The Thomas Flyer

CHAMPION ENDURANCE CAR OF THE WORLD

1910

Instruction Book

INSTRUCTIONS

Thomas Flyer, 6-40
Model "M"—1910

INSTRUCTIONS

FOR THE CARE AND OPERATION

OF THE

THOMAS FLYER 6-40

MODEL "M"—1910

E. R. THOMAS MOTOR COMPANY

BUFFALO, NEW YORK

Member Association Licensed Automobile Manufacturers

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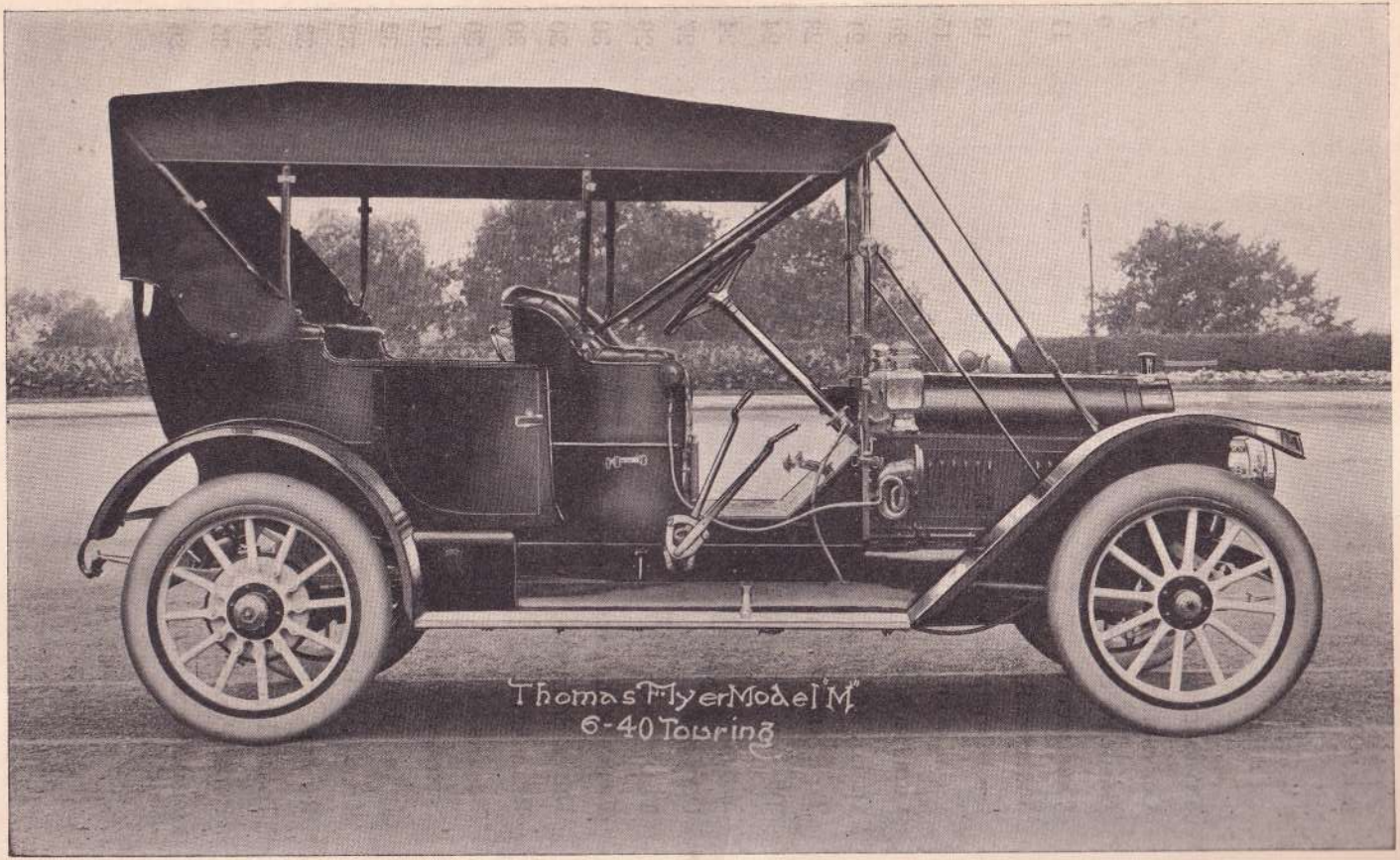

Thomas Flyer Model M
6-40 Touring

INTRODUCTION

IT is assumed that the reader is more or less familiar with the general principles of the gasoline engine and its adaptation to motor car use. However, a few introductory words along this line may not be out of place.

Gasoline is vaporized and mixed with air in proper proportions to form an explosive mixture by means of a device known as a carburetor. The mixture thus formed is led into the cylinders of the engine through the inlet valves, which mechanically open and close at the proper time. This charge, once in the cylinders, is compressed and then fired by means of an electric spark and the energy due to the resulting explosion is transmitted by means of transmission, drive shaft, etc., to the rear wheels.

The "Thomas" engine, in common with most automobile motors is of the four cycle type, by which is meant that the cycle of its operation is divided into four parts or stages, i. e.

First. The explosive charge is drawn into the cylinders through the carburetor and inlet valve by the downward or suction stroke of the piston.

Second. The charge is compressed preparatory to the explosion by the upward stroke of the piston at the end of which the explosion takes place.

Third. The downward or power stroke of the piston is induced by the expansion of the exploded gases. At the end of this movement the exhaust valve opens and the burned gases escape.

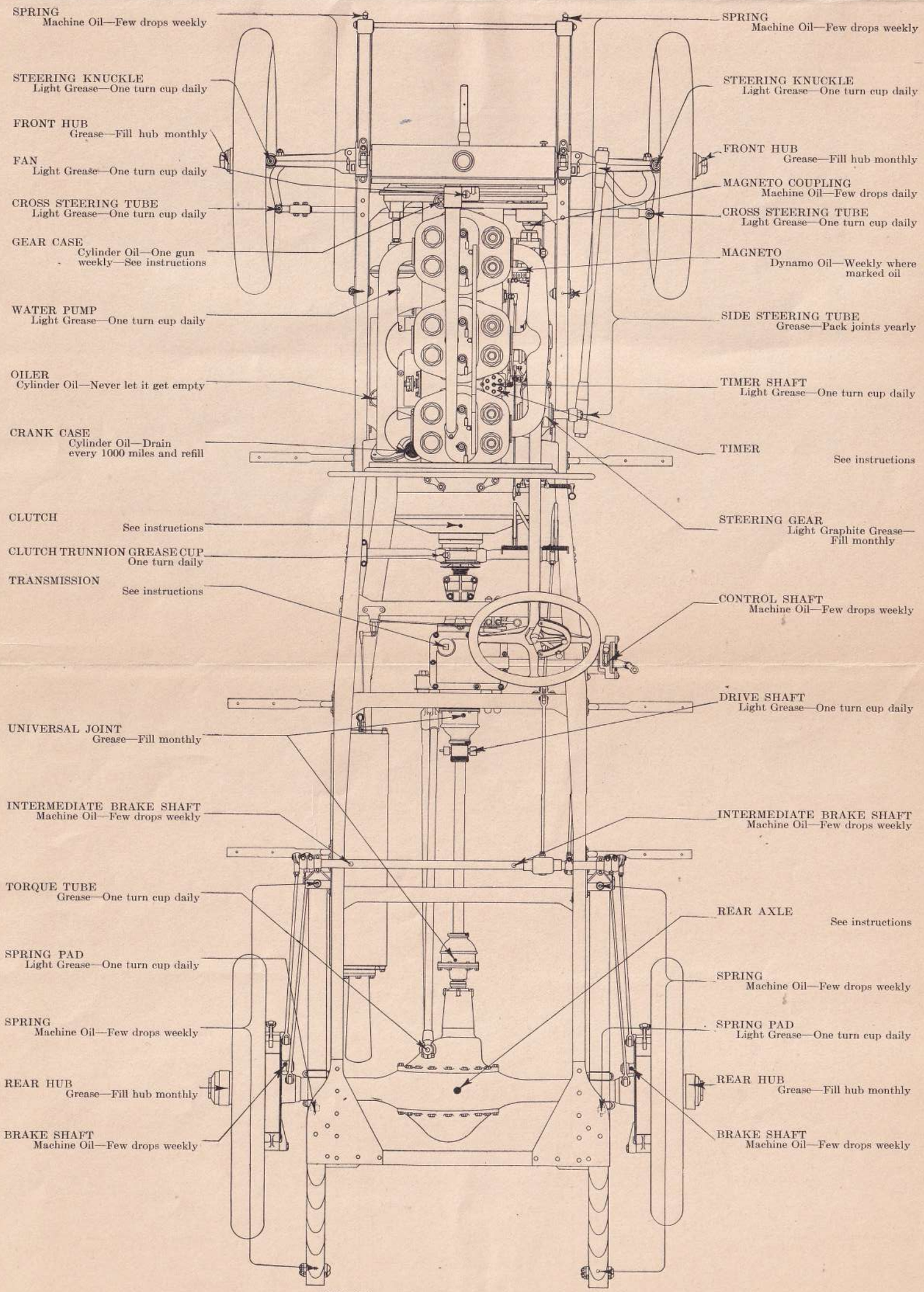
Fourth. The upward stroke of the piston forces the remaining gases through the exhaust valve and the cycle is complete.

