The Thomas Flyer

CHAMPION ENDURANCE CAR OF THE WORLD

INSTRUCTIONS

Thomas Flyer, 6-40
Model "M"—1911

INSTRUCTIONS

FOR THE CARE AND OPERATION

OF THE

Thomas Flyer 6-40

MODEL "M"—1911

E. R. THOMAS MOTOR COMPANY

BUFFALO, NEW YORK

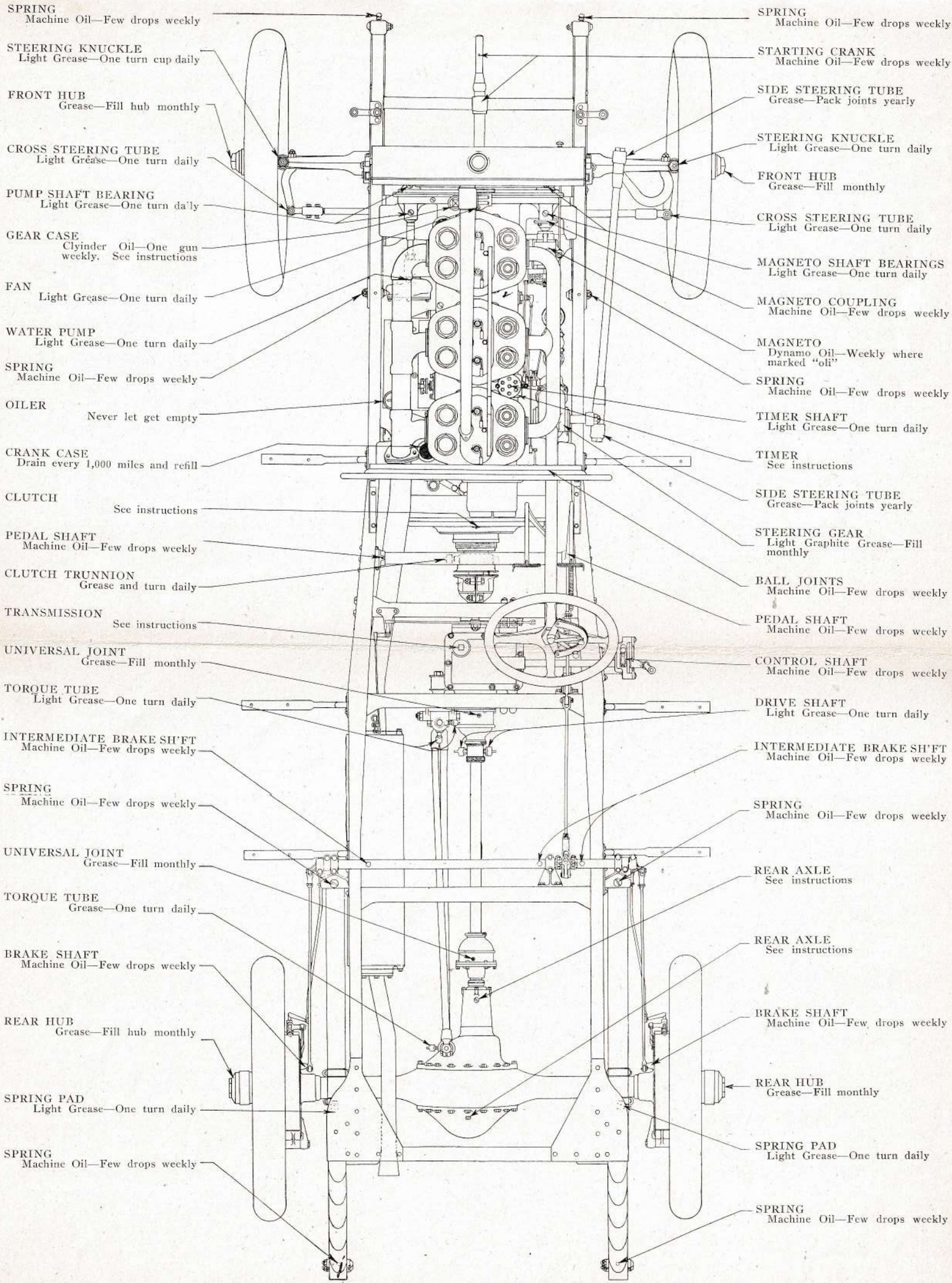
Member Association Licensed Automobile Manufacturers

CONTENTS

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 wheel, 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.

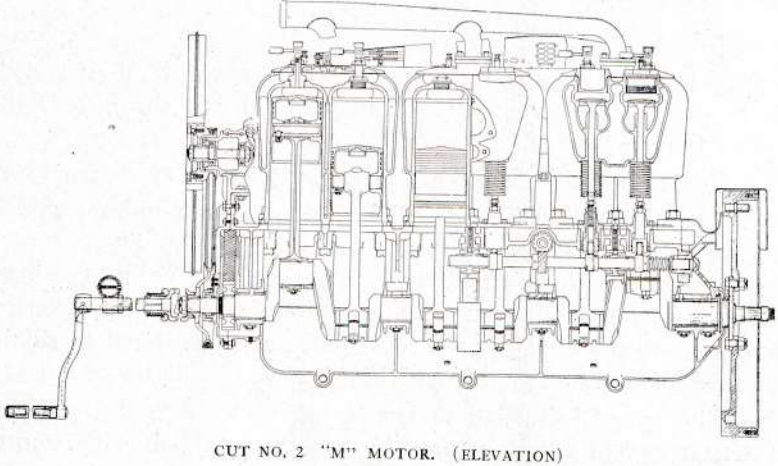
No. 6. Foot brake lever—the right-hand foot lever.

