

Ford

INSTRUCTION

BOOK

Ford Motor Company.

DETROIT, MICH.

Ford

Instruction Book

For Owners and Operators
of Ford Cars

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FOREWORD

The simplicity of the Ford car and the ease with which it is operated make it unnecessary for the driver to possess an intimate knowledge of mechanics.

While it is not essential, it is desirable that every Ford owner thoroughly understands his car. With such knowledge at his command he will maintain his car more economically—prolong its serviceability—and he will also derive more pleasure from its use.

The fact that there are thousands of authorized Ford dealers throughout the United States where adjustments and repair parts can be obtained with no annoying delay—give the Ford owner a singular freedom from mechanical annoyances which beset owners of cars which have less service facilities.

This book is published for the purpose of instructing owners in the proper care and operation of Ford cars, and is not intended to provide repairmen with the mechanical information required in handling general repair work. For the benefit of mechanics, complete technical information on the proper methods of performing all repair operations is contained in the "Ford Service" book, obtainable through authorized dealers.

Ford Service Organization

The network of authorized Ford dealers throughout the country constitutes the greatest service organization in the automotive industry. Wherever the Ford owner drives, he knows a Ford dealer is close at hand—ready to render dependable and economical service whenever it is needed.

The dealers co-operate in carrying out the service policies of the Ford Motor Company—they employ trained Ford mechanics—use proper tools and machinery—adhere to fair and reasonable charges—and use Genuine Ford Parts in repair work.

As the owner of a Ford car, you should, in the interest of economy and efficiency, **GO TO THE AUTHORIZED FORD DEALER FOR YOUR SERVICE REQUIREMENTS.** It stands to reason that skilled Ford mechanics, with special tools at their command, will do a better job than it would be possible to obtain by the monkey wrench and screwdriver methods employed by the average garage man. Poor workmanship is expensive at any price.

Always Insist Upon GENUINE *Ford* Parts



It is most important that owners of Ford cars insist upon getting genuine Ford parts when having repairs or replacements made. This will be assured when the car is taken to the authorized Ford dealer, who is interested in the welfare of Ford owners and feels a responsibility for the repair work he performs.

Imitation or counterfeit parts of inferior quality are being made and sold as "Ford Parts." Avoid their use by dealing with the authorized Ford dealers. Do not risk your life and property to save a few cents in the purchase price of vital parts.

Ford parts are specially designed—the metals used are of special analysis, all steel and iron parts being specially heat treated to meet the various strains and stresses to which the car is subjected.

Genuine Ford parts—quality and workmanship considered—cannot be equalled in price without substituting inferior materials.

The Car and Its Operation

Filling the Radiator

Before starting the car, see that the radiator is filled with clean, fresh water. The system will hold approximately three gallons. The water will run out of the overflow pipe onto the ground when the entire water system has been properly filled. During the first few days that a new car is being driven it is a good plan to examine the radiator frequently and replenish the water supply whenever necessary.

Filling the Gasoline Tank

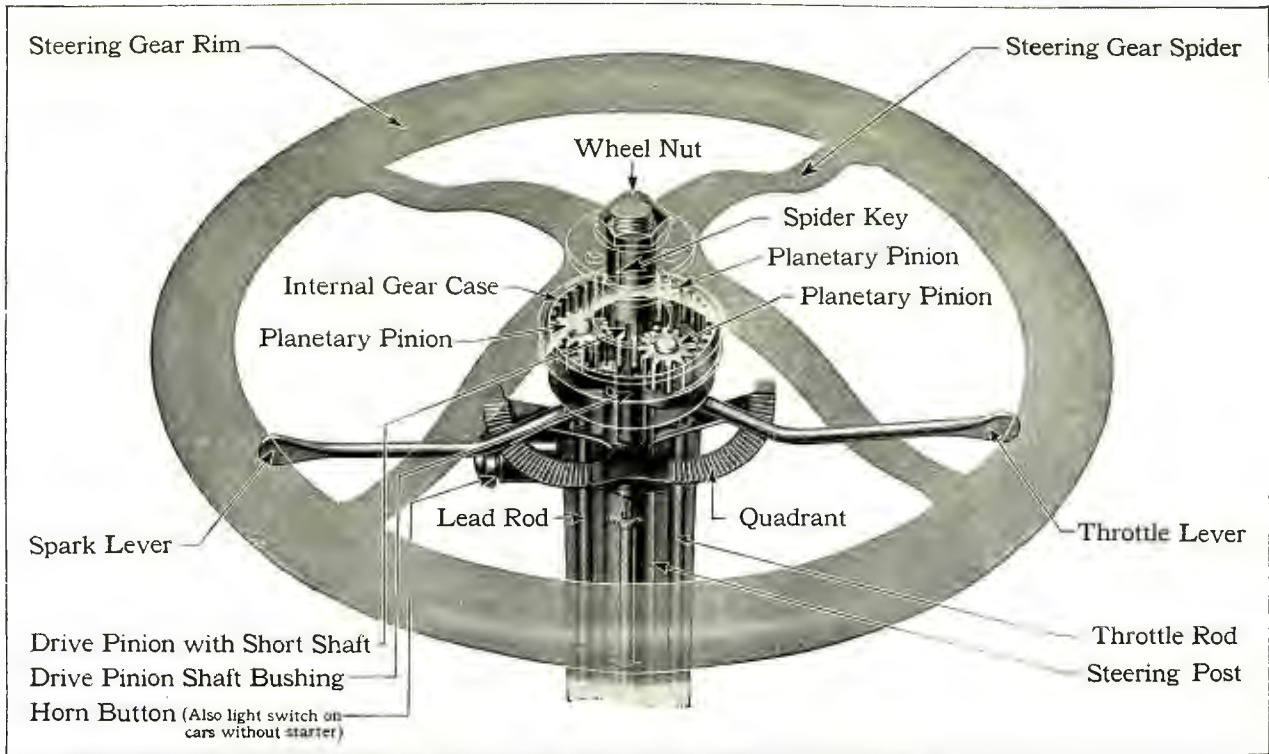
The gasoline tank should be filled and the supply should never be allowed to get low. When filling the tank be sure that there are no naked flames within several feet, as the vapor is extremely volatile and travels rapidly. Always be careful about lighting matches near where gasoline has been spilled, as the air within a radius of several feet is permeated with the highly explosive vapor. The small vent hole in the gasoline tank cap should not be allowed to get plugged up, as this would prevent proper flow of the gasoline to the carburetor. The gasoline tank may be drained by opening the pet cock in the sediment bulb at the bottom of the tank. Do not fill gasoline tank when engine is running.

Oiling the Car

Before starting the engine see that there is a sufficient supply of medium light, high-grade gas engine oil in the crankcase. Down under the car on the side of the crank case (the reservoir which holds this oil) you will find two pet cocks. See that there is sufficient oil in the crankcase so that the oil will run out of the upper pet cock when it is opened. If there is not sufficient oil more should be added through the breather pipe at the front of the engine (a metal cap covers it). Under no circumstances should the oil level be allowed to get below the lower cock. All other parts of the car are properly oiled when it leaves the factory. However, it will be well to see that all grease cups are filled and that oil is supplied to necessary parts. (See Cut No. 3, also chapter on Lubrication, page 10.)

Before Starting the Engine

See that the hand lever, which extends through the floor of the car at the left of the driver, is pulled back as far as it will go. The lever in this position holds the clutch in neutral and engages the hub brake, thus preventing the car moving forward when the engine is started.



Steering Wheel, showing reduction gears meshing with the teeth of the gear case and centre pinion. (Cut No. 1)

There are two small levers under the steering wheel—the right hand or throttle lever controlling the quantity of gas entering the cylinders and the left hand or spark lever regulating the timing of the spark which explodes the gas in the engine. The throttle lever should usually be placed in about the fifth or sixth notch, but the spark lever should be fully retarded (all the way up on the quadrant—the notched half-circle on which the levers operate). As soon as the engine starts the spark lever should be advanced notch by notch until the motor reaches its maximum speed.

Starting the Engine

First: Insert switch key and turn to left or battery side. Turn the switch key over to the right or magneto side as soon as the engine is started. Second: With the spark and throttle levers in the proper position, press on the starting switch (on the floor just ahead of the driver's seat) with the foot. This closes the circuit between the battery and starting motor, thus turning over the engine.

