The F. A. Starting *and* Lighting System

Installed on

Sedans *and* Coupes

FORD MOTOR COMPANY
DETROIT, MICHIGAN

Introduction

IN this pamphlet we describe the type of starting and lighting system used on Sedans and Coupes, also the care and operation of the different units making up the system.

We do not discuss repairs to the starter or generator, as dealers and customers should not attempt repairs when it is necessary to tamper with the mechanism.

The F. A. Starting and Lighting System Installed on Sedans and Coupes

Of what does the Starting and Lighting System consist?

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

Where is the Starter located?

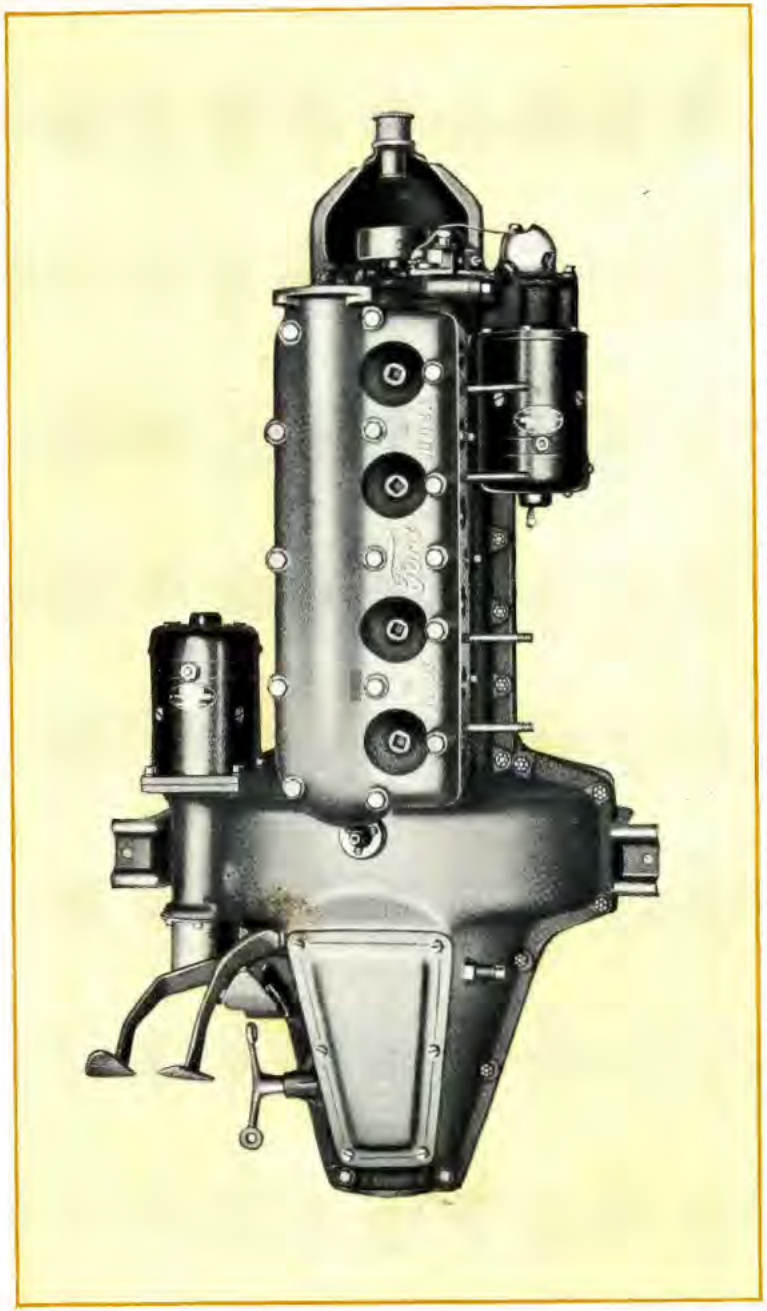
The starting motor is mounted on the left-hand side of the engine and bolted to the transmission cover. When in operation the pinion on the Bendix drive shaft engages with the teeth on the flywheel.