No. 7. Accelerator pedal—small pedal at right or between 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.

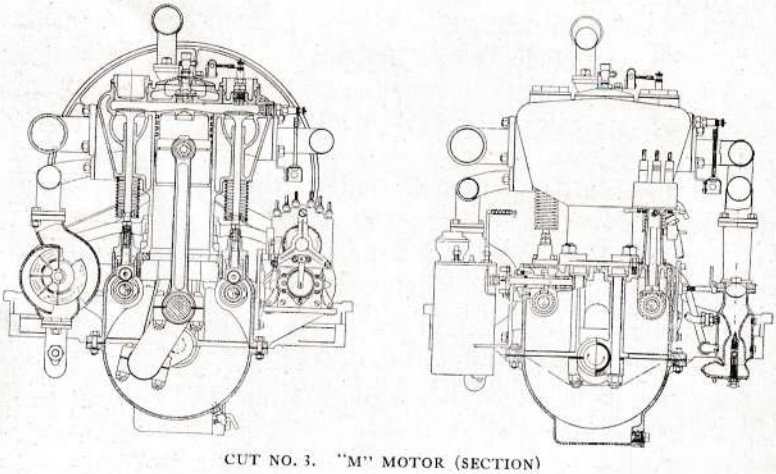
The spark lever controls the time at which the spark ignites the charge in the cylinder. When the lever is nearest the operator, the spark is retarded, i. e., the charge is ignited after



CUT NO. 2 "M" MOTOR. (ELEVATION)

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



CUT NO. 3. "M" MOTOR (SECTION)

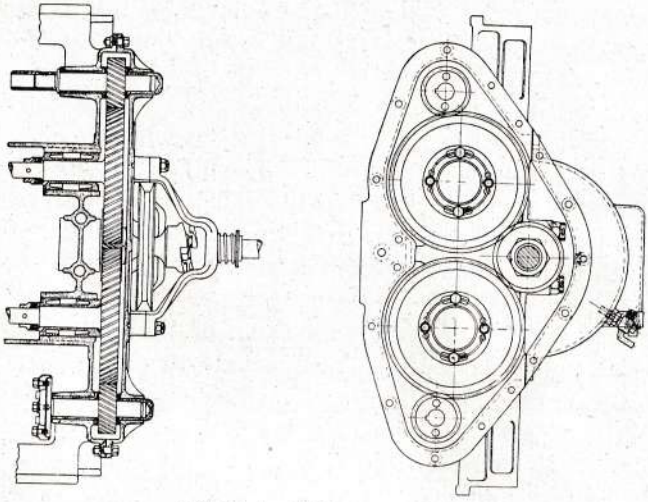
smoothly. Hence, the spark must be advanced at high speeds and retarded at low speeds, or in other words the higher the speed the greater the advance.

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.



CUT NO. 4- "M" MOTOR GEARS

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 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 a car until the emergency brake is released and the lever is 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 pedal 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 of the condition of the motor, for, since exhaust is 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 to the positions as marked, throws the battery ignition system on or off.

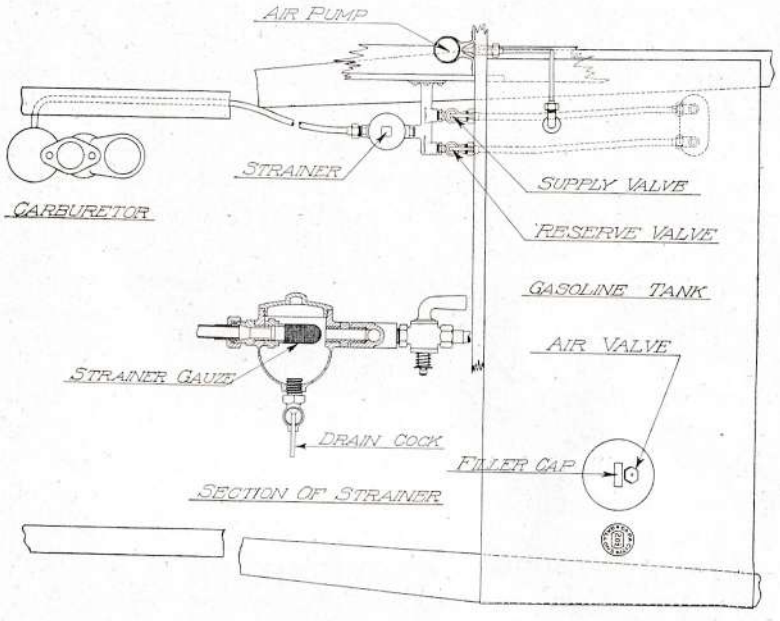
Gasoline System

This is shown diagramatically in Cut No. 5. The 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. 5. 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 gets too low for gravity feed.

In the filler cap a small air valve is provided which normally allows the tank to be under atmospheric pressure, but which closes and prevents the pressure from escaping when the hand pump is operated. If this fails to operate, clean it.