When the engine is cold, it is advisable to turn the vaporizer adjusting rod (located on the instrument board and also referred to as priming rod) a quarter turn to the left (anti-clockwise) and pull out on this rod to prime the engine. In order to avoid flooding the engine with an over-rich mixture of gas, the priming rod should only be held out for a few seconds at a time. As soon as the engine warms up turn adjusting rod back to the right.

Another method of starting a cold engine is as follows:

- (1) Fully retard spark lever and place throttle lever in about the fifth or sixth notch.
- (2) Turn vaporizer adjusting rod a quarter turn to the left.
- (3) Pull out priming rod while you turn the motor over a few times with the starter, then let go of priming rod.
- (4) Advance throttle lever to ninth or tenth notch.
- (5) Turn on switch.
- (6) Press on starter switch with foot turning engine over a few times when it should run.
- (7) As soon as the motor starts it is advisable to advance the spark eight or ten notches on the quadrant and let the motor run until thoroughly warmed. If you start out with a cold motor you will not have much power and are liable to "stall." The advantage of turning on the switch last, or after priming, is that when you throw on the switch and start the motor, you have plenty of gas in the cylinders to keep the motor running, thereby eliminating the trouble of the motor starting and stopping. After motor is warmed up, turn carburetor adjustment back one-quarter turn.

Operating Foot Pedals

The first pedal toward the left operates the clutch. When pressed forward the clutch pedal engages the low speed. When half-way forward the clutch is in neutral (i. e., disconnected from the driving mechanism of the rear wheels), and the releasing of this pedal engages the high-speed clutch. The center pedal operates the reverse. The right-hand pedal operates the transmission brake.

Starting the Car

1. Slightly accelerate the engine by opening the throttle.
2. Press the clutch pedal half-way forward, thereby holding the clutch in a neutral position while throwing the hand lever forward.
3. Press the clutch pedal forward into slow speed and when under sufficient headway (20 to 30 feet), allow the pedal to drop back slowly into high speed, at the same time partially closing the throttle, which will allow the engine to pick up its load easily. With a little practice, the change of speeds will be easily accomplished, and without any appreciable effect on the smooth running of the machine.

To Stop the Car

Partially close the throttle; release the high speed by pressing the clutch pedal forward into neutral; apply the foot brake slowly but firmly until the car comes to a dead stop. Except when a quick stop is necessary it is advisable to apply the brake until the speed of car is reduced, then release brake slightly and re-apply. This method of braking retains a film of oil between brake band lining and brake drum and prolongs the life of the band lining. In making emergency stops use both hand brake and foot brake. It is advisable, especially when stopping the car on wet or slippery pavements, to reduce the speed of the car by applying the foot brake, before releasing the clutch. Do not remove foot from the clutch pedal without first pulling the hand lever back to neutral position, or the engine will stall. To stop the motor turn off the switch.

Endeavor to so familiarize yourself with the operation of the car that to disengage the clutch and apply the brake becomes practically automatic—the natural thing to do in case of emergency.

To Reverse the Car

It must be brought to a dead stop. With the engine running, disengage the clutch with the hand lever and press the reverse

pedal forward with the left foot, the right foot being free to use on the brake pedal if needed. Do not bring the hand lever back too far or you will set the brakes on the rear wheels.

Experienced drivers ordinarily reverse the car by simply holding the clutch pedal in neutral with the left foot, and operating the reverse pedal with the right.

To Control the Spark

Drive with the spark lever advanced just as far as the engine will permit. Do not, however, advance the spark too far as this will cause a dull knock in the engine, due to the fact that the explosion occurs too early. The spark should only be retarded when the engine slows down on a heavy road or steep grade, and care should be exercised not to retard the spark too far as this will result in late ignition, which causes loss of power and overheating of the engine. Learn to operate the spark as the occasion demands. The greatest economy in gasoline consumption is obtained by driving with the spark advanced sufficiently to obtain the maximum speed.

Driving the Car

The different speeds required to meet road conditions are obtained by opening or closing the throttle. Practically all the running speeds needed for ordinary travel are obtained in high gear, and it is seldom necessary to use the low gear except to give the car momentum in starting. Careful driving will usually prevent skidding. However, should the car start to skid, the skid can usually be checked by turning the front wheels in the same direction as the rear wheels are sliding.

Descending Hills

Do not depend entirely on the brakes to hold the car when descending long hills.

Keep the clutch engaged in high speed and close the throttle, also leaving the ignition switch turned on. This allows the engine to turn over against compression, and the engine acts as a brake. On exceptionally steep hills, engage the low speed.

The Owner's Responsibility in Caring for the Car

Remember that a new machine requires more careful attention during the first few days it is being driven than after the parts have been thoroughly "worked in." To obtain the best results, the car should not be driven faster than 20 miles per hour for the first 500 miles. The oil should be changed after the first 400 miles, and every 750 miles thereafter. Never start out with

your car until you are sure that it has plenty of oil, water and gasoline.

Frequently inspect the running gear. See that no unnecessary play exists in either front or rear wheels, and that all bolts and nuts are tight. Make a practice of taking care of every repair or adjustment as soon as its necessity is discovered. This attention requires but little time and may avoid delay or possible accident on the road.

See that proper air pressure is maintained in all tires. Keeping the air pressure up to the recommended schedule (see page 33) has an important bearing on the life of tires.

Inspect your battery every two weeks and keep it filled to the proper level with distilled water. Remember that if the water is allowed to evaporate below the top of the plates, the life of the battery will be seriously affected.

The Ford dealer from whom you made the purchase will be glad to inspect your car, without charge, during the first thirty days after delivery. If the new owner will take advantage of this service and continue calling on the dealer for periodical inspections, it will insure his receiving the maximum of satisfaction from his investment.

The Ford Lubricating System

The Ford Lubricating System

It is simplified—and there are fewer places to oil. Practically all of the parts of the engine and transmission are oiled by the Ford splash system from the one big oil reservoir in the crankcase. Cut No. 3 shows the points of lubrication, and specifies when replacement should be made, according to mileage. This chart should be studied carefully and often. It is a good plan to frequently supply all oil cups with the same oil used in the engine (any good light grade lubricating oil will answer) and the dope cups with good grease. Be sure to see that the commutator is kept freely supplied with oil at all times.

Filling the Grease Cups

When filling grease cups it is advisable to fill the cup covers, screw them down, refill with grease and repeat the operation two or three times. Occasionally remove front wheel hub cap, fill with grease and screw back on—forcing the lubricant into the bearings, repeating this operation two or three times. A drop of oil now and then in crank-handle bearing is necessary. The axles, drive shaft and universal joint are well supplied with lubricant when the car leaves the factory, but they should be lubricated regularly as specified on lubrication chart.

The Proper Oil to Use

We recommend only medium light high-grade gas engine oil for use in the Model T motor. This grade of oil is preferred as it will naturally reach the bearings with greater ease and consequently less heat will develop on account of friction. This oil should, however, have sufficient body so that the pressure between the two bearing surfaces will not force the oil out and allow the metal to come in actual contact. Heavy and inferior oils have a tendency to carbonize quickly, also "gum up" the piston rings, valve stems and bearings. In cold weather a light grade of oil having a low cold test is absolutely essential for the proper lubrication of the car. Graphite should not be used as a lubricant in the engine or the transmission as it will have a tendency to short-circuit the magneto.

Draining the Crank Case

It is advisable to clean out the crank case by draining off the dirty oil when the new car has been driven four hundred miles; thereafter it will only be necessary to repeat this operation about every seven hundred and fifty miles. Remove the plug underneath the flywheel casing and drain off the oil. It is desirable to occasionally flush the crank case by replacing the crank case plug and putting two quarts of lubricating oil into the motor and running the engine slowly for a few minutes; then remove crank case plug and drain off the flushing oil, replace plug and refill with one gallon of fresh oil (see paragraph entitled "Oiling the Car," page 5).

Oiling the Commutator

Keeping the commutator well oiled is a matter of far greater importance than many drivers believe.

