


**Instructions for
Operating 1903
Model 17 and 18
Thomas Auto-
mobiles** 



**MANUFACTURED BY
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Instructions for Operating No. 18



IMPORTANT.

Do not run your car unless you see personally that it is properly oiled in every part before you start it, as our guarantee does not cover replacements and repairs when necessitated by failing to oil or keep parts properly adjusted.

HINTS.

When the motor does not ignite regularly it is usually caused from :

- 1st—Getting not enough or too much gasoline or of a poor quality.
- 2nd—Loose wire connections.
- 3rd—Corroding of the points on the ignition plug or buzzer.
- 4th—The vibrator at the induction coil may be out of adjustment
- 5th—Weak batteries.
- 6th—The contact trembler spring out of place causing a poor contact.
- 7th—Valve operating rods out of adjustment.
- 8th—Water in the cylinder.
- 9th—Water in gasoline which stops flow at the mixer.

Never lose confidence in your ability to handle the vehicle or the motor.

On approaching a team always retard the spark and throttle mixture to reduce the noise as much as possible.

Black smoke at the exhaust means improper mixture, that is too much gasoline. Examine carburetor to locate the difficulty, usually caused from dirt under the needle valve, at the inlet, or a leaky float which will cause mixer to overflow.

White smoke at the exhaust means too much oil in the cylinder head ; the relief cock at the head of the motor should be open to relieve an over dose of oil before starting.

Never use very early spark only when the motor is running at high speed.

Never use a lighted lamp or candle where gasoline is exposed, as it may cause an explosion.

Always use the speeder or throttle wide open when ascending grades.

If you come to a bad place in the road or into a tight place throw out the clutch, when your motor slows up from overload, throw out the clutch quickly to prevent the motor stopping.

Never leave your vehicle alone with the motor running, as someone might throw in the gears which would cause the rig to start off.

Before starting the engine be sure that the spark shift lever is at the starting point which is as far back as it will go, the top of the vibrator being about on a level with the opening of the crank case where the cover fits on.

Never start your engine unless the gear shift lever is in the neutral notch which is the second from back.

Should you be ascending an extremely stiff grade or passing over very rough, sandy or muddy roads and your engine should slow down so that it would nearly stop, throw out your clutch, allowing the engine to again obtain momentum, applying your slow speed gear.

If it runs slow and gives a jerky motion while clutch is in, relieve same for an instant to allow the motor to pick up again, start with the low speed, working into the medium and high speed.

Never try to start your vehicle through the use of the high speed gear or try to ascend any stiff grades on high speed unless you have sufficient momentum at the foot of the grade to carry you well up before your speed slackens.

In throwing in the clutch, it is better to throw in same gradually as the speed of the vehicle increases. A few drops of oil should be applied occasionally to prevent too quick a grip.

In running the vehicle should you notice a pounding, this means that you have advanced the spark too quickly, as this has to be regulated according to the speed of your vehicle, as the speed of your vehicle increases very gradually.

SUGGESTIONS

Familiarize yourself with the motor and vehicle, and study the parts closely.

The two main points to look after on a gasoline engine are the gasoline flow and the spark, if these are working properly the engine is bound to do its work.

SPARK

Follow the wire connections throughout carefully, starting at the two sets of cells furnished, the use of which can be alternated by shifting the switch from right to left, the circuit being off or broken when in the center. Then follow each of the wires leading from the vibrating induction coil to the various parts including the vibrator or trembler, the spark plug, battery and the grounding, familiarize yourself with their functions to locate your troubles. Should your ignition plug fail to spark at the point: To locate this trouble first remove the ignition plug again connecting the wire allowing it to lay on top of the engine not allowing the brass tip to come in contact with any metal part of the engine, then with the switch on turn over the engine and take notice whether the spark takes place regularly between the two points on the plug which should be 1-32 in. apart. Should your flow of sparks be irregular or none appearing, first clean the two points, also the porcelains thoroughly by the use of a small piece of emery cloth and if there is still no spark, hold the spark plug wire 1-4 inch from the motor and see if the spark jumps across; if not, follow your connections carefully to see that they are all tight, then remove the top of the induction coil and loosen the lock screw and turn the thumb screw 1-32 of a turn, or more or less as the case may require, till the spark takes place regularly, then turn up the set screw, never allowing the vibrating induction coil to buzz unless ignition plug wire is connected with the plug and the plug in