What must be done before starting the Engine?

The spark and throttle levers should be placed in the same position on the quadrant as when cranking by hand, and the ignition switch turned on. Current from either battery or magneto may be used for ignition. When starting, especially if the engine is cold, the ignition switch should be turned to "battery." As soon as the engine is warmed up, turn switch back to "magneto." The magneto was designed to furnish ignition for the Model T engine and better results will be obtained by operating in this way. Special attention must be paid to the position of the spark lever as a too advanced spark will cause serious back firing which in turn will bend or break the shaft in the starter. The starting motor is operated by a push button, conveniently located in the floor of the car at the driver's feet. With the spark and throttle levers in the proper position, and the ignition switch turned on, press on the push button with the foot. This closes the circuit between the battery and starting motor, causing the pinion of the Bendix drive shaft to engage with the teeth on the flywheel, thus turning over the crank shaft. When the engine is cold it may be necessary to prime it by pulling out the carburetor priming rod, which is located on the instrument board. 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.

What if the Engine fails to start?

If the starting motor is turning the crank shaft over and the engine fails to start, the trouble is not in the starting system. In this event, release the button at once so as not to unnecessarily discharge the battery and inspect the carburetor and ignition system to determine the trouble.



Top View of Model T Motor, Showing Starter and Generator in Position (Cut No. 1)

What if the Starting Motor fails to act?

If the starting motor fails to act, after pushing the button, first inspect the terminal on the starting motor, the two terminals on the battery and the two terminals on starting switch, making sure all of the connections are tight; then examine the wiring for a break in the insulation that would cause a short-circuit. If the wiring and connections are O. K. and the starting motor fails to act, test the battery with a hydrometer. If the hydrometer reading is less than 1.225 the trouble is no doubt due to a weak or discharged battery.

How is the Generator operated?

The generator is mounted on the right-hand side of the engine and bolted to the cylinder front end cover. It is operated by the pinion on the armature shaft engaging with the large time gear. The charging rate of generator is set so as to cut in at engine speeds corresponding to 10 miles per hour in high speed and reaches a maximum charging rate at 20 miles per hour. At higher speeds the charge will taper off, which is a settled characteristic of battery charging. This operation of cutting in and cutting out at suitable speeds is accomplished by the cut-out, which is mounted on the dash. This cut-out is set properly at the factory and should not under any circumstances be tampered with.

What about Oiling?

