiently cold to cause difficulty in starting. The choke button should be pushed in to its stop as soon as the engine is sufficiently warm to run smoothly.

HAND THROTTLE No. 4 is the control button to the right of the instrument panel group. Pulling this button outward opens the carburetor throttle and increases the speed of the engine. During cold weather this control should be pulled out approximately one-quarter of an inch so the engine will idle somewhat faster until it is thoroughly warmed up. This control can also be used when it is desirable to run the engine at a constant speed.

ACCELERATOR No. 5 is a treadle-type lever which actuates the linkage connected to the carburetor throttle plate and thus increases or decreases the speed of the engine.

CLUTCH PEDAL No. 6 causes the tension exerted by the Clutch Pressure Plate Springs to be released when the pedal is pressed downward. This disengages the engine from the transmission and causes the transmission gears to stop revolving so the gears the operator desires to use can be meshed easily.

It is a good practice to disengage the clutch before starting the engine as this will not only enable the starter to crank the engine more easily in cold weather but will also prevent the vehicle from moving in the event the transmission gear shift lever has been unknowingly left in gear. Do not drive with the foot resting on the clutch pedal as this will cause premature wear of the clutch facings and clutch throwout bearing .

BRAKE PEDAL No. 7 is connected by a rod to a piston in the Brake Master Cylinder. When pedal is pressed downward the piston forces fluid from the Master Cylinder through connecting tubes to cylinders at each of the four wheels which in turn expand the brake shoes.

TRANSMISSION SHIFT LEVER No. 8 is used in exactly the same manner as the gear shift lever on Ford commercial cars. It provides three forward speeds and one reverse and operates entirely independent

of the two transfer case shift levers. Lever positions for the various gear changes are shown on the plate attached to the instrument panel and are also discussed in detail in a following paragraph.

EMERGENCY BRAKE No. 9 actuates a separate brake shoe located on the rear propeller shaft directly behind the transfer case. This lever should be pulled backward as far as possible whenever the vehicle is parked. After starting the engine and placing the transmission in gear, the brake should be released by pushing the lever forward as far as possible.

FRONT AXLE DRIVE LEVER No. 10 is connected to the transfer case and is used to engage or disengage the front axle drive as desired. When the vehicle is to be operated on smooth hard ground or pavement the lever should be pushed to the forward position so the front axle drive will be disengaged.

TRANSFER CASE AUXILIARY GEAR LEVER No. 11 enables the operator to shift into low speed gears when the vehicle must be operated through mud or sand or in the high speed gears when the vehicle is being operated on pavement or hard ground without pulling a load. The low speed auxiliary range gears cannot be engaged unless the front axle drive is engaged.

LIGHT SWITCH No. 12 is located on the instrument panel directly below the choke button and has two positions. When pulled out to the first position, it turns on the blackout lights only. The button on the side of the switch knob must then be pressed before the switch can be pulled out to a stop in which position it turns on the headlights, tail light and instrument panel light.

This button is a safety feature which prevents accidentally turning on the headlights during a blackout period. Before leaving the vehicle after dark, make sure the light switch is in the "off" position so as to avoid the possibility that the blackout lights may have been left burning.

INSTRUMENT PANEL LIGHT SWITCH No. 13 is controlled by a small toggle switch mounted underneath the instrument panel to the left of the steering column. This will turn the instrument panel lights on or off as desired.

LIGHT BEAM CONTROL SWITCH No. 14 is located on the floor board to the left of the clutch pedal. After the headlights have been turned on, this switch can be operated by the left foot to switch to either the upper or lower beam in the headlights. The upper beam is used for fast driving on country highways while the lower beam is used for driving in traffic.

BEAM INDICATOR No. 15 is a small red light which is turned on when the headlights are switched to the upper beam. When approaching an on-coming car, switch to the lower beam, red light off, by pressing down on the foot switch so as to avoid blinding the approaching driver.

FUEL GAUGE No. 16 is an electrical type gauge which indicates the approximate amount of gasoline in the tank. The gauge does not register except when the ignition is turned on.

AMMETER No. 17 is located in the instrument group. The dial indicates whether current is being charged into or discharged from the battery. The current flow is controlled by the generator regulator and the amount of charge will vary with the load and condition of the battery. When the voltage of the battery reaches a pre-determined value, the indicator hand will drop to a lower charging rate.

A slight fluctuation of the indicator hand at this point is caused by the action of the generator regulator.

OIL GAUGE No. 18 is an electrical type pressure gauge. Normal pressure is approximately 25 pounds, depending of course, upon the condition of the oil in the engine. Heavy or cold oil will result in higher pressure; thin or hot oil will show a lower pressure. The oil pressure gauge merely indicates whether or not the engine oil is circulating and does not show the quantity or quality of the oil.

In the event the indicator hand drops to Zero or fluctuates rapidly, the engine should be stopped immediately as this indicates that proper oil pressure is not being maintained and the engine might be damaged.

TEMPERATURE INDICATOR No. 19 is also an electrical type instrument and shows the temperature of the water in the cooling system. The gauge operates only when the

ignition switch is on and points to the hot end of the gauge when the ignition switch is turned off.

WINDSHIELD CLAMPS Nos. 20 and 21: The windshield is so designed that it can be opened forward while in the upright position. This is done by loosening the two knurled clamp nuts and pushing the bottom of the windshield outward to the desired position. The two clamp nuts should then be tightened on the swing arms.

FIRE EXTINGUISHER No. 21 is held in place against the cowl panel by a spring-type clamp. This clamp must be sprung open before the fire extinguisher can be removed. After removing the fire extinguisher from the mounting brackets, it can be operated by turning the handle to the left and then pumping it in and out. Each operator should carefully read the directions on the fire extinguisher so as to familiarize himself with its use.

SPEEDOMETER NO. 22

The speedometer should be used as a guide for correct gear shifting, following the recommendations indicated on the caution plate for each transmission and transfer case gear change.

WINDSHIELD LATCHES NO. 23

Latches are provided at the lower right and left corners of the windshield that, when released, permit the windshield to be folded forward over the hood. When in the lowered position, it is important that the windshield be securely fastened to the hood, using the latches provided for that purpose located on each front corner of the hood.

REAR VIEW MIRROR NO. 24

The rear view mirror, located at the left-hand side of the instrument panel, is adjustable, permitting the mirror to be extended further from the body for better rear view.

GEAR SHIFT PLATE NO. 25

The plate illustrated in Figure 3 is fastened to the instrument panel to assist operators who are not familiar with the

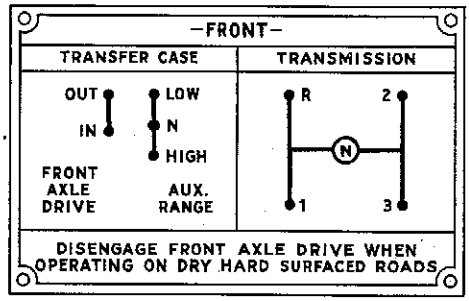


Fig. 3

operation of the vehicle. It shows the correct positions in which to place the transfer case shift levers, as well as the transmission shift lever, for various speeds.

— CAUTION —
MAXIMUM PERMISSIBLE ROAD SPEEDS IN THE FOLLOWING GEAR POSITIONS

TRANSMISSION IN:	TRANSFER CASE IN: HIGH RANGE	TRANSFER CASE IN: LOW RANGE
HIGH	55 M.P.H.	27 M.P.H.
INTERMEDIATE	32 "	16 "
LOW	18 "	9 "
REVERSE	14 "	7 "

Fig. 4

CAUTION PLATE NO. 26

The maximum permissible road speeds for the various gear positions are specified on this plate Figure 4. It is very important that the instructions outlined on the caution plate be carefully observed.

NOMENCLATURE: TRUCK, ¼ TON, 4X4
SUPPLY ARM OR SERVICE
MAINTAINING VEHICLE: QUARTERMASTER CORPS
MAKE AND MODEL: FORD-GP
SERIAL NUMBER:
MAXIMUM GROSS WEIGHT: 2800 LBS.
DATE OF DELIVERY:
RECOMMENDED BY MANUFACTURER:
OCTANE RATING OF GASOLINE - MIN. 68
S.A.E. GRADE OF OIL FOR SUMMER USE 30
S.A.E. GRADE OF OIL FOR WINTER USE 20

Fig. 5

NOMENCLATURE PLATE NO. 27

This plate, located on the right side of the instrument panel, provides all necessary information for readily identifying the vehicle. An illustration of the plate is shown in Figure 5.

MASTER CYLINDER INSPECTION COVER NO. 28

The master cylinder inspection cover, located in the floor, must be removed before the fluid level in the hydraulic brake master cylinder can be examined.

OPERATING INSTRUCTIONS

STARTING THE ENGINE

1. Be sure transmission gearshift lever is in neutral position, as indicated on the gearshift information plate.

2. If the engine is cold, pull out the hand throttle from 1/4" to 3/8".

3. Pull choke outward slightly in cool weather or almost to the stop in severely cold weather.

4. Turn ignition switch key to the right.

5. Press starter button. It is always advisable to disengage the clutch at the same time. As soon as the engine starts, release the starter button.

6. Push the choke in gradually as far as possible without disturbing the smooth performance of the engine. As soon as the engine is warmed up, push the choke all the way in.

7. Push in the hand throttle after the engine warms up sufficiently to idle smoothly. AVOID RACING THE ENGINE WHILE IT IS COLD.

STARTING THE VEHICLE

The following instructions apply to normal operations such as are encountered in driving a vehicle of this type during a training period.

1. Make sure the front axle drive lever is in the forward position so the front axle drive is disengaged.

2. Make sure the transfer case auxiliary range lever is pulled backward to the high speed range as indicated on the instruction plate (Figure 3).

3. Fully depress clutch pedal so the clutch will be completely disengaged.

4. Move transmission gearshift lever to the left and backward into low speed position (See Instruction Plate).

5. Release hand brake lever.

6, Gently depress Accelerator Pedal to speed up engine slightly.

7. As the engine speed increases gradually and smoothly release the clutch pedal. As the clutch engages and the vehicle starts to move, put slightly more pressure on the Accelerator Pedal so the engine will pick up the load smoothly.

8. At a speed of approximately 7 miles per hour, depress clutch pedal and at the same time release pressure on the Accelerator Pedal. As soon as the clutch is disengaged, move the transmission gear shift lever out of the lower gear position into neutral and from there into the second speed position which is to the right and forward (See Instruction Plate). After this shift is completed, the clutch can be released without any hesitancy and at the same time press down on the Accelerator.