Put a little oil into the commutator every other day—at least every 200 or 300 miles. The same oil as used in the engine is satisfactory for this purpose. The commutator roller revolves very rapidly, and without sufficient lubrication the parts soon become badly worn. When in this condition perfect contact between the roller and the four contact points is impossible, and as a result the engine is apt to misfire when running at a good rate of speed.

Lubricating the Differential

Do not put too much grease in the differential housing. The housing should not be more than one-third full. The differential is supplied with the required amount of lubricant when the car leaves the factory. The oil plug should be removed about every 1,000 miles and more grease added if necessary. If a fluid

grease is used the level should be approximately one and one-half inches below the oil hole.

Oiling Generator and Starter Motor

The starting motor is lubricated by the Ford splash system, the same as the engine and transmission. The generator is lubricated by a splash of oil from the time gears. In addition an oil cup is located at the end of the generator housing and a few drops of oil should be applied occasionally.

Oiling the Fan

Occasionally remove the fan pulley plug, fill pulley hub with oil and replace plug.

Ford Engine

How Power is Produced

Gasoline flows from the tank to the vaporizer where it is mixed with air in the proper proportion, forming an explosive vapor or gas. This gasoline vapor is drawn through the intake manifold into the cylinders where it is compressed by the action of the pistons and exploded by an electric spark—thus producing power which turns the crank shaft. The exploded gas is driven out through the exhaust valves and pipe to the muffler. The power produced by the engine is in direct proportion to the quantity of gas supplied through the vaporizer and this is regulated by opening or closing the throttle lever under the steering wheel.

Care of the Valves

They seldom get out of order—but they do get dirty, as a result of carbon collecting on the valve seats. These carbon deposits, by preventing proper closing of the valves, permit the gases under compression to escape, resulting in loss of power and uneven running of the motor. If, when turning the engine over slowly, there is a lack of resistance in one or more cylinders, it is probable that the valves need re-grinding. As the "life" of the engine depends largely upon the proper seating of the valves, it is necessary that they be ground occasionally. It is advisable to have this done by a Ford dealer or Service Station, as doing the work satisfactorily requires special tools as well as skill and experience.

Cause of Engine Knocks

There are several causes, the two most common being carbon in the combustion chamber and too advanced spark.

Carbon knock is a clear, hollow sound, most noticeable in climbing sharp grades, particularly when the engine is heated. It is also indicated by a sharp rap immediately on advancing the throttle. The remedy is to remove carbon as directed in paragraph "How to Remove Carbon from Combustion Chamber."

Spark knock is indicated by a knock when the spark is fully advanced and which disappears when the spark is retarded. When the engine knocks from any cause consult a Ford dealer who will locate and correct the trouble.

How to Remove Carbon from Combustion Chamber

First, drain the water off by opening the pet cock at the bottom of the radiator; then disconnect the wires at the top of the motor and remove the spark coil; also disconnect the cylinder head outlet connection. Remove the 15 cap screws which hold the cylinder head in place. Take off the cylinder head and, with a putty knife or carbon scraper, scrape the carbonized matter from the cylinder head and top of pistons, being careful to prevent the specks of carbon from getting into the cylinder or bolt holes. In replacing the cylinder head gasket turn the motor over so that No. 1 and No. 4 pistons are at top center; place the gasket in position over the pistons and then put the cylinder head in place. Be sure and draw the cylinder head bolts down evenly (i. e., give each bolt a few turns at a time); do not tighten them on one end before drawing them up at the other. After the engine has warmed up the bolts should again be tightened.

The Ford Cooling System

Cooling the Engine

The Ford engine is cooled by the circulation of water through jackets which surround the combustion chamber. The water is circulated by thermo-syphon action, on the principle that hot water seeks a higher level than cooler water—consequently when the water becomes thoroughly heated it flows into the upper radiator tank and is cooled by filtering through the radiator tubes to the lower tank from which point it rises to repeat the process.

Overheating of Radiator

No harm will result if the water boils occasionally, especially in driving through mud, sand or up long hills in extremely warm weather. The engine develops the greatest efficiency when the water is heated nearly to the boiling point. If there is persistent

overheating when the car is being driven under ordinary conditions, inspect fan belt. If it is slipping tighten it by means of the eccentric in the fan bracket. Loosen fan bracket nut and adjust eccentric so that belt will just slip when fan is turned by hand, then tighten fan bracket nut. If this does not stop overheating, consult a Ford dealer who will locate and correct the trouble.

No trouble will result from filling a heated radiator with cold water, provided the top tank is not entirely empty. If the top tank is empty the motor should be allowed to cool before the cold water is put in.

Cleaning the Radiator

The entire circulating system should be thoroughly flushed out occasionally. To do this open the pet cock at the bottom of the radiator and insert a hose into the filler neck, allowing the water to flow through the system for about fifteen or twenty minutes.

Care of the Radiator in Winter

In freezing weather it is necessary to use an anti-freeze solution in the circulating system to prevent freezing of the water, and bursting the tubes of the radiator. In severe weather it is not safe to depend upon draining the radiator as a precaution against freezing. As the circulation does not commence until the water becomes heated, it is apt to freeze while the car is being driven, before the water has become heated sufficiently to circulate. The use of an anti-freeze solution is the best insurance against a radiator loss.

Anti-freeze solutions may be obtained from Ford dealers. Directions accompanying these solutions with regard to percentage of solutions to be used should be followed.

As anti-freeze solutions containing alcohol may prove injurious when brought in contact with the pyroxylin finish now being used on Ford cars, it is necessary when using an alcohol solution that the radiator cap be screwed down tightly against the gasket to prevent the solution spattering on the finish. Care must also be exercised to prevent the solution spilling on the finish when filling the radiator.

Gasoline System

How Vaporizer Operates

The vaporizer is of the automatic float feed type, having but one adjustment—the gasoline needle valve. The cross-section diagram of vaporizer (Cut No. 2) shows how the gasoline enters the vaporizer, is vaporized and passes through the inlet pipe

to the engine in the form of an explosive mixture. The gasoline, entering the bowl of the vaporizer, gradually raises the float to a point where the inlet needle is forced upwards into its seat, thus cutting off the flow of gasoline. As the gasoline in the bowl recedes, the float lowers, allowing the needle to drop from its seat and the flow of gasoline is resumed. It is plain to see that a constant level of gasoline is maintained in the vaporizer by the automatic action of float and needle. The quantity of gasoline entering into the mixture is governed by the needle valve. The volume of gas mixture entering the intake pipe is controlled by opening and closing the throttle, according to the speed desired by the driver.

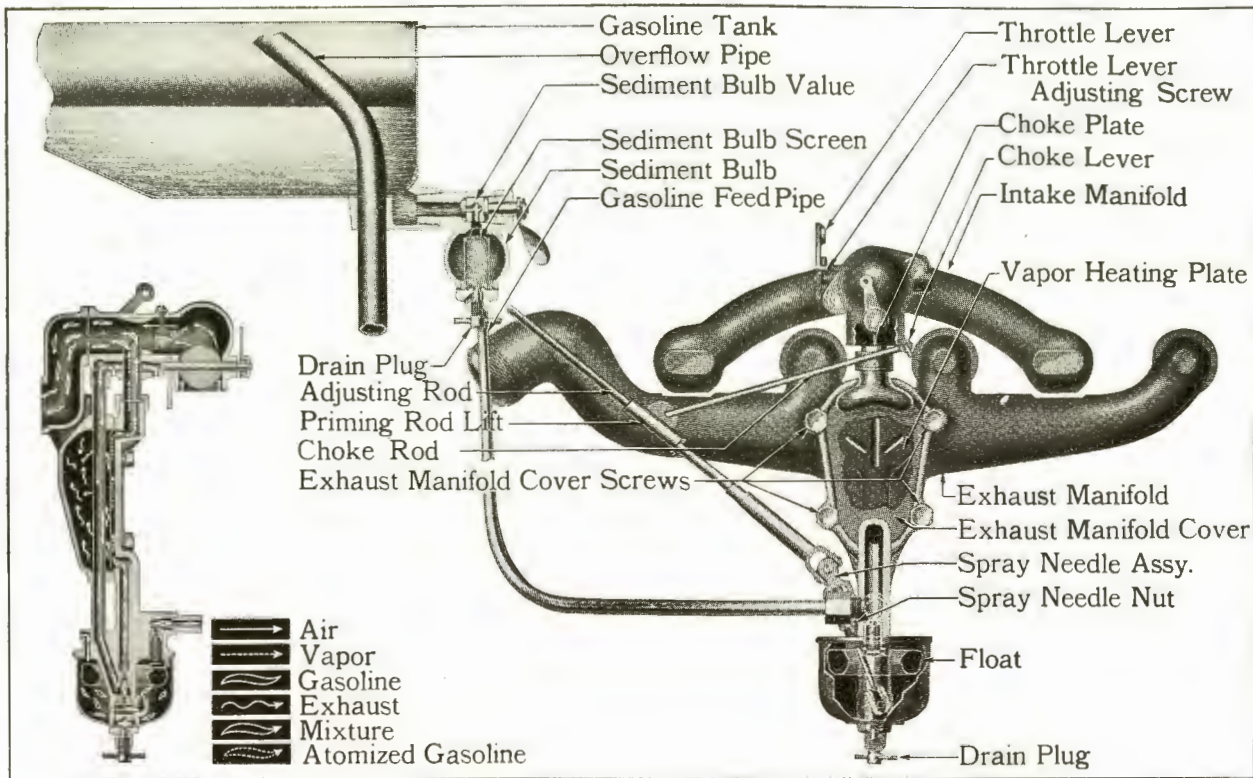
Regulate Vaporizer Adjustment from Instrument Board