contact with some part of the engine as it will injure the coil, but in adjusting the spark never allow a contact to take place longer than the frictional part of a second, as it will weaken your cells. Examine the vibrator or trembler at the left of your engine as you stand at the rear of your vehicle, as the contact spring may be shifted, which would cause improper contact or else a continuous spark, which would appear to be short circuit. If you find your spark is O. K. and your engine refuses to start, examine

GASOLINE FLOW

The center of the float feed mixer or carburetor is below the line of the bottom of the gasoline storage tank so that the gasoline should flow to the top of the carburetor in the float feed chamber, thus lifting the float which shuts off the gasoline flow, there being an automatic self-seating needle at the bottom of the mixer, thus keeping a constant flow of gasoline in the air chamber or the mixer. This also should have careful study, as a perfect working carburetor is as essential as the spark. Should your reservoir fail to fill sufficient to raise the float, follow your gasoline flow back to the tank, which will no doubt lead you to your troubles through clogging of the pipe, valve shut off or no gasoline. In filling your gasoline storage tank always use a very fine sieve or strainer, which can be soldered into the funnel, which would obviate trouble which is liable to arise from the use of gasoline which is not entirely free from little particles of sediment which will settle in the bottom of the carburetor and prevent the proper working of the little self-seating needle valve. A hexagon cap at the bottom of the mixer will relieve sediment and water if deposited. Should your carburetor be overflowing at the air intake, examine the lift and shut off at the bottom of the float chamber, as there may be a speck of dirt in the seat, also the float which may have sprung a small leak which would weigh it down and hold open the shut off, in this case fit a small piece of

wood or cork into the chamber until the float can be soldered. Too much gasoline as well as too little will cause irregular explosions or the stopping of the motor entirely. Always use the best gasoline, 72 or 76 when obtainable. Regulate the air mixture by the use of the little lever at the front which operates the top lever of the mixer, adjust to attain fastest speed of motor.

WATER SUPPLY

When starting the engine be sure to have water enough in your reservoir which should be kept clean and all water used free from foreign matter which would be liable to clog your circulating pump or stop your radiating system. A small pet cock at the bottom of the cylinder can be used to drain off the water in case it becomes foul or muddy, or in case of cold weather to prevent freezing 8 lbs. of calcium chloride dissolved in a pail of hot water and poured into the water tank will prevent same from freezing in cold weather.

OILING.

The multiple oil tank on the front contains cylinder oil which feeds to the cylinder on the right side. The oil being fed from the pressure tubes leading from the muffler, and lubricating oil on the left side. These feed pipes should be watched closely to see that they are feeding at all times. The vibrator and cam, as well as the valve lift levers, the running and the steering gear, also the *brass thrust collar on the shaft near the clutch* should be oiled occasionally. The driving chain should be removed and cleaned with oil or gasoline and oiled with lubricating oil and graphite mixed and then again wiped off thoroughly

before putting back on the sprocket. If too much cylinder oil is fed it may foul the plug and corrode on the valves and inside of the head, therefore a small pet cock on the bottom of the crank case will be found to relieve an over amount of oil in the crank case although great care should be used to prevent the piston rings from running dry and cutting, therefore the oil feed should be watched very closely. The top of the oil tank should be turned down when the engine is stopped.

TO START THE MOTOR.

First see that outside gear shift lever is in the second notch; see that your gasoline is turned on, place your spark lever on the right side at the starting position which is as far back as it will go towards the seat, which gives a late spark which will prevent back explosions or kick, also open the throttle which is the left lever opening forward, flush the carburetor by the use of the bulb flusher, turn on the switch, relieve compression by pulling up the short lever which is to be found at the right side of the carriage under the seat flap; place the starting crank in position and turn to the left briskly once or twice until one or two explosions have taken place; again close the exhaust lift by pressing down the little lever. Should the engine refuse to start easily, press the bulb flusher several times, again relieve compression and pull the spark shift lever at the top of the steering post a little further ahead and again turn the crank letting a few explosions take place before closing the relief.