9. After the vehicle has attained a speed of approximately 18 miles per hour in second gear, follow the same procedure outlined above to shift the gearshift lever into the third or high speed position. This is done by merely disengaging the clutch pedal, releasing pressure on the accelerator and then moving the transmission gearshift lever straight backward from the second speed gear position to the high speed position.

SHIFTING TRANSFER CASE LEVER

The foregoing instructions cover operation of the vehicle on dry hard surface roads. Under such conditions, the front axle drive should always be disengaged. Operation over muddy roads or in deep sand, of course, necessitates the application of more power to the wheels and this can be accomplished by engaging the front axle drive. To do this proceed as follows:

1. Disengage the clutch and at the same time release pressure on the accelerator.

2. Pull front axle drive lever backward, thus engaging front axle drive gears.

3. Shift Transmission lever to engage gear considered necessary for the particular type of road.

4. Immediately engage clutch and press down on the foot accelerator.

SHIFTING TRANSFER CASE FROM HIGH TO LOW SPEED RANGE

Occasionally the vehicle must be operated with capacity load in deep mud or sand which cannot be negotiated by using the high speed range of gears. To shift to the low speed range, proceed as follows:

1. Bring the vehicle to a complete stop.

2. Make sure the front axle drive lever is moved backward into the engaged position as the Auxiliary Range gears cannot be engaged unless the front axle drive is connected.

3. With the clutch disengaged, push the transfer case auxiliary range lever all the way forward into the low position as shown on the Instruction Plate.

4. Move transmission gearshift lever to low or second speed as desired and follow the procedure previously outlined for starting the vehicle.

SHIFTING INTO REVERSE

The vehicle must be brought to a complete stop before the transmission can be shifted into reverse gear. To operate in reverse, proceed as follows:

1. Disengage clutch.

2. Move transmission gearshift lever to the left and forward.

3. Speed up the engine slightly by putting a light pressure on the accelerator pedal.

4. Release clutch pedal gently and at the same time exert slightly more pressure on the accelerator pedal so the engine will pick up the load smoothly.

STOPPING THE VEHICLE

1. Remove foot from accelerator pedal. Except in emergency stops, this should be done some distance before reaching the point where the vehicle is to stop so the compression of the engine will slow down the vehicle.

2. Apply brake by pressing down on brake pedal.

3. When speed has been reduced to approximately 7 miles per hour, disengage clutch and move transmission gearshift lever into the neutral position, maintaining pressure on brake pedal until vehicle stops.

4. Apply hand brake.

PERMANENTLY LUBRICATED PARTS

The following parts are packed with lubricant at the factory and will not require the addition of any lubricant unless disassembly of the parts becomes necessary for some other reasons.

Front and rear propeller shaft
Universal joints
Clutch throw-out bearing
Clutch pilot bearing
Water pump

In the event the flywheel is disassembled from the engine for any reason, it will, of course, be necessary to re-pack the pilot bearing with a lubricant having a high melting point, such as ES-444, Type 1, Grade 2.

STEERING GEAR

The level of the lubricant in the steering gear should be checked each 1000 miles and if necessary, add Gear Lubricant VV-L-761, Class No. 2. This will apply to either summer or winter operations.

SHOCK ABSORBERS

The shock absorbers should be refilled every 5,000 miles with Ford Shock Absorber Fluid. When refilling an instrument, clean it thoroughly around the filler plug before removing the plug. An extremely small particle of dirt inside the instrument might cause it to become inoperative.

CHASSIS FITTINGS

The Lubrication Chart, Figure 6, clearly indicates the various fittings to which chassis lubricant should be applied. A semi-fluid lubricant intended for use in a pressure gun should be injected into these particular fittings. Every fitting should be wiped clean before the pressure gun is applied so as to avoid forcing particles of dirt or abrasive into the parts which are to be lubricated.

WHEELS AND TIRES

Pressed steel, drop center rim wheels which were especially designed for this unit, are used on the Ford Reconnaissance and Command Car. The wheels are 16" in diameter, have a 4" rim, 5-1/2" bolt circle and five bolt holes. They are fitted with either 550 x 16 tires or 600 x 16 tires. In either case the correct inflation pressure is 24 pounds.

The most important factor controlling tire life is the air pressure in the tire. Tire inflation should, therefore, be checked at least once each week and every precaution taken to prevent operation of the vehicle with tire pressures less than 20 pounds. Under-inflation not only decreases tire life but also adds to the possibility of a rim bruise.

Rim bruises are caused by the tire hitting a curb or some other object with sufficient force to pinch the tire between the object struck and the rim. Several cords may be broken in the second or third layer of fabric but the tire will not show any outward signs of an injury. These cords will gradually wear on other cords until a break occurs.

One of the most important reasons for close attention to inflation pressures is the fact that this vehicle has four wheel drive. When both front and rear axles are driving, the rolling radius of all wheels must be equal in order to avoid premature or excessive wear in the axle differentials.

CHANGING WHEEL AND TIRE

To change a wheel and tire assembly, the procedure outlined below should be followed:

1. Apply the emergency brake.

2. Block one of the wheels resting on the ground with a large stone or block of wood.

3. Place jack under axle close to the spring seat of the wheel which is to be removed, and jack up car until wheel is at least 1" clear of the ground.

4. Remove the five nuts holding the wheel to the hub. See **Figure 12.** The wheel can then be removed.

REMOVING TIRE FROM WHEEL

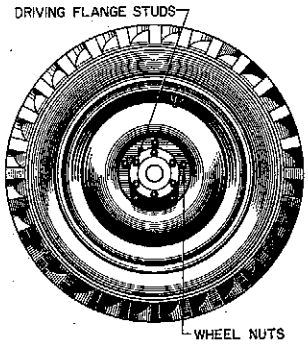


Fig. 12

Deflate the tube completely. Loosen both beads from bead seats on rim. Force the outside bead from the bead seat into the rim well at a point opposite the valve. Be sure the bead is in the rim well, then with two tire tools placed approximately 4" on each side of the valve, lift the bead closest to you over the rim flange. (See Figure 13.) Follow around the flange with the tire tools until the outside bead is free from the rim. Then force the inside bead into the rim well at the top and pull out the bottom of the tire until it swings clear as shown in Figure 13.

MOUNTING TIRE ON WHEEL:

Inflate the tube until it is fairly rounded out and insert it in the tire. The tube must be placed in the tire with the valve stem at the balance mark. Push the inside bead of the tire into the rim well at the point next to the valve. Force the remaining portion of the bead over the outside flange of the rim. Do not attempt to force too large a portion over the flange at one time. Lift up on the tire, placing the outside bead in rim well at the valve. Starting at either side of the valve, force short length of the bead over the flange, continuing around the wheel until the entire bead is replaced. Always keep as much of the bead as possible in the rim well while installing the tire.

Before inflating the tube, push the valve stem into the casing as far as possible to make sure that the tube is not

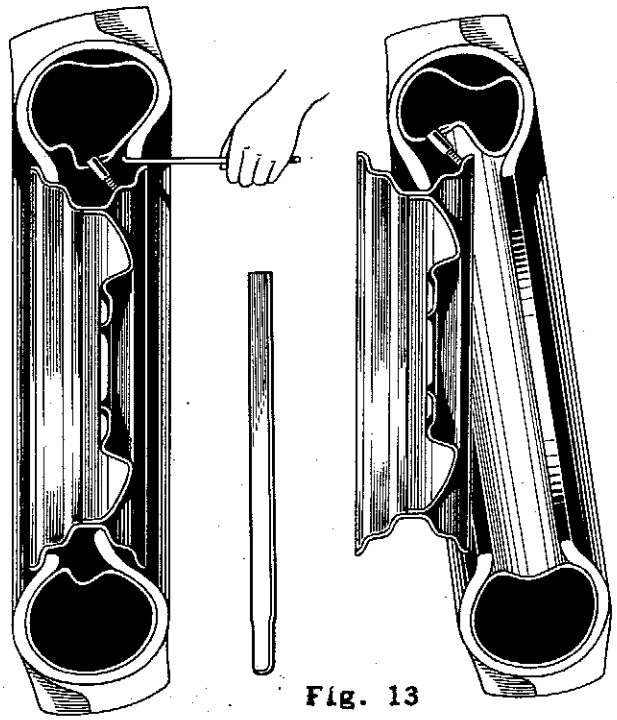


Fig. 13

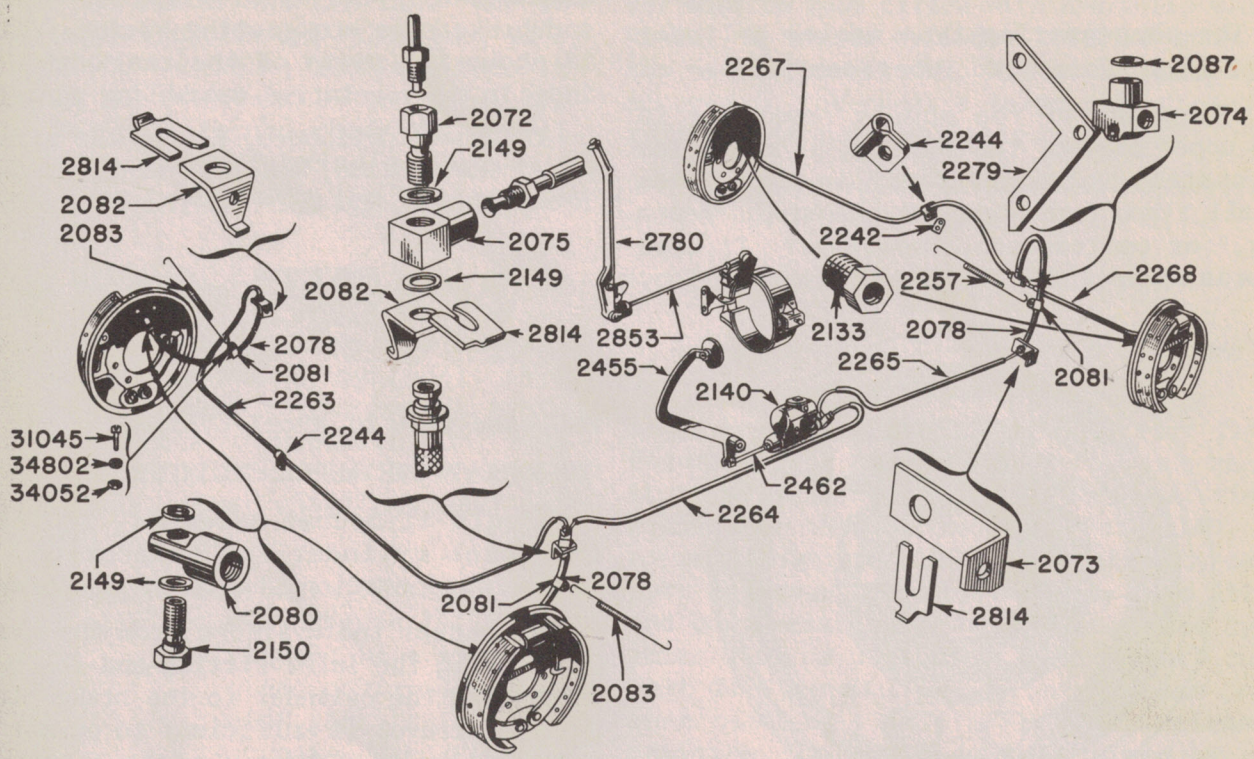
pinched under the tire beads. Do not let go of the valve stem while doing this.