After the new car has become thoroughly worked in, the driver should observe the angle of the vaporizer adjusting rod at which the engine runs most satisfactorily. In starting, particularly with a cold engine, turn the adjusting rod one-quarter turn to the left, turning it back to the right as soon as the engine warms up. The driver will find it economical to reduce the quantity of gasoline in the mixture by turning the adjusting rod to the right as far as possible without reducing speed. This is particularly true when taking long drives where conditions permit a fair rate of speed being maintained, and accounts for the excellent gasoline mileage obtained by good drivers.

Turning vaporizer adjustment too far to the right results in a "lean" mixture—too far to the left results in a "rich" mixture. A lean mixture has too much air and not enough gasoline. A rich mixture has too much gasoline and not enough air. A rich mixture will not only quickly cover the cylinders, pistons and valves with carbon, but will tend to overheat the cylinders, and is likewise wasteful of the fuel. It will often choke the engine and cause misfiring at slow speeds, although at high speeds the machine will run perfectly. The mixture should be kept as lean as possible without the sacrifice of any of the power of the motor. A lean mixture will often result in back-firing through the vaporizer, for the reason that the gas burns slowly in the cylinder, and is still burning when the inlet valve opens again, which causes the gas in the intake to ignite. A rich mixture is shown by heavy, black exhaust smoke with a disagreeable smell. Proper mixture will cause very little smoke or odor. For average running, a lean mixture will give better results than a rich one.

Adjustment of Vaporizer

The usual method of regulating the vaporizer is to start the motor, advancing the throttle lever to about the sixth notch,



This cut illustrates the principle of Ford Carburetion. (Cut No. 2)

with the spark retarded to about the fourth notch. The flow of gasoline should now be cut off by turning the vaporizer adjusting rod to the right until the engine begins to misfire, then gradually increase the gasoline feed by reversing the adjustment until the motor picks up and reaches its highest speed and no trace of black smoke comes from the exhaust.

Use care in adjusting the vaporizer as turning the needle down too tightly will result in its becoming grooved and the seat enlarged. When these parts are damaged it is difficult to maintain proper adjustment of the vaporizer.

Effect of Water in Fuel System

The presence of water in the vaporizer or gasoline tank, even in small amounts, will prevent easy starting and the motor will misfire and stop. As water is heavier than gasoline it settles to the bottom of the tank and into the sediment bulb along with other foreign matter. It is advisable to occasionally drain the gasoline tank sediment bulb and the vaporizer to clean out water as well as other foreign matter.

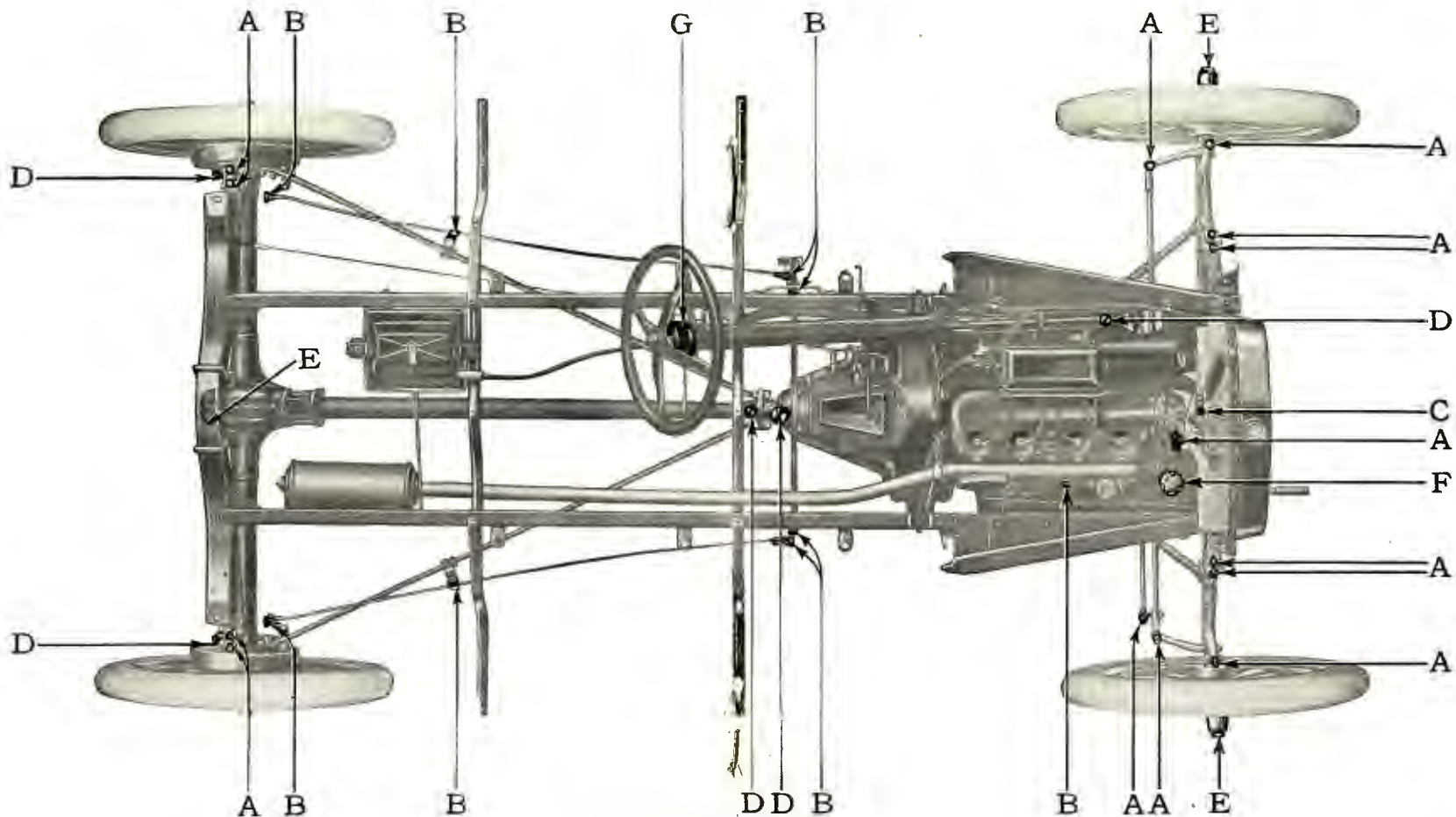
Result of Dirt in Vaporizer

The flow of gasoline entering the vaporizer through the feed pipe is automatically regulated by the float needle raising and lowering in its seat. Should any particle of dirt become lodged in the seat, which prevents the needle from closing, the gasoline will overflow in the bowl of the vaporizer and leak out upon the ground. The spraying nozzle of the vaporizer having a very small opening, a minute particle of grit or other foreign matter will clog up the opening, and as a result the motor will begin to misfire and slow down as soon as it has attained any considerable speed. This is accounted for by the fact that at high speeds the increased suction will draw the particles of dust, etc., into the nozzle. By opening the needle valve half a turn and giving the throttle lever two or three quick pulls the dirt or sediment will often be drawn through, when the needle may be turned back to its original place. If this does not accomplish the purpose, the vaporizer should be drained.

