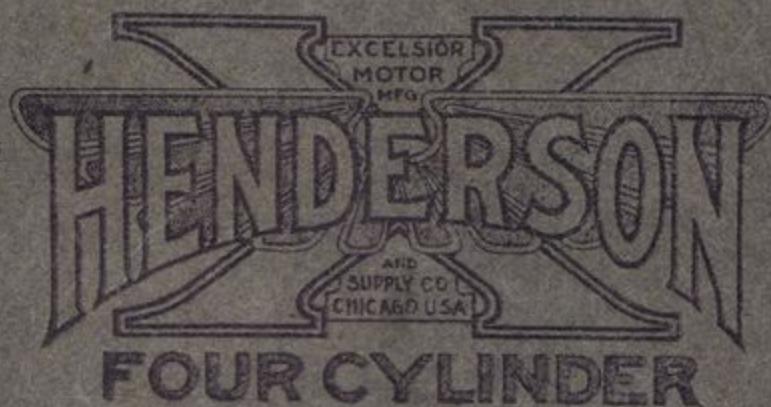


INSTRUCTIONS

FOR THE CARE AND
OPERATION OF THE
DE LUXE MODEL

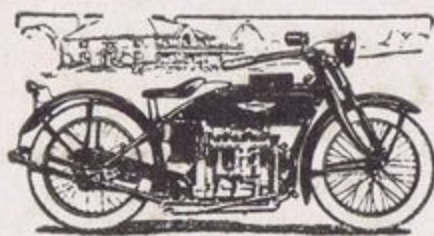


INSTRUCTIONS

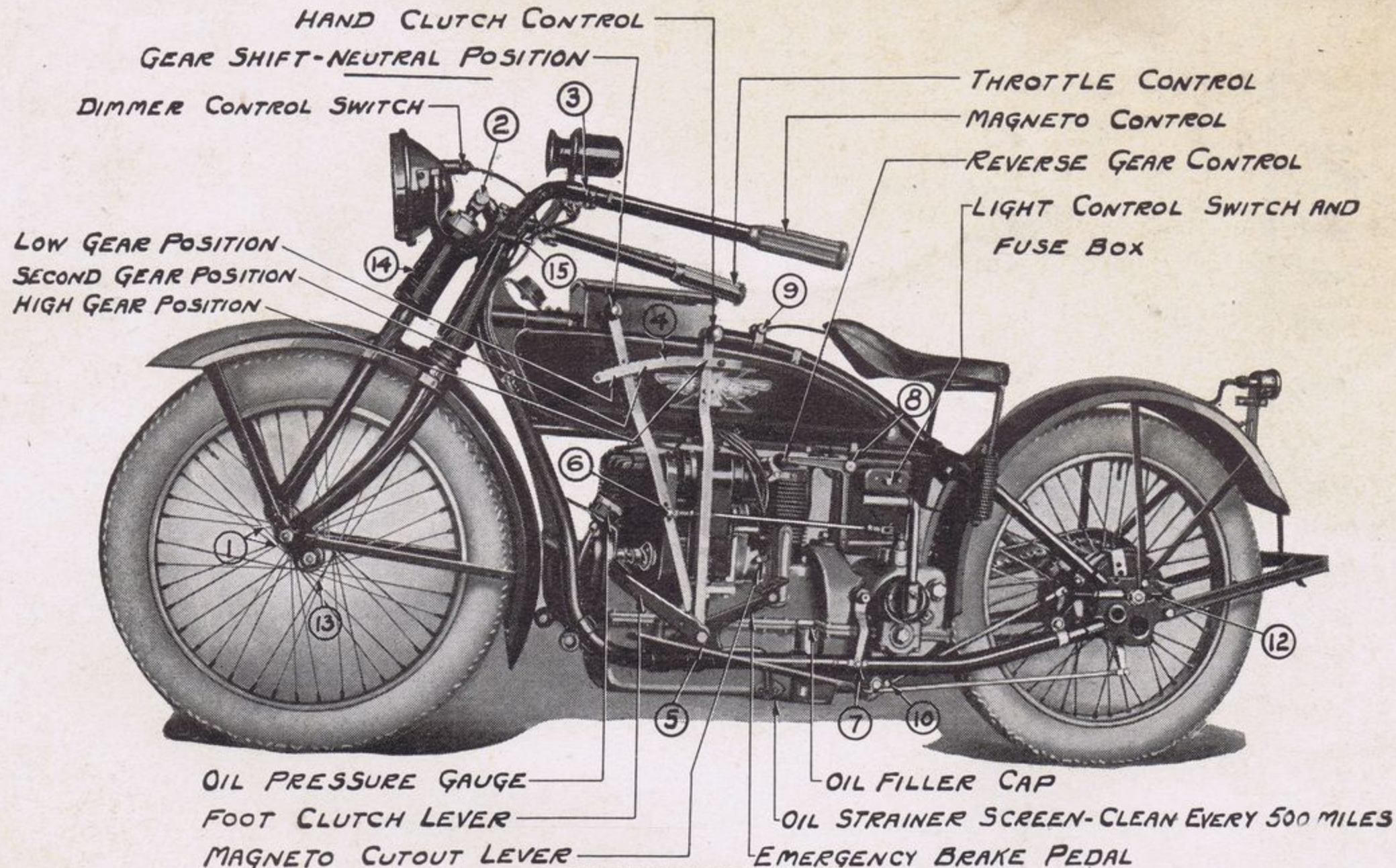
*For the Care and
Operation of the*

HENDERSON

De Luxe Model



Excelsior Motor Mfg. & Supply Co.
3701 Cortland St. Chicago, Illinois



1. Fork Rockers 2. Fork Clevis 3. Controls 4. Gear Shift Quadrant 5. Clutch and Brake Pivots 6. Gear Shift Clevis 7. Clutch Rod Clevis 8. Reverse Lever Pivot 9. Saddle Pivot 10. Brake Clevis, Clean and Lubricate Front (13) and rear (12) hub bearings with 600W oil every 5000 miles Clean Head Bearings (15) and Spring Fork Barrel (14) and Pack with Hard Grease Twice Each Season.

TO OBTAIN the best results with any piece of mechanism it is necessary to understand it thoroughly and to give it proper attention and care. Really, the four-cylinder Henderson is very simple in construction, and very easy to maintain in proper operating condition. The workmanship and finish of Henderson motor parts are on a par with those of the very finest automobiles. Give your Henderson the same consideration and treatment that you would accord a high-grade watch or any other fine, accurately-made piece of machinery, and you will receive big dividends in satisfaction and service.

Your new machine can be *improved or ruined* by the early treatment it receives. Run it slowly and *do not ride faster than 30 miles an hour for the first 1,000 miles*. This will give the bearings, cylinder walls, pistons and piston rings a high polish, which will mean greater speed, smoother running and better all 'round performance after the machine is fully run in. If you attempt any speeding before your machine is thoroughly limbered up, your machine can never attain the performance of which it would otherwise be capable. Take it easy for the first 1,000 miles.

Conscientious following of the instructions in this book will save time, trouble and expense.

REGISTRATION CARD—First of all, fill out and return to the factory the registration card included with your machine. If you do not find a card, ask your dealer for one. It is important that this card be filed immediately, for otherwise the Henderson guarantee is not effective.

All Hendersons are warranted against imperfections in workmanship and material, and any part proving defective within ninety days from date of delivery by the dealer, will be replaced free of charge, providing such parts are sent to us transportation charges prepaid, subject to our inspection, accompanied by a letter giving full explanation. Since our

BARNES & CO. NEW YORK

guarantee dates from delivery of the machine and not from date of shipment from the factory, it is evident that the guarantee is contingent upon registration of your machine. You may never have occasion to take advantage of the guarantee, but should such occasion arise, you want to be taken care of.

Registration has other advantages. Considering the number of Hendersons in service, it is small wonder that a number are stolen every year. Our registration system has enabled us to locate many of these stolen machines. Police Departments and dealers throughout the country give us full co-operation in tracing and locating stolen Hendersons.

At some time you may need a part in a hurry, and may neglect to mention what model you are riding. If your registration card is on file here at the factory, we can promptly ascertain just what model you have, and save delay. Occasionally, we issue instructions and literature of interest to Henderson owners, and if your registration card is on file, you will be sure of receiving this.

IMITATION PARTS—Every good article is imitated and there are concerns marketing imitation Henderson parts. These parts pirates make no real attempt to supply parts which will give satisfactory service. They have no interest in satisfying purchasers or maintaining the reputation of the machines. Their one ambition is to sell as many parts as possible, and invariably, the service given by these fake parts is disappointing. Not only may the imitation parts themselves fail to operate, but they may impair the operation of other parts, and even damage the machine.

For our own protection, we refuse to make good under our ninety day guarantee, any damage to any part of a machine in which we find that imitation parts have been used. Whenever you need replacements, insist that your dealer give you genuine parts made by the Excelsior Motor Mfg. & Supply Co.

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SETTING UP—After removing the machine from the crate, in case your dealer does not turn it over to you assembled, start the handle bars on the fork stems, making sure the Woodruff key is in place, driving the bars home with a mallet or a block of wood. Tighten down the nut and cap screws alternately, and then insert spring fork clevis pin and tighten securely.

Connect control wires which you will find disconnected only at the end of the control sleeve. Make sure that right grip opens throttle all the way and closes it fully. See that the left grip gives full advance and retard to the magneto.

Make sure that tires are pumped up. When you are seated in the saddle, the tires should not flatten appreciably. Riding with soft tires breaks down the side walls of the casings, causes rim cuts and stretching of the bead, which may allow the tires to creep and pull out the valves. More pressure is naturally required in the rear tire than in the front. If you want to obtain maximum tire mileage, buy a tire gauge and carry about 50 pounds pressure. When riding slow on a slippery surface, it is well to let out some of the air, but pump the tires up again just as soon as you are riding on dry streets.

Fill the gasoline tank and put three quarts of "Valvoline" oil in the motor crankcase, following the lubrication instructions on Page 9.

PREPARATIONS FOR STARTING

PLACE the gear-shift lever (inside lever nearest the tank) in the neutral position, which is the second notch from the front end of the quadrant. If machine has reverse, this is now controlled by outside lever, formerly used for hand clutch.

Open the gasoline valve under the tank which allows gas to flow to the carburetor. Close carburetor air choke; open throttle slightly by turning right grip in a very little bit. Advance the spark about half-way by turning left grip in.

Turn kickstarter pedal out in position for use. Press down gently on kickstarter pedal until you feel it firmly engaged with the jaws on the shaft. Then give a quick push downward. It is best not to remove the foot immediately upon reaching the bottom of the stroke. When the motor starts, you can slide your foot off sideways, allowing the lever to return to the top position.

When the air choke is closed, the carburetor supplies an exceedingly rich mixture, and repeated kicking may flood the cylinders with a raw gas mixture that is too rich to fire. Usually Hendersons will start on the first or second kick, but if not, it is well to open the choke slightly if the motor does not start after kicking a few times.

As soon as the motor starts, open the air choke about a quarter or half-way, and close the throttle to prevent racing. Racing the motor on the stand is the worst kind of abuse. With present-day low-grade gasoline, it is well to let the motor run for a short time before starting out to thoroughly warm the manifold and carburetor. If it is necessary to make a quick start, especially in cold weather, leave the air choke about half open until the motor is warmed up, which will generally be indicated by misfiring because of the rich mixture supplied by the carburetor. At the first indication of missing, open the choke all the way. Running for any length of time with the choke closed, will give too rich a mixture.

For all general running at moderate speeds, best results will be obtained with the spark advanced about $\frac{3}{4}$ of the way. When accelerating or getting away from a standing start, retard the spark. Also retard the spark when motor is under a heavy pull on a steep hill or when laboring through sand or mud, or when idling along in traffic. When running at full speed, the spark should be advanced fully.

CLUTCH AND GEAR SHIFT—For slow riding, the hand clutch will be found useful, although for sidecar work, the foot

clutch is generally used. With the motor running, depress the foot clutch pedal all the way, and with a firm, quick push, move the gear shift lever forward into the front notch to engage the low speed gears. Open the throttle slightly at the same time and allow the foot clutch lever to rise slightly, engaging the clutch and starting the machine.

When a speed of from five to eight miles an hour is attained, again depress the foot clutch pedal and pull the gear shift lever back to the center notch, engaging second or intermediate gear. Then release foot clutch pedal entirely. On reaching a speed of ten to twelve miles an hour in second, again throw out the clutch and shift into high gear. In shifting from high to second or low, for climbing steep hills or riding through sand or crowded traffic, reverse the operation but do not attempt to change from high gear to the lower gears when the machine is moving very rapidly. The great flexibility of the Henderson "four" obviates a lot of gear-shifting. When you want to slow down in traffic or at a corner, it is usually unnecessary to shift into second, for the Henderson motor will throttle down and pick up again on high. Whenever it is necessary to shift from high into second though, first slow down the machine to eight or ten miles an hour and always fully release the foot clutch before changing gears.

When the machine is standing still, if the gears do not shift readily, do not force gear shift lever. Move the machine backward a couple of feet, or if machine is on the stand, turn rear wheel backwards, and gear engagement will be easy. Reluctance of the gears to engage is due to the dogs happening to stop opposite from the meshing position, and a slight movement of the rear wheel will give enough drag on the clutch to move the dogs around so that they can mesh.