For satisfactory results it is necessary that the owner familiarize himself with the various operating parts of the motor with which he must come in daily contact. A careful reading of this book together with a thorough examination of the car will tend to make everything clear. In case any point is obscure, a letter written to us concerning it will be immediately answered with full and complete information.

DON'T
TAMPER WITH YOUR CAR

When car leaves factory it is properly adjusted to give the best results. These adjustments should not be changed except where it is absolutely necessary.

Remember that all parts of the car must be properly lubricated if satisfactory results are to be obtained.



CUT NO. 1. LUBRICATION DIAGRAM

INSTRUCTIONS

Controlling Levers and Switches

The controlling levers and buttons are eight in number, two are located on top of the steering wheels, two on the side of the car and four are placed at the feet of the operator.

No. 1. Throttle Lever—the longer lever on top of the steering wheel, stamped "Gas."

No. 2. Spark Lever—the shorter, stamped "Spark."

No. 3. Change gear lever—the inside hand lever on the side of the car.

No. 4. Emergency brake lever—the outside hand lever.

No. 5. Clutch lever—the left-hand foot lever.

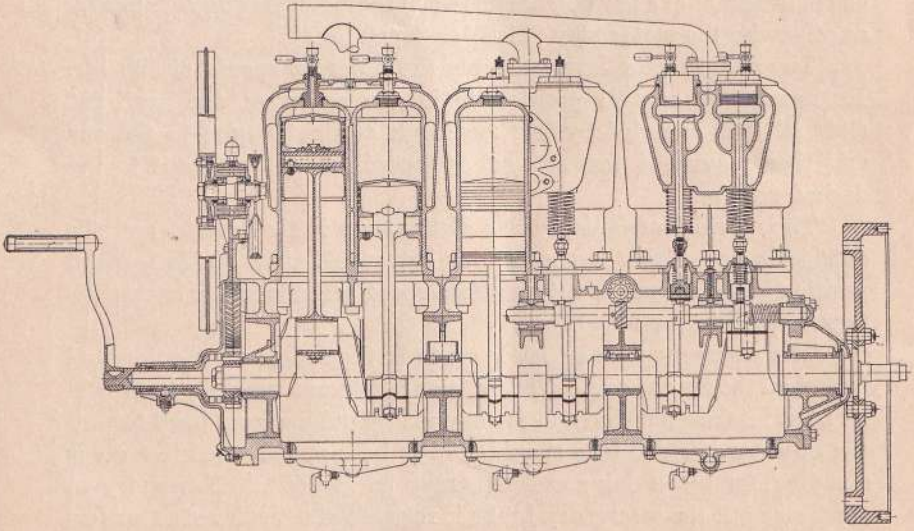
No. 6. Foot brake lever—the right-hand foot lever.

No. 7. Accelerator button—button at right of foot levers.

No. 8. Muffler cut-out button—button under feet of operator.

The throttle lever controls the amount of explosive mixture admitted to the motor cylinders. It is closed at the end of the quadrant nearest the operator and wide open at the opposite end.

The spark lever controls the time at which the spark ignites the charge in the cylinder. When the lever is nearest the operator, the



CUT NO. 1-A. "M" MOTOR.

spark is retarded, i. e., the charge is ignited after the piston has reached its highest point and begun its downward stroke. When pushed away from the operator, the spark is advanced, i. e., the explosion of the charge is made to occur before the piston has fully completed its upward stroke.

A certain appreciable time is required for the total combustion of the explosive mixture after it is compressed and fired. The combustion being more of a slow burning than a true explosion. This time remains practically the same for all speeds of the motor, hence at high speeds the charge must be fired somewhat before the end of the upward stroke of the piston, in order to get the maximum power from the motor. At slow speeds firing must occur after the piston has started on its downward stroke in order that the motor may run smoothly. Hence, the spark must be advanced at high speeds and retarded at low speeds, or in other words the higher the speed the greater the advance.

However, if the spark is advanced too far for any given speed, a perceptible knock will be heard in the motor, this is a sign that power is being lost and the spark should be retarded until this ceases. Always drive with the spark as high as possible, without causing the "knocking" referred to, and control car with throttle. Under these conditions best results will be obtained from the motor and less gasoline will be consumed.

The spark lever must always be in the retarded position (at near end of quadrant or a few notches up) when the motor is being "cranked," as otherwise the motor may "kick" or "back fire."

The change gear lever controls the different speeds of the car. Its normal or neutral position is in the center of the quadrant slot and it is operated by first moving it at right angles to the car and then moving it forward or backward in the quadrant to the desired position.

The outside forward position of the lever is the reverse and the outside back position is the first or low speed. The inside forward position is the second or intermediate speed and the inside back position is the third or high speed.

The emergency brake lever controls the action of the internal brakes on the rear wheels. The brakes are released when the lever is in its most forward position and are applied by pulling lever back toward the operator. This brake should always be applied when the car is standing, for by so doing accidents may be avoided. Never try to start car until the emergency brake is released and the lever as far forward as possible.

The clutch lever or pedal controls the action of the clutch which is normally engaged by a powerful helical spring. To release clutch, press the lever as far forward as it will go. This lever also operates the clutch brake; its function is to bring the revolving parts of the clutch to a stop immediately the clutch is released and thus make gear changing easy for even the novice.

The foot brake lever controls the action of the external band brakes on the rear wheels. To apply this brake, merely press on the lever until the desired braking effect is obtained.

The accelerator button or foot throttle is inter-connected with the throttle lever mechanism so that the amount of explosive mixture admitted to the cylinders of the motor may be controlled by foot as well as by hand. This will be found a great convenience in driving as the hand throttle may be set for a given speed on the level and any rough places or slight grades overcome by merely pressing the foot throttle, thus leaving the hands free to guide the car.

In addition to the above a muffler cut-out button is placed in the front floor board immediately under the driver's feet. This operates a cut-out valve in the exhaust pipe, which allows the exhaust gases to pass into the air without passing through the muffler. In this manner the back pressure of the muffler is eliminated and more power is realized. The cut-out is also handy as an indicator to the condition of the motor, the exhaust being more perceptible, one is able to detect any irregularity in the action of the same, such as skipping or failure of the charge to explode in one or more of the cylinders.

The switches are two in number, both on the coil box, one for the battery and one for the magneto ignition. To use the battery switch, a small plug must be inserted in the hole provided for it on the side of the switch, then moving the lever to the positions as marked, throws the battery ignition system on or off.

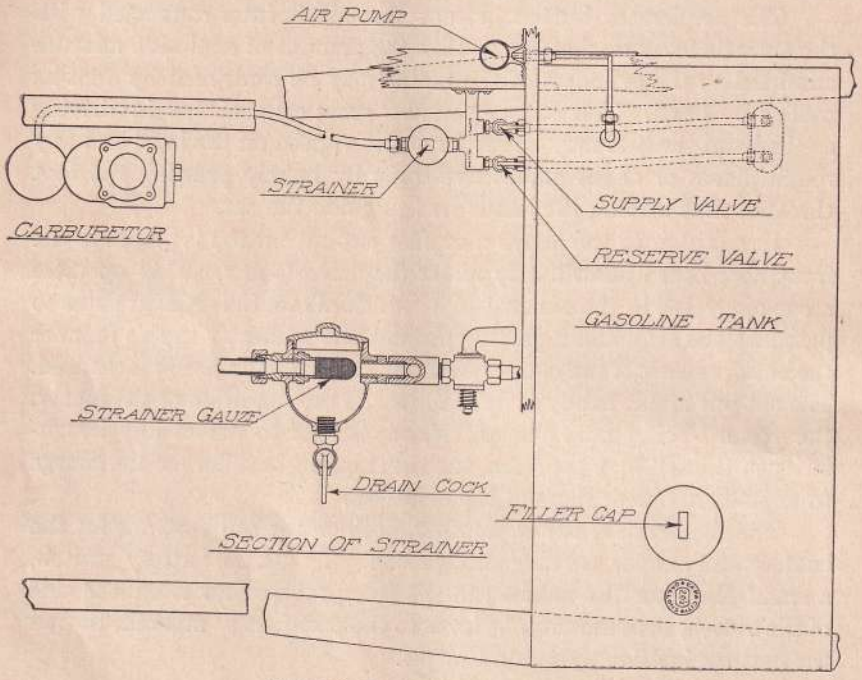
Gasoline System

This is shown diagramatically in cut No. 2. The twenty-gallon gasoline tank is located under the front seat of the car with filler under the left cushion. The carburetor is connected to the tank, by means of copper tubing, through a double controlling valve and strainer.

Under ordinary conditions the gasoline should be drawn through the supply side of the double gasoline valve and the reserve valve should be closed. The supply valve is connected to the tank through a small tube which rises about 1½ to 2 inches above the bottom of the tank. Hence, when the gasoline level in the tank falls below the top of the

tube, the supply to the carburetor is cut off, and the engine ceases to run. This warns the operator that his supply of fuel is almost exhausted, but by opening the reserve valve sufficient gasoline is available to run to the nearest source of supply.

When filling tank always see that the supply valve is open (handle lengthwise with car) and reserve valve closed (handle crosswise with car), then the many annoyances due to exhaustion of the gasoline supply without warning will be obviated.