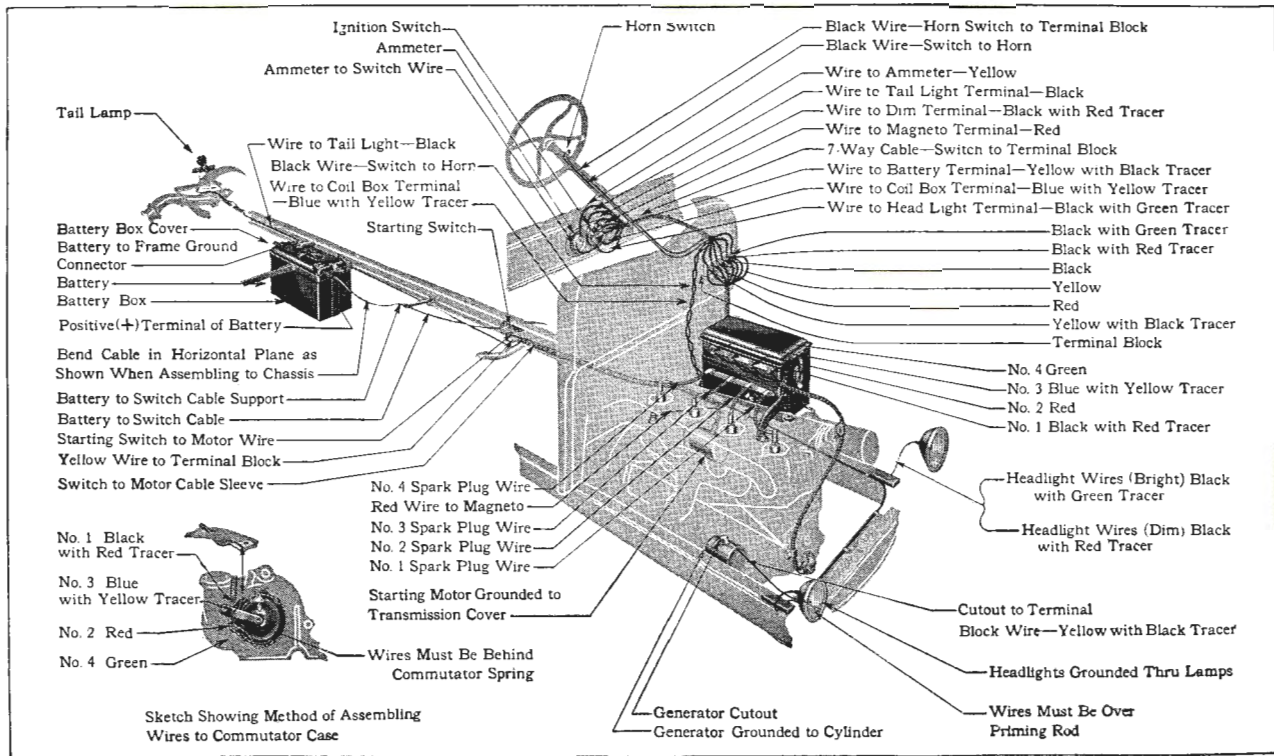
Cleaning Vaporizer Heating Plate

Approximately every five thousand miles it is advisable to remove and clean the vaporizer heating plate.

This plate can be easily removed by removing the four exhaust manifold cover screws, loosening the vapor outlet tube nut and moving the cover away from the manifold.



A-Oil Every 200 Miles
 B-Oil Every 500 Miles
 C-Oil Every 1000 Miles
 D-Grease Every 500 Miles
 E-Grease Every 1000 Miles
 F-Oil Motor Daily. Keep Oil Level
 between crank case pet cocks
 G-Grease Every 5000 Miles



Wiring Diagram Cars Equipped with Starter. (Cut No. 4)

To Prevent Engine Running Too Fast or Choking with Throttle Retarded

If the engine runs too fast with the throttle fully retarded, unscrew the vaporizer throttle lever adjusting screw until the engine idles at suitable speed. If the motor chokes and stops when throttle is fully retarded the adjusting screw should be screwed in until the proper adjustment is obtained.

Starting Warm Motor

The vaporizer does not ordinarily require priming when the motor is warm, and starting with the rod pulled out is apt to "flood" the engine with an over-rich mixture of gas, which does not readily explode. This naturally causes difficulty in starting. If you should accidentally flood the engine, close the throttle and turn the engine over a few times in order to exhaust the rich gas.

Ignition System

Source of Ignition Current

The Ford car is equipped with a dual ignition system, the current being supplied by either battery or magneto. As the magneto current delivers a hotter spark, we recommend the use of the magneto for ignition purposes rather than the battery. The magneto or battery current is delivered to the spark coil by the connecting wires.

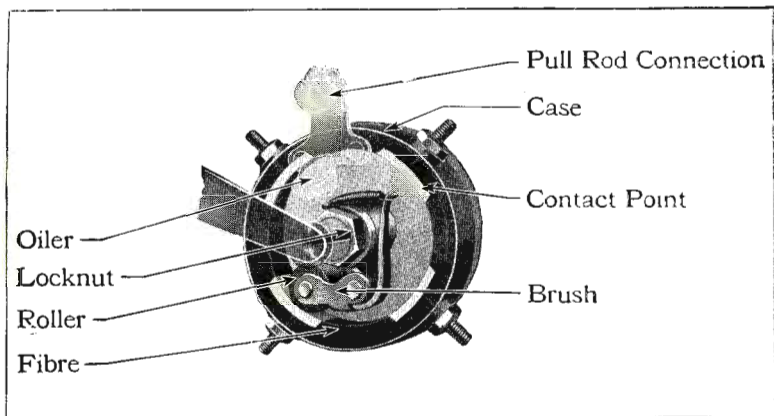
The Spark Coil

The spark coil, consisting of four coil units in a metal box, mounted on the engine, receives the low tension current from magneto or battery, and transforms it into the high tension current necessary to produce the spark at spark plug.

The Commutator

The commutator (or timer) determines the instant at which the spark plugs fire.

The commutator should be kept clean and well oiled at all times. Even the best grades of lubricating oil are apt to congeal to some extent in cold weather. If this occurs in the commutator it may prevent the roller from making perfect contact with the contact points. To overcome this, we recommend the use of a mixture of kerosene with lubricating oil during freezing weather which will thin it sufficiently to prevent congealing.



The Ford Commutator
(Cut No. 5)

Removing the Commutator

Remove cotter pin from spark rod and detach latter from commutator. Loosen the cap screw which goes through breather pipe on top of the time gear cover. This will release the spring which holds the commutator case in place and this part can be readily removed. To remove the brush, unscrew lock nut; withdraw steel brush cap and remove the retaining pin. The brush can then be removed from the cam shaft.

The Spark Plugs

The spark plugs (one located at the top of each cylinder) are the medium through which the electric current ignites the gasoline charge in the cylinder. Hard starting or misfiring of the engine may be caused by dirty spark plugs or spark plugs on which the spark gap is not properly set. (See paragraph on cleaning spark plugs, for directions as to cleaning the plugs and adjusting the spark gap.) There is nothing to be gained by experimenting with different makes of spark plugs as the spark plugs with which Ford engines are equipped when they leave the factory are best adapted to the requirements of the Ford engine.

Cleaning and Adjusting Spark Plugs

After removing the plug from the engine the points may be cleaned with an old tooth-brush dipped in gasoline. However, in order to do the work thoroughly, the plug should be taken apart by securing the large hexagon steel shell in a vise and loosening the pack nut which holds the porcelain in place. The

carbon deposits can then be easily removed from the porcelain and shell with a small knife.

The distance between the sparking points should be $\frac{1}{16}$ " , about the thickness of a smooth dime.

Misfiring of Engine

Misfiring may result from trouble in the ignition system, the fuel system or valves.