TO START THE CARRIAGE.

Get in the vehicle and grasp the steering wheel firmly, advance the spark a little to increase the speed of the motor before throwing in the gears; first press down on the left foot lever which throws

out the clutch, move the outside gear lever slowly ahead to the third notch and let up gradually on the foot clutch, this being the slow speed, leave it in this position and advance the spark until the vehicle is well under motion, then again throw out the clutch and move gear lever into the next notch which is the intermediate gear. To throw into the high speed again throw out the clutch and move lever into the last notch and leave it in this position never removing same unless you wish to stop your vehicle. To reverse, throw out the clutch and place gear shift lever in first notch. To increase the speed of your rig, advance the spark by moving the shift lever gradually toward the front at the same time placing the throttle lever or speeded forward which is used in starting, ascending grades and fast driving. Never advance the spark too quickly, as the vehicle will not pick up as rapidly as it should if the spark is advanced too suddenly, but will cause a pounding of the engine, as the vehicle increases in speed the spark should be advanced.

TO STOP THE RIG.

Place foot on the clutch lever to release clutch apply the brake and remove gear shift to neutral notch. The vehicle should be brought to a stop when throwing the lever from reverse to slow speed or vice versa. As soon as the clutch lever is thrown out so that the engine is running free, the spark shift lever should be placed back as far as possible to prevent the engine racing, which heats up the engine and uses an unnecessary amount of oil and gasoline, also causing unnecessary wear. To stop the engine turn off the switch at the same time opening the exhaust lift which places the engine in starting position, as the exhaust lift cannot always be worked should the cam happen to be up against the compression, but by turning the starting handle against the compression and allowing the engine to bound back 1-2 turn, the exhaust lift lever can then be pulled up.

ADJUSTMENT.

To adjust the motor relieve compression by opening the exhaust lift or the pet cock at the head of the motor and turn the motor over by the use of the starting handle with the switch off; take special notice as to how it turns, should it be turning too hard investigate the cause, as it may be too tight at the shaft, or perhaps the oil cup is not feeding properly; if it is turning free, tighten the nuts on the main bearings until you discover that the motor turns a trifle harder, but the slightest tension noticeable is all that is required, as more than this will cause trouble. Should your engine pound, examine the connecting rod bearings. To do this first remove the splash pan or crank case cover, turn the crank to the front end and place your hand inside next to the piston and see if you can move the connecting rod, or if same is loose turn fly wheel back and forward a trifle and notice if any play appears in the connecting rod bearings; should there be a little lost motion, examine the two bolts on the crank end to see if they are tight and there still be play, remove same and file off a trifle from the face of each plate, care being taken to file evenly. Should there be play at the piston end of the connecting rod, remove the set screw then draw up on the nuts until the connecting rod is properly adjusted, then replace the set screw.

After the motor has been adjusted a short run should be made and the bearings again examined to see that they are not adjusted too tight, which may have caused heating; of course the piston end would heat from the explosion, but any looseness would be detected by a pounding of the engine. No adjustment of the main clutch is necessary; if it grips too hard apply a few drops of oil, and should it slip, apply a little powdered rosin.

The chain is adjusted by the right and left thread collars on the radius rods leading from the rear axle to the angle iron frame. The chain should always run a trifle loose to prevent too much wear on the sprocket

and working parts; all nuts and bolts should be watched very closely, as all these are liable to loosen, especially examine those connected with the steering apparatus.

Too much strain on the motor or running the motor without water, might cause the head gaskets to leak, which will allow water to accumulate in the head of the engine which would render it impossible to start. Should this be the case open the pet cock on the head of the motor, turn the motor over several times with the starting crank until the water is all forced out and the motor will usually start without further trouble. Head nuts should be drawn up from time to time.