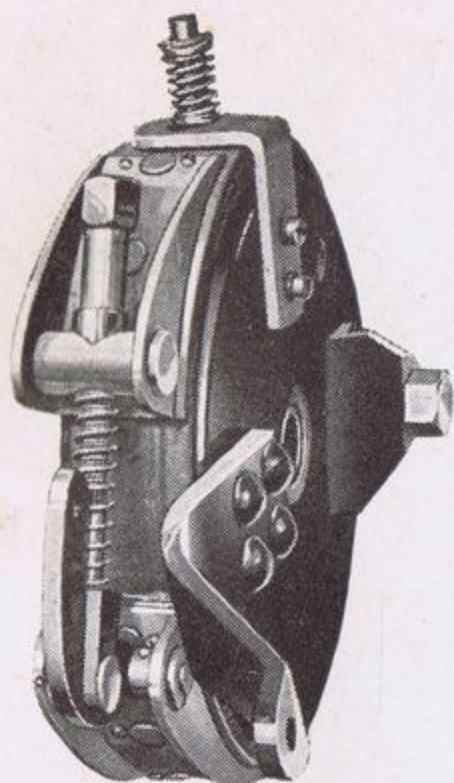
If the motor should be stalled accidentally in traffic, put gear shift lever in neutral and use kickstarter as already described. If motor does not start the first or second kick, close air choke half way and open it again as soon as motor starts.

The reverse gear furnished as extra equipment is very useful for sidecar work. The reverse gear is held out of engagement by a spring which prevents accidental meshing. When reversing, it is necessary to have forward gears in neutral position and reverse gear is now controlled by the outside lever formerly used for operating the hand clutch control. This lever holds reverse gear in mesh so that both hands may be kept on the bars. When reverse is in mesh, allow foot clutch lever to go up slowly and open throttle as much as may be required. After a little practice, the Henderson may be reversed as readily as any car.

BRAKES—The brake of the De Luxe Model is more powerful than that of any other motorcycle. When applying the brake, clutch pedal should be released, the throttle closed and pressure applied gradually on the brake pedal. When stopping in traffic, gears should be shifted in neutral. Indeed, when stopping for any length of time at all, form the habit of shifting gears into neutral. Except in emergencies do not jam on your brake suddenly for quick stops are hard on tires, brake lining and the whole machine.

In descending long, steep hills, particularly in mountainous sections of the country, it is well to use the motor to hold the machine back, saving the brake lining for quick emergency stops. When starting down-hill, short circuit the magneto by pressing on the ground switch and entirely close the throttle. A handle-bar magneto cutout switch is handy for this purpose and it can be wired to the switch connection on the magneto breaker cover. Be sure switch and wiring are well insulated. Just before reaching the bottom of the hill, open the throttle slightly and release magneto ground switch.

If the hill is particularly steep or long, the motor braking effect will be increased if in second or low gear. For ordinary conditions though, high gear will be found sufficient.



De Luxe Brake Showing
Method of Adjusting
Outside Band.

The De Luxe brake is tightened by turning down on the brake clevis cap nut. A turn or two on this cap nut will make an appreciable difference.

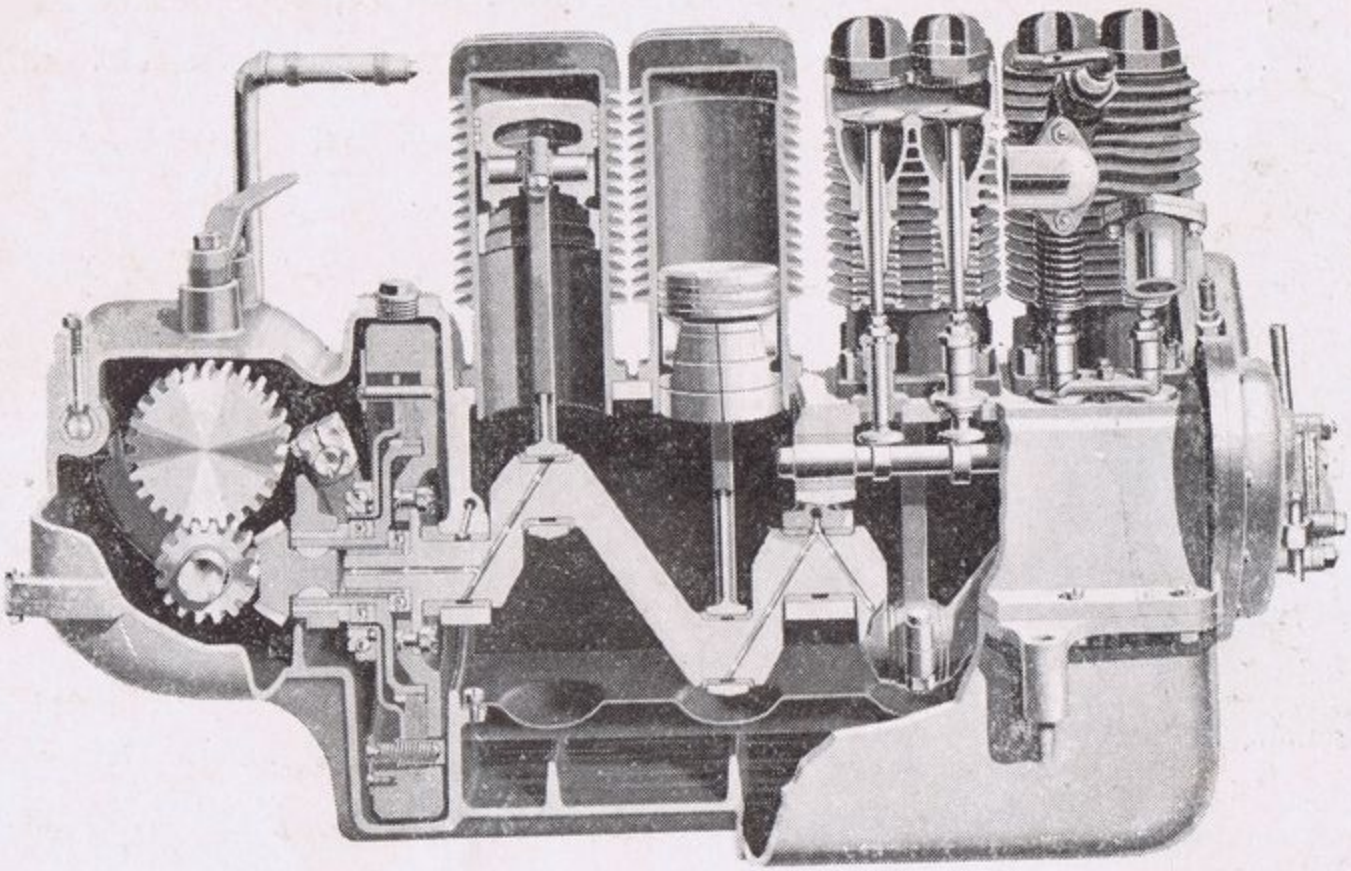
If rear wheel is moved forward any considerable distance in adjusting chains, try your brake before starting, for it may be necessary to tighten the brake clevis a turn or two. In the same way, moving the wheel backwards will tend to tighten the brake. Make sure the brake does not drag. This can be tested by putting the machine on the stand and seeing that the wheel is free. A dragging brake will wear out the

lining, waste a lot of power, and slow down the machine.

MOTOR LUBRICATION

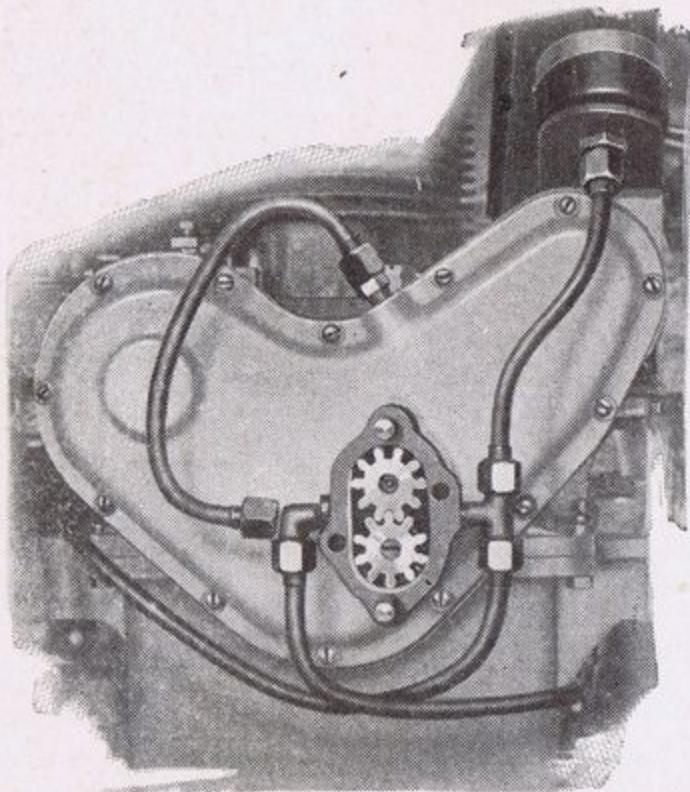
THE HENDERSON is the only motorcycle equipped with a true pressure feed oiling system. The entire oil supply is carried in the bottom of the crankcase. The oil pump is very simple and consists of two gears meshing within a close fitting housing. This pump forces oil through pipes and ducts directly into all of the crankshaft main bearings. In these main bearings are oil grooves corresponding with holes drilled diagonally through the crankshaft, carrying oil into the connecting rod bearings. A sufficient excess of oil is forced into the connecting rod bearings to spray up into the cylinders. A bypass with an adjustable spring loaded check valve permits variation of the oil supply, and the oil pressure gauge immediately indicates the effect of any such adjustment. (See diagram of oiling system, Page 12.)

The oil filler cap is located on the left side of the crankcase next to the fly-wheel housing. In the oil filling passage,



Sectional View of Motor Showing Pressure Feed Oiling System Through Hollow Crankshaft.

it will be noted that three steps are cast in the aluminum. *The bottom step is the danger point*, and the oil level should never be allowed to come below that point. The ideal level



Details of Henderson Oil Pump and Piping System.

is with the surface of the oil not quite reaching the top step. *When filling or checking oil level, have rear wheel on level ground.* If the oil level is over the top step, the connecting rods will dip in the oil and may cause plug fouling.

Watch the oil gauge. If at any time it does not register, stop at once and ascertain the cause, for if no oil is circulating, the bearings will be damaged. When run-

ning in very warm weather at very slow speed, the gauge may show only a slight pressure. This is all right providing you know there is fresh oil in the crankcase. However, if you have covered 500 miles or so without replenishing the oil supply

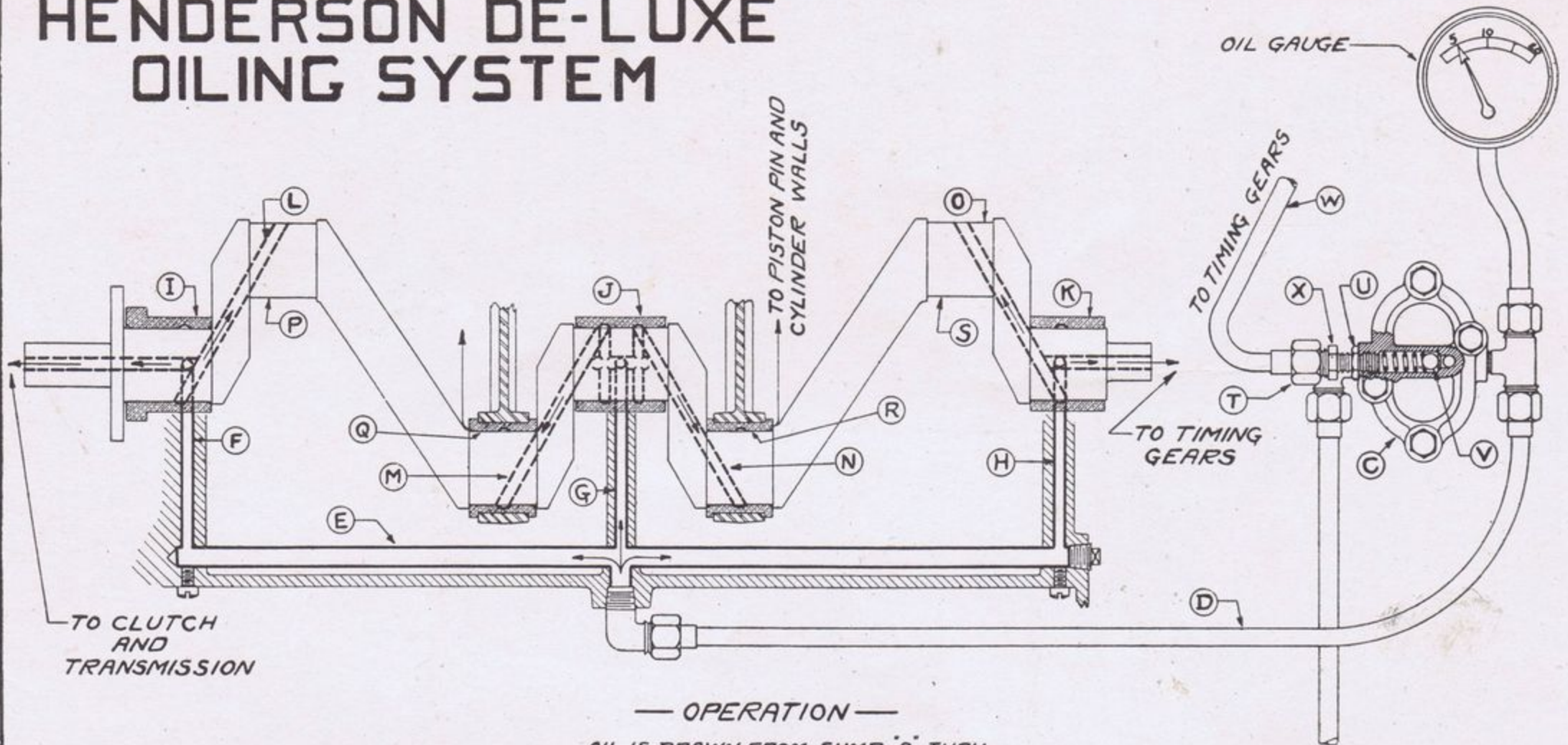
and the gauge does not register at low speed, it is undoubtedly an indication that the oil is thinned out, providing a very low pressure is shown at 25 to 30 miles an hour. It is poor economy to use the oil too long, and it is even worse to use cheap, thin oils which lose their body within a couple of hundred miles. It is inadvisable to add fresh oil to the old oil in your crankcase, except as an emergency measure when the level is low to get you home where you can fill up with fresh Valvoline oil.