To determine the cause of misfiring, start the engine and place a screw driver on the cylinder head near one of the spark plugs, then lean it against spark plug terminal. This "shorts" the current past the spark plug. (To prevent receiving shock, use a screw driver with a wooden handle in making this test.) Check each plug in this manner until one is found the "shorting" of which makes no change in the sound of the exhaust. When this plug is found, the trouble lies in the ignition or valves of that cylinder. Next, stop the engine and disconnect the spark plug wire from the plug in the missing cylinder, then start the engine and hold the end of this wire approximately $\frac{1}{8}$ " away from any part of the cylinder head. If a spark occurs the trouble lies in the plug and can be overcome by cleaning, or if necessary, installing a new plug. Before replacing the plug, check the spark plug points for gap. The gap between the points should measure approximately $\frac{1}{32}$ ". Also examine the porcelain to make sure that it has not been cracked.

If no spark occurs when the above test is made, again hold the end of the spark plug wire approximately $\frac{1}{8}$ " away from the engine, at the same time shorting the commutator terminal of the missing cylinder at the coil box by placing a screw driver on the cylinder head and resting it against the terminal. (The commutator terminals on the coil box are the four upper terminals and for convenience are numbered 1, 2, 3, and 4 to correspond with the cylinders.) If a spark occurs between spark plug wire and cylinder the trouble lies in the commutator or commutator loom and can be detected by inspecting the loom for breaks in the wire and insulation and noting whether commutator loom terminals are properly soldered and that the points where they are connected to commutator case and coil box are clean and all connections are tight.

If the trouble is not in the loom or connections, remove commutator as described in paragraph entitled "Removing the Commutator," page 22. Clean the commutator thoroughly by washing it with kerosene. Inspect interior surface of the commutator where the roller travels; this surface should be clean and smooth. If the surface is uneven and as a result, the roller fails

to make good contact with any one of the four contact points, its corresponding cylinder will not fire. This usually occurs when driving at high speed. Examine roller for wear. Inspect brush spring to see that spring is not weak or broken. If commutator case or roller is badly worn or the spring is weak or broken, new parts should be installed.

If no spark occurs between spark plug wire and cylinder when commutator terminal is shorted to cylinder head, the trouble probably lies in the spark coil and the car should be driven to a Ford dealer who has special equipment for testing and adjusting units, and will gladly furnish expert service.

If the Ford dealer, upon checking the spark coil, finds it O. K., the trouble will no doubt be due to the valves or fuel system. (See chapters on engine and fuel system.)

The Ford Starting and Lighting System

The Starting and Lighting System

The starting and lighting system is of the two unit type and consists of the starting motor, generator, storage battery, ammeter and lights, together with the necessary wiring and connections.

The Starting Motor

The starting motor is mounted on the left side of the engine. If the starting motor turns the crank shaft over and the engine fails to start, the trouble is not in the starting system. In this event take your foot off the starter switch at once, so as not to unnecessarily discharge the battery, and inspect the vaporizer and ignition system to determine the trouble. (See chapters on gasoline system and ignition system.)

If the starting motor fails to act when the starter switch is depressed, inspect the terminals on starting motor, battery, and starting switch and ground connection to frame. If these connections are tight, examine the wiring for a short circuit. If the wiring and connections are O. K. and the starting motor fails to act, the battery is no doubt discharged and should be taken to a Ford dealer for recharging.

The Generator

The generator is mounted on the right-hand side of the engine and bolted to the cylinder front end cover.

The Ammeter

The ammeter is located on the instrument board. This indicator registers "charge" when the generator is charging the battery

and "discharge" when the lights are burning and the engine not running above 10 miles per hour. At an engine speed of 15 miles per hour or more the ammeter should show a reading of from 8 to 10 amperes with lights turned off. If the engine is running above 15 miles per hour and the ammeter does not register "charge," ground generator as indicated in paragraph "Running Engine with Generator Disconnected from Battery," page 26. Consult a Ford dealer, who will locate and correct the trouble.

Operation of the Lights

The lighting system consists of two headlights and a tail light operated by a switch located on the instrument board. All closed cars are equipped with an instrument panel lamp and the Fordor Sedan also has a dome lamp. The headlamp bulbs are of 6-8 volt, double filament gas filled type. The major filament is 21 candle-power, and the minor filament is two candle-power. The small bulb used in the tail light, instrument panel lamp and dome lamp is of 6-8 volt, single contact, three candle-power type. All of the lamps are connected in parallel so that the burning out or removal of any one of them will not affect the others. Current for the lamps is supplied by the battery. Do not connect the lights to the magneto as it will result in burning out the bulbs and might discharge the magnets. Cut No. 4 shows the different circuits.

Attention Required by Headlights

When the car is delivered to the owner, the headlamps are properly focused and aligned, and they should require no attention other than replacement of burned out bulbs or broken lenses, and refocusing or realigning should they get out of focus or alignment. Headlights equipped with the Ford refracting lens and Ford 21 candle-power gas filled bulbs, when properly focused and aligned, pass the lighting requirements of all states, and should they get out of focus or alignment they should immediately be refocused and realigned.

Replacing Bulbs

When replacing burned out bulbs purchase genuine Ford bulbs (marked with the name FORD on the base), as satisfactory results cannot be obtained with the many inferior bulbs now on the market. It is essential that the Ford 21 candle-power gas filled bulbs be used in the lamps equipped with the Ford Refracting Lens as the use of any other than genuine Ford bulbs may result in the lights failing to meet the lighting requirements of the various states.

Focusing and Aligning Headlights

When headlamps need refocusing or realigning the car should be taken to a Ford dealer, as Ford dealers are specially equipped to do this work.

Running Engine with Generator Disconnected from the Battery

If for any reason the engine is run with the generator disconnected from the battery, as when battery has been removed for repair or recharging, be sure that the generator is grounded by running a wire from the terminal on generator nearest dash to one of the dust cover screws in the yoke. Two strands of shipping tag wire may be used for this purpose. Be sure the connections at both ends of the wire are tight. Failure to do this when running the engine with the generator disconnected from the battery will result in serious damage to the generator. **NEVER GROUND THE GENERATOR THROUGH THE CUT-OUT.**

The Ford Battery

The Ford Starting System uses a six-volt, 13 plate battery, designed and built in our factory to meet the requirements of the Ford car. The Ford battery cannot be compared with batteries having fewer plates and built to sell at bargain prices. The value of a battery depends upon the quality of the materials entering into its construction. Cheap batteries are short lived and a poor investment. Consult your Ford dealer on this battery question.

Adding Water to Battery

Add water to battery every two weeks, using distilled water. The solution (electrolyte) should be maintained at a level with the bottom of the filling tube. All water for battery use should be kept in clean, covered vessels of glass, china, earthenware, rubber or lead. In cold weather add water only immediately before running the engine so that the charging will mix the water and electrolyte, and avoid freezing. If, for any reason, it is necessary to add acid, the battery should be taken to a Ford dealer. Your Ford dealer will be glad to inspect your battery and add water.

Care to be Given Filling Plugs and Connections

Keep the filling plugs and connections tight and the top of the battery clean. Wiping the battery with a rag moistened with ammonia will counteract the effect of any of the solution which may be on the outside of the battery. A coating of heavy oil or vaseline will protect the connectors from corrosion. It is of

vital importance that the battery is firmly secured in its supporting brackets at all times. If clamps are loose, the battery will shift about in the compartment and result in loose connections, broken cells and other trouble. If repairs are necessary or if the car is to be laid up for the winter, take the battery to a Ford dealer for proper attention and storage. Do not entrust the battery to inexperienced or unskilled hands.

The Ford Transmission

Adjusting Bands

The slow speed band may be tightened by loosening the lock nut at the right side of the transmission cover, turning the adjusting screw (see Cut No. 6) to the right and tightening the lock nut. To tighten the brake and reverse bands remove the transmission cover door and tighten the adjusting nuts on the shafts. See that the bands do not drag on the drums when disengaged, as they exert a brake effect, and tend to overheat the motor. However, the foot brake should be adjusted so that a sudden pressure will stop the car immediately, or slide the rear wheels in case of emergency. The bands, when worn to such an extent that they will not take hold properly, should be re-lined, so that they will engage smoothly without causing a jerky movement of the car.