Inflate the tube to not more than 2 pounds pressure, working casing back and forth. Proper fitting of the tire is indicated by the molded line on the side of the tire being equally spaced from the rim at all points.

SPARE TIRE

The spare tire and wheel assembly is mounted on the back of the body and held in place by three nuts. The bottom of the tire rests on a support plate which is bolted to the bumper. This support plate has slotted holes so that it can be adjusted up or down to provide adequate support for either 5.50 or 6.00 size tires.

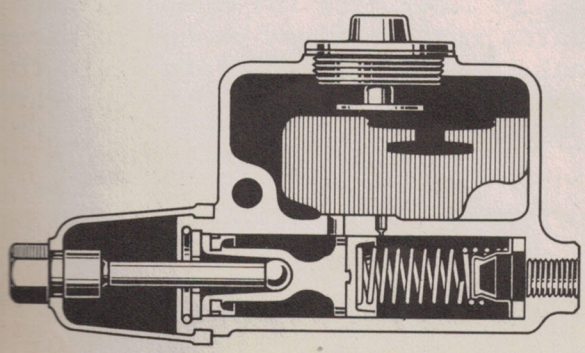
BRAKE SYSTEM



Brake System - Fig. 14

The system consists of a master cylinder in which hydraulic pressure is built up by pressure on the brake pedal, 4 wheel cylinders operating brake shoes against each wheel drum when pressure is applied, and the lines consisting of tubing, flexible hose, brackets and unions, interconnecting the master cylinder and wheel cylinders. See Figure 14.

The master cylinder is fitted with a piston, and the wheel cylinders are each fitted with two opposed pistons, all of which are provided with cup packings, which act as seals to maintain pressure and prevent loss of brake fluid.



Brake Master Cylinder - Fig. 15

The brake pedal, when depressed, moves the piston within the master cylinder; thus, sending the brake fluid from the master cylinder through the tubing and flexible hose to each of the four wheel cylinders.

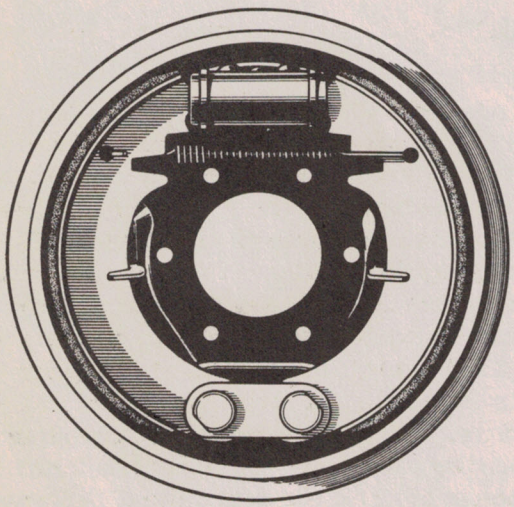
Brake fluid is placed under pressure at each of the wheel cylinders causing the pistons to move outward against the brake shoes, bringing the shoes into contact with the drums. See Figure 16. As pressure on the brake pedal is increased, greater hydraulic pressure is built up within the wheel cylinders and consequently greater force is exerted against the brake shoes. The system is self equalizing since all pressure is transmitted to the brake shoes by the column of fluid and no pressure can be developed in any of the wheel cylinders or brake lines until the pressure is equally distributed at all points.

When the pressure on the foot pedal is released, the retracting springs on the brake shoes return wheel cylinder pistons to their normal or "off" position thereby, forcing the brake fluid back through the flexible hose and tubing into the master cylinder.

THE MASTER CYLINDER

The compensating-type master cylinder Fig. 15 performs two functions:

1. By means of the supply reservoir in the upper part of the housing, it maintains a constant volume of fluid in the system at all times regardless of expansion, "heating," or contraction, "cooling." It also acts as a pump during the "bleeding" operation.



Wheel Brake Assembly - Fig. 16

2. It permits additional fluid to enter the system to counterbalance any loss due to gravity seepage.

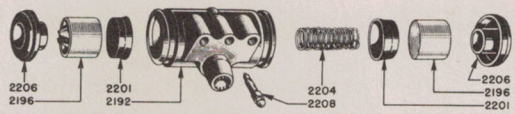
Piston and cup return to release position much faster than the fluid in the lines. A momentary vacuum is created in the cylinder barrel and additional fluid is drawn into the system from the supply reservoir through the drilled holes in piston and past the lip of cup.

After fluid returns from the wheel cylinders, any excess of fluid in the system is passed through port into the reservoir; thus the cylinder is always full of fluid for the next brake application.

WHEEL BRAKE ASSEMBLIES

The wheel brake units are composed of a dust shield assembly or support plate, two brake shoes, the wheel cylinder assembly and brake shoe contracting spring. Figure 18 shows all parts of the rear wheel cylinder in their relative assembling positions.

The wheel cylinders, are of the straight bore construction, being 1" diameter on the front wheels and 7/8" on the rear wheels.



Exploded View of Wheel Cylinder-- Fig. 18

TO REMOVE THE WHEEL CYLINDER

Should it become necessary to remove the wheel cylinder for inspection, the following operation should be performed:

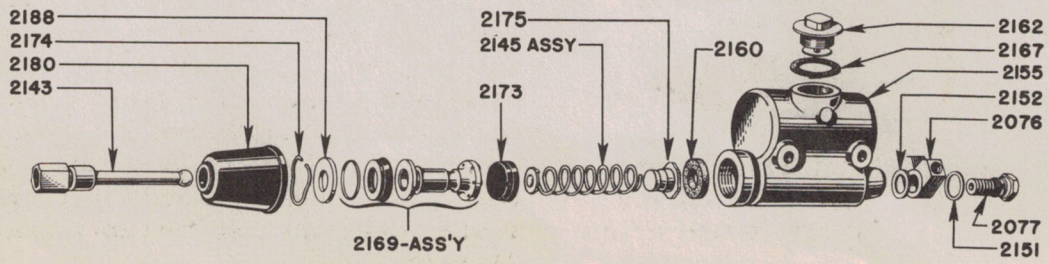
Disconnect the cylinder from the system by removing the inlet fitting and the bolts which hold the cylinder to the brake plate. The shoe travel is sufficient to permit the cylinder to be withdrawn without removing the brake shoes, after the retracting spring has been disconnected.

INSPECTION OF WHEEL CYLINDER

After removing the wheel cylinder, from the brake assembly, remove the boots, Part No. 2206, from both ends of the cylinder. The pistons, Part No. 2196 and cups, Part No. 2201, are forced out of the barrel by the return spring pressure, Part No. 2204. Inspect the cups for ragged ends and the bore for smoothness.

Should the bore be scratched or pitted, it will be necessary to replace the cylinder, to prevent loss of fluid or excessive cup wear.

When re-assembling the wheel cylinder, all parts must be first washed in clean alcohol, then dipped in Brake Fluid for lubrication. Re-assemble the cup, Part



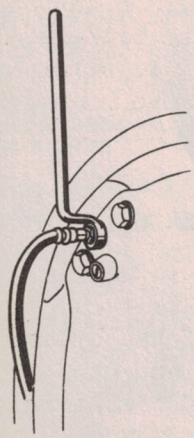
Exploded View of Brake Master Cylinder - Fig. 17

2201, piston, Part 2196, and boot, Part 2206, in one end of the casting. The return spring, Part 2204, and other cup, 2201, piston, 2196, and boot, 2206, are then installed in the other end of the wheel cylinder. The unit is now ready for installation. New inlet fitting gaskets must be used when connecting the cylinder to the system.

BLEEDING HYDRAULIC LINES

Whenever a tubing line has been disconnected at the master cylinder, it is necessary to "bleed" the hydraulic system at all four wheels to expel all air. Whenever a line is disconnected from any individual wheel, that wheel cylinder only must be "bled."

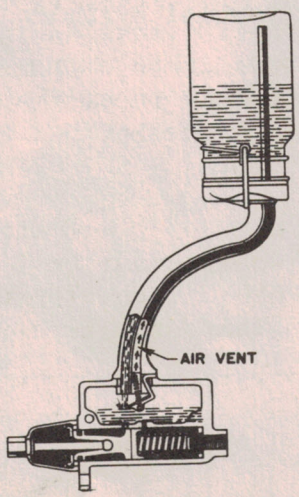
Loosen the bleeder hose fitting, Part 2208, and slip on hose, Figure 19. Allow bleeder hose to hang in clean container, such as pint jar.



Bleeding Wheel Cylinder - Fig. 19

Depress the foot pedal slowly by hand; allow return spring to return pedal "slowly" to "off" position. This produces a pumping action which forces fluid through the tubing and out at the wheel cylinder, carrying with it any air that may be present.

Watch the flow of fluid from hose, the end of which should be kept below the surface of fluid. When all air bubbles cease to appear and when fluid stream is a solid mass, close bleeder connection.



Refilling Master Cylinder during Bleeding Operation Fig. 20

During this operation the master cylinder must be kept filled with Hydraulic Brake Fluid. A master cylinder refiller such as the one illustrated in Figure 20 should be secured in the event a large, air pressure refiller is not available.

Fluid withdrawn in "bleeding" operation should not be used again.