CUT NO. 2. GASOLINE SYSTEM

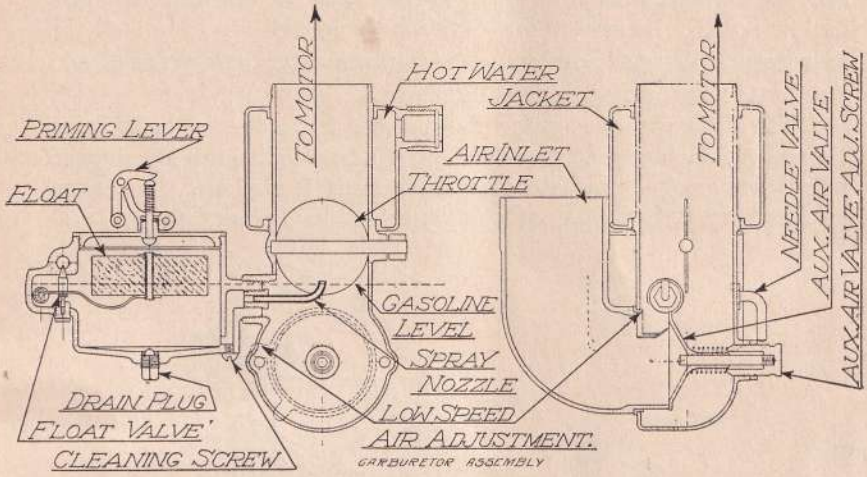
A strainer is placed in the gasoline line to insure the absolute cleanliness and purity of the gasoline delivered to the carburetor. From time to time dirty water, etc., which collects in this strainer should be drawn off through the drain cock at the bottom and at least once a season strainer should be taken apart and cleaned.

An air pump is placed to the right of the driver's seat so that air pressure is available to force gasoline to the carburetor when a steep grade is to be negotiated, or the gasoline level gets too low for gravity feed.

Carburetor

Cut No. 3 shows in section the automatic float feed carburetor used on the car. Gasoline from the tank enters the float chamber through the conical float valve and rises to within $\frac{1}{16}$" of the top of the gasoline spray nozzle, when the float rises and automatically shuts off the flow. The position of the float is adjusted before leaving the factory and need not be again touched.

The air supply enters the carburetor as shown, passes through the auxiliary air valve and by the gasoline nozzle, vaporizing the gasoline



CUT NO. 3. CARBURETOR

which it draws from the float chamber. The amount of gasoline fed through the nozzle is regulated by the needle valve and the air is controlled by adjusting the tension of the spring placed back of air valve. The throttle valve controls the amount of gasoline mixture admitted to the cylinders of the motor and by properly adjusting the tension of the air valve spring and the gasoline needle valve, a constant mixture will be supplied to the motor at all speeds.

The carburetor is water jacketed as shown, by passing a small part of the cooling water around through it. The flow of water may be controlled by a cock placed in the piping.

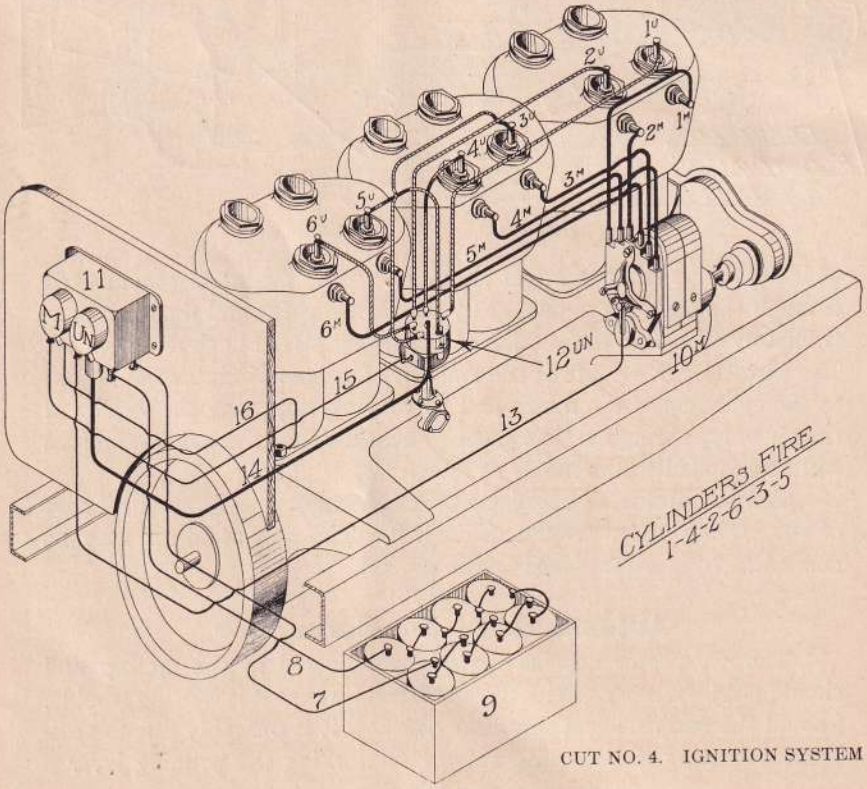
Adjustment of the Carburetor

The carburetor has been carefully adjusted at the factory and should not be tampered with until it is certain that it is causing trouble. Should the carburetor at any time overflow it is probably due to sediment collecting on the float valve. If working the priming lever a

little does not remedy this, the plug under the needle valve will have to be unscrewed and the needle valve removed for cleaning.

To adjust the carburetor, open the needle valve ½ to ¾ of a turn. The upper lug of the low speed air adjustment must be down against the clamp screw as shown, in which position the adjustment is wide open. By loosening the two clamp screws this may be easily done. The engine should start after first priming the carburetor. The auxiliary air valve and the needle valve should be adjusted until good results are obtained at high speed. The engine must then be throttled down and the low speed air adjustment moved until the engine runs nicely at low speed. Be sure to draw the screws up tight again to lock the adjustment. This adjustment has been made at the factory and should not be touched unless accidently moved.

Too little gasoline or too much air is indicated by back firing through the carburetor. Too much gasoline or too little air is indicated by a black smoke. In both cases the remedy is obvious. Care must be taken not to have too much pressure on the auxiliary air spring.



CUT NO. 4. IGNITION SYSTEM

Ignition System

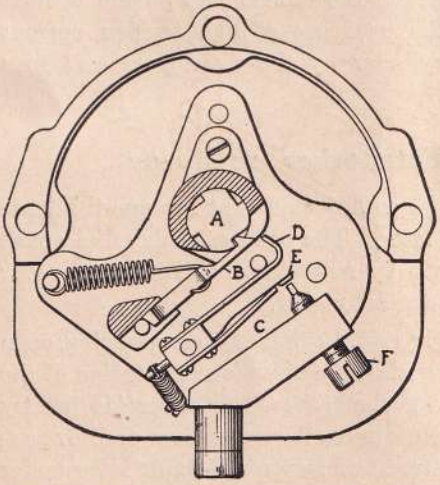
Two complete and separate systems of ignition are employed on this car in combination with two sets of spark plugs.

An Atwater-Kent Unisparker is used to furnish a spark from dry cells for starting the motor or for use in emergencies, while a Bosch Magneto supplies the spark for regular use.

Cut No. 4 shows both of these systems, properly mounted and connected up, also the two switches by which they are controlled.

Atwater-Kent Unisparker

This device is mounted on the engine and driven by bevel gears from the cam shaft. It consists of a single coil, mounted on dash, a distributor and a mechanical contact maker. This contact maker is shown with cover removed in cut No. 5. The shaft A has six notches milled in it and as it revolves the snapper B is forced against D which in turn moves E and the primary circuit through the coil is completed by the platinum contacts at that point.



CUT NO. 5. TOP VIEW OF CONTACT MAKER

Further movement of the shaft allows the snapper B to drop into the next milled slot and the primary circuit through the coil is instantaneously broken. This making and breaking the current induces in the secondary circuit of the coil a high tension current, which will jump any small gap, such as the gap at the points of the spark plug. A condenser is connected in parallel with the contact maker.

As there are six notches milled in the shaft, six sparks are obtained for each revolution of the shaft and these are distributed to the spark plugs by means of the distributor, the operation of which may be plainly seen by removing the distributor cover which is held on by three screws.

The batteries for the operation of this system are placed in the right front box on running board, eight cells of any good battery being used for the purpose. This system is so economical of current that

the batteries may be used until they test less than 2 amperes, but it is advisable to change them when they fall below 3 amperes.

Once properly adjusted, there is but one adjustment that needs attention from time to time. This is the platinum-tipped screw on the contact maker, which may be seen by removing the plugged wire and the clipped cover on the side. These contacts are intended normally to be apart and should be screwed only close enough to get good explosions without missing. These contacts will never pit and it is not necessary to file them. Sometimes, when the battery is nearly exhausted and new ones cannot be conveniently obtained, this screw can be adjusted very close so as to get a good spark until such time as replacements can be made. A close adjustment gives a hotter spark and uses up the battery faster, while an adjustment with some distance between the contacts gives a lighter spark and draws on the battery less.