When putting in fresh oil, drain the old oil out through the drain plugs in the bottom of the crankcase. *At the same time, remove the strainer screen and clean it thoroughly.* The oil supply to the pump is drawn through this screen, and obviously if it is choked with foreign matter, the oil supply to the pump will be shut off. It is an easy matter to remove the screen by disconnecting the oil pipe and taking off the two nuts which hold the screen elbow fitting to the crankcase. It is well worth-while when replenishing oil, to flush out the crankcase with kerosene, being sure all of the kerosene is drained out before filling up with new oil. New motors particularly, should be washed out with kerosene, for in process of breaking-in the machines, particles of metal are worn off and carried into the crankcase.

When oil lines have been removed and replaced or when the machine has been standing for any length of time, in rare cases it may be necessary to prime the pump. To do this, disconnect the pipe from the pressure gauge, and pour oil down this pipe into the pump.

In warm weather at very low motor speeds, the pressure registered will be low, but when running at 25 to 35 miles an hour, the gauge should show a pressure of from five to eight pounds. Adjusting the pump to furnish too high an oil pressure will increase oil consumption unnecessarily. However, for speed trials, etc., it is advisable to carry higher oil pressure than for ordinary running.

HENDERSON DE-LUXE OILING SYSTEM



TO CLUTCH AND TRANSMISSION

TO PISTON PIN AND CYLINDER WALLS

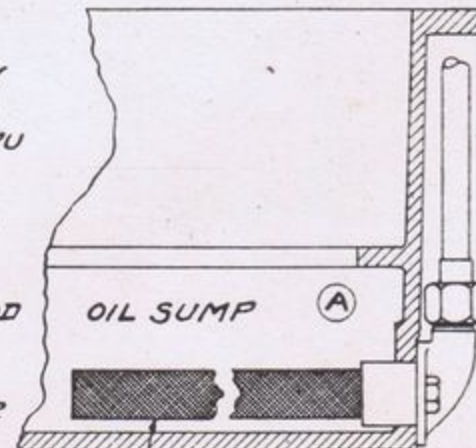
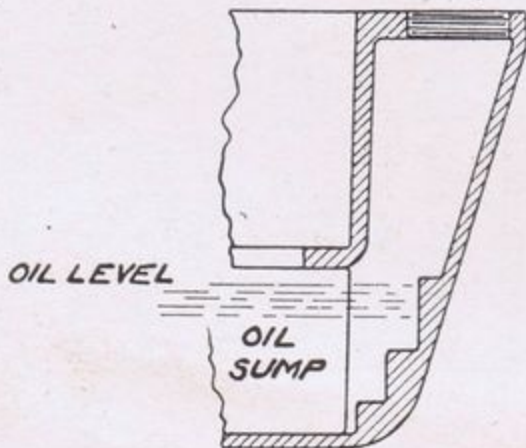
OIL GAUGE

TO TIMING GEARS

TO TIMING GEARS

— OPERATION —

OIL IS DRAWN FROM SUMP A THRU STRAINER B TO GEAR PUMP C. FROM THE PUMP THE OIL IS FORCED UNDER PRESSURE (WHICH IS CONTROLLED BY ADJUSTING NUT X) VIA OIL PIPE D TO DISTRIBUTING PIPE E, CONTINUING THRU OIL DUCTS F, G, H, DIRECT TO CRANK SHAFT BEARINGS I, J & K. THE MAIN BEARING GROOVES REGISTER WITH DRILLED HOLES L, M, N & O IN CRANK SHAFT, WHICH LEAD TO CONNECTING ROD BEARINGS P, Q, R & S. THE OIL FORCED OUT OF THESE BEARINGS IS THROWN BY CENTRIFUGAL FORCE TO CYLINDER WALLS & PISTON PINS.



USE HIGH-GRADE OIL—Most automobile engines are water-cooled, and therefore operate at lower temperatures than air-cooled motorcycle engines. For this reason, automobile oils can be much thinner in body than motorcycle oils. These thin oils of course become still thinner at running temperatures and do not have sufficient body to protect the working parts of a motorcycle engine. The difference between the first cost of thin automobile oils and suitable motorcycle oils is very slight. With proper motorcycle oil your machine will give long and satisfactory service. *With cheap thin oils, your machine can never give satisfactory service and will soon wear out.* Indeed, proper lubrication is the most important point in motorcycle maintenance.

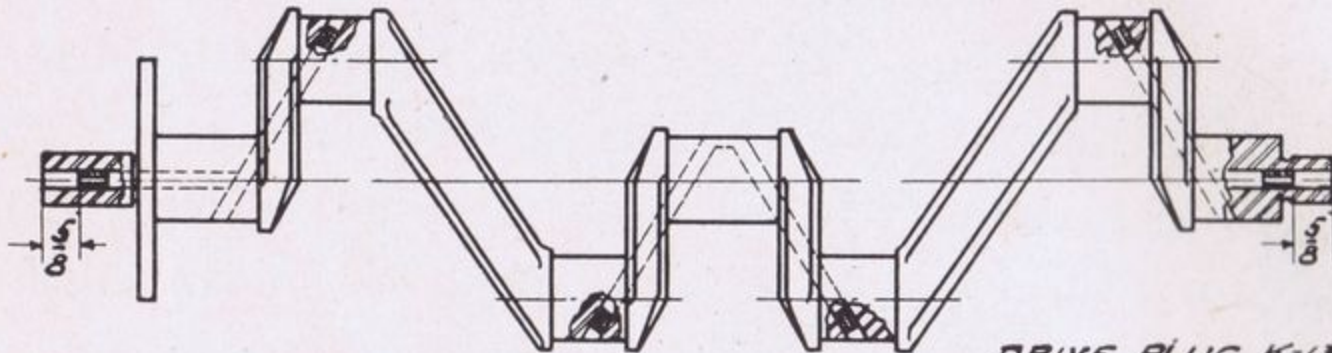
After extensive tests at the factory, we unreservedly recommend "Valvoline Heavy" oil for summer and "Valvoline Medium" for winter. Other oils that have been found suitable are "Quaker State," Mobiloil A" or "Texaco Extra Heavy Motor." Thinner oils than these will not protect the wearing surfaces of your motor and heavier oils may cause heavy carbon deposits, gum up your valves, and cause the clutch to drag, especially in cool weather. Do not take some garage man's word that some other oils are just as good. *Our guarantee will not cover damage resulting from the use of oils other than recommended.*

TO REGULATE OIL SUPPLY—Refer to sectional view of oiling system on Page 12. Loosen the connection "T" and the lock-nut "U" and screw in adjusting nut "X" which increases spring pressure on ball check valve "V" in the bypass line to the timing gear case. This causes oil pressure in main line to the bearings to rise to the pressure necessary to lift the ball off its seat, allowing a smaller amount of oil to flow through the bypass "W" into the gear case. The rise in pressure can be observed from the oil gauge. When proper adjustment has been made, tighten the nuts "T" and "U."

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SERVICE BULLETIN N°2

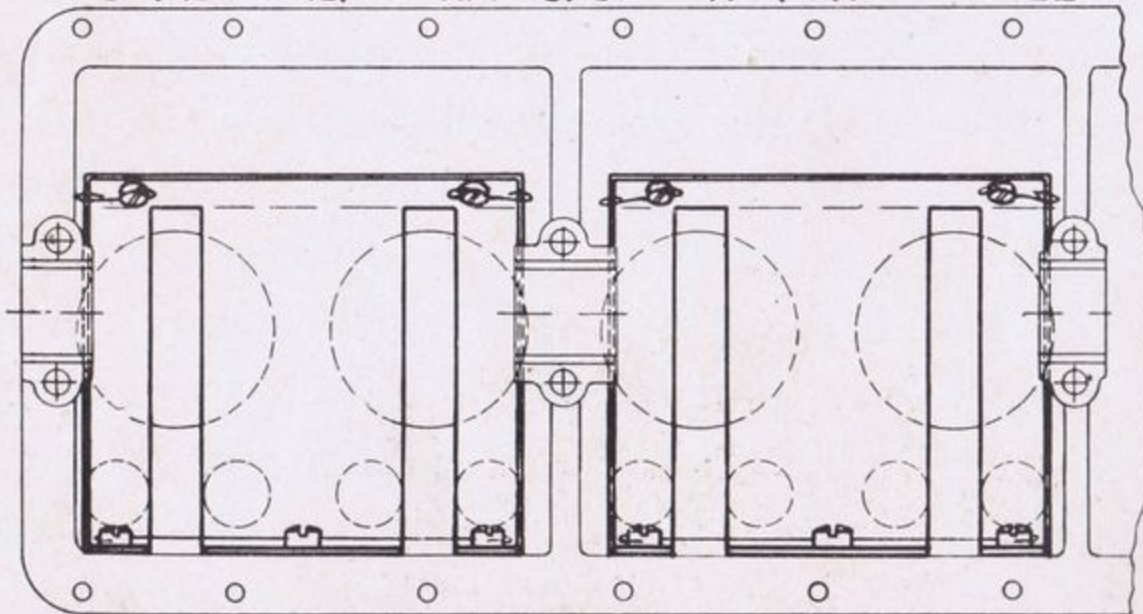
HENDERSON DELUXE AND "K" OIL DISTRIBUTION



DRIVE PLUG K-1301
SECURELY INTO EACH END
OF SHAFT AND ALSO FOUR
CRANK THROWS AS SHOWN.

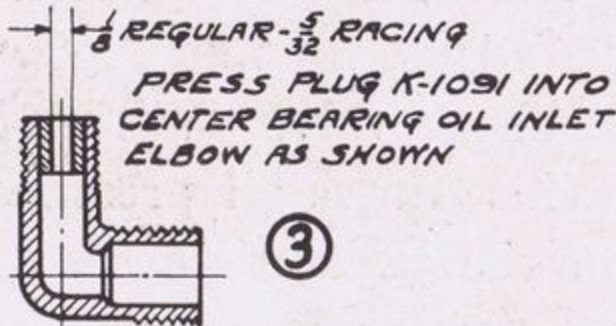
①

UPPER HALF CRANK CASE WITH PAN REMOVED

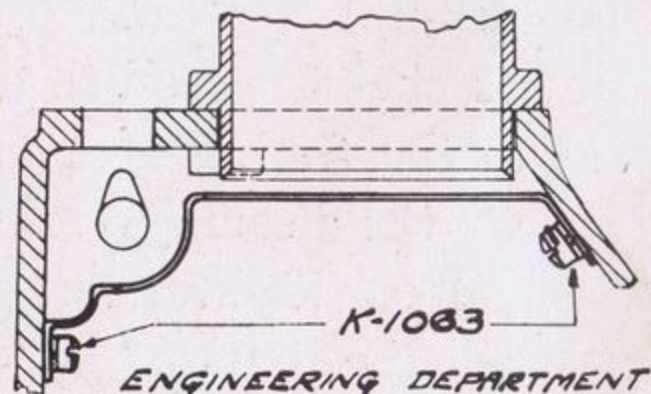


②

#24(152) DRILL AND TAP #10-24 CRANK CASE FOR SECURING BAFFLE PLATES, LOCATING SAME SO THAT CONNECTING RODS ARE IN CENTER OF SLOTS. SECURE BAFFLES K-1060, BY THE USE OF SCREWS K-1063, ALSO LOCK WASHERS & WIRES



③

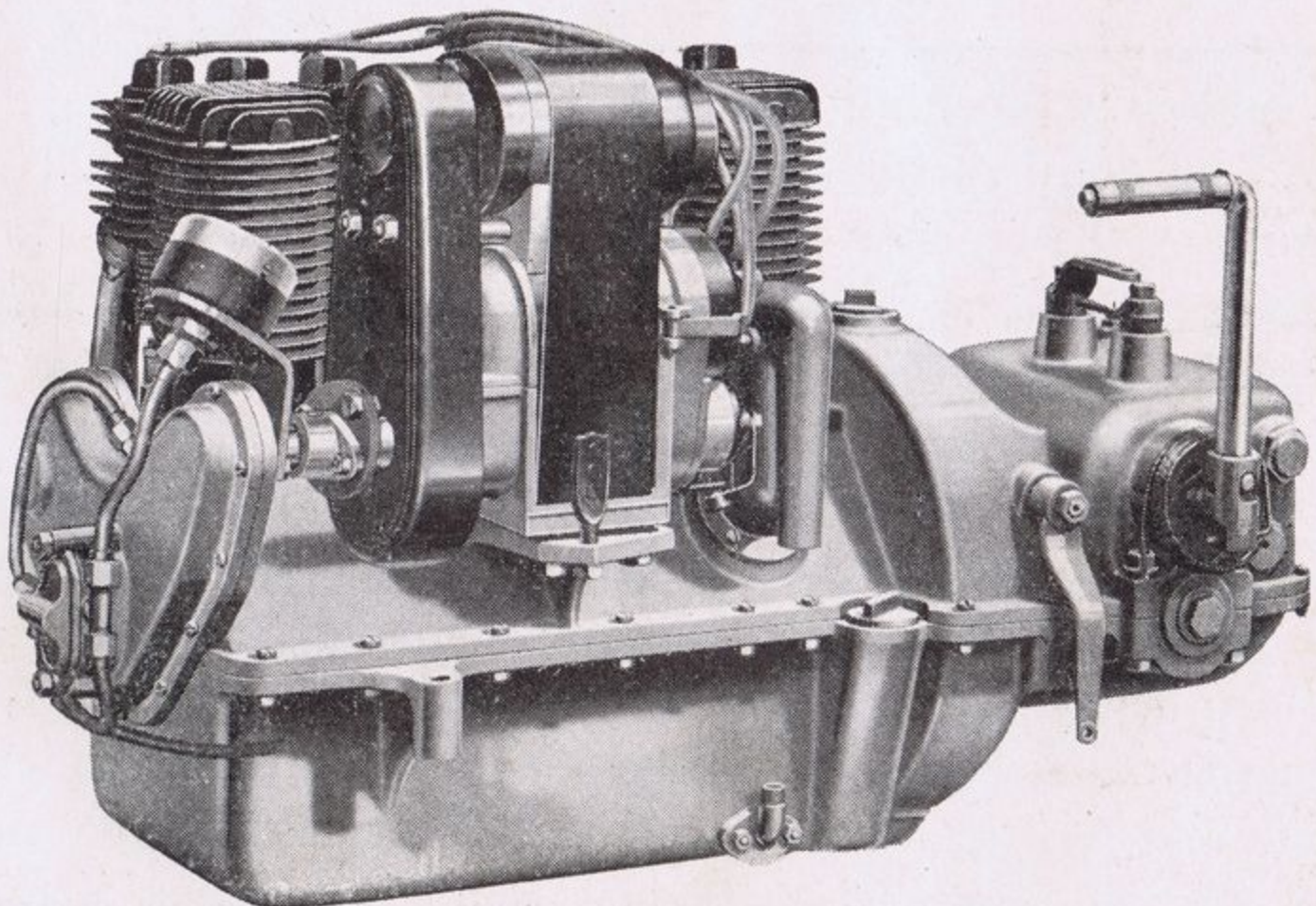


K-1063
ENGINEERING DEPARTMENT

To reduce the pressure, the same procedure is followed except that the adjusting connection "X" is screwed out, reducing the spring pressure on the check valve and bypassing more of the oil to the gear case.