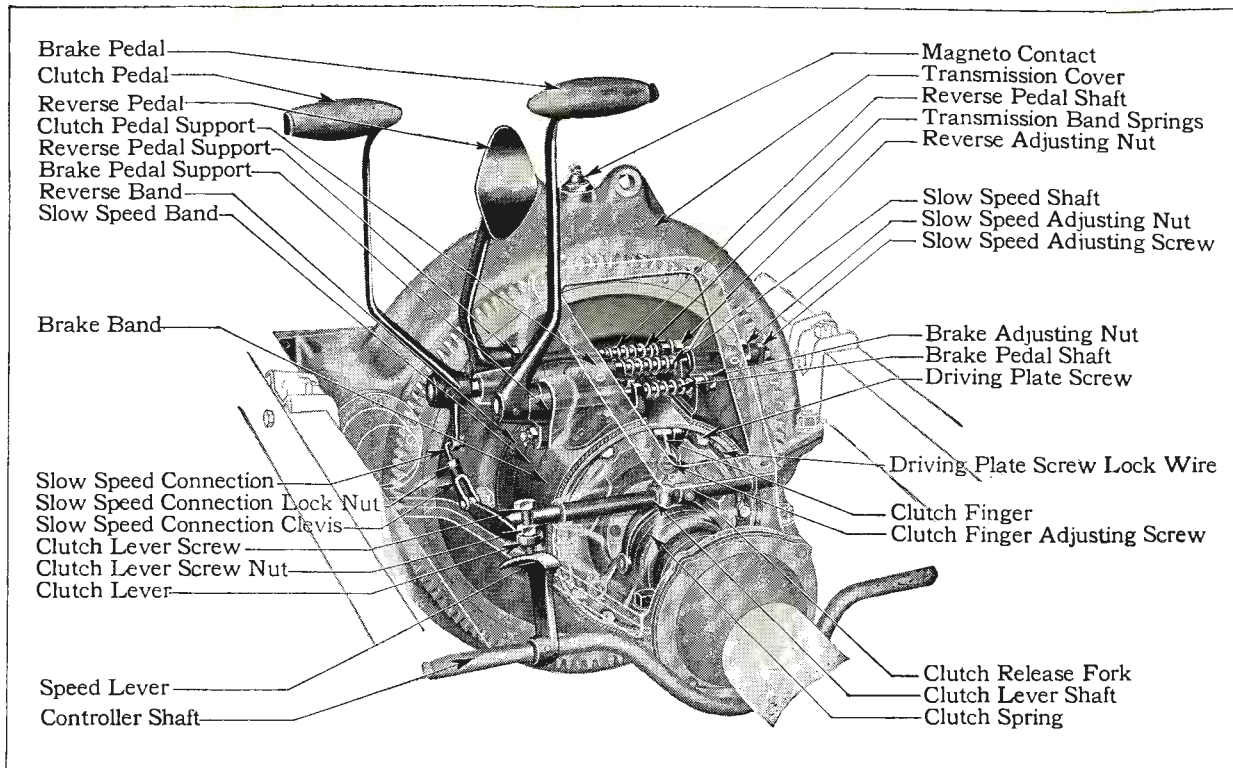
Removing Bands

To remove the transmission bands, remove the transmission cover door. Run off the nuts and lock washers from the ends of the pedal shafts, run out slow speed adjusting screws, and remove springs.

"EXTREME CARE SHOULD BE EXERCISED TO PREVENT DROPPING ANY PARTS INTO THE TRANSMISSION."

The reverse pedal and brake pedal should then be withdrawn as far as possible, and the detachable ears removed. To remove the ear, simply insert a tool (a screw driver with the end bent over approximately one-quarter inch) through the end of the ear into the square hole in the end of the transmission band and lift up on the tool, forcing the band down and the ear back. The bands may then be withdrawn from the right side, permitting them to follow close to the cover to prevent their being distorted.

To replace the bands, insert the plain end in the right side of the transmission cover, forcing the band around until it is



The above drawing of Transmission shows clearly the operation of Clutch, Reverse and Brake Pedals. (Cut No. 6)

possible to reach the square hole with the hooked tool. When the end of the band has been pulled around, the ear may be slipped over the studs and forced forward into the locked position, if necessary forcing it forward with the hooked tool.

The reverse band should be replaced first, the brake band second and the slow speed band last.

The slow speed adjusting screw, reverse and pedal shafts and transmission band springs are now reassembled, and the ears drawn into place, holding them against the compression of the spring with the hooked tool.

The lock washers and nuts may then be replaced and the bands adjusted in the regular way. The raised point on the washers must be placed toward the nut so as to engage in the notch in the nut.

The Running Gear

Care of Running Gear

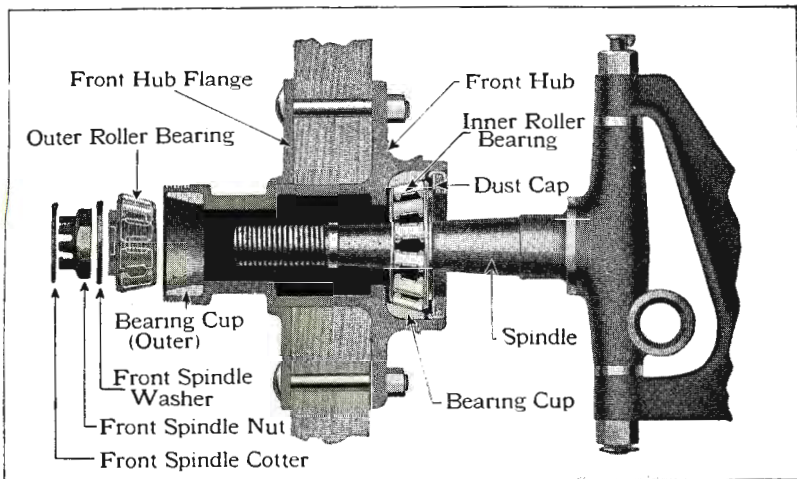
Every few weeks the front and rear axles should be carefully gone over to see that all nuts and connections are tight, with cotter pins in place. The spring clips, which attach the front spring to the frame, should be inspected frequently to see that everything is in perfect order.

The Front Wheels

The front wheels should be jacked up periodically and tested for smoothness of running, and side play. A wheel in perfect adjustment should, after spinning, come to rest with the tire valve directly below the hub. Undue wear of the hub bearings is usually caused by lack of lubrication and excessive friction, due to the adjusting cone being screwed up too tight. It is a good plan to clean the bearings frequently and keep the hub well filled with grease.

Adjusting Front Wheels

Take off hub cap, remove cotter pin nut and spindle washer. Adjust bearing so that the wheel seems to bind; give the wheel a few turns to be sure that all the working parts are in perfect contact; then back off the bearing $\frac{1}{4}$ to $\frac{1}{2}$ turn, which will allow the wheel to revolve freely without end play. To determine if there is end play, grasp the spokes and shake the wheel. Do not mistake loose spindle bushings for loose bearings. Insert a cold chisel between axle and spindle to take up any play while testing the bearings. Next, put on spindle washer and nut, drawing the nut to a firm bearing. Make sure that the bearing has not been forced out of adjustment. This can be determined



Sectional view of Hub showing Roller Bearings. (Cut No. 7)

by giving the wheel a few turns. Insert the cotter pin which locks the nut on the spindle, fill the hub cap with grease and screw it in place on the hub.

Emergency Brake

When the emergency brake requires relining the car should be driven to a Ford dealer who has the facilities for properly doing this work.

Care of Springs

The springs should be lubricated frequently with oil or graphite. To do this, loosen spring clamps, pry the leaves apart near the ends and insert the lubricant between them. This will restore the original flexibility of the springs and improve the riding quality of the car.

It is a good plan to frequently inspect the clips which hold the springs to the frame and see that they are kept tight, otherwise the center bolt may become sheared off—allowing the frame and body to shift a trifle to one side.

Ford Wire Wheels

To remove Ford wire wheels remove the five hub bolt nuts and the wheel can be lifted off hub. In replacing wheel replace all hub bolt nuts, tightening each one a few turns. Then follow around hub, tightening each nut firmly. If nuts are not drawn up evenly wheel will not run true.