For starting on the spark, the battery switch is so arranged that when it is in the "On" position, a quick tap to the left (toward the side marked "Start") makes and breaks the circuit just as the contact maker does mechanically. This produces a high tension current which is sent to the proper cylinder by the distributor and fires the charge.

Adjustment of Unisparker on Motor

The "Unisparker" should be so adjusted that for one-third advance, ignition takes place on center. The point at which the spark occurs may be readily determined by removing the distributor cover and listening for the click of the contact maker.

With engine turned over so that No. 1 cylinder is compressing, open the priming cock and turn fly wheel in the direction of rotation of the engine until the point on the fly wheel marked "1-6 Center" is directly opposite the timing indicator. Now move the spark lever on the steering column about ⅓ of the quadrant and loosen the clamp lever under timer. Then turn timer against the direction of rotation of the timer shaft until a click is heard and fasten the clamp screw in lever. Replace distributor cover and connect terminal which is in contact with distributor wing with No. 1 cylinder. The next cylinder to ignite is then connected with the next segment, etc., keeping in mind the direction of rotation of the distributor and the fact that the motor fires in the cylinders in the following order:—1–4–2–6–3–5.

The Bosch Magneto

This is a self-contained igniter mounted on the base of the motor and gear, driven through a coupling. The rotation of a so-called shuttle armature, between the poles of two pairs of very strong steel magnets causes an electric current to be induced in its windings, which current is a so-called alternating current that attains a maximum intensity twice each revolution.

The tension of the current is increased by short circuiting the primary current through a contact maker at the proper moment, and then opening it. At the moment the circuit is opened or interrupted, an arc flame is formed at the spark plug which effects the explosion. As the arc can only be obtained for a definite position of the armature, and as the ignition must take place for a definite position of the motor piston, the armature of the magneto is gear driven from the motor shaft. Further, as the car has six cylinders and only two sparks can be obtained per revolution of the armature, the magneto is geared to run 1½ times the motor speed in order to get the six sparks per two revolutions of the motor, which are necessary.

The armature is wound in two parts, one, the primary winding consisting of a few turns of heavy wire and the other, the secondary winding, consisting of many turns of fine wire.

Referring to Cut No. 6. The end of the primary winding is connected to brass disc (1). Into the hub of this disc is screwed the fastening screw (2), which serves, in the first place for securing in place the contact maker, that is fitted into the rear end of the armature shaft and positively driven by a key. In the second, for conducting the primary current to the platinum screw block (3), of the contact maker. Screw (2) and contact piece (3) are insulated from the interrupter disc (4), which is metalically connected with armature core. In the contact piece (3) is arranged the platinum tipped screw (5). Pressed against this screw by means of spring clips is the contact maker lever (7), which is connected to the armature core, and therefore, with the beginning of the primary winding. The primary winding is therefore, short circuited as long as (7) is in contact with platinum screw (5). The circuit is interrupted twice each revolution when the lever is moved off the screw, by means of the fibre rollers (19) mounted on the timing lever (20). A condenser (8) is connected in parallel with the gap thus formed.

The beginning of the secondary winding is connected to the end of the primary, so that the latter is a direct continuation of the former. The end of the secondary winding is led to the contact ring (9), on which runs the carbon brush (10), which is insulated from the magneto

frame by means of the brush holder (11). From the brush (10) the secondary current is conducted through the connecting bridge (12), in which is mounted a central spring pressed carbon brush (13), through the rotating distributor piece (14), which carries a contact carbon (15), to the distributor disc (16).

The driving disc which turns the distributor brush (15), is geared from the armature shaft at such a ratio that the contact brush rotates at the speed of the cam shaft of the motor.

In the distributor disc (16) are embedded six metal segments (17), and during the rotation of the contact carbon (15), the latter makes contact successively with individual segments, and always leads the secondary current into one of these. Connected to the segments are sockets which serve for the reception of contact plugs (18). The plugs serve as terminals for the cables leading to the spark plugs of the individual cylinders.

From the end of the secondary winding the high tension current is led through the parts just described, alternating to the spark plugs of the different cylinders and produces there the spark for the ignition of the explosive charge; then returns through the motor frame and armature core to the primary winding, which leads it back to the beginning of the secondary winding.

The variation in the time of ignition is effected by causing the interruption of the primary circuit to take place earlier or later. To this end the timing lever (20) is arranged rotatively, by which means it is possible to obtain about 27° variation on the axis of the motor.

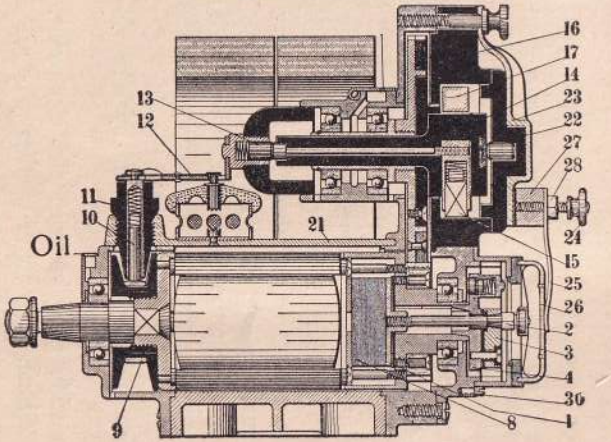
The apparatus, in common with all ignition magnetos, gives a better spark for earlier ignition, hence, it is more advantageous to slightly advance the spark for starting.

The ignition system may be disconnected or rendered inoperative by permanently short circuiting the primary circuit. This is accomplished by leading an insulating wire, clamped under the nut (24), to a switch, the other pole of which is connected to the motor frame. As soon as this switch is closed, the primary circuit is permanently short circuited and the system is rendered inactive.

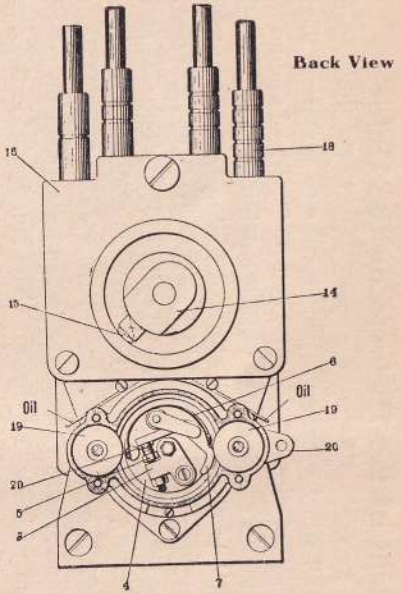
In order to protect the insulation of the armature and of the current carrying parts of the apparatus against dangerously excessive pressures, a safety spark gap is arranged on the dust cover (21). The current will pass through this gap in case a cable is taken off while the magneto is in operation, or if it should accidentally drop off. However, the discharges should not pass through the safety gap for any length of time, and it is in such a case absolutely necessary to short circuit the primary winding as above described, and thereby switch off the ignition.

1. Brass plate.
2. Contact-breaker screw.
3. Platinum screw block.
4. Contact-breaker disc.
5. Long platinum screw.
6. Contact-breaker spring.
7. Contact-breaker lever.
8. Condenser.
9. Slip ring.
10. Carbon brush.
11. Carbon holder.
12. Connecting bridge.

Longitudinal Section



Back View



13. Contact carbon.
14. Rotating distributor piece.
15. Distributor carbon.
16. Distributor disc.
17. Metallic segments.
18. Contact plug.
19. Fibre roller.
20. Timing lever.
21. Dust cover.
22. Cover.
23. Triangular clamp.
24. Nut for switch wire (short circuit).
25. Spring for fastening brass cap.
26. Brass cap.
27. Brass block for fastening spring of brass cap.
28. Fixing bolt.
29. Short platinum screw.
30. Stop screw for timing lever.

CUT NO. 6. BOSCH MAGNETO

Adjustment of the Magneto on the Motor

To adjust the magneto, advance the spark lever to the limit, turn the engine over until No. 1 cylinder is just starting to compress, then open the priming cock of that cylinder and pull the fly wheel around in the direction of rotation of the engine until the point on the fly wheel marked "magneto" is directly opposite the timing indicator. The two contact points (20) and (5) should just start to break at this point. This may be easily noticed by turning the spring (25) to one side and removing the cover (26). By removal of the yoke (23) and the cover plate (22) the position occupied by the distributor carbon (15) can be seen. The carbon should rest on the inside lower segment so as to make connection with No. 1 cylinder. The No. 1 wire is the one nearest the motor on top of the magneto. The armature core will be found to be midway between the poles of the magnet.

If the above conditions do not exist loosen the four nuts on the fan pulley which clamp the magneto coupling to the gear shaft. Having the mark on the fly wheel under the gauge as before and the engine on the compression stroke turn the magneto until the points just separate and the other conditions are fulfilled, then lock in this position. The total separation of the contact points should have been previously adjusted to the thickness of the magneto gauge provided in tool equipment.

The next cylinder to ignite is then connected with the next segment, etc., it being kept in mind that the distributor carbon rotates in the opposite direction from the armature and the engine fires 1–4–2–6–3–5.

Method of Proceeding in Case of Faulty Ignition

In case of defective ignition, it must first of all be determined whether the fault is with the Unisparker, the magneto or the plugs.

It may be pointed out that in general, in case only one cylinder misses, the fault is very likely to be with the plugs. By substituting a new plug for the one in this cylinder, that point may be cleared up.