IGNITION

THE HENDERSON is equipped with the latest two-unit electrical system with high tension magneto for ignition and a separate generator and battery lighting system. A flexible coupling is furnished on the De Luxe Model which facilitates removal of the magneto, should this be necessary at any time. Before removing magneto, however, mark both halves of the coupling with a file or piece of chalk, and see that coupling is connected up again in accordance with these marks, otherwise the magneto may be replaced half-a-revolution out of time.



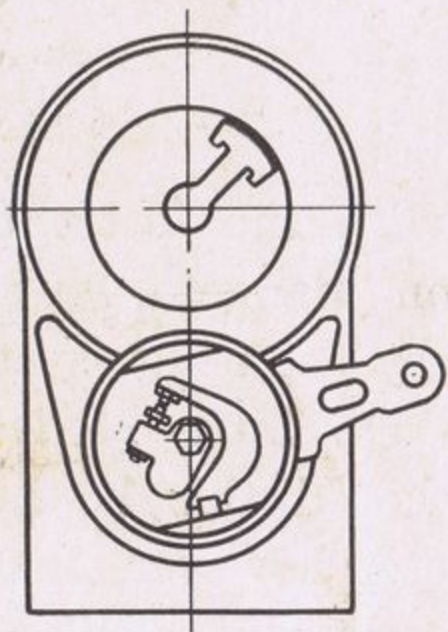
Henderson Unit Power Plant Showing Mounting of Magneto and Generator, Flexible Coupling and External Oil Pipes.

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It is not advisable for the average motorcycle rider to undertake any complicated magneto adjustments or repairs. Such work should only be done by a service man who has

experience and equipment for magneto repair work. Therefore, we give only instructions for care and cleaning of the magneto.

ADJUSTING THE BREAKER—It will be noticed that the breaker is similar to that used on a magneto for a twin. This is because the magneto is driven just twice as fast as the twin cylinder magneto. In checking adjustment of the breaker points, with the fibre block of the breaker lever on the highest point of one of



NOTE: PLATINUM POINTS SHOULD OPEN NOT LESS THAN .016" AND NOT MORE THAN .020". OPENINGS ON BOTH CAMS SHOULD BE THE SAME.

the cams the opening between the platinum contact points should be not less than .016" and not more than .020". The opening of the breaker on each of the cams should be the same. A feeler gauge is riveted to the magneto adjusting wrench, and this should barely pass between the contact points when they are fully opened.

The breaker points pass low tension current and for this reason must be smooth and bright. If there is any roughness, burning or pitting of the contact surfaces, the points should be smoothed off with a magneto file made especially for this purpose. It is best to slip the magneto file between the two points and file them both together. If properly done, the surfaces of the points should then come in contact over their whole area. Make sure that the breaker lever moves freely. If it is tight and sluggish remove it and clean out the fibre

bushing, being careful not to enlarge the hole on which it pivots. When the breaker is removed for inspection, see that the carbon ground brush on the back makes good contact with the surface on which it rubs.

Be sure when replacing the breaker, that the key fits in the keyway in armature socket and do not tighten excessively the screw which holds the breaker to the armature. These retaining screws are small and may be twisted off easily.

CLEANING THE DISTRIBUTOR—The distributor should be taken out two or three times a year and the accumulation of carbon dust wiped off. At the same time, the carbon brushes should be inspected to make sure they are in proper contact with the distributor.

LUBRICATION—The magneto should be oiled every thousand miles with four or five drops of "3 in 1" oil (not engine oil), in each of the oil cups, which are located over the armature driving shaft and top of the distributing block. Avoid over-oiling.

The contact breaker **SHOULD NEVER BE OILED** and care should be taken to keep the points free from oil at all times.

LOCATING IGNITION TROUBLE—Irregular firing, stopping entirely, or inability to start, may or may not indicate trouble in the ignition system. First of all, though, it is usually safe to assume that the trouble is not in the magneto for magnetos are very reliable. The carburetor, gasoline supply, spark plugs and valves should be examined first.

Then, if there is reason to suspect magneto trouble, the first thing to do is to see if it delivers a spark. Disconnect one of the high tension leads from the spark plug and hold the terminal approximately 1/16 ins. from cylinder. Better yet, remove the plug and with the wire connected, rest the threaded part of plug on the cylinder, making sure the insulated term-

inal of plug does not come in contact with the machine in any way. Kick the motor over, observing closely if a spark occurs. If there is no spark, then try the other terminals. Before removing the wires from the plugs though, mark them by means of notches cut in the insulation so that they can be connected to the proper plugs afterwards. If no spark is obtained from any of the wires then the trouble is in the magneto.

First of all, look at the magneto breaker and make sure the breaker points are separating and coming together. See that the points are bright and are making good contact. If the points are very badly burned it may indicate a broken down condenser, which should be fixed by a magneto service station.

If a good spark is observed, the plugs themselves should be cleaned and examined. A spark plug may spark in the air and yet give no spark in the dense compressed mixture within the cylinder. The most common trouble with spark plugs is fouling due to the deposit of a layer of burnt oil and carbon over the insulation which short-circuits the plug, for carbon is a conductor of electricity. The insulation of a plug itself may break down and allow current to leak through without making a spark. The gap between plug points may be too great or too small. If the plug is of the two-piece type, it should be taken apart and the core thoroughly scraped clean of soot and burnt oil. The gap between the points should not be wider than $1/32$ ins. or less than $1/64$ ins. A little less than the thickness of a worn dime is about right. Too small a gap may be caused by melting of the electrodes, and in time the points may be burned away and leave too wide a gap. If you are in doubt about a plug, try a new one. If the missing is in one or two cylinders, the trouble can be located by shorting the plugs with a wooden-handled screw driver held from the manifold to the spark plug terminal and noting the effect of this on the operation of the motor. Another way of testing individual cylinders is to remove the nuts from the spark plug terminals,

but leave the wires on the plugs. Then with the motor running slowly, remove the wires one at a time and note the effect on the operation of the machine.

A short-circuit in the high tension wiring as a result of chafing of the insulation, may cause trouble, and the wiring should be examined carefully.

Make sure the ground switch on the breaker cover is in the proper place. It is possible for this lever to become loose and drop down in contact with the crankcase, short-circuiting the magneto. If a handle-bar magneto cutout switch is used, make sure that the connecting wires are not shorted.

If the trouble is found to be in the magneto, it should be turned over to your dealer, to a competent magneto repair man, or returned direct to the Simms Magneto Co., East Orange, N. J.

TIMING

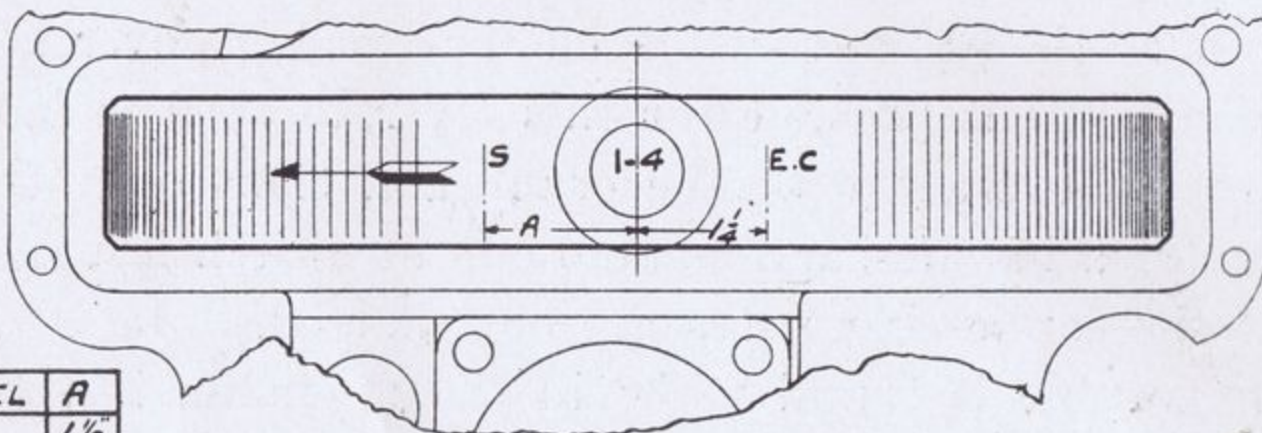
TO DEVELOP full power and speed, it is essential that the timing of magneto and valves be correct.

Before making any changes whatever in the existing setting, check it up in accordance with the diagram on Page 20. If the motor is in the frame, shift transmission gears into high and turn the rear wheel forward very slowly. If motor is on the bench, right side up, use a wrench on sprocket lock nut and turn forward (or to the right).

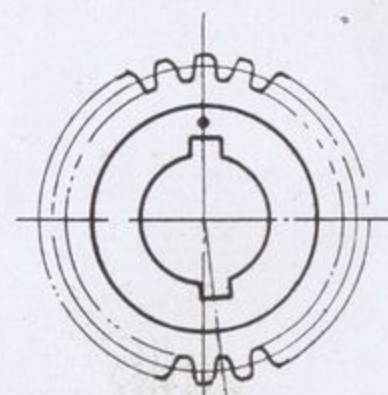
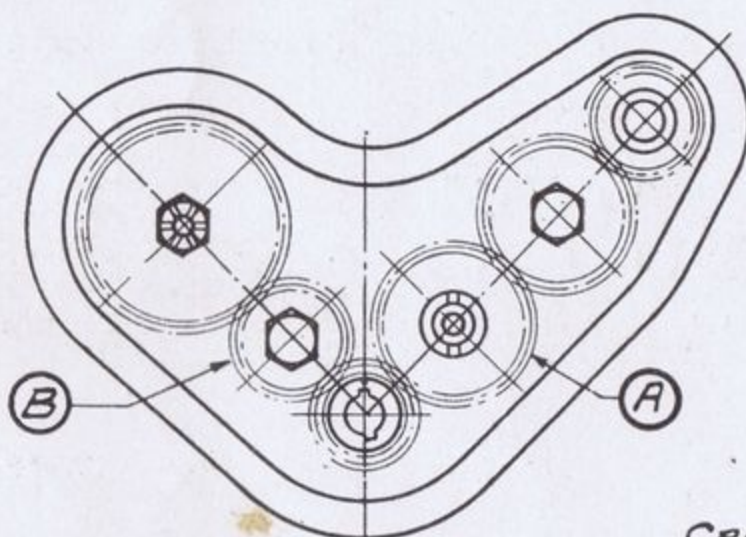
MAGNETO TIMING—With the magneto breaker in the fully retarded position, the magneto points should be closed but just ready to open with the slightest advance of the breaker when the letter “S” appears on the center of housing inspection hole. The magneto distributor brush at the same time should point to the upper right segment which connects to the high tension wire for No. 1 cylinder (front cylinder) as shown on the timing diagram. When inspecting magneto timing, be sure to turn the magneto coupling backward slightly to bring timing gear into contact, thus preventing any inaccuracy in the tim-

SERVICE BULLETIN N°1

HENDERSON TIMING



MODEL	A
K	1/2
DE LUXE	7/8



CRANKSHAFT GEAR K-1305

MAGNETO:

1. REMOVE PLUG FROM INSPECTION HOLE IN TOP OF FLYWHEEL HOUSING, TURN FLYWHEEL IN DIRECTION OF ROTATION AS SHOWN BY ARROW UNTIL LETTER "S" APPEARS IN CENTER OF INSPECTION HOLE. REMOVE OIL PUMP GEAR "A".