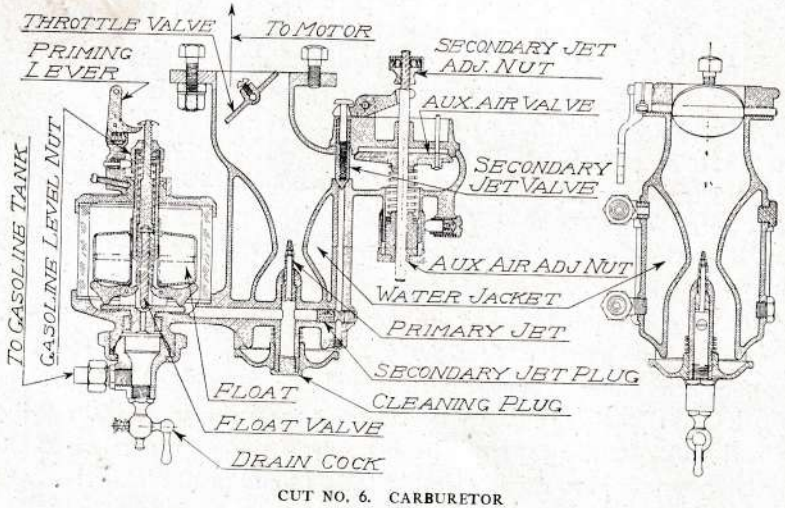
Carburetor

Cut No. 6 shows in section the automatic float feed carburetor used on the car. Gasoline from the tank enters the float chamber and rises to within a short distance of the top of the primary jet, when the float rises and automatically shuts off the flow.

At low speeds of the motor the large portion of the entering air is drawn through the annular opening at bottom of the carburetor, passing upward through the Venturi tube and vaporizing the gasoline drawn from the primary jet. As needed, to keep the mixture correct, the auxiliary air valve admits more and more air. As the speed still increases, the secondary jet adjusting nut comes into contact with the lever operating the secondary jet valve, which now permits additional gasoline to flow at this point; thus helping out the primary jet and maintaining a correct mixture.

The carburetor is water jacketed as shown, by passing a small part of the cooling water around the Venturi tube. A cock is provided to shut off the jacket water when desired. In hot weather the cock should be closed, as otherwise the hot water will cause boiling of the gasoline and irregular running of the motor. The throttle valve controls the amount of gasoline vapor admitted to the cylinders.

The carburetor has been carefully adjusted at the factory and should not be tampered with until it is certain that it is



CUT NO. 6. CARBURETOR

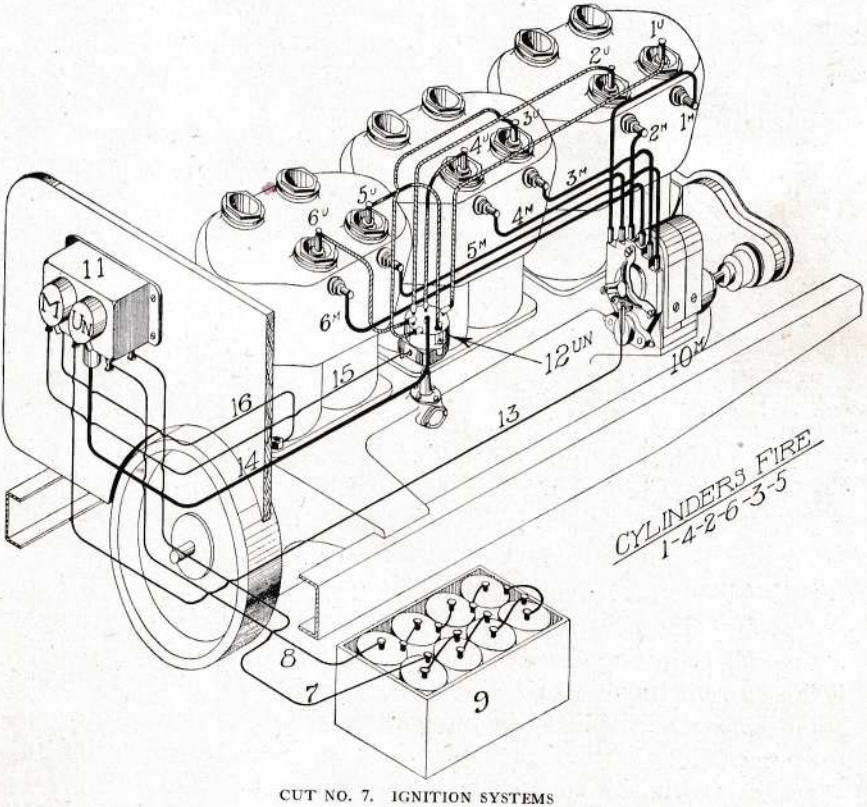
causing trouble. Should the carburetor at any time overflow, it is probably due to sediment collecting on the float valve. If working the priming lever a little does not remedy this, the needle valve will have to be removed and cleaned.

To Adjust.

First. Turn the gasoline level nut either up or down until gasoline in float chamber is about level with line on carburetor float chamber. This, however, is done at the factory and usually requires no further adjusting.

Second. Back off secondary jet adjusting nut until it clears level 1-16", then turn up auxiliary air adjusting nut until air valve is seated firmly.

Third. Retard spark, and, with throttle open a very little, start motor and turn the auxiliary air adjusting nut either up or down to the point when the motor throttles down best.



CUT NO. 7. IGNITION SYSTEMS

Fourth. Advance spark and open throttle quickly. If motor fires back through carburetor or is slow in speeding up, turn the auxiliary air adjusting nut down until back-firing is stopped and you get the proper speed. To start the motor when cold, raise the gasoline lever in float chamber by operating the priming button on front of car until it floods over into priming cup on bottom of carburetor.

By following these directions carefully, you should have no trouble in getting perfect adjustments. Also see separate leaflet, "Carburetor Instructions."