The more common defects of spark plugs are as follows:

First. Short circuit at the spark gap, due to small metallic beads which are formed from the metal of the electrode by the intense spark and form a conducting connection between the electrodes. This defect is easily ascertained and may be remedied by removing the metallic beads.

Second. Too wide gaps between the electrodes. The normal width of gap is .02 inch. Larger or smaller gaps are detrimental to the ignition. The proper width of gap may always be obtained by bending the plug electrodes.

Third. Sooting of the plug. The parts exposed to the burning gases should be cleaned with gasoline.

To test the spark of the Unisparker or the magneto, take off the secondary terminal from one of the spark plugs and watch the spark jump to the engine. By this method the secondary cables are simultaneously tested with the timer or magneto, and special attention must be paid to ascertaining that the insulation is intact. The metal terminals at the ends of the cables must not come in contact with any metal part of the motor or the magneto.

If the cables and plugs are in good condition, and the magneto ignitions takes place irregularly, the defect must be looked for in the magneto itself. In such a case the most important thing is to make sure of the proper interruption of the primary current. Spring (25), cut No. 6, must be moved sideways, cover (26) taken off and it must be ascertained whether screw (2) is well tightened. Next, it must be ascertained whether lever (7), in the position of rest, contacts with screw (5), and whether the lever is moved the right distance (.02 inch) off the screw when it passes over the fibre roller (19); otherwise it must be adjusted by means of screw (5). The platinum screw contacts must be examined, and any oil or dirt present removed; in case the contacts are uneven (but only then) they must be smoothed with a fine file. If, after continued use, the platinum contacts have completely worn down, the platinum screw (5) and (29) must be renewed. In addition the distributor carbon (15) must be examined, which is an easy matter after the yoke (23) and the cover plate (22) have been removed.

If the ignition fails abruptly there may be a short circuit in the cable clamped under the nut (24), which serves for turning the ignition off. This may be ascertained by removing cable from the magneto.

If thus far no defect has been discovered and it is absolutely impossible to start the motor, timing of the ignition must be verified in accordance with the previously given directions. If the timing is correct it is advisable to send the magneto to the factory, as still further disassembling serves no purpose.

If the cables and plugs of the Unisparker system are in good condition, but ignition fails, the trouble must be looked for in the timer or the primary circuit.

The batteries should be tested and the battery wires, switch and ground wires, traced up and examined. If failure still occurs, examine the generator contact maker and see if it is adjusted properly. Also examine the distributor and see if the timing of the ignition is correct. If all the above fails to place the trouble, the generator should be returned to the factory for repairs.

Care and Maintenance

Four or five drops of light oil should be placed in the top of the contact maker of the Unisparker, and in the grease cup on the side of the timer bracket about every 500 miles.

All shafts of the magneto run on ball bearings which should be lubricated about every 500 miles by injecting a few drops of oil at the places stamped "Oil." All the rest of the magneto requires no lubrication, and it may be pointed out that the interrupter is designed to work without oil.

Cooling System

Cooling is accomplished through the medium of water which is circulated through the system by a gear driven centrifugal pump. As shown in cut No. 7, the pump takes water from the bottom of the radiator, and forces it through the cylinder jackets to the top of the radiator, whence it flows through the cooling tubes to the bottom. The water is cooled as it passes through the radiator by the natural draft due to the motion of the car, aided by the belt driven fan. An overflow pipe is provided on the back of the radiator to allow surplus water, steam or air to escape.

Adjustment of the Fan Belt

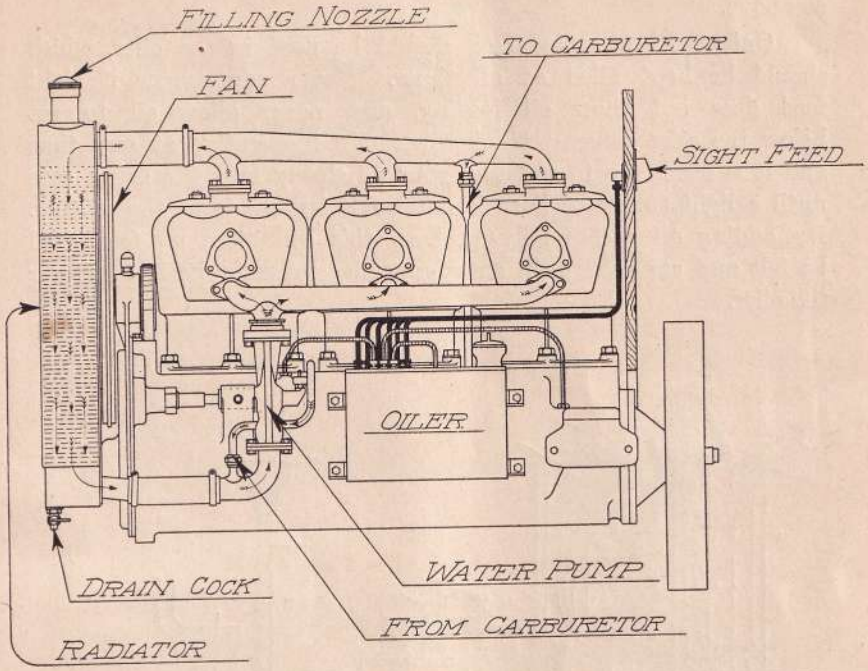
If the fan belt is too loose it may easily be tightened by loosening the clamp bolts on the side of the fan housing, holding back the locking plunger and turning the eccentric on which the fan is mounted. Be sure the lock is in one of the slots provided and clamp bolts drawn up tight. Do not get the belt too tight.

The temperature of the circulating system at the bottom of the radiator is a good indication of the motor's condition. If the radiator is unusually hot, the excessive heat of the engine must be due to insufficient lubrication, low water, clogged water pipes or to operating the motor with throttle open and spark retarded.

Never run the motor unless the cooling system is full of clean pure water, rain water being the best for the purpose. If dirty water must be used, strain it. If car is to be laid up for any length of time, drain the system by means of the drain cock at the bottom of the radiator. After all water has been drained off, turn the motor over a few times to make sure that no water is pocketed.

During the winter or cold weather, when the temperature is below freezing, never allow car to stand for any length of time without the

engine running. If this precaution is not taken the water system may freeze and expansion will burst the seams of the radiator, and possibly the water jackets of the cylinders. In such weather an anti-freezing mixture should be used. There are several of these that are



CUT NO. 7. COOLING SYSTEM

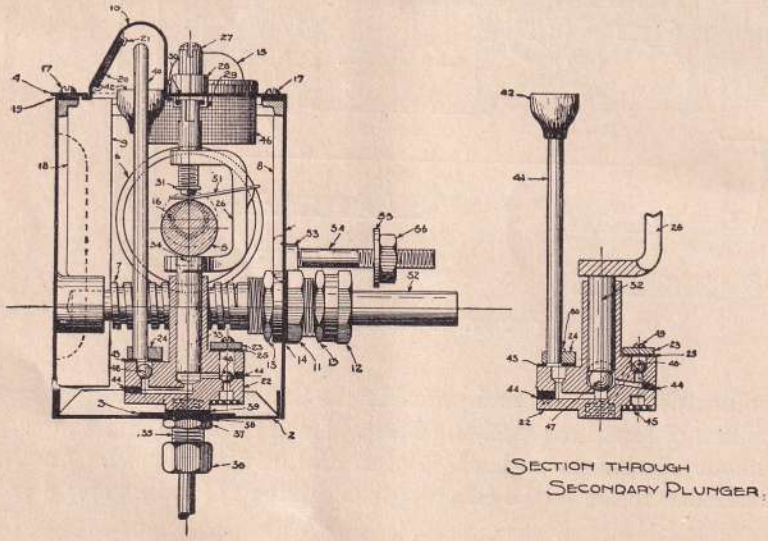
excellent, the simplest and probably the best being a 20-30 per cent. solution of denatured alcohol, which will stand from 10 degrees to zero without freezing, according to the per cent. of alcohol used. Another excellent solution is the following: Glycerine 1½ gal., water 4 gal., wood alcohol 1 pint.

Oil and Oiling

On the motor, splash lubrication is used, the oil level in the crank case being kept approximately constant by a three feed oiler with sight feed on dash. The oiler is bolted to the crank case and is gear driven from the motor. Cut No. 8 shows a sectional view of the oiler used. The oil is pumped from the oiler to the sight feed by one set of pumps and then returned by gravity to the oiler, where a second set forces it

to the crank case. Both sets of pumps should be adjusted by means of the slotted adjusting screws, so as to feed three drops of oil per revolution of the pump, remembering that screwing down gives more oil and up less. When car leaves factory, oiler is set to feed four drops, but after a few weeks this may be reduced as above.

Only the best cylinder oil should be used in the oiler, which should be kept filled at all times. Never run engine if sight feed does not show oil feeding, and never allow oil to get below the oiler gauge. If oiler becomes inoperative at any time and it is necessary to run car, pour oil slowly into the crank case until a light smoke or haze is noticeable issuing from the muffler. By adding oil occasionally to keep this condition, no fear need be felt and car used until an opportunity presents itself to repair the oiler.



CUT NO. 8. OILER

In the bottom of the crank case, an oil level glass has been provided. The correct level of oil is about one inch in the glass.