PEDAL ADJUSTMENT

Pedal adjustment is made as follows:

It is important that the link, Part 2143, Figure 17, be adjusted for clearance where it seats in the piston. See sectional view, Figure 15. Should the link, Part 2143, be adjusted tightly against the piston, by-pass port may be blocked by the cup, Part 2173, and compensating action of the master cylinder will be destroyed. The primary cup, Part 2173, must be clear of by-pass port when piston is in its "off" or released position. This may be determined by ascertaining if there is 1/4" to 1/2" free movement of the brake pedal before the piston starts to move.

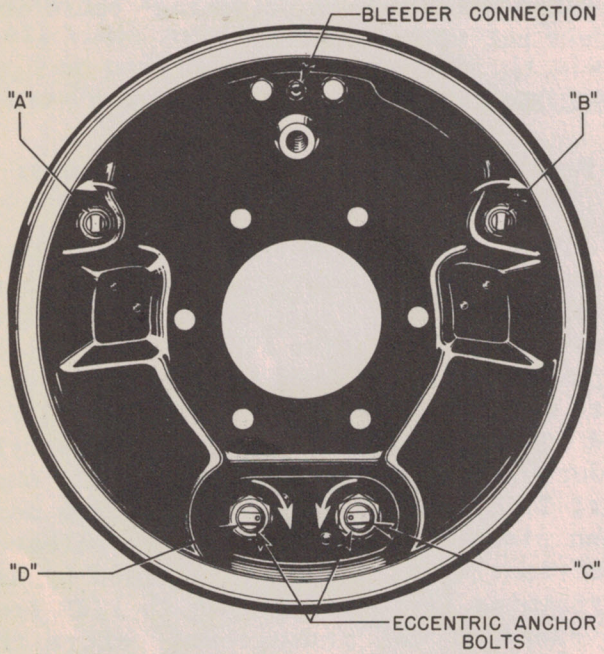
Secondary cup (on 2169 assembly) prevents fluid from leaking out of the master cylinder into the boot.

CAUTION: BEFORE REMOVING SUPPLY TANK FILLER CAP, EXTREME CARE MUST BE USED TO PREVENT DIRT FROM ENTERING THE MASTER CYLINDER. DIRT GETTING LODGED BETWEEN THE PISTONS IN THE SYSTEM AND THE CYLINDER WALLS MAY CAUSE SPASMODIC BRAKE FAILURE.

The use of other than an approved Brake Fluid or the introduction of oil with a mineral base or any unsuitable liquid will cause the rubber parts to swell and become inoperative. Grit and abrasive substances permitted to enter the fluid reservoir will cause the cylinder barrel to become scratched and pitted. When either of these conditions occur, it becomes necessary to remove the master cylinder for inspection and reconditioning.

ADJUSTMENT FOR WEAR

Brakes should be adjusted when the linings have been worn to the extent that the pedal pad travels to within 1" of the toe board on a hard brake application.



Brake Shoe Adjustments - Fig. 21

Brake drums should be approximately at room temperature when making adjustments. If brakes are adjusted when drums are hot or expanded, the shoes may drag when the drums cool and contract..

1. Jack up all four wheels.

2. End play in wheel bearing should be taken up.

3. Check pedal adjustment to make sure that pedal pad travels approximately 1/4" before master cylinder link end play has been taken up and master cylinder piston starts to move.

Repeat the following operations at each wheel.

4. Adjustment is made by turning the cams "A" and "B" (Figure 21) with a wrench, in the direction of arrows, until the shoes come in contact with the drum, then back off the adjustment slightly until the wheel rotates freely in either direction of rotation. Proceed in a like manner on the brake shoes of all wheels.

PREPARING PARTS FOR MAJOR BRAKE ADJUSTMENT

When major brake adjustment is required or brake parts renewed, it is recommended that all brake drums be removed and cleaned and brake shoes and parts removed, cleaned and inspected as to condition of lining, shoe return springs, hydraulic wheel cylinders, etc.

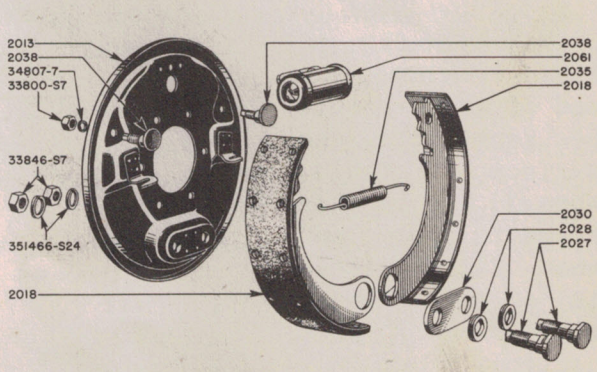
During this inspection or disassembly of brakes, the hydraulic portion of the system should be left intact so that bleeding of the lines will not be required. This is readily accomplished by disconnecting the brake shoes from the cylinder at the connecting links, without disturbing the hydraulic connections. The brake pedal must NOT be depressed at any time when brake drums are not in place.

REPLACING BRAKE SHOES

1. Remove wheel and drum assemblies.

2. Remove brake shoe retracting spring, Part 2061, Figure 22. Remove lock nut and washers from eccentric anchor bolts, Part 2027. Remove anchor bolts. Grasp brake shoes at the bottom and pull sidewise to release them from the brake shoe locating lugs and then remove the upper ends from the wheel cylinder.

3. Remove the rubber cups and pistons from the wheel cylinder.



Exploded View of Wheel Brake Assembly
Fig. 22

Examine all parts in the wheel cylinders and reassemble the units as outlined on page 20.

Install the new brake shoes on the brake plate. Be careful that the upper end of the brake shoes are properly placed in the slots in the cylinder pistons. Install the brake shoe anchor bolts, Part 2027, eccentrics, Part 2028, lock washers and nuts. Leave the anchor bolt lock nuts sufficiently loose so the anchor bolts can be turned. Each anchor bolt is provided with a mark on the tang which indicates the high side of the eccentric. Set these two marks toward each other before installing the brake drum. Reinstall brake shoe retracting spring, Part 2035.

The above operation should be performed at all four wheels before proceeding with the work of adjusting the brakes.

After reinstalling the hub and brake drum assemblies and wheels, bleed the braking system at all 4 wheels, as described on page 21.

Apply from 25 to 35 lbs. pressure to the brake pedal. This pressure should be maintained while making the brake adjustment. Applying pressure to the brake pedal expands the brake shoes out to the brake drum. Using a small open end wrench, turn the anchor bolts C&D in the direction of the arrows on Figure 21 until each shoe barely touches the brake drum. Tighten the lock nut on each anchor bolt, making sure that the anchor bolt is held securely while the nut is being tightened, so as not to change the setting.

Remove the pressure from the brake pedal and turn each wheel by hand to make sure that the shoes are not dragging. If there is any indication that a shoe is dragging, repeat the above operation more carefully.

The above operation should be performed for each shoe at all 4 wheels.

After making sure that the eccentric anchor bolts are properly adjusted, as outlined above, the upper ends of the brake shoes should be adjusted to the correct clearance by turning the adjusting cams "A" and "B", Figure 21, in the directions indicated by the arrows until the shoes touch the drums. Then back them off very slightly so there is clearance between the shoes and the drum. This clearance should be approximately .008".

BRAKE MAINTENANCE HINTS

1. Pedal goes to floor board.

Cause:

a. Normal wear of lining.
b. Leak in system.
c. Air in system.
d. No fluid in supply tank.

Remedy:

a. When brake linings become worn, it is necessary to set the shoes into closer relation to brake drums. This condition is usually accompanied by the remark from the driver that it is necessary to PUMP the pedal several times before a brake is obtained. Shoes should be set as close to brake drums as possible without drag. Do not disturb anchor pins when making this adjustment. Adjustment must be made while drums are cool.

b. A connection leak in the system will allow the pedal, under pressure, to go to the toe board gradually. A cup leak does not necessarily result in loss of pedal travel, but will be indicated by a loss of fluid in the supply tank. If no leaks are found at wheels or connections, remove master cylinder and check bore of barrel for score or scratches.

c. Air in the system will cause a springy, rubbery action of the pedal. Should a sufficient quantity be introduced into the system, the pedal will go to the toe board under normal pressure. System should be bled.

2. All Brakes Drag.

Cause:
a. Mineral oil in system.
b. Port hole closed.

Remedy:
a. The introduction into the system of any oil of a mineral base, such as engine oil, kerosene, or the like, will cause the cups to swell and distort, making it necessary to replace all rubber parts. Flush system with alcohol and refill with Approved Brake Fluid.

b. Directly ahead of the master cylinder piston cup, Part 2173, (when in normal release position) is a relief port. It is imperative that this port be open when the brakes are released. Should this port, Figure 15, be blocked by piston cup not returning to its proper release position, the pressure in the system will gradually build up and cause brakes to drag. Opening a bleeder screw will allow built-up pressure to escape and give temporary relief. Bleeder screw must be tight before car is driven.

3. One Wheel Drags

Cause:
a. Weak brake shoe return spring.
b. Brake shoe set too close to drum.
c. Cups distorted.

Remedy:
a. Springs sometimes lose their contracting power and take a set. Replace spring.
b. Readjust shoes to proper clearance.
c. If in repairing wheel cylinders, kerosene, gasoline and other fluids are used as a cleaner instead of alcohol, the cups will swell and distort. The return action of the shoes will be retarded and the brake drum will heat. Replace cups and wash unit in alcohol and dip all parts in fluid before reassembling.

4. Car pulls to one side.

Cause:
a. Oil-soaked lining.
b. Shoes improperly set.
c. Backing plate loose on axle.
d. Different makes of lining.
e. Tires not properly inflated.
f. Incorrect caster angle.

Remedy:
a. Replace with new Ford lined brake shoes. Grease-soaked linings cannot be salvaged by washing or cleaning.
b. The construction of the brake is such as to cause a slight pull or drift if shoes are improperly set on the front wheels. On the rear wheels there will be no drift noticed, but one wheel will slide before the other. Re-adjust the shoes to proper clearance.

c. Loose brake support permits the brake assembly to shift on the locating bolts. This shifting changes the predetermined centers and causes unequal efficiency. Tighten backing plates and readjust shoes.

d. Different makes of linings have different braking efficiency. Two different makes, one with high efficiency and one with low efficiency, would cause car to pull to one side. Use Genuine Ford brake lining.

e. All tires should be properly inflated.

f. Check front axle.

5. Springy, Spongy Pedal

Cause:
a. Brake shoes not properly adjusted.
b. Air in system.

Remedy:
a. Adjust brakes.
b. Bleed brake system.

6. Excessive Pressure on Pedal, Poor Stop.

Cause:

a. Brake shoes not properly adjusted.
b. Improper lining.
c. Oil on lining.