Ignition Systems

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. 7 shows both of these systems, properly mounted and connected up, also the two switches by which they are controlled.

On the bottom of the Coil Box, a short wire (not shown) leads from the terminal marked "Magneto Ground" to terminal marked G.

Atwater-Kent Unisparker

This device is mounted on the engine and driven by bevel gears from 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. 8. The shaft A-A has six notches milled in it, and as it revolves the snapper A-D is forced against A-F, which in turn moves light spring, and the primary circuit through the coils is completed by the platinum contacts.

Further movement of the shaft allows the snapper A-F 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 underneath.

The batteries for the operation of this system are placed in the left 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.

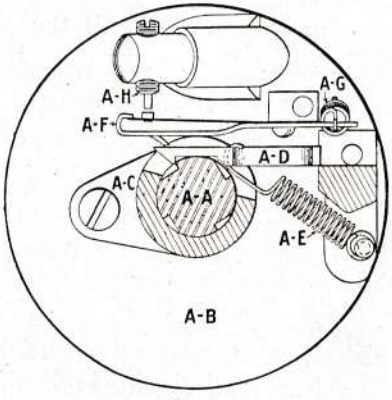


Fig. 5

CUT NO. 8. VIEW OF CONTACT MAKER

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 cover. 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 (to-

ward 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

If for any reason the setting of the Unisparker has been disturbed, it may be easily reset as follows:

With the engine turned over so that No. 1 cylinder is compressing open the priming cock and turn the flywheel in the direction of rotation of the engine until the point on the flywheel marked "1-6" Center is directly opposite the timing indicator. With the cover of the distributor removed and the spark lever on the steering column slightly less than one-third of the travel on the quadrant, connect up the small link operating the Unisparker housing and mesh the bevel gears so that when the spark lever is moved up to one-third of its travel a click occurs. The Unisparker has been carefully set at the factory and the length of the link adjusted to give good results, and should not be touched. 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. 9. 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 (6) 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.

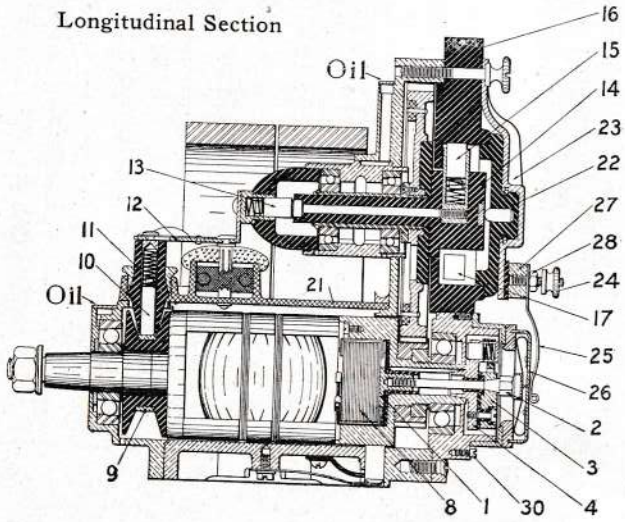
The apparatus, in common with all ignition magnetos, gives a better spark for earlier ignition; hence, it is more advantageous to slightly advance the spark for starting.

The ignition system may be disconnected or rendered inoperative by permanently short circuiting the primary circuit. This is accomplished by leading an insulated 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.

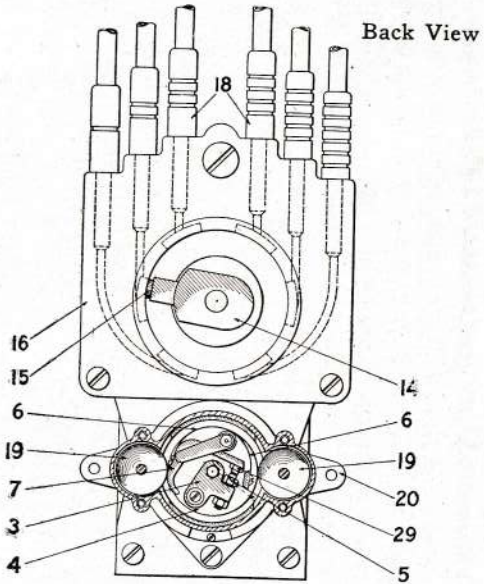
In order to protect the insulation of the armature and of the current carrying parts of the apparatus against dangerously excessive pressures, a safety spark gap is arranged on the dust cover (21). The current will pass through this gap in case a cable is taken off while the magneto is in operation, 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 brush.
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. 9. 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 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 screws on the clutch 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 electrodes 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 take 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. 9, 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 the 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 dynamo oil should be placed in oil holes in the top of the contact maker of the Unisparker, and the grease cup on the side of the timer bracket kept filled with Standard Oil Auto No. 4 cup grease and given a turn every day.

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. 10, 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.