The gears in the front of the crank case should be lubricated with a gun full of cylinder oil weekly.

Cut No. 1 shows graphically the important points to be lubricated and which lubricant to use for each point. In general, all places where there is any movement at all should be oiled, this includes brake and pedal shafts, brake rod pins, torsion tube, etc.

To Start Motor

1. Fill the gasoline tank, making sure that the gasoline valve has its cocks properly set as already described.

2. Fill the oiler through the filler cap, at end, being sure that the strainer is in place.

3. Fill the cooling system with clean water through the cap on top of radiator.

4. Place the spark lever so that it is at the late position as described.

5. Open the throttle a few notches.

6. See that change gear lever is in its neutral position in the center of the slot.

7. Place plug in battery switch and throw lever to the "on" position, at the same time placing magneto switch in the " off " position.

8. Prime or flood the carburetor by pulling on the priming rod button which will be found at the front of the radiator.

9. Engage the starting crank, by pushing in on it, then give a quick pull upward to the left, which action will start the motor. If motor is cold or has been standing long, several pulls will be necessary to start it.

Note:—Never push down on the starting crank, as in case of a back fire the operator is liable to be injured.

10. Finally, after the motor is running properly, cut in the magneto, by moving the magneto switch lever to the "on" position and switch off the battery ignition system.

If for any reason the motor should fail to start on the Atwater-Kent, it may be easily started on the magneto. Be sure the switch on the Atwater-Kent is on the "off" position, advance the spark lever until about 1" from the top of the quadrant, throw the magneto switch to the "on" position and then give a quick upward pull on the starting crank.

If the motor is warm it can be started from the seat by merely tapping the battery switch lever to the left, after properly placing the switch plug.

To Stop Motor

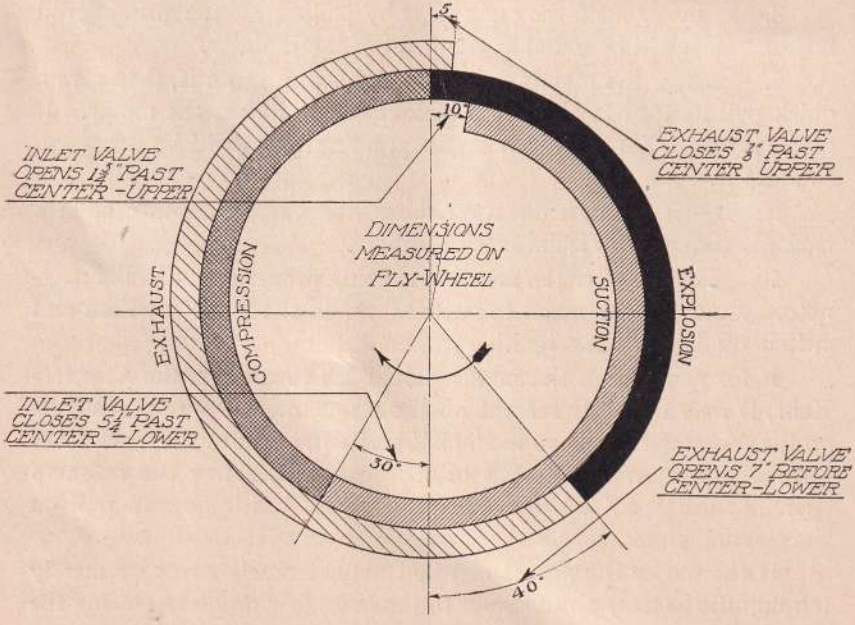
Shut off the gas by bringing the throttle lever to the lower end of the quadrant, and then short circuit the magneto by throwing switch to "off" position. If it is desirable that the motor start easily, it is a good plan to open the throttle just as the ignition is thrown off, then each cylinder will hold a good charge of gas and motor should start without cranking.

Always stop the car before stopping motor. If this is done, the car will never be left standing with the gears engaged, which would be dangerous, if operator tried to start motor. When leaving car always remove battery switch plug.

Motor

The more important features of the motor have already been described, so under this head we will consider the care of the motor.

The lower half of the motor or crank case is a solid aluminum casting, and by removing the cylinders, the pistons, rings, crank shaft, connecting rods and bearings are open to inspection. These parts may also be examined by removing the plates on the bottom of the crank case.



CUT NO. 9. TIMING DIAGRAM

Note:—If for any reason one or more of the motor gears require replacement we prefer to furnish a complete new set as a worn gear will not run well with a new gear. Within a year we will make an allowance for any usable gears returned.

Unless the very best oil is used, the motor pistons and rings will become gummed and they should be cleaned from time to time with kerosene. This may be done by injecting about a tablespoonful of kerosene into the cylinders, two or three times per week. Open the priming cocks and pour in the kerosene. It is well to do this at night and leave the motor stand until morning, when the kerosene will have disappeared.

From time to time the compression of each cylinder should be tested as follows: Be sure that neither the battery nor the magneto is in circuit. Then open all pet cocks except No. 1, turn engine over slowly until the compression is felt. Disengage starting crank, re-engage with the handle up and then push downward slowly (clockwise), noting the force necessary. Repeat the above operations with the other cylinders in the order 1–4–2–6–3–5. By this means, it is very easy to tell if the compression of all the cylinders are alike.

If poor compression is found it is probably due to leaky valves and they should be ground:

First, remove by unscrewing the valve plug over the exhaust valve on the cylinder which showed lack of compression. For this purpose, a special wrench has been provided in the tool equipment. Next, take the valve spring lifter, unscrew enough to permit the point of the screw to be placed in the center in the valve head, while the forked end straddles the valve stem and is under the valve spring seat. By screwing the valve lifter tighter, the valve spring will be compressed, and by removing the halves of the split collar and easing off the lifter the spring will free itself of the valve. By screwing the valve puller into the tapped hole in the valve head, the valve may be removed by pulling upward. Remove the valve spring and the valve spring seat. Use ground glass compound for grinding. Put a little of the compound on the edge of the valve and seeing that the engine is turned so that there is clearance between the push rod and the valve stem, turn the valve about half way around and back again by means of a screw driver placed in the slot in the valve head, repeating this operation and occasionally lifting the valve and turning when clear from seat. This is to prevent grooving the seat. Do not turn valve continually in one direction, but as stated; and when needed, apply more compound. Grind until both the valves and the seat are bright and smooth. Then clean all of the compound out of the valve pocket and reassemble

the valve. Be careful to see that no compound gets into the cylinders. If the cylinder shows no compression then grind in the inlet valve. If there is yet trouble, it lies in the piston rings, and that cylinder must be removed and cylinder and piston inspected.

The correct valve timing is marked on the fly wheel according to the diagram, cut No. 9, all distances being measured on the circumference of the fly wheel. To time the engine, begin with No. 1 cylinder and turn the motor over until its exhaust valve closes. At that moment the point on the fly wheel marked Ex CL 1 & 6 should be at the tip of the timing indicator on the rear end of the engine. If this is not the case, the timing should be corrected by adjusting the screw and lock nut on the valve lifter.

After the exhaust valve is timed, the inlet valve should be adjusted in the same way, then the next cylinder may be turned to, and so on for all of the cylinders. The essential thing to be considered in valve timing is that the inlet valve must open at the right point and the exhaust must close at the correct time. Slight variation in the other events is of small consequence.

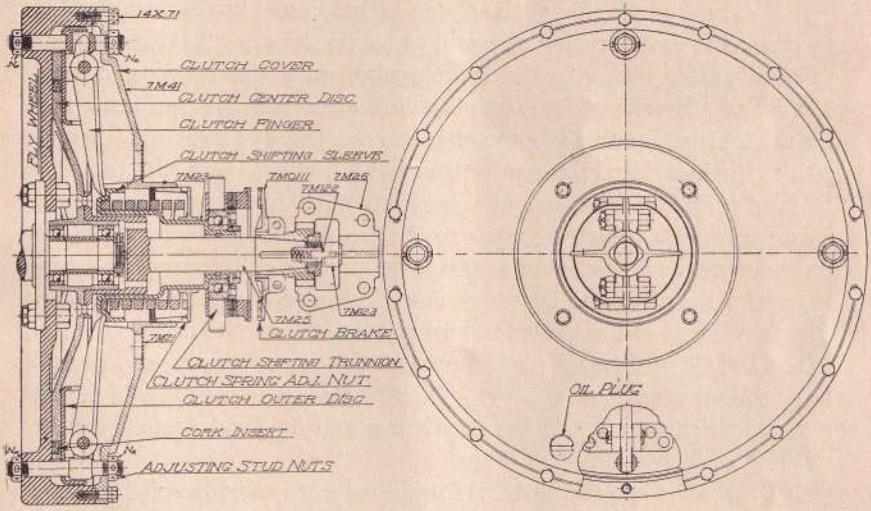
If, for any reason the marks on the fly wheel are lost, the top and lower dead center may be found as follows, and the other events laid off from them: By dead center, is meant the point on the fly wheel corresponding to the end of the piston travel, upward or downward. Taking one cylinder at a time, remove priming cock, through the hole insert a piece of stiff wire about 14 inches long, turn the fly wheel until the wire is pushed out as far as it will go by the piston and commences to follow the piston back. The wire must be kept vertical by guiding it with the hands. Turn the fly wheel about an eighth turn further, with a file, make a small mark on the wire even with the top of the pet cock hole. Next, mark the position of the fly wheel by making a small mark on the fly wheel opposite the timing indicator point. Rotate the fly wheel in the opposite direction until the mark on the wire again becomes even with the top of the pet cock hole. Mark the position of the timing indicator on the fly wheel. With a tape line on the circumference of the wheel measure the distance between the two points found. Half of this distance is to be marked by a point and when this point is opposite the timing indicator, the piston will be at the top dead center. The lower dead center may be determined in a similar way.