Remedy:

a. Adjust brakes.
b. Replace with new shoes and linings recommended type, as improper grades of brake linings lose their gripping qualities after a few thousand miles.
c. Install new brake shoes and linings.

ADJUSTING THE EMERGENCY BRAKE

The emergency brake is an external band type mounted at the rear of the transfer case which operates on a drum fastened to the rear propeller shaft. All parts of the brake are shown in their relative assembling position in Figure 23.

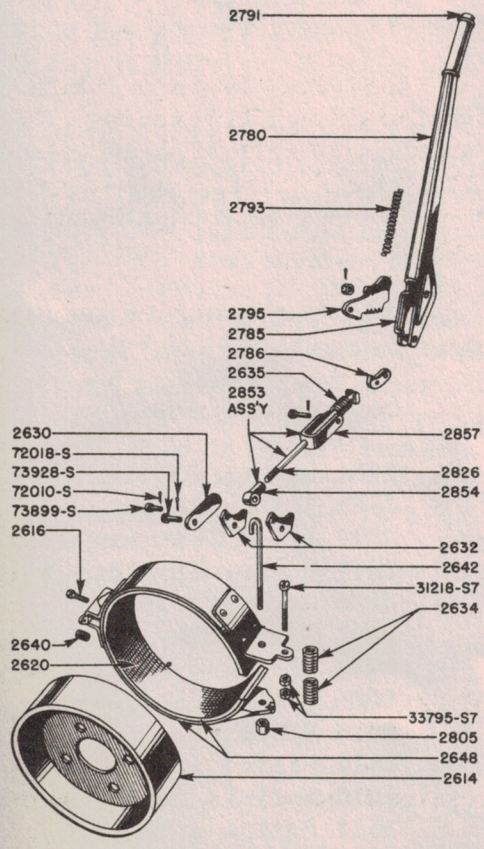


Fig. 23

The various adjustments on the emergency brake are clearly shown in the illustration, Figure 24. The procedure outlined below should be followed in making the adjustments:

1. Set the hand brake lever in full release position.

2. Make sure the flat portion of the cam "F", Part No. 2632, is resting on the ear of the brake band as shown in the illustration, Figure 24. If not, remove pin "G" so the cam will be free.

3. Turn anchor adjusting screw "C" clockwise" to move the band in toward the drum until a clearance of .010" is established at this point. Replace the locking wire.

4. Loosen the lock nut "A" and adjust screw "D" to establish .010" clearance for upper half of shoe. Tighten the lock nut.

5. Tighten adjusting nut "B" until a clearance of .010" is likewise established for the lower half of the brake shoe.

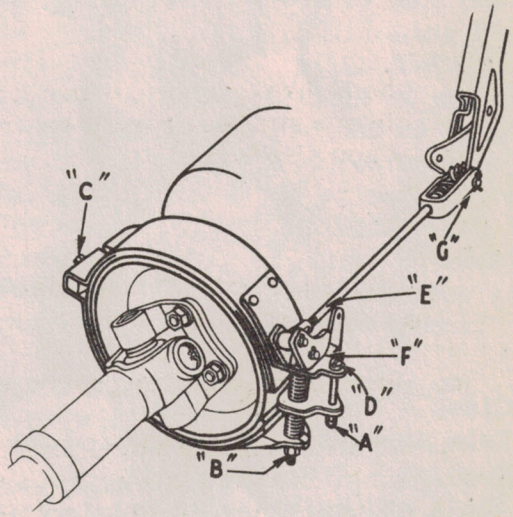
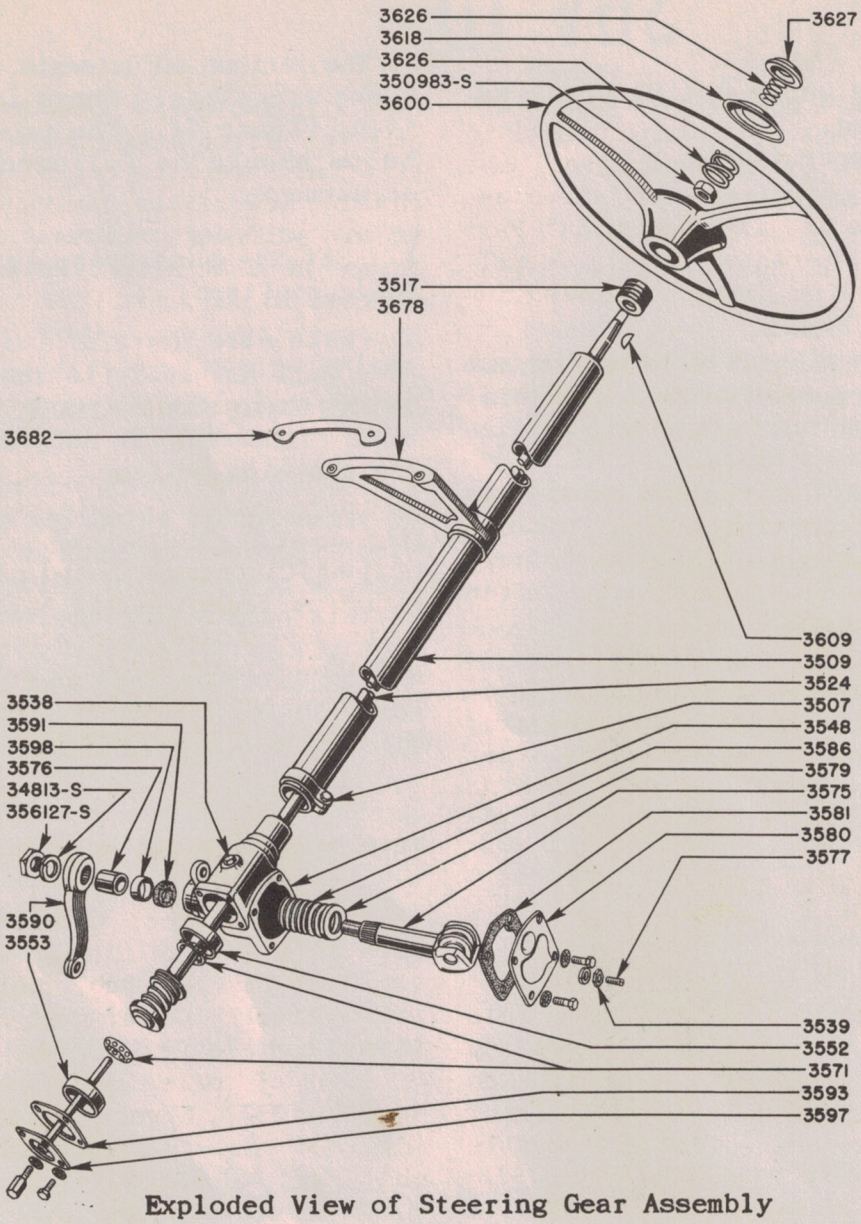


Fig. 24

6. Adjust the clevis on rod "E", Part No. 2826, so that it is exactly the right length with hand lever in full release position and the flat of the cam "F" resting on the ear of the brake band as pointed out in Operation No. 2.

7. Replace pin "G" and cotter pin.



Exploded View of Steering Gear Assembly
Fig. 25

3507 Clamp - Steering Column
3509 Tube Assembly - Steering Column
3517 Bushing - Steering Shaft
3524 Shaft and Worm Assembly
3538 Plug
3539 Nut - Sector Lock
3548 Housing - Steering Gear
3552 Cup - Steering Gear Bearing
3553 Cup - Steering Gear Bearing
3571 Roller Assembly
3575 Shaft Assembly - Steering
3576 Bushing - Steering Sector Shaft
3577 Screw - Adjusting
3579 Washer - Thrust
3580 Cover - Housing
3581 Gasket - Housing
3586 Shim - Sector
3590 Arm - Steering Gear
3591 Seal - Steering Sector
3593 Cover Plate Shim
3597 Worm Cover Plate
3598 Retainer - Oil Seal
3600 Wheel - Assembly
3618 Plate
3618 Plate
3626 Spring - Horn Button
3627 Button - Horn
3678 Bracket - Steering Column
3682 Shim - Steering Column

STEERING GEAR

The steering gear is the worm and roller type and has a reduction ratio of 18.2 to 1. All parts of the steering gear are shown in Figure 25 in their relative assembling positions and are marked with Part numbers so the parts can be readily identified when referred to in the following instructions.

Means for mechanically eliminating all play within the mechanism have been provided.

In this type of gear, the major adjustments are accomplished with the use of shims. The need for adjustment, however, should present itself only after considerable usage.

Before altering any adjustments, jack up front wheels of car and make sure that cause of complaint is not from some other looseness such as ball sockets, and so forth. Then make the following test.

INSPECTION FOR PROPER WORM BEARING ADJUSTMENT:

Turn hand wheel about one turn to right from straight ahead driving position. Hold securely in this position to prevent any oscillation when front wheels are shaken violently. Now have helper shake front wheels hard sidewise. This will enable any end play in worm bearings, Part 3571, to be felt at wheel hub. If any end play exists, worm bearings need adjusting. Be sure end play is felt, and not be confused with play or give in jacket bushing. Worm bearing adjustment should be correct before further inspection of gear is made.

WORM BEARING ADJUSTMENT:

Loosen four screws which secure worm cover, Part 3597, 1/8 inch. Use a knife to separate the top shim, Part 3593, passing blade all the way around between shims, and taking care not to multilate the remaining shims. Remove only one shim at a time between inspections, to remove end play. Care should be taken not to set up stiffness in worm bearings.

It is important the drag link be removed from steering gear Pitman arm, Part 3590, in order to effect a satisfactory inspection of other adjustments and alignment of gear in car. Now revolve hand wheel to determine if any stiffness exists. If so, too many shims have been removed or gear is misaligned in car.

CORRECTION OF GEAR MISALIGNMENT

Loosen the frame bracket bolts just enough to allow gear to shift in frame to line up at angle determined by height setting of instrument board gear bracket and retighten frame bracket bolts. Now loosen instrument board gear bracket, Part 3678, and allow it to shift to match gear column position, and retighten. This will correct any possible misalignment of gear column.

INSPECTION FOR END PLAY OF ROLLER SHAFT

Turn hand wheel to either extreme and back an eighth of turn. Gripping Pitman arm, Part 3590, at hub, roller shaft should rotate freely without particle of end play. If any end play exists, adjust as required by means of roller shaft adjustment screw, Part No. 3577, Figure 25, at back of housing. Be sure to lock SECURELY with lock nut, Part No. 3539, at back of housing, and reinspect for end play and free rotation throughout whole gear movement.