To put in new gasket, remove the head, should the leak be at the head, and clean off both cylinder and head proper very thoroughly by scraping with a knife and wash both parts with alcohol, painting both sides of the vulc. asbestos gasket, which we recommend, with shellac and put together, great care being taken to give all nuts and bolts an equal tension. Before putting water into the jacket the engine should be started and allowed to run two or three minutes, the nuts tightened and allowed to stand and cool off at least half an hour, which will allow the shellac to dry well. After running awhile the nuts should be again tightened and from time to time thereafter.

Should the intake valve gasket leak, this same process should be followed. Should your engine self ignite, it is most likely caused from a piece of the gasket getting into the head, or else corroding of the inside of the head or valves with burned oil. If too much oil is fed and gets into the head it will burn and form a scale which heats up red hot and causes self ignition. In this case the head will have to be removed and the scale cleaned off, great care being used to prevent this in future.

Should your engine fail to develop its usual amount of power, remove the intake valve; this will disclose the exhaust valve. Remove the nuts on the exhaust poppet and grind in the valves by the use of medium emery and oil. In replacing the poppet, be sure the

nuts clear the lift levers or you will lose compression, but there should be 1-62 play between the points.

Should occasion require the setting of the 2 to 1 gears, in case the engine was taken apart, to insure the right position of the cam, first place the piston within 3-8 inch of its lowest point, connecting rod being nearly level, slowly turn the engine forward and see if the exhaust springs commence to open; also taking notice if it closes just as the piston reaches the highest point at the head. The inlet opening and closing on the center. Most of our 2 to 1 gears are center punched at the teeth which mesh, therefore the timing of our motor is comparatively easy, especially so as we use the one gear which operates the exhaust, intake, exhaust lift or relief and spark contact.

GENERAL INSTRUCTIONS.

Many automobile owners fail to recognize the fact that their car depreciates very rapidly in value by not being properly cleaned. The mud allowed to dry on the paint and leave spots instead of being washed immediately, it is returned to the coach house. It is well when a carriage is first received, before being used, to sponge off well several times with cold water to harden the varnish to prevent spotting. The motor gets coated with grease and dust and rapidly puts on a dirty and second hand appearance. On the other hand there are cars which after running several thousands of miles look almost as well as they did the day they were turned out.

To remove dust from the paint work, a large common painter's brush is as good as anything, but in muddy weather a soft sponge should be used. The sponge should be frequently plunged into the water and daubed on the mud; do not attempt to wipe it off, as this will scratch the varnish. When every vestige of dust has been removed, the car may be wiped down with soft chamoise leather. Not even the brush, sponge or leathers should touch any greasy part, or it

will spoil the gloss of the varnish. Separate cloths or leathers should be used for the motor or gearing, those parts being finished last and care being taken that no grit or dust be wiped into the bearings. - It is almost needless to say that all lubricators, tanks, etc., should be closed during cleaning operations.

A little kerosene on the cloths used in cleaning engine, greatly facilitates the removal of any grease. To clean the chain, use the same oil, well brushed in with a common paint brush. After having removed all the dirt and water from the car, wipe the bright parts with a rag having a little vaseline on it, and give the chain a coating of tallow and black lead, which can be kept ready mixed and applied with a brush like that used in cleaning.

All dirt should be washed off the tires, and having dried them carefully, cuts and bad places should be cleaned out with benzine and then plugged and cemented with pure rubber and solution so that they may be allowed to harden before being used again. On no account should a deflated tire be allowed to support the weight of a car. If it is not convenient to repair the tire at once the weight of the car should be taken off it by a jack or other support.

There is nothing worse for tires than to allow them to stand on greasy patches, and as it is almost impossible to prevent oil from dropping on the floor, it is best to get a sheet iron tray about five feet long by three wide, having sides about one inch high and slide this under the car as soon as it is brought in, or a piece of linoleum tacked upon a wooden frame may be used.

Instructions for Operating No. 17



IMPORTANT.

Do not run your car unless you see personally that it is properly oiled in every part before you start it, as our guarantee does not cover replacements and repairs when necessitated by failing to oil or keep parts properly adjusted.
Transmission must be oiled at least every 25 miles on ordinary runs and the slow speed oiled oftener where the road demands the use of this gear very much. Oil carefully the four axles of the internal slow speed gears ; also the main shaft on the high, low and reverse gears.