From these center marks, the distances, as shown on the timing diagram, may be laid off by measurement, the valves set to open and close correspondingly. The dead centers of cylinders Nos. 1 and 6 are the same; similarly, Nos. 2 and 5, and 3 and 4.

As a rule valve timing should be left to the care of an expert repair man.

Clutch

The three disc, enclosed clutch used on this car is shown in section in cut No. 10. The cast iron fly wheel forms one of the clutch discs, the center disc being of manganese bronze and the outer disc pressed steel. The clutch outer disc revolves with the fly wheel and the center disc with the main drive shaft, the first being normally pressed against the center disc and that in turn against the fly wheel by the action of the clutch levers and the clutch spring.



CUT NO. 10. CLUTCH.

When it is desired to release clutch, pressure is applied at the foot pedal and the clutch shifting lever is moved backward, removing the pressure of the spring from the clutch levers. This allows the clutch release spring to force the plates apart and release the clutch. At the same time the clutch brake becomes operative and brings the clutch disc and main drive shaft to rest.

The ball thrust bearings shown in cut are operative only when the clutch is released. The clutch disc has cork inserts to make the action of the clutch smooth and easy and clutch requires practically no attention, but one-half pint of oil should be added about

every 500 miles. To do this remove the brass plug in the face of the clutch. For ordinary weather we recommend one-third kerosene and two-thirds cylinder oil for use in the clutch. In cold weather it may be necessary to use more kerosene to get good results.

The clutch is provided with two separate means of adjustment. See cut No. 10. The main adjustment is obtained by the "clutch spring adjusting nut," as shown. The nut regulates the tension the spring brings to bear on the clutch fingers. The other adjustment provides a means for regulating the pressure of the individual clutch fingers, and consists of the four studs near the outside of the fly wheel. The position of these studs is retained by the "adjusting stud nuts," Ni and Nf.

If excessive slipping of the clutch occurs in use, it will be necessary to screw the clutch spring adjusting nut clockwise, with the spanner provided, after removing the locking wire, until the slipping ceases. The other adjustment need only be used after the car has been run for a long time, as this adjustment is to compensate for wear. To re-adjust the individual pressure of the fingers, loosen and slip the ring marked "7M21" back out of the way. With the clutch disengaged by an assistant, adjust the studs so that as the clutch is let in the four fingers come under pressure at the same moment. This may be determined by inserting the fingers of the hand in the opening uncovered. The movement of the studs forward cause the fingers to engage earlier. When the clutch lever is pushed out, all the fingers should be loose and have the same amount of play. The adjustment is very sensitive and a very little movement of the stud is necessary. Be sure to lock the nuts Nf and Nr well.

To disassemble the clutch: First remove the clutch shifting tube by taking off the bracket caps, then the four bolts holding the clutch shaft coupling (7M26) together. Next take out the two bolts holding the keys in (7M0111), the clutch brake disc. The disc is now screwed forward giving clearance so that the coupling (7M26) may also be drawn forward and removed. A sharp instrument is inserted in the slot shown at 7M123 and the plunger (7M122) pushed back. The plunger cap (7M123), is now removed. The lock wire through the cap screw, 14 x 71, holding the clutch cover (7M41), is drawn out and the screws removed. The four stud adjusting nuts are also unscrewed. Pull the short clutch shaft (7M25) upward and to the rear as far as possible, then the cover, shaft, clutch spring, and clutch shifting sleeve may easily be removed. The removal of the other members will be self-evident.

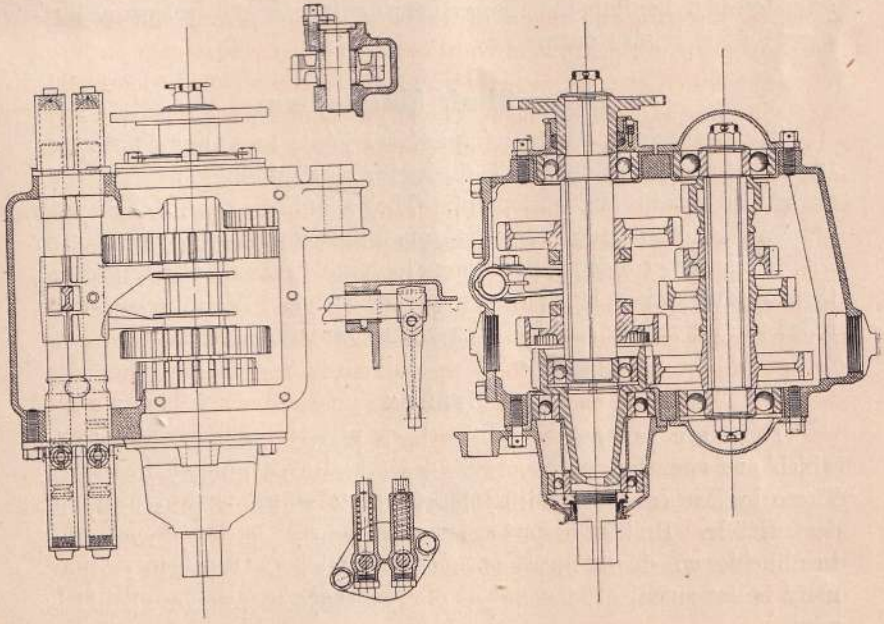
The clutch is properly adjusted when it leaves the factory and if attention is paid to the above, the clutch should give perfect satisfaction.

About once a month all the oil should be drawn from the clutch by taking out oil plug and turning fly wheel until hole is at the bottom. After the oil has run out, turn half way around and inject four guns of gasoline or kerosene. Then turn the wheel down again and kerosene will run out, carrying any dirt or sediment with it. Finally, put in about one-half pint of the above mixture of kerosene and oil.

See that the grease cup on the clutch trunnion is kept packed with grease.

Transmission

The transmission is mounted on the frame as shown in cut No. 11. It is of the selective sliding gear type, with three speeds forward and one reverse, all obtained by manipulating the control levers as explained. The only attention necessary to the proper working of the transmission is, that it be kept well filled with good heavy gear oil. About every 1000 miles the cover should be removed and the old oil washed out with gasoline and replaced with new. Cut No. 11, which is self explanatory, shows sectional views of the transmission.



CUT NO. 11. TRANSMISSION

Rear Axle

The rear axle is of the floating type with drive through bevel gears and a bevel gear differential. The wheels may be easily removed by taking off hub caps, pulling out the drive shafts and removing the lock nut on end of axle. After this the wheel itself may be pulled or gently tapped off. Plain heavy grease should be used in the axle and the old grease should be removed every 1000 miles as directed for transmission, by removing rear cover. The hubs should be filled with Albany grease and one filling should last almost an entire season. Grease cups are provided in the spring seats and should be kept full.

Front Axle Bearings

Timken roller bearings are used on the front axle. They should at all times be adjusted so that the wheel turns freely, but without side play. The adjustment is made by removing hub cap and adjusting the castle nut which holds the bearings in place. Care must be taken to replace cotter in nut after adjustment is made. The hubs should be packed with Albany grease and one packing should last an entire season. The caps should be removed and the bearings inspected for oil at least once per month.

It is important that these front wheel bearings should be kept adjusted as not only is the wear on bearings increased by a loose adjustment but it is also dangerous.

Drive Shaft Mechanism

The main drive shaft and universal joints are amply protected from dust and provided with facilities for lubrication. The universals are non-adjustable and dust proof. They should be kept packed with grease which may be introduced through the plugs shown in cut No. 1. The drive shaft is fitted with a sliding joint which should also be greased through the grease cups, shown in cut No. 1. About every 5000 miles the universals should be examined for lubrication.

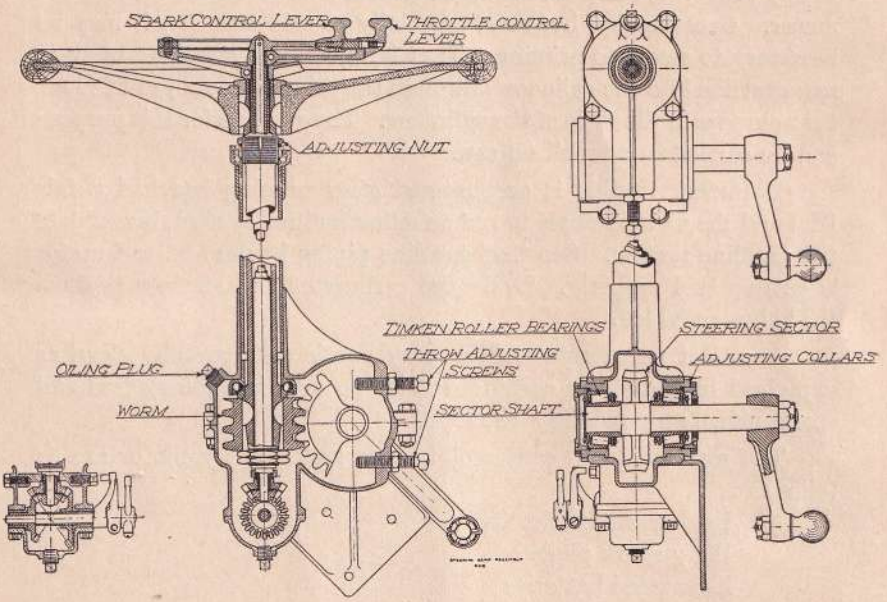
Brakes

There are two sets of brakes both placed on the rear wheels, which are operated by foot and hand levers as already described. These brakes are faced with "Raybestos" which is practically indestructible. Brakes may be adjusted when worn by means of turnbuckles which will be found on the brake rods. When this adjustment is not sufficient, the device on the bands themselves should be used.