INSPECTION FOR PROPER MESH OF SHAFT ROLLER IN WORM

(Never make inspection for proper mesh, without first correcting roller shaft and column adjustments described above.) Turn hand wheel to the mid-position of its complete travel or turning limits (drag link previously disconnected), and shake Pitman arm, Part 3590, to determine amount of lost motion. If this lost motion exceeds one-thirty-second of an inch, roller shaft adjustment should be made. In this case, gear must be removed from car.

IMPORTANT NOTE

Before drag link is again connected to steering gear Pitman arm, Part 3590, swing front wheels throughout their turning radius to determine if any tight spots exist. There should not be more than 10 lbs. pull on drag link either fore or aft throughout entire turning radius.

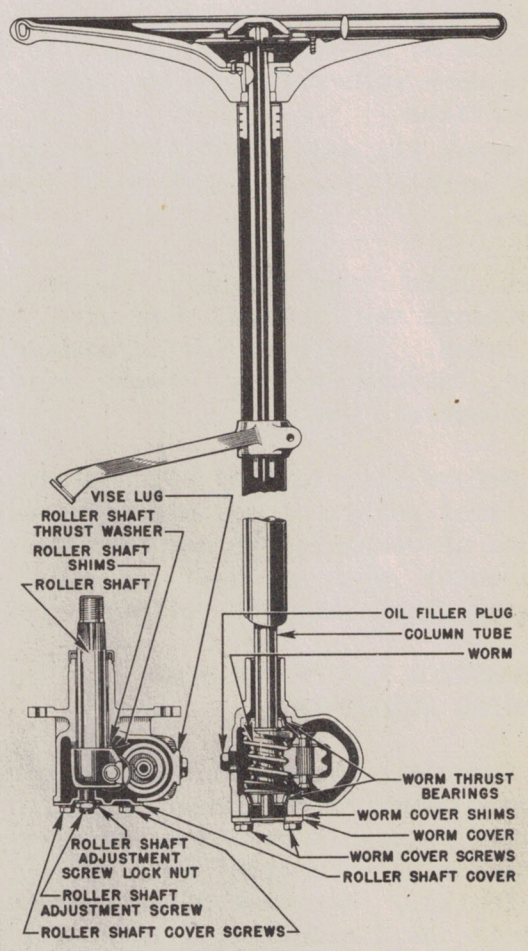
WHEN GEAR IS REMOVED FROM CAR

Holding gear in vise and with column to right of vise, remove roller shaft, Part No. 3575, care being taken that all roller shaft shims, Part 3586, remain on roller shaft, so none will drop into housing behind worm, which may cause interference with proper gear operations. Replace hand wheel on column. If proper worm bearing adjustment has not been accomplished, readjust as per previous instructions. Note that roller shaft thrust washer, Part No. 3579, is assembled with chamfered side next to roller shaft thrust face.

ROLLER SHAFT MESH IN WORM

Adjustment for closer mesh of the shaft roller, Part 3575, with the worm or, in other words, elimination of excessive play at this point, is accomplished by the removal of shims which are in place behind the roller shaft thrust washer. See Figure 26. The position of roller contact with worm is offset from the centerline of worm, hence whem a shim is removed, the roller is moved into closer mesh with the worm.

Select, through trial, the proper amount of shims to produce not more than .006 inch play measured at end of Pitman arm, and without heavy drag on hand wheel. Remove only one shim, Part No. 3586, from roller shaft, and insert roller shaft in housing. Then turn hand wheel nearly to left stop. Now hold roller shaft in place with thumb pressure on head end of roller shaft, and revolve hand wheel to the right until shaft roller is in center of worm. (Do not reverse turn to left.) Still holding roller shaft with other hand, try to rotate it. If any play exists remove another shim and repeat operation until play felt by hand in center of gear is removed.



Sectional View of Steering Gear
Fig. 26

When proper amount of shims have been selected, turn hand wheel close to either stop and reassemble roller shaft cover, Part No. 3580. Tighten screws securely. (Drive Pitman arm, Part 3590, on roller shaft.) Now loosen roller shaft adjustment screw lock nut, Part No. 3539, and tighten roller shaft adjustment screw, Part No. 3577, until all end play in roller shaft has been removed, when gear shaft is rotated in this lash position near end of worm. Lock roller shaft adjustment screw lock nut, Part No. 3539, and reinspect gear for freedom of operation throughout and absence of end play in roller shaft adjustment.

LUBRICATION

Remove oil filler plug and vent hole cover, Part No. 3538. Fill with approved lubricant until it comes out of oil vent. Replace oil filler plug and vent hole cover to prevent dirt from entering housing.

Avoid use of graphite, white lead, or heavy solidified oil.

If these adjustment instructions are followed carefully and CORRECT lubrication used, proper funtioning of the steering mechanism will result. Do not deviate from these instructions to correct any erratic action of the front wheels, as evidenced by shimmy or steering wheel fight, but instead see that tires are properly inflated and front axle checked for correct toe-in. camber and caster specifications. Shock absorber adjustment should be at the recommended standard. Tie rod and drag link sockets or connections must also of necessity have no excessive looseness.

WHEEL ALIGNMENT

The proper alignment of the front wheels is essential to insure normal tire life as well as to maintain ease of handling and roadability at the higher speeds. The first three factors which control this are the camber, castor and toe-in of the front wheels.

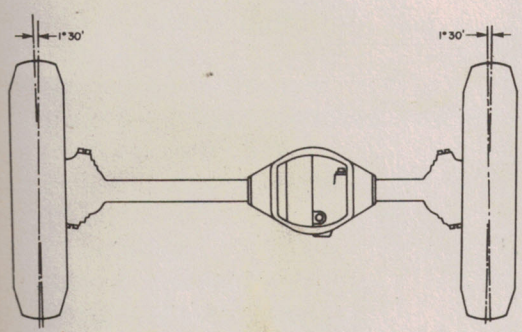


Fig. 27

CAMBER

The angle that the wheel is tilted outward at the top from a vertical line is known as the camber. The purpose of the camber angle is to place the load to a greater extent on the inner wheel bearing. As shown in Figure 27, the correct camber angle of the front wheels on the Ford truck is one deg. 30 min. The camber angle is not adjustable on this axle, as it is controlled by the manner in which the parts are manufactured. Any change in the camber angle can only be due to a damaged part, and such part should, of course, be replaced.

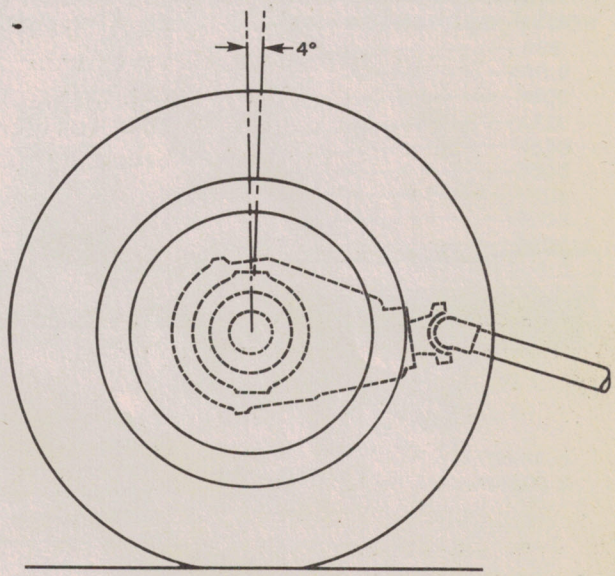


Fig. 28

CASTER

The caster of the front axle is the backward tilt of the top of the front axle or in the case of this particular unit the top steering knuckle bearing. The best example of caster is the front forks and wheel of a bicycle. By placing the top steering knuckle bearing back of the center line of the front wheel, the weight of a vehicle tends to keep the front wheels lined up in the direction of travel. If there is insufficient caster, the front wheels would have a tendency to wander at the higher speeds If the caster angle is excessive, there is a greater tendency for the wheels to hold in a straight ahead position and it is more difficult to turn the wheels when parking the car.

As shown in Figure 28, the correct caster angle in the Ford truck is 4 degrees.

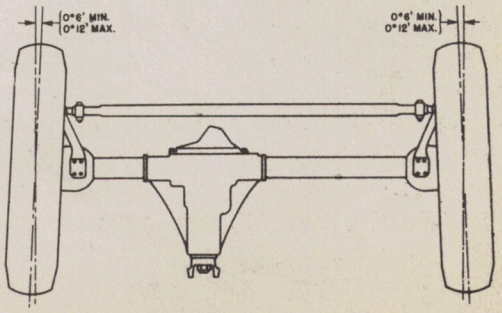


Fig. 29

WHEEL TOE-IN

It is necessary to adjust the front wheels so they turn in slightly at the front, in order to offset the higher wear which would otherwise result from the camber. A tendency for the wheels to toe-out is created by tilting the top of the wheel outward, and the purpose of toeing the wheels in is to counteract their tendency to toe-out.