HINTS.

When the motor does not ignite regularly, it is usually caused from:

1st—Getting not enough or too much gasolene or of a poor quality.

2nd—Loose wire connections.

3rd—Corroding of the points on the ignition plug or buzzer.

4th—The vibrator at the induction coil may be out of adjustment.

5th—Weak batteries.

6th—The vibrator springs out of place causing a poor contact.

7th—Valve operating rods out of adjustment.

8th—Water in the cylinder.

Never loose confidence In your ability to handle the vehicle or the motor.

On approaching a team always retard the spark and throttle mixture to reduce the noise as much as possible.

Black smoke at the exhaust, means improper mixture. That is, too much gasolene; $\frac{1}{2}$ turn of the needle valve is usually the proper mixture. This should be adjusted to the fastest speed of the motor after starting. Also examine the carburator to locate the difficulty usually caused by dirt getting under the needle valve at the inlet or a leaky float.

White smoke at the exhaust means too much oil in the cylinder head; the relief cock at the head of the motor should be opened to relieve an over dose of oil before starting.

Never use very early spark only when the motor is running high speed.

Never use a lighted lamp or candle where gasolene is exposed, as it may cause an explosion.

Always use the speeder or throttle wide open when ascending grades.

If you come to a bad place in the road or into a

tight place, pull your lever back from the high speed; the first thing that is done when your motor slows up from over load, throw out the clutch lever quickly to prevent the motor stopping.

Never leave your vehicle alone with the motor running, as some one might throw in the gears, which would cause the rig to start off.

Before starting the engine be sure that the spark shift lever is at the starting point, which is as far back as it will go, the top of the vibrator being about on the level with the opening of the crank case where the cover fits on.

Never start your engine unless the clutch lever is free, being as far forward as it will go.

Never throw into low speed when your car is running faster than six miles per hour.

Never make a quick turn of the steering apparatus while the vehicle is running at a high rate of speed, as it is liable to cause a bad accident.

Should you be ascending an extremely stiff grade or passing over very rough, sandy or muddy roads, and your engine should slow down so that it would nearly stop, throw out your clutch, allowing the engine to again obtain momentum, applying your slow speed clutch.

If it runs slow and gives a jerky motion while clutch is in, relieve same for an instant to allow the motor to pick up again; start with the low speed, working into the high speed.

Never try to start your vehicle through the use of the high speed clutch or try to ascend any stiff grades on high speed unless you have sufficient momentum at the foot of the grade to carry you well up before your speed slackens.

In throwing in the high speed clutch, it is better to throw in same gradually, working it in as the speed of the vehicle increases.

In running the vehicle should you notice a pounding this means that you have advanced the spark too quickly, as this has to be regulated according to the speed of your vehicle as the speed of your vehicle increases very gradually.

SUGGESTIONS.

Familiarize yourself with the motor and vehicle and study the parts closely.

The two main points to look after on a gasoline engine are the gasoline flow and the spark; if these are working properly the engine is bound to do its work.

SPARK.

Follow the wire connections throughout carefully, starting at the two sets of cells furnished, the use of which can be alternated by shifting the switch from right to left, the circuit being off or broken when in the center. Then follow each of the wires leading from the vibration induction coil to the various parts including the vibrator or trembler, the spark plug, battery and the grounding, familiarize yourself with their functions to locate your troubles. Should your ignition plug fail to spark at the point: To locate this trouble first remove the ignition plug again connecting the wire allowing it to lay on top of the engine, not allowing the brass tip to come in contact with any metal part of the engine, then with the switch on, turn over the engine and take notice whether the spark takes place regularly between the two points on the plug which should be 1-32 in. apart. Should your flow of sparks be irregular, or none appearing, first clean the two points, also the porcelains thoroughly by the use of a small piece of emery cloth and if there is still no spark, hold the spark plug wire 1-4 inch from the motor and see if the spark jumps across. If not, follow your connections carefully to see that they are all tight; then remove the top of the induction coil and loosen the lock nut and turn the thumb screw 1-32 of a turn or more or less as the case may require, till the spark takes place regularly; then turn up the set nut, never allowing the vibration induction coil to buzz unless ignition plug wire is connected with the plug and the plug in