2. SET MAGNETO DISTRIBUTOR BRUSH POINTING TO UPPER RIGHT SEGMENT WHICH REGISTERS WITH TERMINAL FOR N°1 CYLINDER

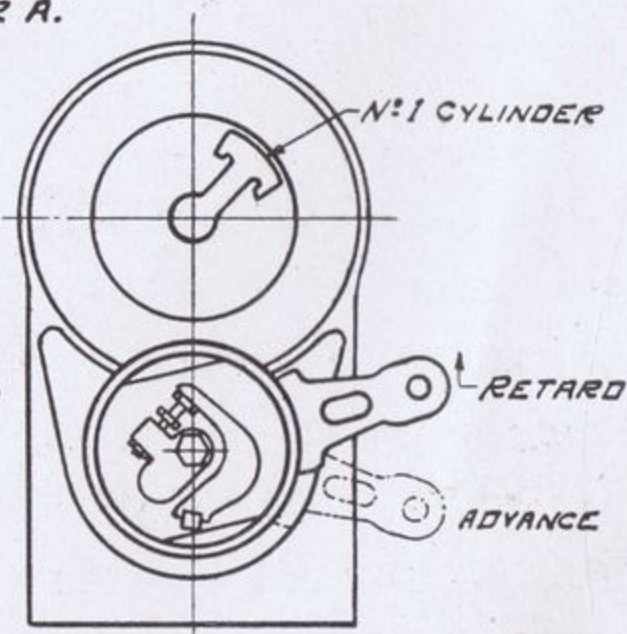
3. FULLY RETARD CIRCUIT BREAKER AND HAVE POINTS CLOSED BUT READY TO OPEN WITH THE SLIGHTEST ADVANCE OF THE BREAKER. SLIP OIL PUMP GEAR "A" IN PLACE.

VALVES:

1. REVOLVE FLYWHEEL SLOWLY IN DIRECTION OF ROTATION AS SHOWN BY ARROW UNTIL LETTERS "EC" SHOW IN CENTER OF THE INSPECTION HOLE IN TOP OF FLYWHEEL HOUSING. REMOVE IDLER GEAR "B".

2. LOOKING AT THE FRONT OF MOTOR, TURN CAMSHAFT TO THE LEFT UNTIL EXHAUST VALVE OF N° 4 (REAR) CYLINDER HAS CLOSED AND TAPPET IS JUST FREE.

3. INSERT IDLER GEAR "B"



BEFORE ATTEMPTING ANY TIMING CHANGES
SEE SERVICE LETTER N° 1

ENGINEERING DEPARTMENT.

ing which might be caused by backlash of the gears. For the same reason, when the fabric disc of the flexible coupling in the magneto drive becomes worn, if there is any considerable play, it may cause slight alteration of the timing and for that reason the disc should be replaced.

VALVE TIMING—The exhaust valve tappet of No. 3 rear cylinder should just release when the letters “EC” appear in the center of inspection hole, with tappets adjusted for from .006” to .008” clearance. By grasping the tappet hexagon lock nut with the thumb and fore-finger, it is easy to determine the exact point where the tappet releases. Be sure the tappet is free during the entire revolution to avoid being deceived by high points. A variation of $\frac{3}{8}$ ” before or past center on fly-wheel is allowable. A change of one tooth on the camshaft gear is equal to approximately $1\frac{1}{4}$ ins. on the fly-wheel. With the two-keyway crankshaft gear (K-1305) shown on Page 20, it is possible to obtain a variation of one-half tooth in the timing by using the special keyway.

When retiming, after overhauling the motor, first of all time the magneto for No. 1 (front cylinder). Then turn the fly-wheel slowly in direction of rotation from “S” to “EC” for valve timing. In other words, No. 1 cylinder must fire on the same revolution on which No. 4 exhaust valve closes.

In case it is necessary to remove fly-wheel from crankshaft, be sure to mark both fly-wheel and crankshaft flange to insure replacement of fly-wheel in proper position.

When it is desired to change the magneto timing only, it is not necessary to disturb gear-case cover. Removal of the oil pump and coupling is all that is necessary to change magneto timing. After the pump and coupling have been removed, scratch a line on the magneto shaft and shaft bushing as a guide to show the original setting. Then with a pair of small pliers, the idler gear can be drawn out of engagement, allowing the magneto to be advanced or set back as desired. To

advance the spark, looking at the motor from the front end, turn the shaft to the right. To retard, turn to the left.

Correct timing of the Henderson is very important. A small error in the timing may make quite a difference in the speed of the machine, particularly if the error is on the side of too great advance.

CARBURETOR

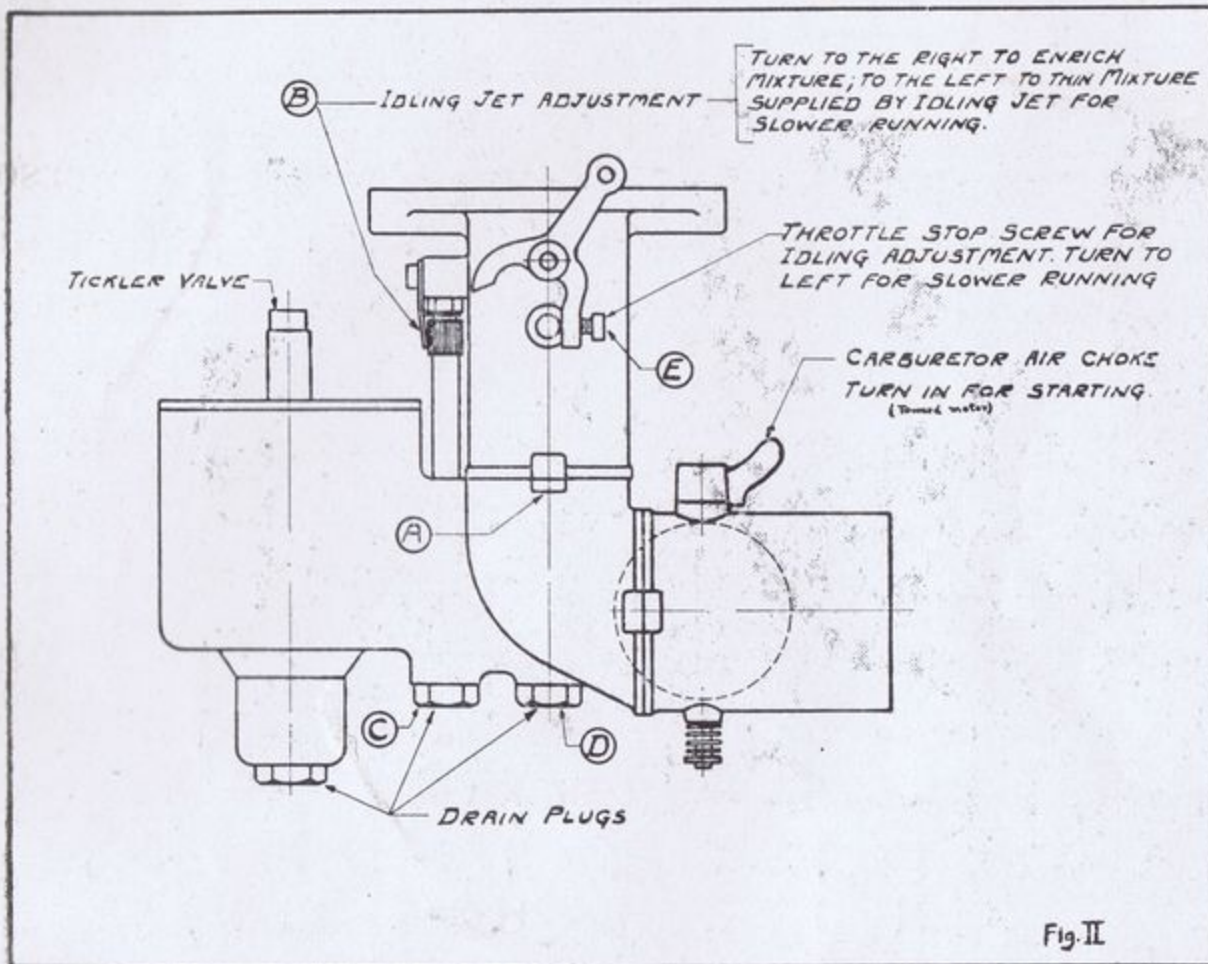
THE Zenith is the standard carburetor for the Henderson and is manufactured by the Zenith Carburetor Co., Detroit, Mich. It is exceedingly simple and can be readily taken apart for cleaning. For best results, keep your carburetor clean.

The Zenith comprises a float chamber or bowl; a carbureting chamber or barrel; and a system of fuel nozzles and air passages so combined as to function on the well-known principle of the Zenith Compound Nozzle. A connection is also provided to draw heated air from the exhaust manifold to facilitate vaporizing present day low-grade fuels. In the winter time a sheet metal shield should be used to cover the carburetor and front end of the intake manifold. These shields may be obtained from the Excelsior Company.

The sizes of the nozzles have been determined at the factory and should not be changed. The only adjustment which may require changing is that of the idling jet. It is very important that the idling adjustment be made when the motor is thoroughly heated with the throttle closed (lever against stop screw which has been properly set for idling). *INTERMEDIATE THROTTLE RANGE CAN BE SPOILED BY IMPROPER IDLING ADJUSTMENT.* To adjust low speed jet, beginning at the center of adjustment turn up to enrich the mixture or turn down to thin the mixture supplied by the idling jet.

If motor refuses to throttle down and stops when you close the throttle, this may be caused by a clogged idling jet. Remove and carefully clean out idling jet with a piece of fine wire. Be careful not to enlarge the idling jet or you will interfere with the slow running of your motor.

AIR CHOKE VALVE—When starting up, close the air choke valve. As soon as the motor fires, partly open choke valve and close throttle to prevent racing, for nothing is harder on motorcycle engines than racing on the stand. With present-day low-grade gasoline, the motor should be allowed to run for

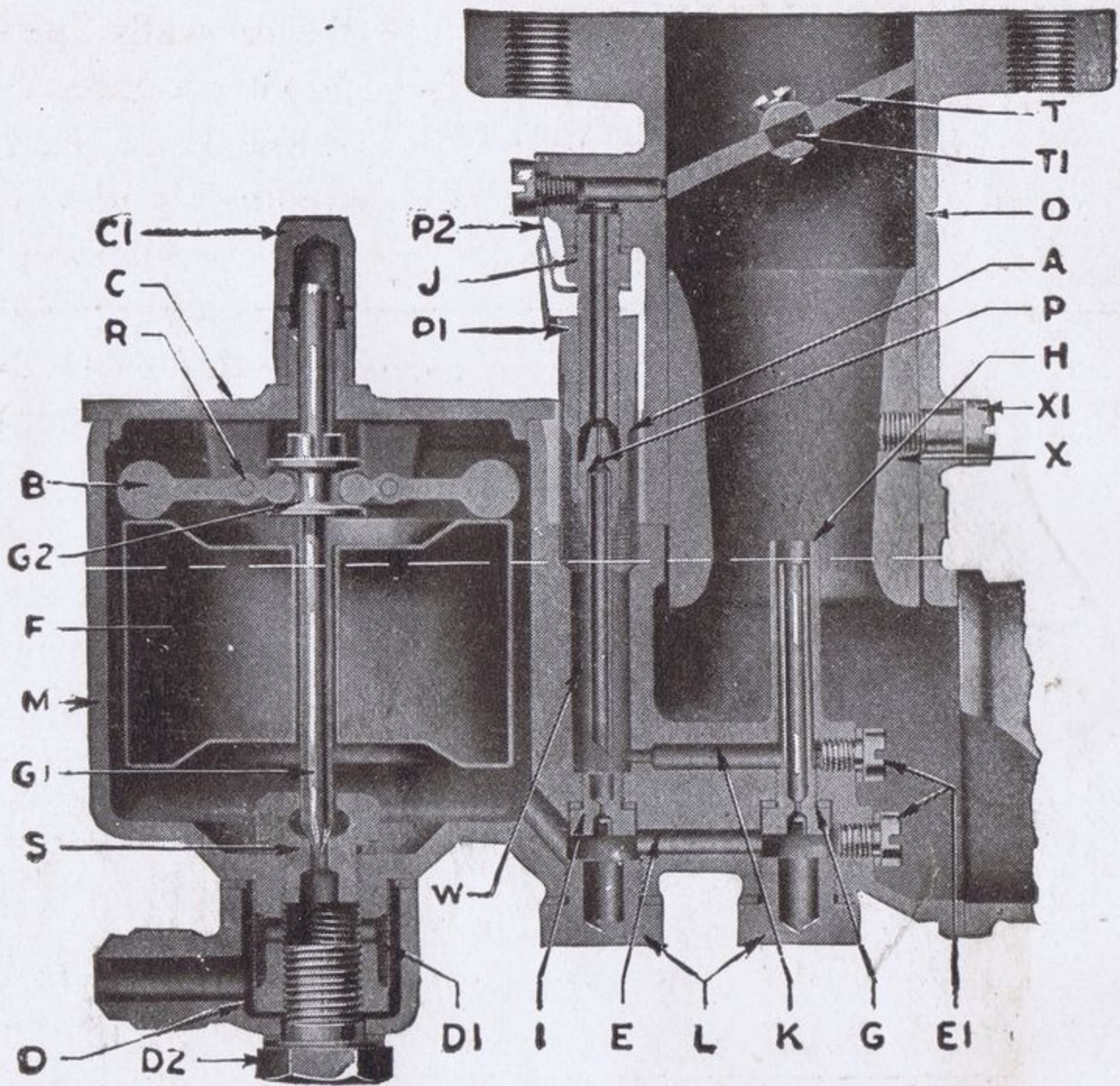


a minute or more to warm the carburetor and manifold. If a quick start is necessary, leave the air choke half or two-thirds open for a couple of minutes, but open it wide

just as soon as the carburetor and manifold are warm. Riding with the choke valve partly closed will supply too rich a mixture and will greatly increase your fuel consumption.

If the idling jet becomes clogged with dirt or foreign matter it will interfere with slow running of the engine, and the jet should be cleaned. Keep the carburetor free from dirt and water, and do not be afraid to take it apart for cleaning. Occasionally remove the drain plug "D2" and the filter screen "D1." The plugs marked "L" should be removed at the same time and any accumulation of sediment cleaned out. If necessary, the jets "I" and "G" can be removed and blown out. However, in replacing these, be careful to tighten them securely: also tighten screws "E1" to prevent leakage.

Water in the gasoline may cause a lot of trouble. It can easily be detected by draining some of the gasoline into a cup



Sectional View of Henderson Zenith Carburetor.

or pan. The water being heavier than the gasoline will lie in globules at the bottom of the can.