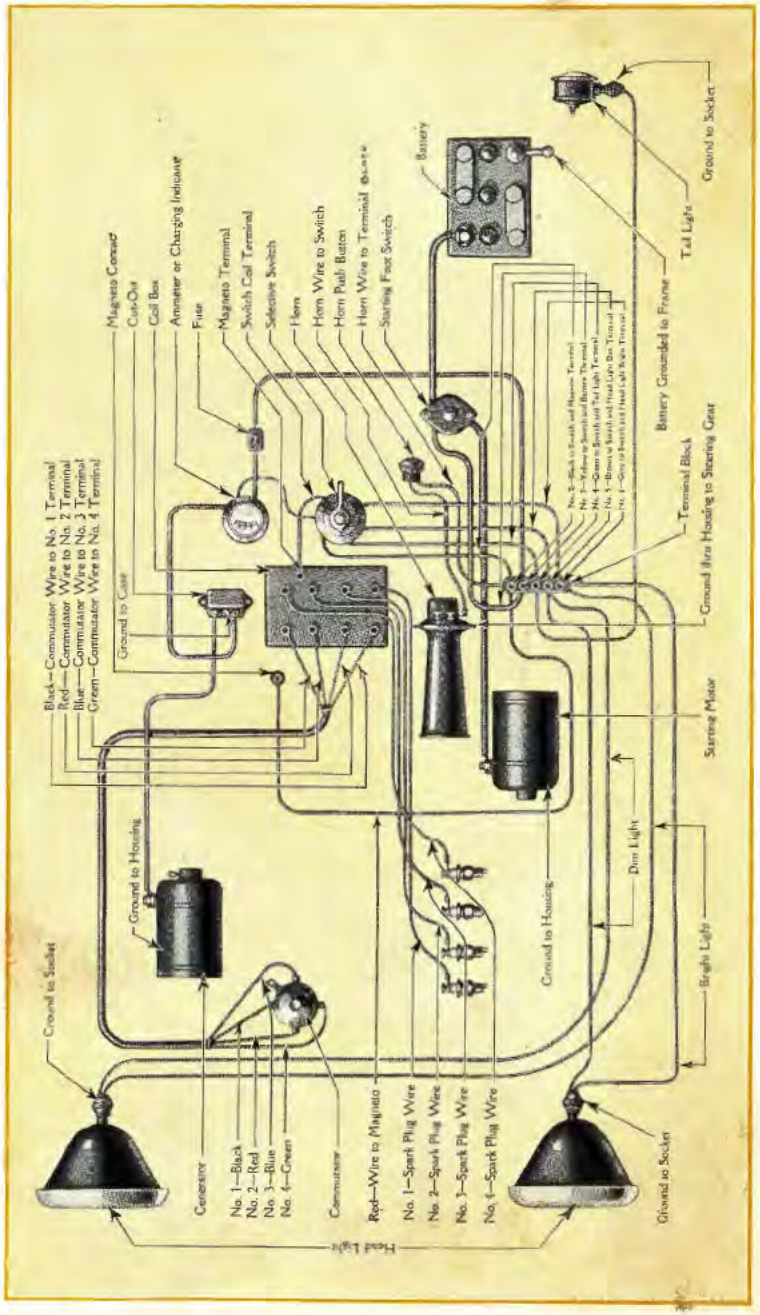
The starting motor is lubricated by the Ford splash system, the same as the engine and transmission. The generator is lubricated by a splash of oil from the time gears. In addition an oil cup is located at the end of the generator housing and a few drops of oil should be applied occasionally.

What should be done when repairing the Ignition?

The introduction of a battery current into the magneto will discharge the magnets and whenever repairing the ignition system or tampering with the wiring in any way, do not fail to disconnect the positive wire from the battery. The end of this wire should be wound with tape to prevent its coming in contact with the ignition system or metal parts of the car.

How does the Charging Indicator operate?

The charging indicator 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 indicator should show a reading of from 10 to 12, even with the lights burning. If the engine is running above 15 miles per hour and the indicator does not



Starting and Lighting Wiring Diagram (Cut No. 2)

show "charge," first inspect the terminal posts on the indicator, making sure that the connections are tight, then disconnect the wire from the terminal on generator, and with the engine running at a moderate speed, take a pair of pliers or a screw-driver and short-circuit the terminal stud on the generator to the generator housing. If the generator is O. K., a good live spark will be noted. (Do not run the engine any longer than is necessary with the terminal wire disconnected.) Next inspect the wiring from the generator through the charging indicator, to the battery for a break in the insulation that would result in a short-circuit.

How are the Lights operated?