connected with some part of the engine as it will injure the coil, but in adjusting the spark never allow a contact to take place longer than the fractional part of a second, as it will weaken your cells. Examine the vibrator or trembler at the left of your engine as you stand at the rear of your vehicle, as the contact spring may be shifted, which would cause improper contact or else a continuous spark, which would appear to be short circuit. If you find your spark is O. K. and your engine refuses to start, examine

GASOLINE FLOW.

The center of the float feed mixer or carburetor is below the line of the bottom of the gasoline storage tank so that the gasoline should flow to the top of the carburetor in the float feed chamber thus lifting the float which shuts off the gasoline flow, there being an automatic self-seating needle at the bottom of the mixer, thus keeping a constant level of gasoline in the air chamber or the mixer. This also should have careful study, as a perfect working carburetor is as essential as the spark. Should your reservoir fail to fill sufficient to raise the float, follow your gasoline flow back to the tank which will no doubt lead you to your troubles through clogging of the pipe, valve shut off or no gasoline. In filling your gasoline storage tank always use a very fine sieve or strainer which can be soldered into the funnel, which would obviate trouble which is liable to arise from the use of gasoline which is not entirely free from little particles of sediment which will settle in the bottom of the carburetor and prevent the proper working of the little self-seating needle valve.

Should your carburetor be overflowing at the air intake; examine the lift and shut off at the bottom of the float chamber, as there may be a speck of dirt in the seat, also the float, which may have sprung a small leak which would weight it down and hold open the shut off; in this case fit a small piece of wood or cork into the chamber until the float can be soldered.

WATER SUPPLY.

When starting the engine be sure to have water enough in your reservoir, which should be kept clean and all water used free from foreign matter, which would be liable to clog your circulating pump or stop your radiating system. A small pet cock at the bottom of the cylinder can be used to drain off the water in case it becomes foul or muddy, or in case of cold weather, to prevent freezing, 8 lbs. of calcium chloride dissolved in a pail of hot water and poured into the water tank, will prevent same from freezing in cold weather.

OILING.

Another very essential part is the lubricating, as any part run dry for a few minutes is liable to cut and cause trouble. The cylinder is lubricated by the use of the automatic sight feed oil cup on the top of the cylinder and the needle valve should be adjusted with the top up to feed about 5 to 8 drops per minute or $\frac{1}{2}$ pint to every hundred miles when the oil is heated and flowing freely. The engine shaft is oiled by the use of three grease cups which should be kept screwed down $\frac{1}{2}$ of a turn for all ordinary runs. The transmission gear should be oiled for every run at all of the oil holes; also oil the cone on the high speed clutch, where it runs on the shaft; also where it runs in the bell crank used to shift same; also a little should be applied to the slow and reverse speed break bands when dry; the vibrator and cam, as well as the valve lift levers, running and steering gear should also have attention occasionally. The driving chain should be removed and cleaned with oil or gasoline and oiled with good lubricating oil and graphite mixed and then again wiped off thoroughly before putting back on the sprocket. If too much oil is fed it may foul the plug and corrode on the valve and inside of the head:

therefore a small pet cock on the bottom of the crank case will be found to relieve an over amount of oil in the crank case although great care should be used to prevent the piston rings from running dry and cutting therefore the oil cup feed should be watched very closely. The top of the oil cup feed should be turned down when the engine is stopped. The slow speed gear should be oiled very often on a run where the roads demand the use of this gear often.

TO START THE MOTOR.