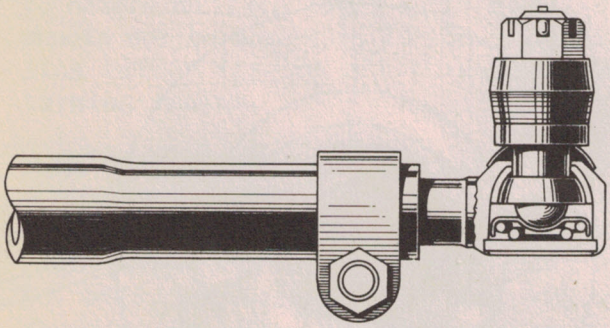
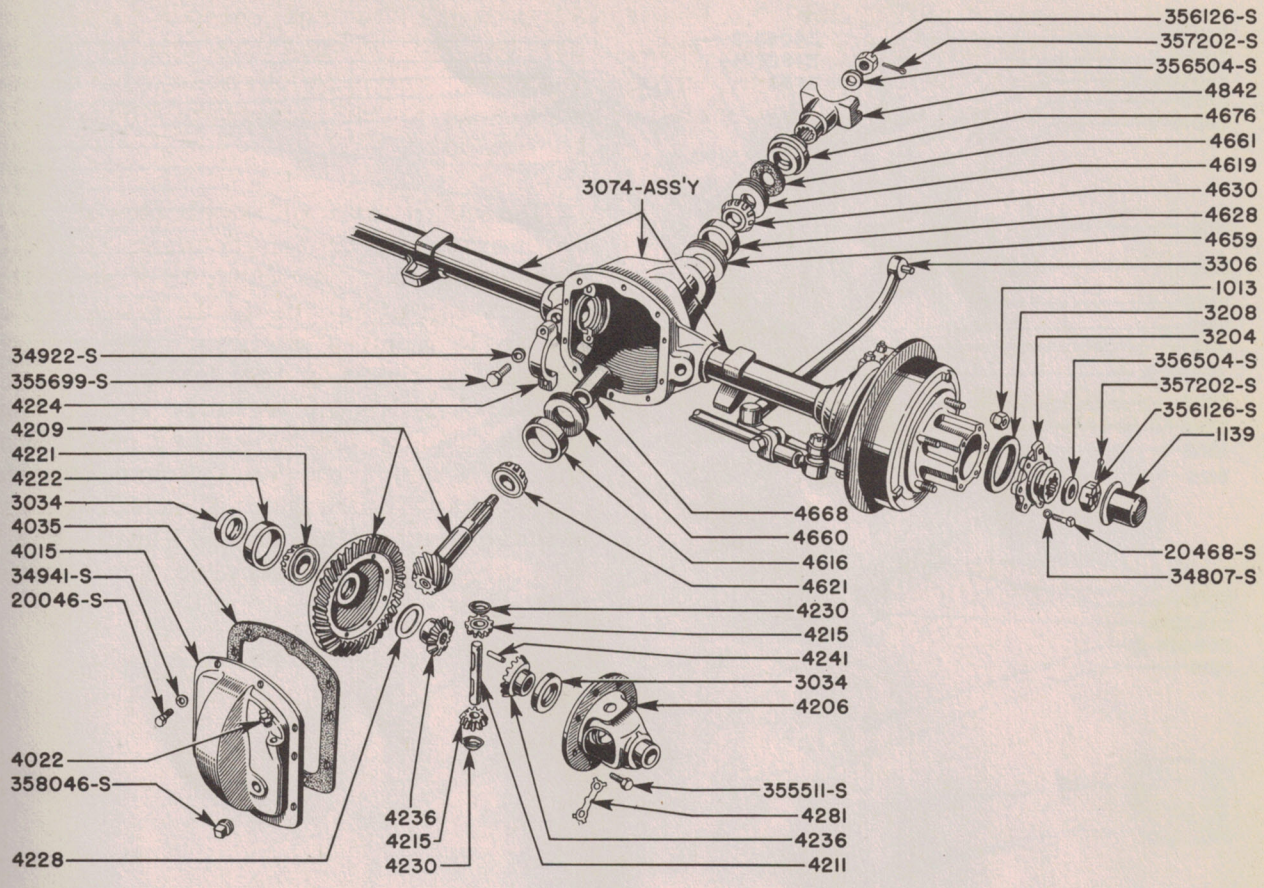


Fig. 30

The adjustment of wheel toe-in, is made by shortening or lengthening the spindle connecting rod. As shown in Figure 29, the correct amount of toe-in is 6 minutes mimimum to 12 minutes maximum. The adjustment is made by removing the cotter pin and lock nut which holds the spindle connecting rod to the spindle arm at either end. Disconnect the rod from the arm and loosen the clamp nut, Figure 30. Then screw out the spindle connecting rod end until the correct adjustment is secured.

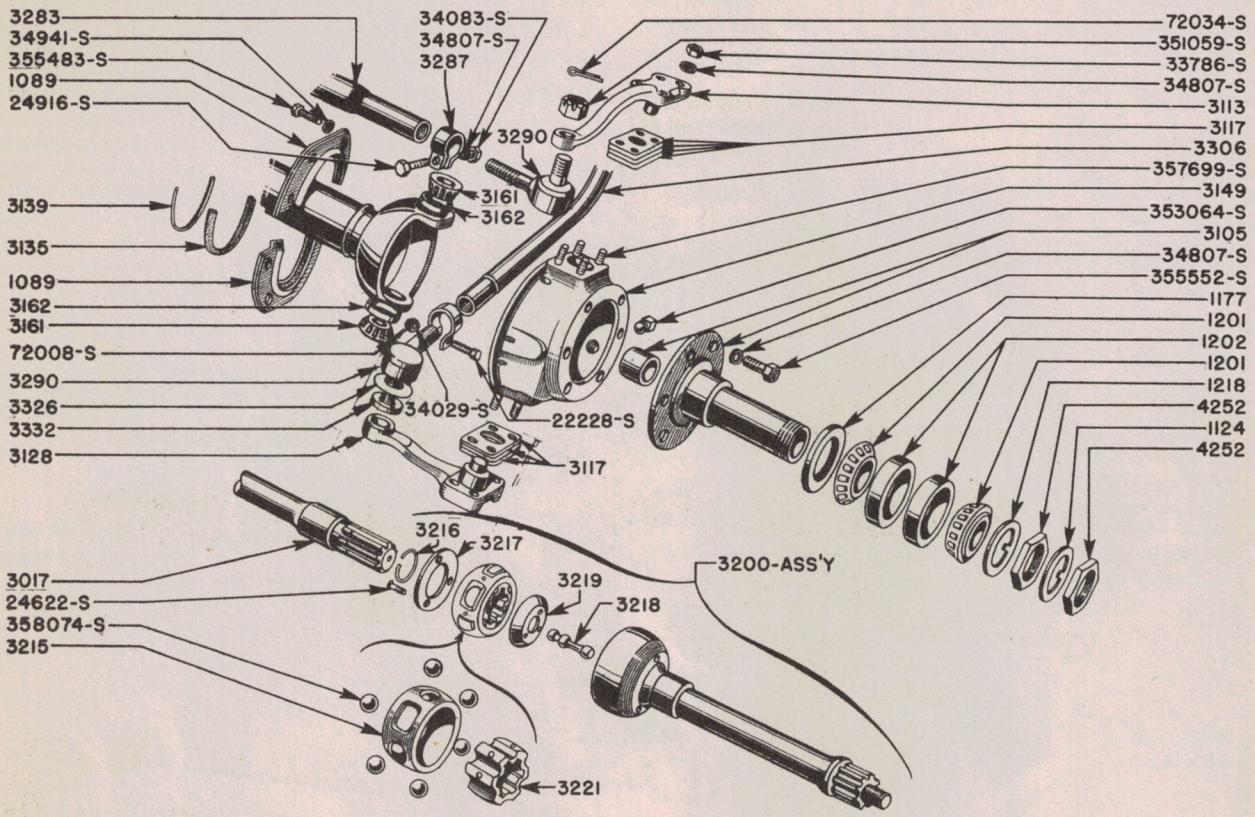


Front Axle Assembly - Fig. 31

1013 Nut - Wheel Hub
1139 Cap - Hub
3034 Retainer - Grease
3074 Housing, Differential and Front Axle Assembly
3204 Hub Driving Flange
3208 Shim
3306 Drag Link
4015 Cover Assembly
4022 Plug - Cover Vent.
4035 Gasket
4206 Differential Gear Case
4209 Ring Gear and Pinion - Driving
4211 Differential Pinion Shaft
4215 Pinion - Differential
4221 Cone & Roller Assembly
4222 Cup Axle
4224 Cap - Differential Bearing
4228 Washer - Thrust
4230 Washer - Differential Pinion Thrust
4236 Gear - Differential
4241 Differential Shaft Lock Pin
4281 Lock Strap

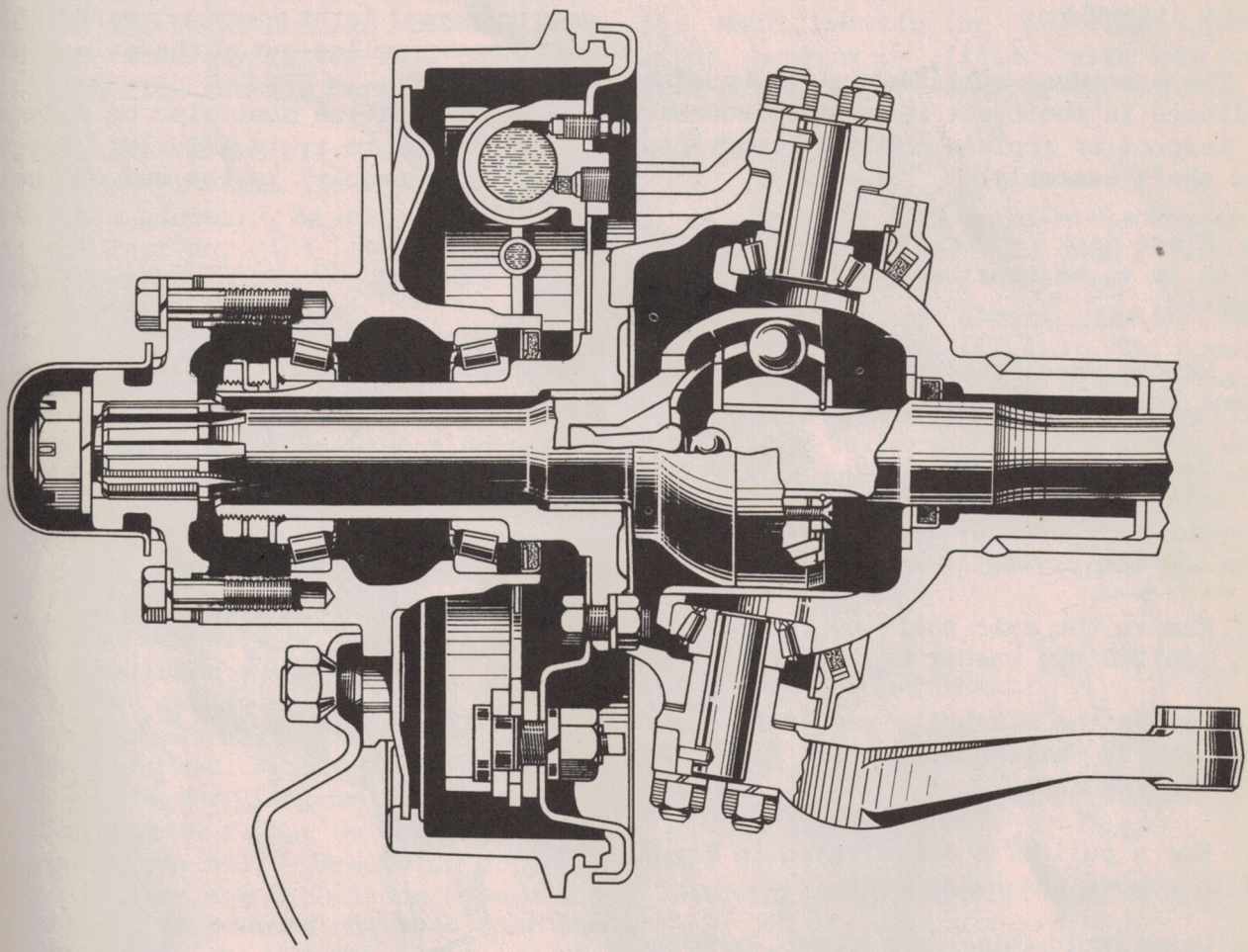
4616 Pinion Bearing Cup - Rear
4619 Oil Slinger
4621 Pinion Bearing Cone & Roller
4628 Pinion Bearing Cup - Front
4630 Pinion Bearing Cone & Roller