In replacing the carburetor be sure that the joint between carburetor and manifold is air-tight.

CARE OF THE MOTOR

A NEW motor can be improved or ruined by the treatment it receives during the first 1,000 miles. In any new piece of fine machinery the fit of working parts is snug, and clearances are close. Careful running during the first 1,000 miles will give all of these close-fitting parts a chance to wear-in, polish, and accommodate themselves to one another, and this is the reason for the stiffness of new motors. After being lim-

bered up carefully, bearing surfaces, cylinder walls, pistons, piston rings, etc., attain a polish which cannot be imparted to them in any manufacturing process, and this is essential for speed. On the other hand, if a new machine is abused by hard running right from the start, instead of polishing the moving parts, the wearing surfaces are scarred and roughened because of the particles of metal gouged out by the rough usage. Take it easy for the first 1,000 miles or more and you will be well repaid.

For best results with the Henderson, carbon deposits should be removed as soon as there is any considerable amount present. With the oils recommended, the carbon deposit will be materially less than with inferior oils. Carbon removal from the Henderson is easy. It may be burned out with oxygen by simply removing the valve caps and the valves may be ground without removing the tank. If desired, the cylinders may be removed without taking the motor from the frame.

When burning out carbon with oxygen, be careful to have the pistons at the top of the stroke and both valves fully seated. Removal of the valve caps will enable you to make sure that piston is on top, and the tappets of both valves should be tried to make sure the valves are on their seats, otherwise cylinder walls and valve seats may be burned. Carbon should be burned out slowly and cylinders afterwards cleaned out with compressed air to remove the incombustible road dust which is always mixed with the carbon deposit.

The valves can be ground easily through the valve cap holes by means of a bent screw-driver, being careful not to get any of the valve grinding compound into the cylinders.

It is, of course, possible to do a better job by removing the cylinders which also permits inspection of the piston rings. The carbon deposit should be scraped from the cylinder heads, valves, valve ports and piston heads. While doing this work, the crankcase opening should be covered with a rag to prevent carbon particles from getting down into the crankcase.

Inspect the piston rings carefully and be sure they are bearing all the way around within the cylinder. If they are gummed in slots with burned oil, they should be loosened and the carbon cleaned out. If there are any burned or black spots, it is evidence that rings are not bearing on the cylinder walls all the way around. Such rings should be replaced with new ones.

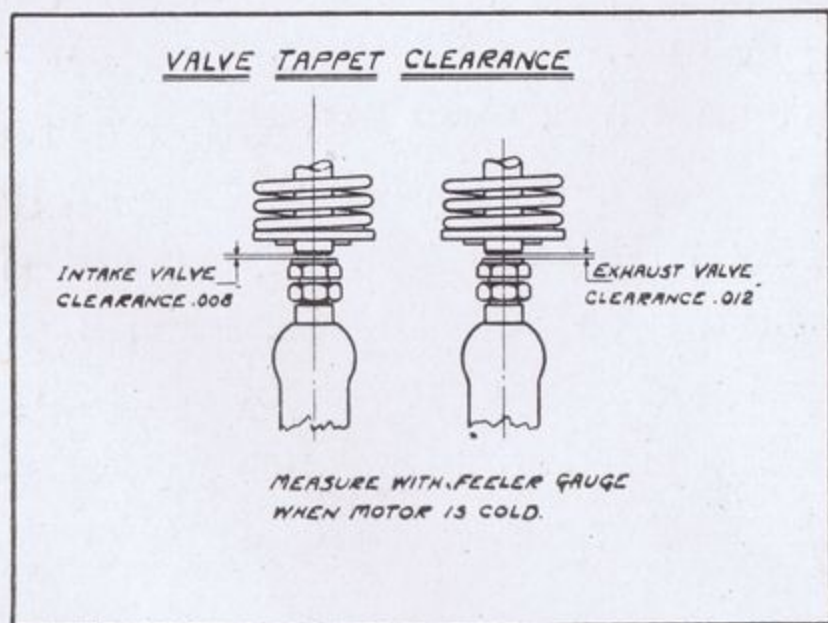
Be very careful of the pistons while the cylinders are removed. If they are allowed to swing around and strike the connecting rods, they may be forced out of round. If possible, measure the pistons with a micrometer before replacing in the cylinders, and if they are out of round, they can be forced back into shape by rapping with a block of wood or a mallet, for cast iron is more or less plastic. Piston distortion may slow down the machine appreciably for it causes undue friction against the cylinder walls.

In replacing the cylinders, be careful not to spring the connecting rods. In this connection, refer to the latter part of instructions for fitting bearings, on Page 29. Before tightening down on the cylinders, check up alignment of the cylinder manifold flanges with a straight edge. Make sure all of the cylinders are straight. Use new gaskets on the manifold joints and tighten manifold in place before drawing the cylinders down on the crankcase. In replacing the valve caps in the cylinder heads, it is always safer to use new gaskets.

GRINDING VALVES—A special wrench is furnished for removing the valve caps. To remove the valves, hold down the head of the valve and pry up on the washer below bottom end of spring extracting the pin from the valve stem. After the valve has been removed and scraped clean, apply a thin coat of "Clover Leaf" valve grinding compound, rotating the valve back and forth in the cylinder until it is evident that the seat is bearing evenly all the way around. During the grinding, the valve should be worked around on its seat occa-

sionally with a slight pounding action to prevent cutting rings or grooves in the seat. Do not rotate the valve continuously on its seat with a drill, for any high spot will cut rings on the valve or seat. The grinding compound should be used sparingly, and care should be taken to keep it out of the cylinders. When the valve and valve seat present a smooth, even surface, the grinding is complete. Seating of the valve can be tested by making lead pencil marks $\frac{1}{4}$ " apart around the valve seat, after which the valve can be turned on its seat in the cylinder. If all of the marks are erased it is evidence that the valve is seating properly. Before replacing the valve, wipe it off with a rag dipped in gasoline to remove all traces of the grinding compound. If the valve spring is short because of long usage, it should be replaced with a new spring. After replacing the valve spring washer and pin, put some graphite on the threads of the valve cap to facilitate

removal next time. If the valve or valve seat in the cylinder should be burned, pitted or shouldered, the cylinder should be taken to one of our authorized dealers' service stations for re-seating.



TAPPET CLEARANCES

After regrinding the valves, it will, of course, be necessary to readjust the tappets. The clearance between intake tappet and intake valve stem (cold) should be not less than .008 while the exhaust valve tappet should have .012 clearance measured with a feeler gauge inserted between tappet and end of valve stem. Clearance of .012 to .015 will give good all-around results, but if tappets are set closer than specified, the motor will not run smoothly and will actually be slower. Besides, there's danger of burning the valves.

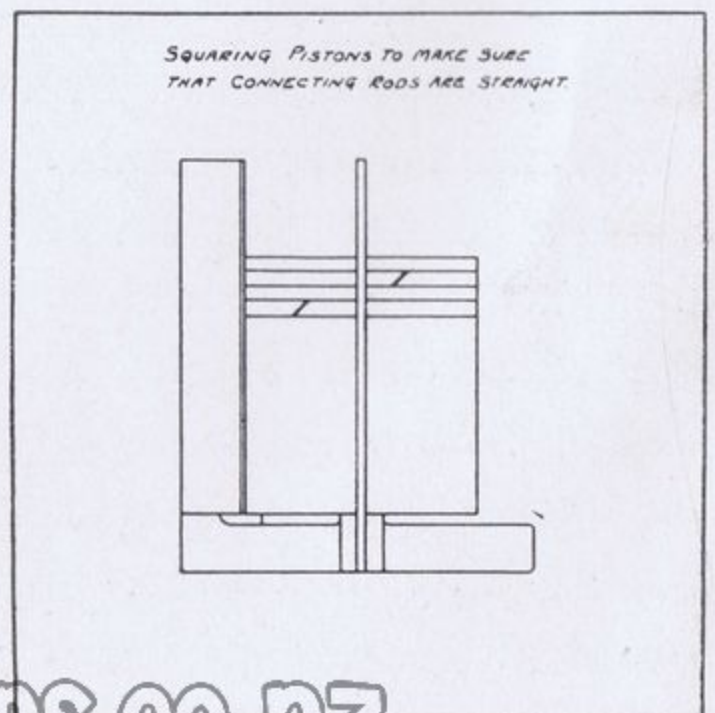
BEARINGS

AFTER a season's use, it is advisable to overhaul the motor, scraping out carbon, regrinding valves, taking up bearings if necessary, etc. Particular care should be observed in connection with the bearings. It is a common error to overhaul crankshaft bearings by merely taking them up instead of bedding in the upper halves first. If this procedure is followed it is likely to leave the shaft in a cramped condition and possibly result in damage to the motor.

If the crankshaft bearings have been worn out of round, use a long strip of emery cloth on the high spots and true crankshaft to within .005".

The proper way to fit the bearings is to remove the caps. Take out crankshaft and clean the oil thoroughly from all the bearings. Use Prussian Blue or Lamp Black for marking the bearings and then replace the shaft. Do not press heavily on the shaft when turning it over to mark the high spots. Then remove the shaft and use a keen-edged scraper to scrape down the high spots until a good surface shows in each bearing. When taking up the main shaft bearings, it is absolutely necessary to line up the main bearings perfectly with each other by scraping them in before putting on the bearing caps. The rear main or clutch bearing must be carefully lined up with the other three main bearings. Some of our authorized dealers have special service reaming sets made by the factory for doing this work, and they can turn out accurate jobs promptly. If your dealer is not equipped to handle work of this kind, the best plan is, of course, to send the motor to the factory where the bearings can be quickly and economically reamed. By no means should the work be attempted by a mechanic who does not thoroughly understand it.

When taking up the connecting



rod bearings it is necessary to scrape the high spots to obtain a perfectly round bearing. If the play is merely taken up, the shape of the bearing will be more or less oval, and it cannot stand up in service as long as if properly fitted.

After refitting bearings, it is necessary to square the connecting rods so that the pistons will line up properly within the cylinders. If this is not done, the pistons are likely to be tipped in the cylinders causing undue friction on the cylinder walls. To square the pistons, use two large squares, placing them against piston sides to determine whether or not connecting rods are bent and pistons tipped. If pistons do not line up properly, the connecting rods should be straightened.

Before removing any of the pistons, the numbers of the cylinders should be scratched on top so that pistons can be replaced in the original cylinders. This is important because in service the pistons are naturally lapped in to fit their respective cylinders.

Baffle plates are used under cylinders to regulate the oil supply. Make sure baffle plates are tightly secured in place.

CLUTCH

WHEN throwing out or engaging the clutch, do not race the motor unnecessarily. The throttle should be opened slightly as the clutch engages to prevent the motor from slowing down or stalling. After a little practice you will know just how much it is necessary to open the throttle. The hand clutch lever should be kept all the way back except for long continued running at slow speed in traffic, or when riding slow and preparing to stop.

Do not get into the habit of continuously slipping the clutch, especially when trying to force your machine up hills on high gear. It is always better to change to second speed. Excessive slipping shortens the life of clutch thrust bearing and causes oil to be burned from disc surfaces, sometimes scoring

the surfaces and impairing the clutch action. The clutch is supplied with oil by means of the pressure feed system through the hollow crankshaft. With reasonable care, wear of the clutch discs is so slight as to be hardly perceptible, and this is automatically taken care of by the springs which provide even tension at all times and do away with any need of adjustment. The only attention required is to see that the release rod adjustment permits full engagement before the lever is all the way back. In other words, make sure that the clutch release mechanism permits full engagement of the clutch. When running very slowly, as in parade work or through congested traffic, the clutch should, of course, be slipped enough to eliminate any jerking. This can be done by setting the hand clutch lever well forward, but do not slip the clutch unnecessarily. When stopping at corners with the motor running, always throw the gears in neutral and have the clutch all the way in.

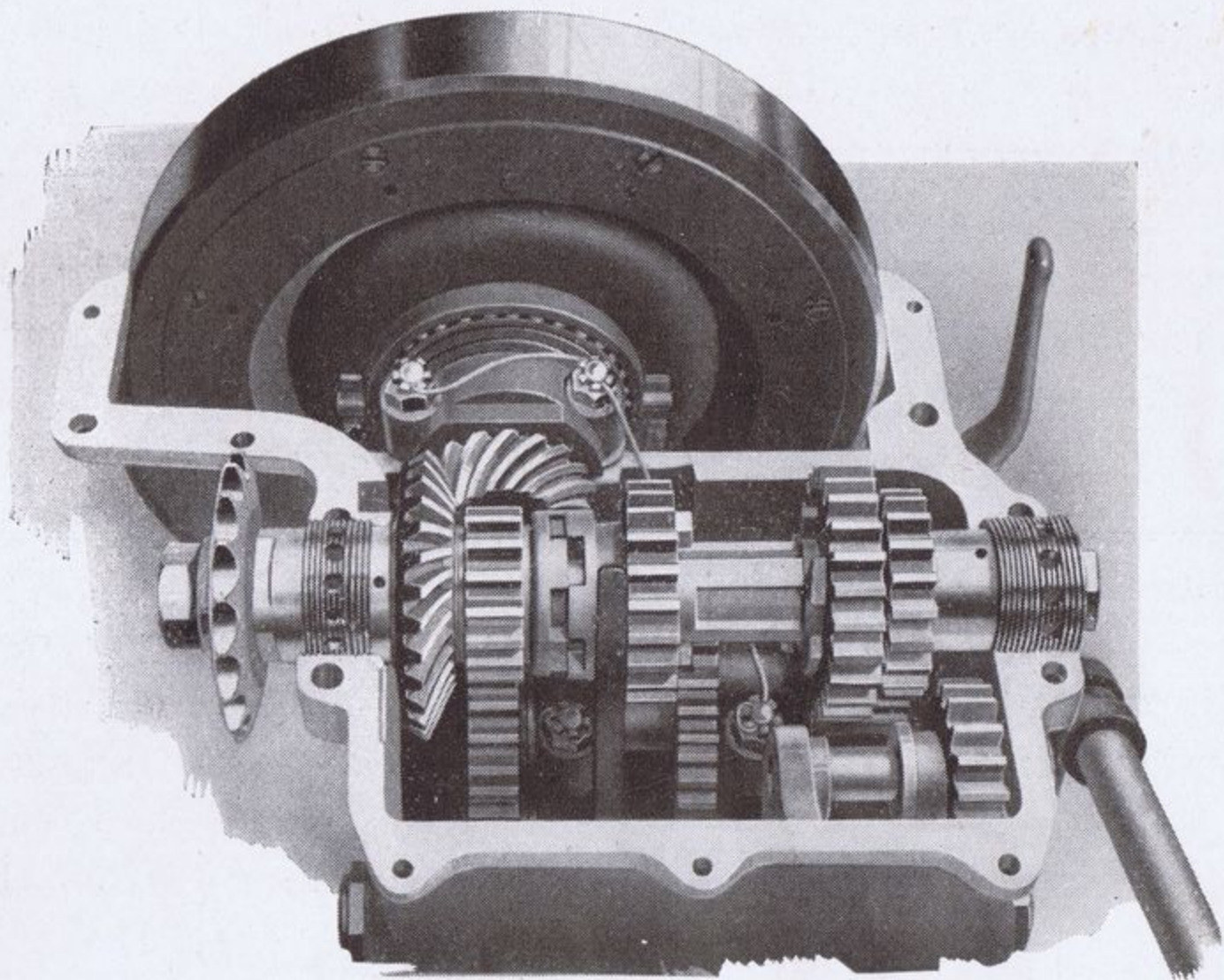
A new design of clutch plate is now used in the De Luxe Models which makes the clutch action more smooth and flexible and entirely does away with slipping.