First see that the clutch arm or lever is free, the same being as far forward as it will go and see that your gasoline is turned on, place your spark lever which is the top one at the starting position which is as far back as it will go towards the seat, which gives a late spark which will prevent back explosions or kick; also open the throttle, which is the lowest lever, by advancing, flush the carburetor by the use of the bulb flusher, turn on the switch, relieve compression by pulling up the short lever which is to be found at the right side of the carriage under the seat flap; place the starting crank in position and turn to the right briskly once or twice until one or two explosions have taken place, again close the exhaust lift by pressing down the little lever. Should the engine refuse to start easily press the bulb flusher several times, again relieve compression and pull the spark shift lever at the top of the steering post a little further ahead and again turn the crank, letting a few explosions take place before closing the relief.

TO START THE CARRIAGE.

Get in the vehicle and grasp the steering wheel firmly, advance the spark a little to increase the speed of the motor before throwing in the clutch, move the clutch lever slowly back to the position where it moves hard and clicks, as this is the low

speed; leave it in this position until the vehicle is well under motion then throw the lever back a little gradually until it again clicks, which means that it is in the high speed and leave it in this position, never removing same unless you wish to stop your vehicle. To increase the speed of your rig advance the spark by moving the shift lever gradually toward the front, at the same time placing the throttle lever or speeder forward, which is used in starting, ascending grades and fast driving. Never advance the spark too quickly as the vehicle will not pick up as rapidly as it should if the spark is advanced too suddenly, but will cause a pounding of the engine, as the vehicle increases its speed the spark should be advanced.

TO STOP THE RIG

Pull the clutch lever forward out of the high speed through the slow speed and apply the brake at the right foot; reverse only in case of emergency, as the axle brake on the right should be used to stop the car. The clutch lever can be thrown forward from the high speed through the slow speed quickly without engaging the slow speed, but if your car is traveling faster than six miles per hour never throw backward into the slow speed without first slowing down your car. Should you wish to coast along at high speed pull the clutch out of the high speed and leave same between high and low speed, not pulling forward past the slow speed, then you can throw into high speed without slowing up your car to throw through slow speed. The reverse, or back up, is worked by pressing the left foot lever, but does not lock the same as the other two speeds.

The vehicle should be brought to a stop when throwing the lever from reverse to slow speed or vice versa. As soon as the clutch lever is thrown out so that the engine is running free, the spark shift lever should be placed back as far as possible to prevent the engine racing, which heats up the engine and uses an un-

ecessary amount of oil and gasoline, also causing unnecessary wear. To stop the engine, turn off the switch, at the same time opening the exhaust lift, which places the engine in starting position, as the exhaust lift cannot always be worked should the cam happen to be up against the compression, but by turning the starting handle against the compression and allowing the engine to bound back 1-2 turn, the exhaust lift lever can then be pulled up.

ADJUSTMENT

To adjust motor, relieve compression by opening the exhaust lift or the pet cock at the head of the motor and turn the motor over by the use of the starting handle, with the switch off, take special notice as to how it turns; should it be turning too hard, investigate the cause, as it may be too tight at the shaft or perhaps the oil cup is not feeding properly, if it is turning free tighten the nuts on the main bearings until you discover that the motor turns a trifle harder, but the slightest tension noticeable is all that is required, as more than this will cause trouble. Should your engine pound examine the connection rod bearings. To do this first remove the splash pan or crank case cover, turn the crank to the front end and place your hand inside next to the piston, and see if you can move the connecting rod, or if same is loose turn fly-wheel back and forward a trifle and notice if any play appears in the connecting rod bearings, should there be a little lost motion examine the two bolts on the crank end to see if they are tight and there still be play remove same and file off a trifle from the face of each plate, care being taken to file evenly. Should there be play at the piston end of the connecting rod remove the set screw then draw up on the nuts until the connecting rod is properly adjusted then replace the set screw.

After the motor has been adjusted a short run should be made and the bearings again examined to see that they are not adjusted too tight, which may have caused

heating, of course the piston would heat from the explosion but any looseness may be detected by a pounding of the engine. The clutches will require setting up from time to time to give power to drive the vehicle but considerable care should be used in the adjustment of such clutches because if they are too tight they will bind and thus retard the speed. The reverse and slow speed brake bands are tightened by loosening the set nut and screwing on the set screw at the end of the brace, be sure that the set nut is again tightened after the screw is adjusted. The high speed clutch is adjusted by loosening the set nut on the set screw which goes through the four-armed dog which screws into the brass collar which is fitted to the engine shaft, also loosen the two end set screws without nuts and turn up brass collars next to disc, turn the dog toward the front of the vehicle so that the set screw will fit in the slots again, tighten the set screw and nuts, moving the set screw one or two slots is usually sufficient to prevent the high speed clutch from slipping, if adjusted too tight the cone cannot be thrown in by the use of clutch lever and if left too loose the engine will run too fast without giving proper speed to the vehicle.