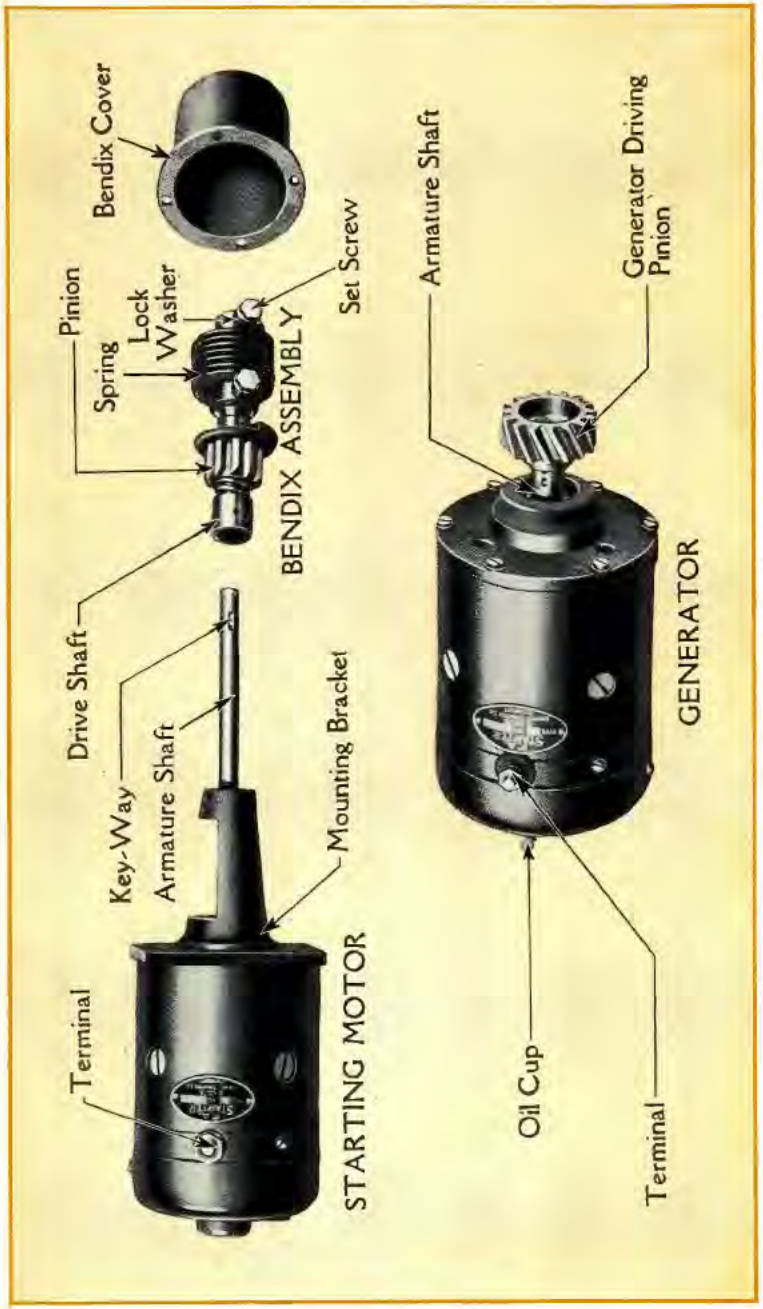
The lighting system consists of two 2-bulb headlights and a tail light operated by a combination lighting and ignition switch located on the instrument board. The large bulbs are of 6-8 volt, 17 candle-power type. The small bulbs of 6-8 volt two candle-power type. The small bulb is also used in the tail light. All of the lamps are connected in parallel so that the burning out or removal of any one of them will not affect the other. 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. 2 shows the different circuits and the course of the current.

What about repairing Starter and Generator?

If either the starter or generator fails to give proper service, the owner should at once consult an authorized Ford dealer. If the trouble is not found in the wiring, connections, etc., as outlined, the dealer ***will remove*** the starter or generator, or both if necessary, and ***return them intact*** to the nearest branch for repair or replacement. ***Dealers or owners should not attempt to repair or tamper in any way with the mechanism of the starter and generator.***

How is the Starter removed?

When removing the starter to replace transmission bands, or for any other reason, first remove the engine pan on the left-hand side of the engine and with a screw-driver remove the four small screws holding the shaft cover to the transmission cover. Upon removing cover and gasket, turn the Bendix drive shaft around so that the set screw on the end of the shaft, as in Cut No. 3, is in the position shown. Immediately under the set screw is placed a lock washer, designed with lips or extensions opposite each other on the outside diameter. One of these is turned against the collar and the other is turned up against the side of the screw head. Bend back the lip which has been forced against the screw and remove the set screw. As the lock washer will no doubt be broken or weakened in removing the starter, a new one must be used when replacing it. These washers may be obtained from the nearest branch. Next, pull the Bendix



Starter and Generator Units (Cut No. 3)

assembly out of the housing, being careful that the small key is not misplaced or lost. Remove the four screws which hold the starter housing to the transmission cover, and pull out the starter, taking same down through the chassis—this is why it was necessary to remove the engine pan. Extreme care should be used in removing the Bendix drive and other parts that none are misplaced nor lost and that they are replaced in their former position. In replacing the starter, be sure that the terminal connection is placed at the top. If the car is to be operated with the starter removed, be sure to put the transmission cover plates in position. These plates may also be obtained from the nearest branch.