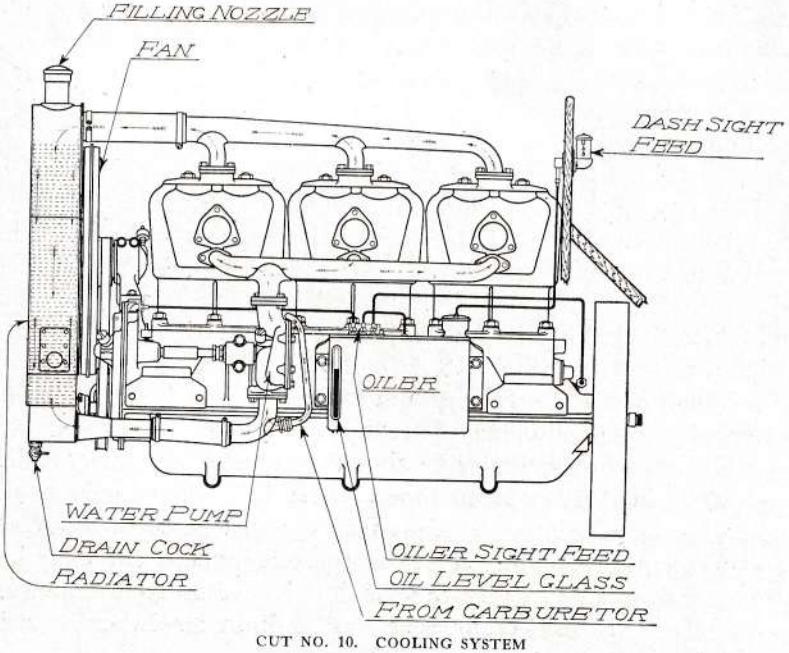
Adjustment of the Fan Belt

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.

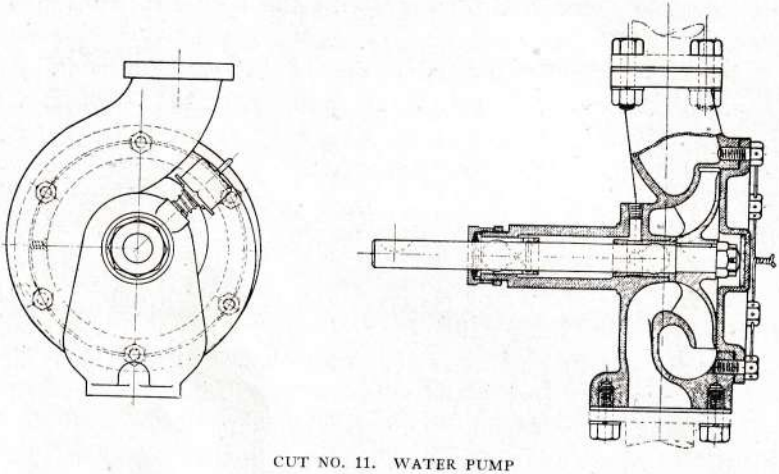
Never run the motor unless the cooling system is full of clean, pure water, rain water being the best for the purpose. If dirty water must be used, strain it. If the car is to be laid up for any length of time, drain the system by means of the drain cock at the bottom of the radiator. After all water 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 excellent, the simplest and probably the best being a 20-30 per cent. solution of denatured alcohol, which



CUT NO. 10. COOLING SYSTEM

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.



CUT NO. 11. WATER PUMP

Oil and Oiling

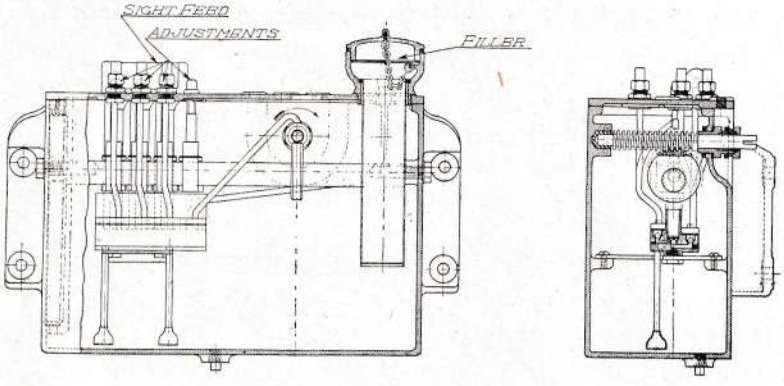
On the motor, splash lubrication is used, the oil level in the crank case being kept approximately constant by a three-feed oiler with sight feed on dash. The oiler is bolted to the crank case and is gear driven from the motor. Cut No. 12 shows a sectional view of the oiler used.

One sight feed on the dash indicates whether the oiler is working or not, and an individual sight feed on the oiler case for each of the three oil leads which feed the crank case of the motor are provided as shown. All the four feeds should feed three drops of oil per revolution of the pump shaft. This feed may be adjusted by the four adjusting screws. Screwing clockwise increases the rate of flow and vice versa.

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. (See lubricants recommended.) 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 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. 12. OILER

Every 1,000 miles the old oil should be drawn off by means of the pipe plug in bottom of case and 1 quart of fresh oil poured into each of the two vent pipes feeding the front and rear pair of cylinders. The three pet cocks on bottom of case are provided with a short stand pipe, and 1 quart of oil for each pair of cylinders should just cause a little overflow, then stop. If this does not happen, add oil until the pet cocks show the level to be right. The cross section of the motor, Fig. No. 3, will make this clear. Be sure the pet cocks and tubes are clean. If in doubt, run a wire up.

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, etc.

Every month or so the car should be jacked up so as to open the leaves of the springs and a mixture of kerosene and flake graphite injected.

Lubricants Recommended

CYLINDER OIL—

Thomas' Special Motor Oil.
Zerolene.
Havolene (medium grade).
Mobil Oil (Vaccum "B"—formerly No. 3).
Harris Motor Oil (medium grade).

GRAPHITE GREASE—

Acheson No. 33 (a graphited grease of the consistency of vaseline).

Acheson No. 63 (a much heavier grease than their No. 33), for use in the universal joints only.