Be sure that both brakes of a set are adjusted alike. To try this, jack up the rear wheels and try them by turning wheels after slightly setting brakes. Do not use oil on the brake bands, but see that the adjustments are always such that the bands do not drag upon the drum, and thus retard the movement of the car.

Steering Gear

This is of the standard "Thomas" worm and sector type, with all parts encased and working in graphite grease, grease being supplied through the plug shown in cut No. 12. Ball bearings are provided to take the thrust of the worm and adjustment can be made for wear by means of lock nuts.



CUT NO. 12. STEERING GEAR

The sector shaft is carried on Timken roller bearings so mounted that when sector is in proper position the retaining collars are flush with the adjusting collars and held in place with lock screws. Throw adjusting screws are provided by means of which the total movement of the front wheels may be adjusted, also throw equalized.

In order to take up any play, due to wear, between worm and sector, the adjusting collars are so constructed as to have their outsides eccentric with the sector shaft. By disengaging the adjusting collar

lock and rotating the adjusting collars, the sector is brought into closer relation with the worm, thereby taking up any backlash. The adjusting collar lock is held in place by bolts as shown and before it can be moved these bolts must be entirely removed.

It is absolutely essential to have the two eccentric collars in the same relative position. Should any adjustment be necessary at this point assure yourself that each eccentric has been rotated the same number of degrees by counting the number of slots from the first to the one which the lock engages.

If the Motor Does Not Start

If the rules given in the paragraph entitled "To Start Motor" are rigidly observed, there should be no difficulty in starting a "Thomas" motor. Occasionally, however, especially in cold weather, it may be necessary to resort to priming. That is, injecting a small quantity of raw gasoline into the cylinders, through the priming cocks provided for that purpose in the sides of the cylinders. The gasoline for this purpose can be carried in a small oil can.

If further trouble is encountered after priming has had a fair trial and the motor refuses to run on either ignition system, investigate the gasoline system. See that gasoline piping is free and carburetor is getting fuel properly. Drain the carburetor and strainer through the valves provided.

As a last resort remove the spray nozzle and carefully clean as explained in section on carburetor, also go over ignition system and spark plugs, as previously explained.

The most common causes of trouble and a balky motor are as follows:

Inadequate lubrication
Dirty spark plugs
Exhausted batteries
Loose or broken wires
Tight brake bands or imperfect adjustment of same
Dirty gasoline
Frozen circulating water
Lack of water circulation
Carbon deposit on valve stems
Lack of compression

Of these the first "inadequate lubrication" is the most detrimental, as it may ruin all of the most important surfaces of the motor, as well as cause serious damage to other parts of the car.

Tires and Rims

The tires and rims used on "Thomas" motor cars are of standard manufacture and carry the manufacturer's guarantee. Any claims for repairs or replacements should be made direct to the manufacturer or through their branch houses or agents.

To insure long life, keep your tires properly inflated.

Below are shown two tables that are commonly used:

Recommended by the Goodrich Tire Co.

Inflation Pressure Table per Tire

Size Tire	Pound Load									
	200	300	400	500	600	700	800	900	1000	1100
	Pounds per Square Inch Pressure Inflation									
3 inch	45	55	65							
3½ inch		50	60	70	80					
4 inch				65	75	85	95	105		
4½ inch					70	80	90	100	110	
5 inch						75	85	95	105	115

The following table has been compiled by a well known tire concern, and represents about average practice:

Size Tire	Front Lbs. Pressure	Rear Lbs. Pressure
3 inch	50	60
3½ inch	60	70
4 inch	70	80
4½ inch	80	90
5 inch	100	110
6 inch	120	130

Repairs and Repairing

If the car requires the attention of a repair man, where practical, it should be taken to a regularly appointed "Thomas" dealer, who will be more interested and in a better position to locate the trouble than any general repair shop. Treat your car as you would your watch and don't let anybody and everybody tamper with its mechanism.

Tools, Equipment, Etc.

The following is a list of the tools and equipment for the car. Check these off when you receive your car, for every car when shipped is fully equipped.

Tools

1 tool box
1 tool equipment roll
1 auto jack
1 auto jack handle
1 auto hammer
1 3/8" cape chisel
1 3/4" cold chisel
1 8" second cut—1/2 rd. file
1 file handle
1 oil gun
1 pair Universal pliers
1 4" screw driver
1 8" screw driver
5 double open end wrenches
1 adj. S wrench
1 12" auto wrench
1 clutch spring adj. spanner
1 clutch trunnion set screw wrench
1 hub and valve cap wrench
1 magneto adj. wrench
1 spark plug wrench
1 valve puller
1 valve spring lifter

Extra Parts

2 spark plugs
2 spark plug gaskets
2 valve cap gaskets
1 gas inlet manifold gasket
1 exhaust manifold gasket
1 exhaust pipe gasket
1 water inlet gasket
1 water outlet gasket
2 valves
2 valve springs
2 2" hose clamps
2 1½" hose clamps
2 valve spring seats
2 valve lifter springs
2 valve stem collars

Standard Parts

5 clamp bolts (assorted)
4 cap screws (assorted)
6 castled nuts (assorted)
7 plain nuts (assorted)
2 plain washers
7 lock washers (assorted)
16 cotter pins (assorted)
2 taper pins
10 rd. head rivets
10 ft. lock wire
6 ft. candle wicking

Miscellaneous

Top
Glass front
Speedometer
Shock absorbers
~~1 trunk cover~~
1 horn and tube
2 head lamps
2 side lamps
1 tail lamp
1 oil can
1 Presto-O-Lite tank
1 tire pump
1 tire repair kit
1 magneto switch blade
2 timer plugs
1 gasoline measure
3 tire bracket straps
1 instruction book

Brief Pointers

Do not start motor without first making sure that gear shift lever is in neutral position.

Do not throw in clutch when brake is on.

Look at the gasoline tank. It is annoying, to say the least, to find that the cause of a balky motor is an empty gasoline tank.

Keep tires well inflated and do not allow oil, grease or gasoline to get on them.

Do not let the car stand with engine running. Throw off the switch when standing for any length of time.

Always run with the spark well advanced as previously explained and control the car by the throttle rather than the spark. If compelled to run very slowly, retard the spark and close the throttle as much as possible. Do not make a practice of running with a retarded spark and an open throttle.

Always look at your gasoline shut-off valves when filling the gasoline tank, or some day you will run out of gasoline and find no reserve to draw from.

Do not speed the car up more than six or eight miles per hour for a long distance while running in the low gear. While the car can stand such treatment for a long time, still its useful life will be much longer if it is handled carefully.

Do not throw on the brakes suddenly except in cases of emergency.

When car starts to skid on wet pavement or muddy road, throw out the clutch, and if necessary to use brakes apply them very gently. By proper attention to this rule, car may usually be kept headed in the desired direction on even the most slippery road.

Run slowly on wet asphalt. Slow down for corners and save your tires.

See that car is always properly lubricated.

Do not run on less than six cylinders. It is not necessary, and besides, you have paid for them all. If one is suspected of not working, try to remedy it immediately. There is always a reason.

All joints in steering gear, steering connecting rods and front wheels should be kept properly adjusted, as it is injurious to the mechanism and dangerous to run with these parts poorly adjusted.

Remember that the car will not run forever without oil. It will run a long time, but greater satisfaction will be obtained if all parts are properly lubricated.

Keep the radiator filled or do not be surprised when the engine looses power and the cylinders begin to cut.

Do not use plugs longer than the standard A. L. A. M. plugs.

National Association of Automobile Manufacturers

Standard Warranty

Adopted August 12, 1902.

We warrant all goods furnished by us, for sixty days following the date of their shipment, based upon the date of invoice covering the goods, this warranty being limited to the replacement in our factory of all parts giving out under normal service in consequence of defect of material or of workmanship.

If the circumstances do not permit that the work shall be executed in our factory, this warranty is limited to the shipment, without charge, of the parts intended to replace those acknowledged to be defective.

It is, however, understood that we make no warranty whatever regarding pneumatic tires or the batteries.

We cannot accept any responsibility in connection with any of our motor cars when they have been altered or repaired outside of our factory.

We are not responsible to the purchaser of our goods for any undertakings and warranties made by our agents beyond those expressed above.

We wish it distinctly understood that we make no warranty of our goods except as stated above, but desire and expect that customers shall make a thorough examination of our goods before purchasing.