How is the Generator removed?

If it is found necessary to remove the generator, first take out the three cap screws holding it to the front end cover and by placing the point of a screw-driver between the generator and front end cover, the generator may be forced off the engine assembly. Always start at the top of the generator and force it backward and downward at the same time. Plates may be obtained from the nearest branch to place over the time gear if the car is to be operated with the generator removed.

Can the Engine be run with the Generator disconnected from the battery?

If for any reason the engine is run with the generator disconnected from the battery, as on a block test, or when battery has been removed for repair or recharging, be sure that the generator is grounded to engine by running a wire from the terminal on generator to one of the valve cover stud nuts. A piece of wire $\frac{1}{16}$" or more in diameter may be used for this purpose. Be sure that 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 injury to the generator.

What about the care of the Battery, repairing or recharging?

The Ford Starting System uses a 6-volt 13-plate "Exide" battery, type 3-XC-13-1. The care of the battery in service is summed up in the following rules:

1. Add nothing but pure water to the cells and do it often enough to keep the plates covered at all times. Distilled water, melted artificial ice or rain water collected in clean receptacles is recommended. In cold weather add water only just before running the engine so that the charging may mix the water and the electrolyte and freezing of the water be avoided.

2. Take frequent hydrometer readings to make sure that the generator is keeping the battery charged. To take reading, remove filler cap of cell, insert end of hydrometer syringe in filler opening, squeeze bulb and release, drawing up enough liquid to float

hydrometer bulb free in the liquid. The reading of the scale at the surface of the liquid when hydrometer is floating is the specific gravity (density) of the electrolyte. A fully charged battery will show a reading of 1.275 to 1.300. A battery half charged will show a reading of 1.225 to 1.250. A completely discharged battery will show a reading of 1.200 or less. When taking hydrometer readings remove the filler cap from only one cell at a time and be sure to return electrolyte to the cell from which it was taken. Then replace and tighten the filler cap. Hydrometer tests taken immediately after filling with water and before water has become thoroughly mixed with the electrolyte will not show the true condition of the battery.

3. If hydrometer reading shows battery less than half charged it should be taken to the nearest Exide Battery Service Station for recharging. Continued operation in a less than half charged condition is injurious to the battery, somewhat as running in a soft or deflated condition is injurious to a tire.

4. Keep the filler caps in place and screwed tight—a half turn tightens them. Keep battery connections tight and clean. A coating of heavy oil or vaseline will protect the connectors from corrosion. Keep battery firmly secured in place. If hold-downs are loose battery will shift about in compartment and result in loose connections, broken cells or other trouble.

5. Exide Battery Service Stations are maintained in principal cities and towns throughout the country to assist you to obtain good service from your battery. Do not entrust your battery to the care of a novice.

What about Battery Guarantee?

The "Exide" batteries are guaranteed by the manufacturers (The Electric Storage Battery Company, Philadelphia, Pa.) to be free from defects in material and workmanship.

At any time within three months from date of delivery to the purchaser any battery which may prove to be defective or incapable, when fully charged, of giving its rated capacity, will be repaired or replaced free of expense on receipt, transportation charges prepaid, at any Exide Battery Depot or authorized Exide Battery Service Station. This guarantee does not cover the free charging of batteries nor the making good of damage resulting from continued lack of charge or from failure to keep the plates covered with solution by filling the cells from time to time with pure water. No claims on account of alleged defects can be allowed unless made within three months of date of delivery of battery to purchaser, and the right is reserved to refuse to consider claims in the case of batteries opened by other than authorized Exide Battery Service Stations.

Purchasers of cars equipped with "Exide" batteries are earnestly urged to cooperate with the battery manufacturers by taking their cars, as promptly as possible after receipt, to the nearest Exide Battery Service Station in order that the battery may be tested and its condition and installation checked. No charge is made for this inspection.