CUP GREASE—

Standard Oil Artic No. 4, or any high grade.

Albany grease.

NON-FLUID OIL—

K-No. 00, regular N. Y. & N. J. Lubricant Co.

GEAR CASE OIL—

Standard Oil or any good grade of heavy oil.

GRAPHITE—

Dixon's Flake No. 1.

DYNAMO OIL—

Any good grade.

The above lubricants can be obtained from almost any supply house or garage.

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. Pull the compression relief handle, which will be found at the right hand side underneath the radiator, forward and turn so that the small projection will engage with the bracket, thus holding the handle in this position. The handle is arranged to move the exhaust cam shaft forward, engaging the relief cams which permit part of the compression to escape, thus making starting easy. If any difficulty is experienced in pulling the handle out, turn the engine over slightly.

10. Engage the starting crank by pushing 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 likely to be injured.

11. Finally, after the motor is running properly, push compression relief handle back as far as it will go and cut in 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

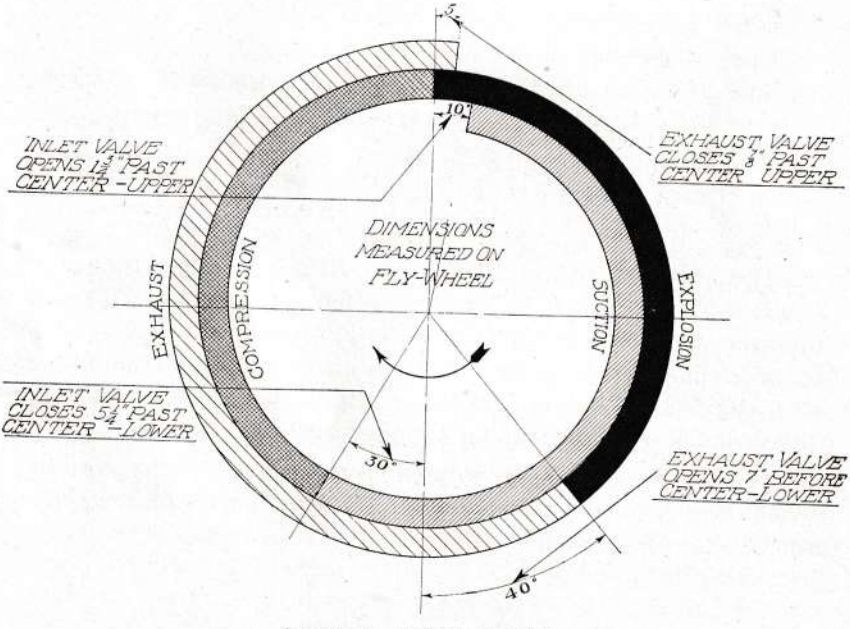
Shut off the gas by bringing the throttle lever to the lower end of the quadrant, and then short circuit the magneto by throwing switch to "off" position. If it is desirable that the motor start easily, it is a good plan to open the throttle just as the ignition is thrown off, then each cylinder will 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 meshed, 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 acts only as an oil pan and may easily be dropped, thus permitting the bearings to be readily inspected and, if necessary, adjusted. The pistons and connecting rods can be removed without removing the cylinders, by turning the crank shaft so as to allow the pistons to be drawn downward.



CUT NO 13. 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 let 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 (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 compressions 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 valves 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. 13, 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.

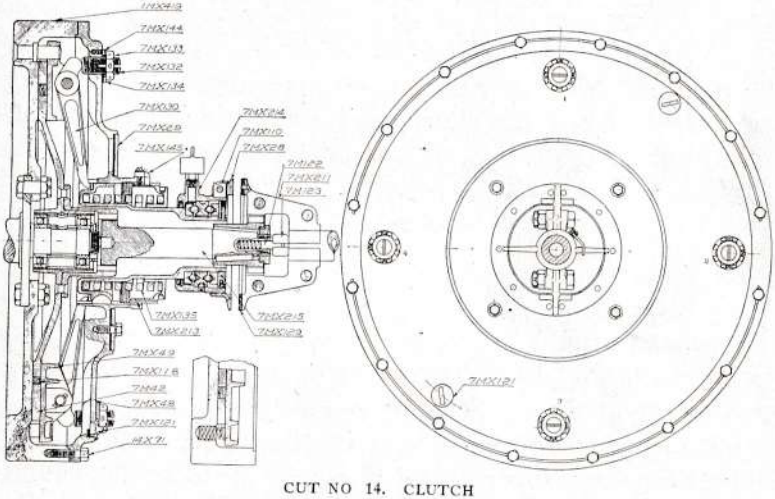
From these center marks, the distances, as shown on the timing diagram, may be laid off by measurement, the valves set to open and close correspondingly. The dead centers of cylin-

ders 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. 14. The steel fly wheel forms one of the clutch discs, the center disc being of manganese bronze and the outer disc cast iron. 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 14. 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 fingers. 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 a stop.

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. 14.) The main adjustment is obtained by the clutch spring adjusting sleeve (7 MX 213), as shown. This sleeve regulates the tension that the spring brings to bear on the clutch finger (7 MX 130). By studying the cut closely, this will be easily understood. The other adjustment provides a means for regulating the pressure of the individual clutch fingers and consists of four finger adjusting screws (7 MX 132) near the outside of the fly wheel. These are locked by special lug washers (7 MX 134) and lock nuts (7 MX 133).