4659 Shim
4660 Shim
4661 Gasket
4668 Bearing Spacer
4676 Grease Retainer
4842 Universal Joint End Flange



Steering Knuckle and Universal Joint Assembly Fig. 32

1089 Retainer - Oil Seal
1124 Lockwasher - Lock Nut
1177 Retainer - Wheel Grease
1201 Cone & Roller Assembly
1202 Cup - Wheel Bearing
1218 Lockwasher - Wheel Bearing
3017 Shaft - Front Axle
3105 Spindle - Front Wheel Bearing Assembly
3113 Arm - Steering Pivot - Assembly
3117 Shim
3128 Arm - Lower Steering
3135 Seal - Front Axle
3139 Strip - Pivot Oil Seal
3149 Knuckle - Steering
3161 Roller & Cone Assembly
3162 Cup - Spindle Bearing
3200 Joint - Assembly
3215 Cage
3216 Ring - Universal Joint Shaft Retainer
3217 Retainer - Wheel Bearing
3218 Pin - Universal Joint Pilot
3219 Pilot - Universal Joint
3221 Race - Universal Joint-Inner
3283 Tube - Spindle Connecting Rod
3287 Clamp - Spindle Connecting Rod
3290 End Assembly
3306 Link Assembly
3326 Spring Seat for Drag Link
3332 Seal - Spindle Connecting Rod
4252 Nut - Wheel Bearing Lock



FRONT AXLE:

Fig. 33

The front axle is especially designed for this unit and has steering drive ends of the constant velocity, Rzeppa type. The differential is mounted in a banjo type housing and is driven by hypoid type gears. The various parts of the axle are shown in their relative assembly position in Figure 31. The driving ends are shown in Figure 32 and have been segregated so that each part can be more clearly illustrated. We believe these illustrations, together with the sectional view of the axle assembly shown in Figure 33 will convey a very clear picture as to the design and construction of the axle. The parts referred to in the following text by part number can be identified by referring to the above mentioned illustrations.

REPLACING AXLE UNIVERSAL JOINT AND SHAFT ASSEMBLY:

The procedure outlihed below should be followed in the event it becomes necessary to inspect or replace the universal joint and shaft assembly.

1. Place jack under front axle at side which is to be repaired, so wheel can be removed.

2. Remove wheel assembly as outlined in wheel and tire section, page 1000-2

3. Remove hub cap No. 1139. This is done by using 2 tire irons, inserting one blade behind each side of the inner flange of the cap and prying it off.

4. Remove the axle shaft cotter pin, nut No. 356126S and washer No. 356504S.

5. Remove the six bolts and lock washers holding the axle shaft drive flange No. 3204 to the hub.

6. Use a puller as illustrated in Figure 34 to remove the axle flange.

7. Using a cold chisel and hammer, bend back the lip of the lock washer, Part 1124, which holds the wheel bearing assembly nut, Part No. 4252 in place. The wheel bearing lock nut can then be removed after which the lock washer can be taken off and the wheel bearing adjusting nut removed.

8. Remove the wheel hub, assembly including bearings. This should be done carefully so as to avoid damaging the oil seal in the hub.

9. Remove the brake plate screws, Part 355552S, and lock washers, Figure 32, thus permitting the brake plate assembly to swing to one side, suspended by the flexible brake tubing.

10. Remove the wheel bearing spindle assembly, Part No. 3105.

11. The complete axle shaft, Part No. 3017 and universal joint assembly, Part No. 3200, can now be pulled out of the axle housing.

This operation must also be done carefully so as to avoid injuring the outer oil seal assembly, in the end of the axle housing.

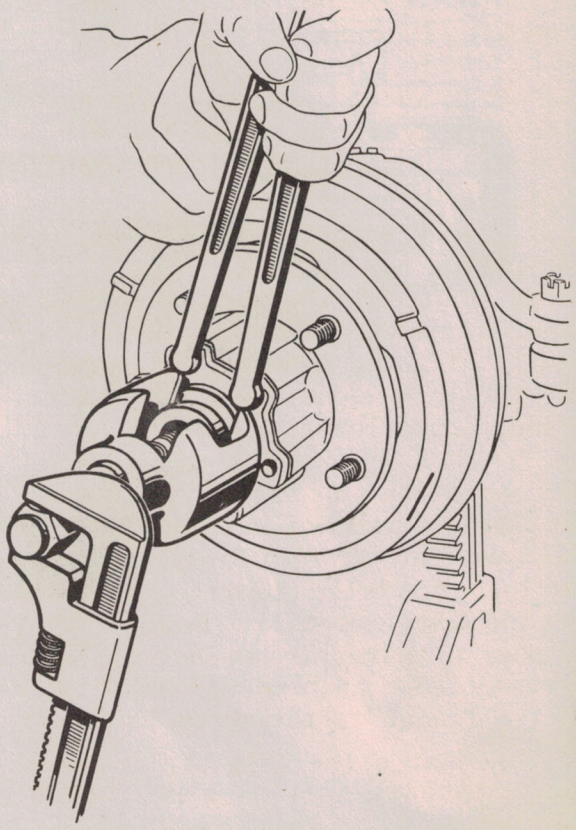


Fig. 34

REINSTALLING UNIVERSAL JOINT AND SHAFT ASSEMBLY:

1. Make sure that all parts are free from dust and other foreign substances.

2. Slide wheel bearing spindle assembly, Part No. 3105 over outer end of universal joint and axle shaft assembly.

3. Carefully insert universal joint and shaft assembly into the housing, being careful to avoid injuring the oil seal.

Enter the spline end of the axle into the differential and push inward until the pilot flange on the wheel bearing spindle, Part No. 3105 is securely fitted into the recess in the steering knuckle Part No. 3149.

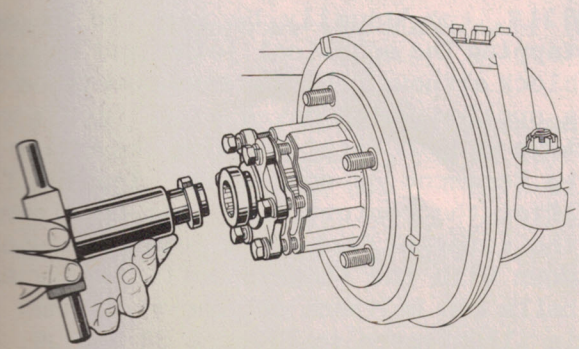
4. Place the brake plate assembly into position and install the six bolts which fasten this assembly, as well as the wheel spindle, Part No. 3105 to the steering knuckle, Part No. 3149.

5. Pack wheel bearings with grease and assemble bearings, wheel hub and drum assembly, into place on the wheel bearing spindle. Install bearing washer adjusting nut, lock washer and lock nut. Run the adjusting nut up until there is a slight drag on the bearing when the wheel is turned and then back off approximately one-quarter-turn. Tighten lock nut, then bend one edge of the lock washer over the lock nut so it cannot come loose.

6. Assemble the axle drive flange, Part No. 3204 and shims, Part No. 3208. A driver such as that shown in Figure 35 must be used to force the drive flange up to the shoulder on the shaft assembly. Be sure the original number of shims are in position before the drive flange is pressed on; then bolt the drive flange to the wheel hub.

7. Assemble the axle shaft washer, Part No. 356504S, nut, Part No. 357202S, and cotter.

8. Press on the hub cap.



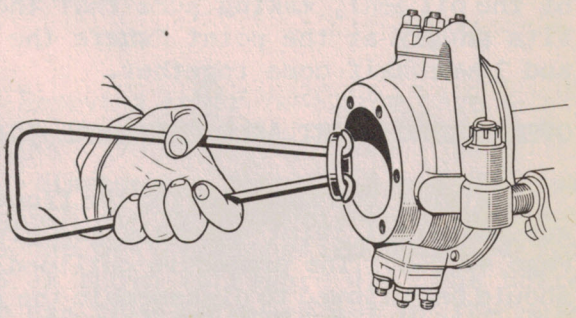
Installing Axle Drive Flange - Fig. 35

9. Assemble wheel.

10. Make certain the steering knuckle joint housing is filled with lubricant (1/2-pound) before running the vehicle.

AXLE SHAFT OIL SEAL:

In the event it should be necessary to replace an axle shaft oil seal, Part No. 3034, remove the axle shaft and universal joint as described above. The oil seal is a light pressed fit into the housing and will require a tool of the type shown in Figure 36 to be removed. Insert the ends of the puller behind the grease seal and tap the end of the puller lightly with a hammer.



Removing Axle Shaft Oil Seal - Fig. 36

Before installing a new oil seal, make sure it has been soaked thoroughly in oil; this will not only make the leather more pliable but will avoid it being burned by friction with the axle shaft when the vehicle is driven.

After placing the new oil seal in position in the housing, it can be driven in place by using a driver such as the one illustrated in Figure 37.

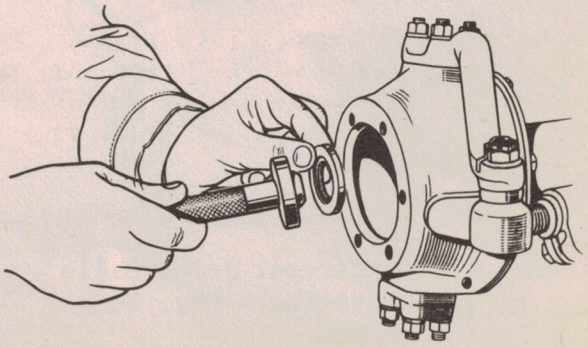


Fig. 37