TRANSMISSION

NOTE adjustment diagram on Page 32. The Henderson transmission is of the progressive type with three speeds forward. The reverse gear is optional equipment. Being integral with the motor, transmission lubrication is effected by the force feed system through the hollow crankshaft and no other lubrication is needed.

If there is any considerable noise in the gears, try adjusting the spline shaft bushings which control the mesh of the large bevel gear as follows:

Back out set screws three or four turns; loosen bolts on either side of bushings and turn bearing "A" one whole turn out on starter, crankcase side. This will give free adjustment of sprocket side bearing "B," which controls bevel gears. Remove inspection plate above sprocket, so that the bevel gear



Details of Henderson Transmission Gears and Clutch.

can be reached with a finger, to determine the depth of mesh. Remember this adjustment requires great care, so do not move more than a quarter turn at a time, being sure that gears do not mesh too tightly. These gears should have not less than .004" and not more than .010" backlash.

When the best adjustment has been obtained, adjust bearing on starter side allowing $1/64$ " end-play for spline shaft, and tighten set screws and bolts securely.

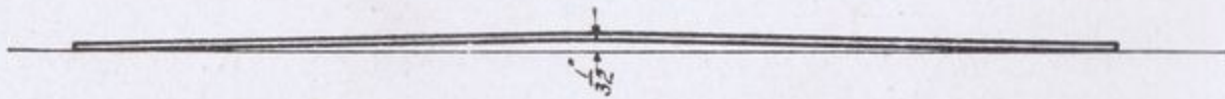
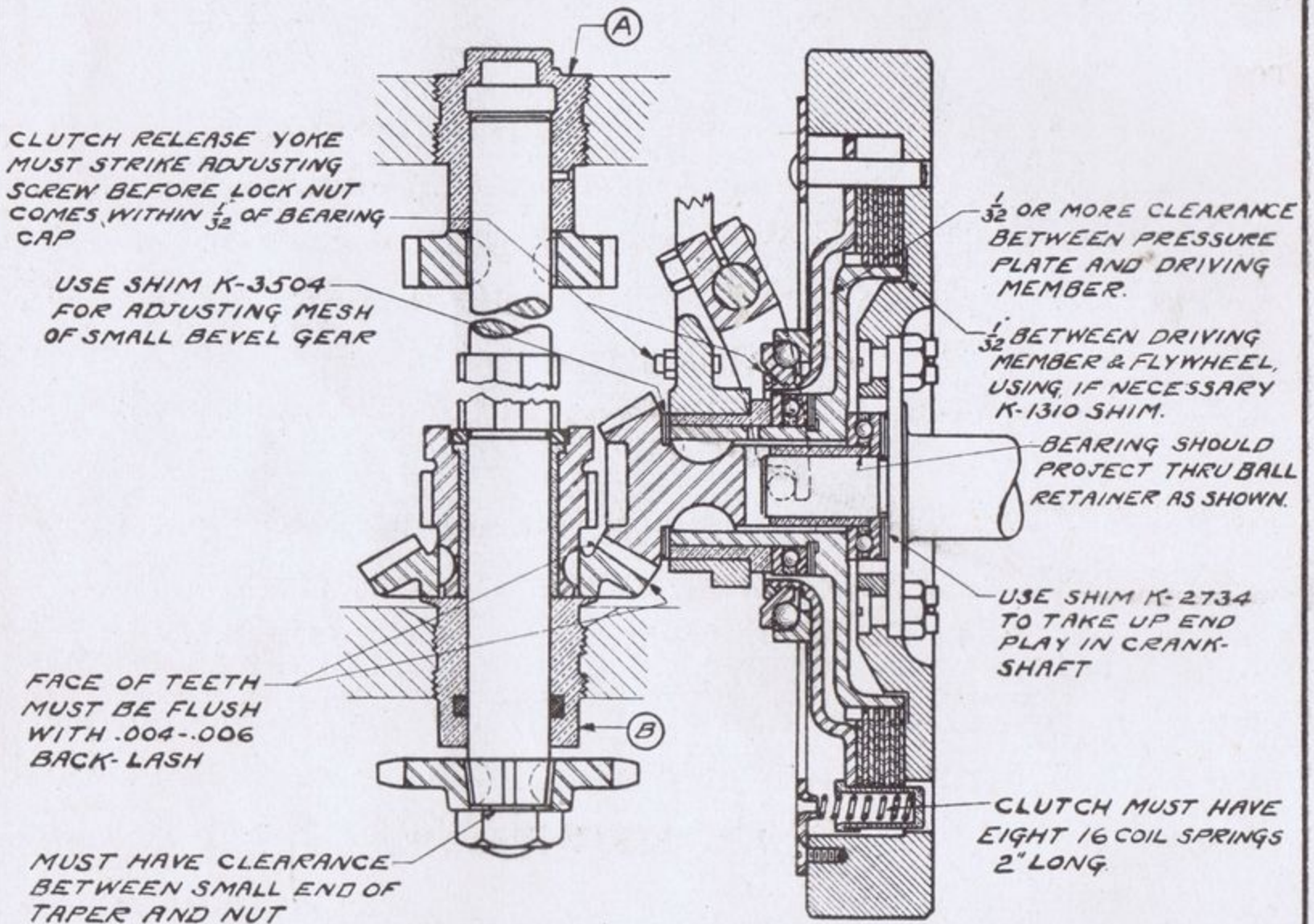
If the noise still persists, the motor should be taken from the frame and the bottom of the crankcase removed. This will give access to the small bevel gear, which can be adjusted by adding or removing shims as may be required. The face of gears must be flush or even, with from .004" to .006" backlash.

GEAR SHIFTER—The gear shifter fork is held in place on the shifter shaft by a clamp screw, and should not require any attention. However, if an adjustment seems advisable, see that engagement of the dogs is the same in both high and

SERVICE BULLETIN N° 3

CLUTCH AND TRANSMISSION

DELUXE AND
MODEL K



INSIDE DISCS (4) WHEN PLACED ON A SURFACE PLATE SHOULD HAVE NOT MORE OR LESS THAN $\frac{1}{32}$ " WARP AS SHOWN ABOVE.

OUTER DISCS (5) MUST BE PERFECTLY FLAT

ENGINEERING DEPARTMENT

low when gear is shifted to either position. Then tighten clamp screw and wire securely.

To adjust gear shift rod connecting hand lever with the shifter finger lever, first place hand lever in forward neutral position. Remove clevis pin and turn rear wheel to ascertain if gear shifter finger lever is in CORRECT NEUTRAL POSITION. Then adjust clevis until the pin holes line up before replacing pin.

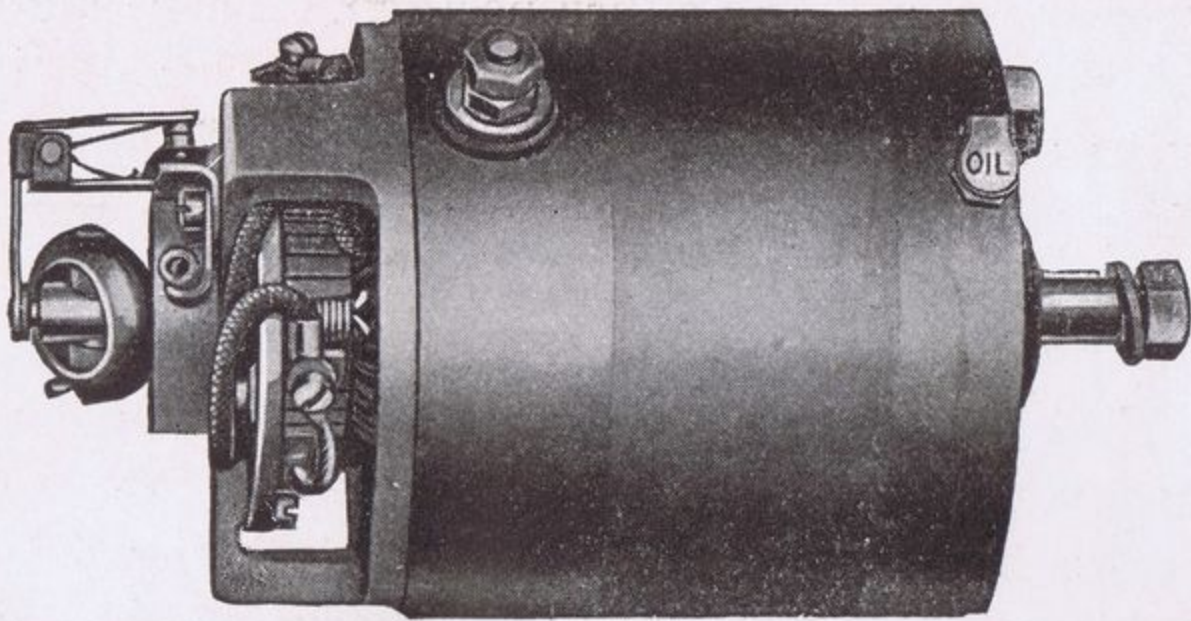
If trouble is encountered with gears jumping out of mesh, examine shifter finger lever above transmission, and make sure the lever is tight on the shaft. Any looseness at this point makes gear shifting and mesh uncertain. The key must fit well and there must be space between the lever and the boss on the crankcase. Also, the nut must not bottom on small end of taper.

Most trouble with gears jumping out of mesh is caused by improper adjustment of the clevis on the rod connecting with the hand shifting lever. Usually a single turn or two of the clevis in the proper direction on the rod will suffice to cure the trouble.

LIGHTING SYSTEM

THE Splitdorf DU-5 is standard equipment on the Henderson. This generator is designed to operate in connection with a 6-volt, 15-ampere hour battery or a battery of larger capacity suitable for greater loads when extra lights are used. The generator has a maximum output of $4\frac{1}{2}$ to $4\frac{3}{4}$ amperes at approximately $7\frac{1}{2}$ volts at 1800 r.p.m. of the generator.

The commutator may be inspected by removing the end cover. The carbon brushes should last an entire season without attention, after which the brushes should be inspected. If worn too short for proper contact on the commutator, they should be replaced. If the brushes are removed for any reason, be sure to replace them in their original position, for they wear to conform to the contour of the commutator. The de-



Generator with Cover Removed Showing Details of Automatic Cutout and Contact Points.

sign and arrangement of brushes is such that when they are fully seated, there is no arcing.

OILING—Oilers are provided at either end of the generator and it is important that four or five drops of “3 in 1” oil should be placed in each of the oil cups every 500 miles.

REGULATION—The generator is set at the factory to deliver sufficient current into the battery to keep it properly charged at all times. This setting should not be disturbed unless absolutely necessary. To increase the charge rate, move the third or regulating brush in the direction of rotation (viewed from the commutator end). After moving the regulating brush, the commutator must be polished with No. 00 sand paper applied on the end of a small flat stick with the generator running.

Generally though, if generator output is not sufficient this may be due to a loose belt or too great a gap between the contact points of the automatic cutout. This cutout is mounted on the end of armature shaft. A centrifugal governor operates a bell crank which closes the circuit when the generator is turning over at sufficient speed to charge the battery. This cutout requires practically no attention, except a drop of “3 in 1” oil on moving parts twice a year. The cutout contacts are properly set at the factory and should not be tampered with. The opening between contacts when the generator is station-

ary, should be from .015 to .025 of an inch, or 1/64 to 1/32 of an inch. If the gap is greater than this, there will be some arcing between the contact points, with the result that the points will be burned away. If the points are set too close together, contact will be made before the generator reaches charging speed, resulting in discharge of the battery.