If excessive slipping of the clutch occurs in use, it will be necessary to screw the clutch spring adjusting sleeve (7 MX 213) clockwise, with the spanner provided—first removing the lock (7 MX 145)—until the action is correct. The other adjustment need only be used after the car has been run a long while, as this adjustment is to compensate for wear. To adjust the individual pressure of the finger, loosen the hand hole plate (7 MX 29) and slip back out of the way, thus permitting access to the finger. With the lock nut (7 MX 133) backed off enough to permit the lug washer (7 MX 134) to slip over the lock screw (7 MX 144), give the adjusting screw a slight turn clockwise and drop the lug washer over the screw, noting the number of spaces turned through. Now repeat with each of the other three adjusting screws. Note whether all the fingers had taken the lead at the same time. If all the adjusting screws have been turned correctly, this will be the case. After all are correct and the clutch releases properly, tighten up lock nuts and insert cotter pin. This adjustment is very sensitive and care will have to be taken that all the fingers take an equal portion of the load. This can be most easily ascertained by a feeler against finger (7 MX 130) at its inner end, which is the end in contact with the Clutch Shifting Sleeve.

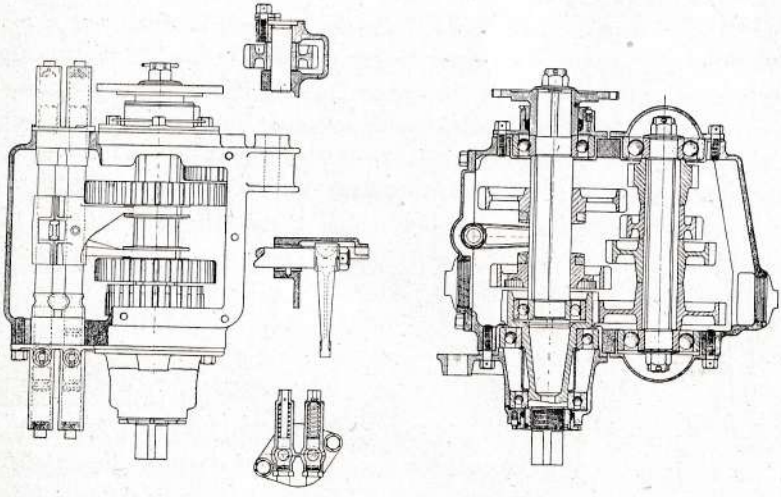
To disassemble the clutch: First remove the clutch shifting tube by taking off the bracket caps; then the four bolts hold-

ing the clutch shaft coupling (7 MX 211) together. Next remove the keys (7 MX 110) and back the clutch brake plate (7 MX 28) away from the coupling so the coupling may be pulled forward and removed in two halves. A sharp instrument is inserted in the slot shown at (7 M 123) and the plunger (7 MX 122) pushed back. The plunger cap (7 M 123) is now removed. The lock wire through the cap screw (14 X 71), holding the clutch cover (7 MX 48), is drawn out and the screws removed. Pull the short clutch shaft (7 MX 215) 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 Artic No. 4 cup grease.



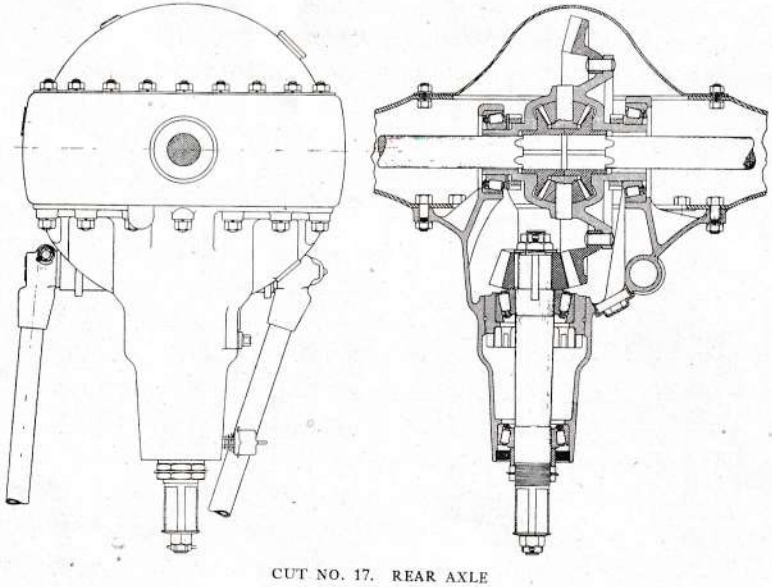
CUT NO. 15. TRANSMISSION

Transmission

The transmission is as shown in Cut No. 15. 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 K 00 Non-Fluid Oil. About every 1,000 miles the cover should be removed and the old oil washed out with gasoline and replaced with new. Cut No. 15, which is self-explanatory, shows sectional views of the transmission.