The chain is adjusted by the right and left thread collars on the radius rods leading from the rear axle to the angle iron frame. The chain should always run a trifle loose to prevent too much wear on the sprocket and working parts, all nuts and bolts should be watched very closely as all these are liable to loosen, especially examine those connected with the steering apparatus.

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In learning to operate the vehicle a person is liable to misuse the motor which would cause trouble in the slow speed gears, as these are made of fibre and when the clutch lever is thrown from high speed into the low speed immediately, unless the rear wheels slide it will break these gears. This will be detected by not being able to stop the rig by the use of the clutch; in

this case throw off the switch to stop your rig and prepare to remove the four slow speed gears as follows:

First, remove the bell crank which shifts the cone on the high speed, slide the cone back on the engine shaft next to the body, loosen up the set screw which goes through the four-armed dog, back off the brass collar which will disclose a brass collar screwing over the brass collar and engine shaft, which can be removed which will allow the slow speed disc to slide out, which will disclose the gears, be sure that in case the fibre is ground up that all particles are removed before putting in new ones, also pack well in solid grease and put back together again, and until they are worn in place should be oiled very frequently.

Too much strain on the motor might cause the head gaskets to leak which will allow water to accumulate in the head of the engine, which would render it impossible to start. Should this be the case open the set cock on the head of the motor, turn the motor over several times with the starting crank until the water is all forced out and the motor will usually start without further trouble. Head nuts should be drawn up from time to time.

To put in new gasket remove the head, should the leak be at the head and clean off both the cylinder and the head proper very thoroughly by scraping with a knife and wash both parts with alcohol, painting both sides of the vulc asbestos gasket, which we recommend, with shellac and put together, great care being taken to give all the nuts and bolts an equal tension. Before putting water into the jacket the engine should be started and allowed to run two or three minutes, the nuts again tightened and allowed to stand and cool off at least half an hour, which will allow the shellac to dry well. After running awhile the nuts should be again tightened and from time to time thereafter.

Should the intake valve gasket leak this same process should be followed. Should your engine self-ignite it is most likely to cause from a piece of the gasket getting into the head or else corroding of the

inside of the head or valves with burned oil, if too much oil is fed and gets into the head it will burn and form a scale which heats up red hot and causes self ignition. In this case the head will have to be removed and the scale cleaned off and great care used to prevent this in the future.

Should your engine fail to develop its usual amount of power remove the intake valve; this will disclose the exhaust valve; remove the nuts on the exhaust poppet and grind in the valves by the use of medium emery wheel and oil. In replacing the poppet be sure the nuts clear the left levers or you will lose compression, but there should be 1-62 play between the points.

Should occasion require the setting of the 2 to 1 gear, in case the engine was taken apart, to insure the right position of the cam, first place the piston within 3-8 of an inch of its lowest point, connecting rod being nearly level, slowly turn the engine forward and see if the exhaust spring commences to open; also taking notice if it closes just as the piston reaches the highest point at the head. The inlet opening and closing on the centers. Most of our 2 to 1 gears are center punched at the teeth which mesh, therefore the timing of our motor is comparatively easy, especially so as we use the one gear which operates the exhaust intake, exhaust lift or relief and spark contact.

Should your engine give serious trouble would advise writing us before taking it apart.

There is nothing worse for tires than to allow them to stand on greasy patches, and as it is almost impossible to prevent oil dropping on the floor it is best to get a sheet iron tray about five feet long by three wide having sides about one inch high and slide this under the car as soon as it is brought in, or a piece of linoleum tacked upon a wooden frame may be used

For General Instructions see pages 11 and 12.