Care of Tires

To Remove Balloon Tire from Rim

Jack up wheel. Remove valve cap and lock nut. Remove rim nuts and rim. Unfasten rim lock at split by removing lock screw or pin or loosening the cam lock. Separate rim at split by lightly tapping rim at the split or by bouncing the rim on the ground, striking the tire on ground at point about 3 inches from the split, on the side opposite the valve stem hole. The tire can then be removed with the hands or tire iron.



Cut No. 8

stone or talc in casing, and insert tube. Place the flap in position so it will protect tube from rim. Position casing and tube on rim with valve stem in the valve stem hole. Starting from this point, follow around rim, placing casing on rim to a point within about 4 inches of the split. Insert the tire iron at split in rim and exert slight pressure against lock plate, forcing rim together. Then place tire iron or screw driver in the split in rim and force rim in position, after which lock rim by means of lock screw or pin or cam lock.

Removing Tires from Ford Wire Wheels (Drop Center Rims)

Remove valve cap and lock nut and place wheel so that valve is at the top. Remove valve inside, thus permitting all air to escape from tube. Push valve stem up into tire. Working both ways from the valve stem, press the casing



Cut No. 9

together and down into the rim well, approximately one foot each side of the valve stem. (See cut No. 9.) Insert tire iron under both beads at point opposite valve and force tire over rim. The tire can then be removed from the wheel with the hands.



Cut No. 10

Mounting Tires on Ford Wire Wheels (Drop Center Rims)

Inflate tube until it is barely rounded out, and insert tube in casing. (Caution: Never use tire flap when mounting tires on Ford wire wheels.) With wheel placed so that valve stem hole is at top, place casing and tube on wheel with valve in valve stem hole. Working both ways from the valve stem, press the casing together and down into the rim well, until lower part of casing can be placed on rim with hands. Raise tire up until it is perfectly centered on rim

and beads are seated on bead seats. Inflate tube to not more than two pounds pressure and work casing back and forth, to insure proper setting of tire, indicated by red line on tire being equally spaced from rim all way around. (See cut No. 10.) Caution: With Ford Wire Wheels (drop center rims) use only casings with red centering line just above rim flange, and tubes marked "for drop center rims."

It is particularly important that the red line show an even distance from the rim all around on both sides before fully inflating tire. Put valve nut on valve and inflate tire. With Ford Wire Wheels, tires can be more easily changed with wheel mounted on axle or tire carrier than by laying the wheel on the ground.

Repairing Tube or Casing

Directions for repairing tubes are given on the can containing the tire patching material. Breaks in the inside of the casing may be temporarily repaired by using same material and following same directions as for repairs to tube.

Before inserting tube in casing, inspect casing to see that there is no dirt or other substance in it which might injure the tube.

Keeping Tire Expense Down

To get the most service at the least expense, the tires should be inspected frequently and all small cuts or holes properly sealed or repaired—thus preventing dirt and water working in between the rubber tread and the fabric, causing blisters or sand holes. Tires should never be run partially deflated, as the side walls are unduly bent and the fabric is subjected to stresses which cause what is known as rim cutting. The chances of getting a puncture will be greatly reduced by keeping your tires inflated as specified below. Be on the safe side with two or three extra pounds of air in each tire. Don't take the chance of ruining your tires with too little air.

Following is a table showing correct balloon tire pressure on Ford cars and trucks:

Roadster	Front, 27 lbs.; Rear, 27 lbs.
Touring Car	Front, 27 lbs.; Rear, 27 lbs.
Coupe	Front, 27 lbs.; Rear, 27 lbs.
Tudor Sedan	Front, 27 lbs.; Rear, 30 lbs.
Fordor Sedan	Front, 27 lbs.; Rear, 30 lbs.
Roadster with Pick-up Body	Front, 27 lbs.; Rear, 30 lbs.
Truck	Front, 40 lbs.; Rear, 80 lbs.

Running a tire flat, even for a short distance, is sure to be costly.

Remember that skidding shortens the life of the tires. Avoid locking the wheels with the brakes—no tire will stand the strain of being dragged over the pavement in this fashion.

Avoid running in street car tracks, in ruts, or bumping the sides of the tire against the curbing.

The wheel rims should be painted each season and kept free from rust.

When mounting rim on wheel replace rim nuts and tighten each one a few turns. Then follow around rim, tightening nuts firmly.

If nuts are not drawn up evenly rim will not run true.

When a car is idle for any appreciable length of time, it should be jacked up to take the load off the tires. If the car is laid up for many months it is best to remove the tires, and wrap up the outer casings and inner tubes separately, and store them in a dark room not exposed to extreme temperatures. Remove oil or grease from the tires with gasoline. Remember that heat, light and oil are three natural enemies of rubber.

Points on Maintenance

The Proper Way to Wash the Car

Always use cold or lukewarm water—never hot water. If a hose is used, don't turn on the water at full force, as this drives the dirt into the finish, thereby causing injury. After the surplus mud and grime have been washed off take a sponge and clean the body and running gear with a solution of water and linseed oil soap. Rinse off with cold water; then rub and polish the body with a damp chamois skin. A body polish of good quality may be used to add lustre to the car. Grease on the running gear may be removed with a gasoline-soaked sponge or rag. The nickeled parts may be polished with a good nickel polish. An excellent body polish and nickel polish may be purchased from the Ford dealer.

Should the body or other Pyroxylin finished parts of the car become spattered with tar or other substances used on roads, the spots can be easily removed with benzol or gasoline. If full strength gasoline or benzol is used, there is a possibility of softening the finish. It is therefore suggested that the benzol or gasoline be mixed with one-third its own volume of motor oil.

Dip a soft cloth into the mixture and, using only one finger, rub the spot gently until it has been removed. The rubbed spot should then be washed off with clear water.

Care of the Top

When putting the top down be careful in folding to see that the fabric is not pinched between the bow spacers, as they will chafe a hole through the top very quickly. Applying Ford top dressing will greatly improve the appearance of an old top.

Storing Car

Drain the water from the radiator, and then put in about a quart of anti-freeze solution, to prevent freezing of any water that may possibly remain. Remove cylinder head and clean out any carbon deposits in combustion chamber. Draw off all the gasoline. Drain the dirty oil from the crank case and flush the crank case, as directed in paragraph "Draining the Crank Case," page 11. Refill the crank case with one gallon of fresh oil and run the engine enough to cover the different parts with oil. Remove the tires and store them away. (See paragraph "Keeping Tire Expense Down," page 33.) Wash the car, and if possible cover the body with a sheet or muslin, to protect the finish.

Summary of Engine Troubles and Their Causes

Engine Fails to Start

1. Gas mixture too lean.
2. Water in gasoline.
3. Vibrators adjusted too close.
4. Water or congealed oil in commutator.
5. Magneto contact point (in trans. cover) obstructed with foreign matter. (This would not apply when car is being started on battery.)
6. Gasoline supply shut off.
7. Vaporizer frozen (in zero weather).
8. Water frozen in gasoline tank sediment bulb.
9. Ignition switch off.

Engine Lacks Power—Runs Irregularly

At Low Speeds

1. Poor compression—account leaky valves.
2. Gas mixture too rich or too lean.
3. Spark plugs dirty.
4. Coil vibrator improperly adjusted.
5. Air leak in intake manifold.
6. Weak exhaust valve spring.
7. Too great clearance between valve stem and push rod.
8. Too close gap between spark plug points.

At High Speeds

1. Commutator contact imperfect.
2. Weak valve spring.

3. Too much gap in spark plug.
4. Imperfect gas mixture.
5. Vibrator points dirty or burned.

Engine Stops Suddenly

1. Gasoline tank empty.
2. Water in gasoline.
3. Flooded vaporizer.
4. Dirt in vaporizer or feed pipe.
5. Magneto wire loose at either terminal.
6. Magneto contact point obstructed.
7. Overheated—account lack of oil or water.
8. Gas mixture too lean.

Engine Overheats

1. Lack of water.
2. Lack of oil.
3. Fan belt torn, loose or slipping.
4. Carbon deposit in combustion chamber.
5. Spark retarded too far.
6. Gas mixture too rich.
7. Water circulation retarded by sediment in radiator.

Engine Knocks

1. Carbon deposit on piston heads.
2. Loose connecting rod bearing.
3. Loose crank shaft bearing.
4. Spark advanced too far.
5. Engine overheated.