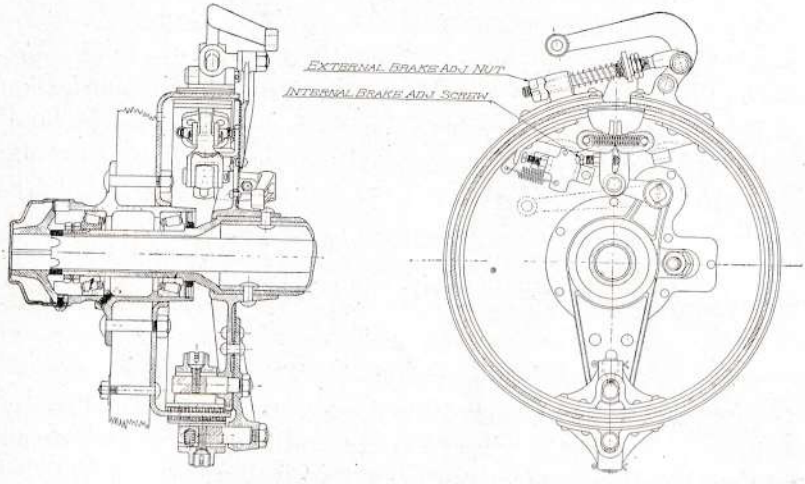
Rear Axle

The rear axle is of the floating type, with drive through bevel gear and a bevel gear differential. (See Cuts No. 17 and No. 18.) The wheels may easily be removed by taking off the hub cap, pulling out the drive shafts and removing the lock nuts on end of axle. A special wrench will be found in the tool-box for this. After this, the wheel itself may be pulled or gently tapped off. Every 1,000 miles the old grease should be removed from the axle, by taking off the cover plate, and the axle washed out with kerosene. The bearings should then be packed with Artic Cup Grease and a half gallon of standard case oil and 3 lbs. of Dixon's No. 1 Graphite added and cover replaced. The



CUT NO. 17. REAR AXLE

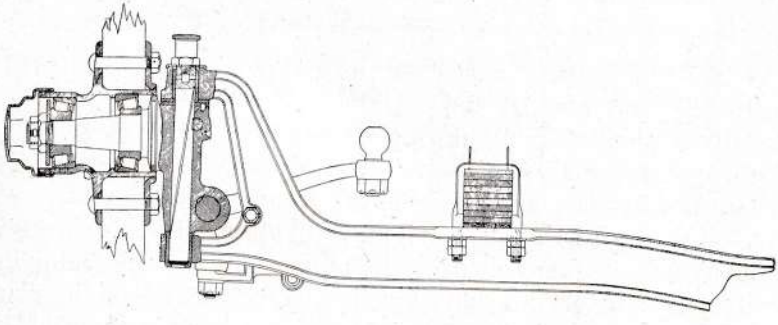
hubs should be filled every month, as needed, with Acheson No. 33 Gredag. Grease cups have been supplied on the spring seats and should be kept full of No. 33 Gredag.



CUT NO. 18. WHEEL MOUNTING AND BRAKES

Front Axle

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 Acheson 33 Gredag, as needed. The caps should be removed and the bearings inspected for oil at least once per month.



CUT NO. 16. FRONT AXLE

The bearings should be kept adjusted, as not only is the wear on bearings increased by a loose adjustment, but is also dangerous.

Main Drive Shaft

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 5,000 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.

The external brake may easily be adjusted by means of the adjusting nut shown in Cut No. 18. The set screw shown provides means of adjusting the internal brake, upon removal of the wheel.

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.

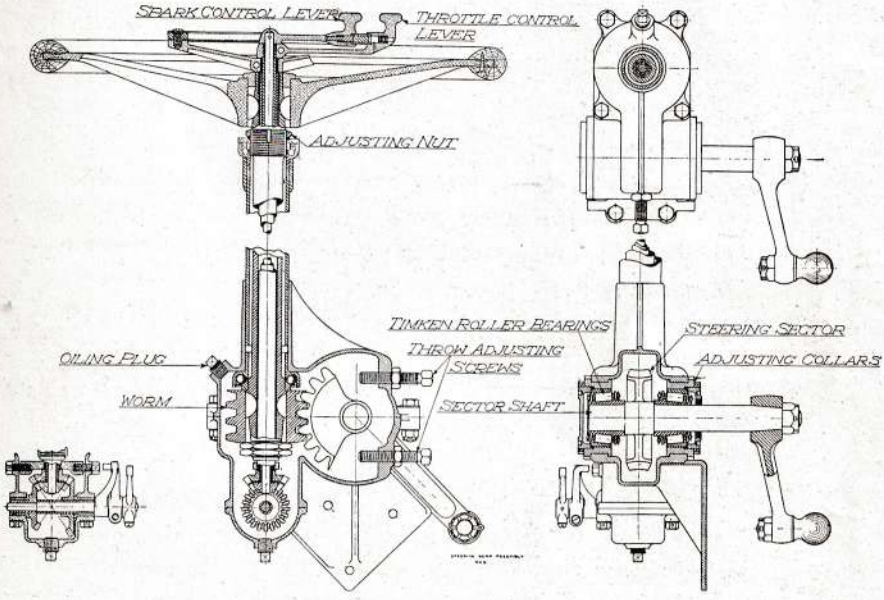
Steering Gear

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. 19. Ball bearings are provided to take the thrust of the worm, and adjustment can be made for wear by means of lock nuts.

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.



CUT NO. 19. STEERING GEAR

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 top 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.

We will not be responsible for any parts substituted for our standard design.

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 (side)
1 tool box (rear)
1 auto jack
1 auto jack handle
1 auto hammer
1 ⅜" cape chisel
1 ¾" cold chisel
1 8" second cut—½ rd, file
1 file handle
1 oil gun
1 pair pliers
1 4" screw driver
1 8" screw driver
5 double open end wrenches
1 clutch spring adj. spanner
1 shock absorber wrench
1 oiler key
1 adj. S wrench
1 12" auto 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
1 valve
2 valve springs
2 2" hose clamps
2 1½" hose clamps
2 valve spring seats
2 valve stem collars

Standard Parts

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

Miscellaneous

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

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 loses 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.