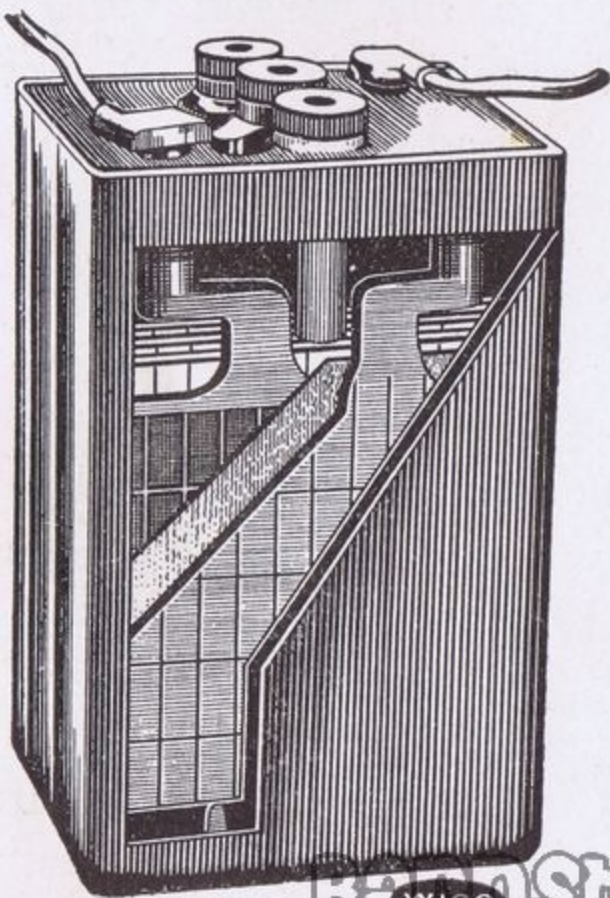
CAUTION—The Splitdorf DU-5 generator is designed to operate with the battery always in circuit. If the battery becomes disabled, the generator must be short-circuited to prevent injury or possible burning out. The generator will operate indefinitely shorted without injury, whereas it may burn out in a short time if operated on open circuit without battery.

To short the generator, disconnect the wire from binding post on top of generator. Connect a piece of wire from this binding post to a good clean ground on the machine. If battery is disabled or removed from machine, do not attempt to use the lights for the battery is necessary to regulate the generator output. If no battery is in circuit, the lights will burn out. In an emergency, several dry cells connected in series and wired in the generator circuit will get you home. However, with proper care, the battery gives but little trouble.

BATTERY—The service given by your battery depends largely on the care it receives. Neglect or disregard of these simple instructions will result in disappointment.

Inspect the battery, first of all removing the three filler plugs on top of each cell and see that the liquid appears in the bottom of the tubes which project from the filler plug openings down into the battery.

For preservation of the battery, it is necessary that the plates which can be seen through these filler tubes, be covered with solution. If the



plates are not covered, add distilled water until the liquid appears in the lower end of the tube. Do not fill the tubes clear up or the battery will slop over and the solution will corrode battery box. Be sure to keep outside of battery perfectly clean.

Form the habit of inspecting the level of the solution in your battery every week during the summer and adding distilled water when necessary. The water does not evaporate so quickly in winter. Use only distilled water, which can be bought at any drug store, for any other water contains minerals which will be deposited on the plates and damage or impair their action. Never add any acid. The acid does not evaporate from the battery solution, and if you add any, you may ruin the battery. If the solution should be spilled out of the battery, the safest plan is to take the battery to a regular battery service station.

The battery should be packed tightly in the battery-box. It is well to have a piece of rubber completely covering the top, but not pressing down on the vent plugs so as to prevent escape of gas. This piece of rubber will serve as an insulator and prevent a short-circuit between the metal terminals and the lid of the battery box.

Do not allow battery to stand in a discharged condition when machine is not being used. If machine is out of service during the winter, keep the battery charged (once every month or so), and maintain the solution at the proper level by adding distilled water. If the battery is kept fully charged, there is little danger of the solution freezing. A fully charged battery will stand at least 35 degrees below zero without freezing. If the battery is discharged though, the acid is absorbed by the plates and the solution is practically water. For this reason, when your battery is discharged, there is danger of freezing as soon as the temperature drops low enough to freeze water. If you put your machine up for the winter and do not want to

disconnect the battery, it can be kept in proper condition by running the engine for five or ten minutes once a week. The best plan though, if you are not using the machine, is to take your battery to a service station and have them care for it during the winter months.

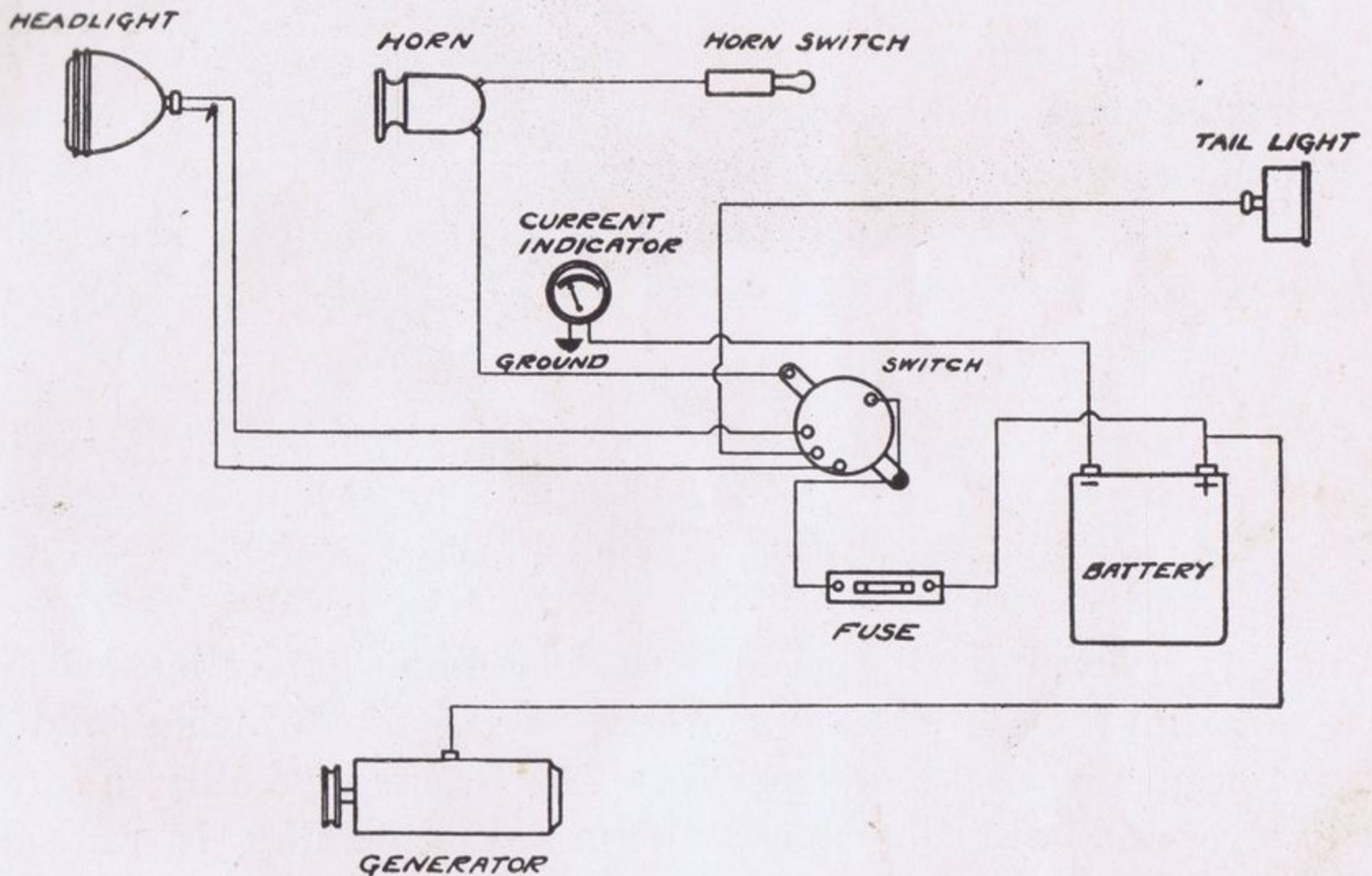


Diagram of Henderson Electrical Wiring System.

The Wico Electric Co., Springfield, Mass., manufacture the Wico battery and are anxious to co-operate to the fullest extent with users of their product. Do not hesitate at any time to write them for further information or assistance.

WIRING—The switch and fuse block are located in a weather-proof box on the left side of battery case. The negative (—) wire runs through the switch box direct to ammeter.

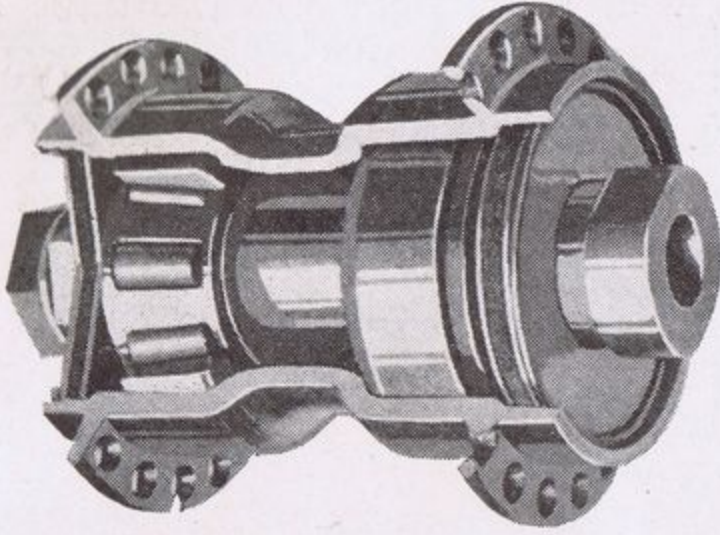
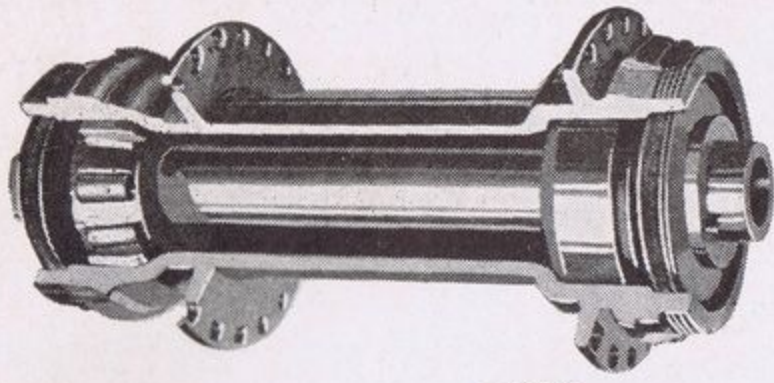
The positive (+) wire from battery enters back of box and is secured to a terminal of the fuse. This fuse protects the entire lighting system. If uncertain about connecting battery, check up with ammeter, which should register discharge when the horn blows.

Should the fuse burn out, if a new one is not obtainable, the best plan is to wrap the burned-out fuse with a single layer of tin-foil such as is used on cigarette or gum packages. Do not use more than a single layer of tin-foil or enough current may be passed to damage the wiring in case of a short. Should no tin-foil be available, the next best plan is to twist a strand of very fine copper wire across the fuse block.

Short-circuiting the fuse block by means of a solid piece of wire or metal is not advisable, for in case of a short, the wiring may be burned out. If it is necessary to do this in an emergency, put in a fuse at the first possible occasion.

If, when inserting a new fuse, it is immediately burned out, there must be a short somewhere on the line which should be promptly located and repaired. The fuse is in reality, a safety valve and will not burn out unless something is radically wrong.

TIRES—We equip all our machines with 27x3 $\frac{1}{2}$ " over-size auto-type tires, which for maximum mileage should be inflated to 50 pounds pressure. Riding with the tires soft puts an extra strain on the side walls and also may cause rim-cutting. For safe, slow riding on a slippery street, it is well to let a little air out of the tires, but just as soon as you are again on dry streets, pump the tires up. Carry a tire gauge and use it. A little less pressure is required in the front tire than in the rear. Do not attempt any speed work with soft tires. It can't be done—you'll waste too much power and may have a blowout.



TIMKEN HUBS — The wheel bearings should be cleaned and lubricated at least every 5,000 miles. Do not use heavy grease—600-W oil is the proper lubricant.

Do not set the bearings too tightly for they must have reasonable running clearance. Another important point is to *always replace front wheel in the forks with adjusting cone on left side.* One cone

is permanently fixed on bearing tube while the other has a right hand thread. If the wheel were replaced with adjusting cone on right hand side and the locking arrangement loosened, turning of the wheel would naturally tend to tighten the adjusting cone and pinch the roller bearings.

In the rear hub the stationary cone has a pin which fits a socket in the brake plate. In assembling the hub be sure this pin fits the socket and that the lock nuts on the other end are tight.

REPAIRING PUNCTURES—Nearly all tires are marked on the side:—"Apply this side last and remove it first." These instructions should be followed, for the inner liner protecting the tube from the spoke ends is fastened to the other side of the casing. If a puncture is caused by a nail which can be found in the tread of the tire, it is only necessary to remove the casing for a short distance on either side of the puncture.

Clean the tube with gasoline; roughen it with sand paper and apply cement to both tube and patch. Allow the cement to dry for several minutes. Never apply a patch too soon for it will not stick. Some of the especially prepared patches with

acid cure cement will make permanent repairs, but of course the best plan is to use a vulcanizer. After applying the patch, shake a little talcum powder over it to prevent sticking to the casing. Be sure to remove the nail which caused the puncture from casing and examine the tube all the way around to make sure that the point of the nail did not pierce the tube and make another hole on the other side. Often a small pin or nail may escape notice on the outside of the casing, but can be felt on the inside.

Should the hole in the casing be large, use an emergency tire patch, so that the tube will not blow out through the casing. A cut or hole in the casing should be repaired with a vulcanized patch if the tire is worth the investment.

Be sure the flap is in place and not twisted or wrinkled so as to cause pinching of the inner tube.

If the inner tube is of the butt-end type, be careful that it is not twisted when replacing in the casing, otherwise a blow-out is pretty sure to result. Care should be taken that the inner tube does not come in contact with grease from the chains, for oil will rot rubber.

Excessive wear on the casing is sometimes due to the rear wheel not being straight in the frame.

Do not jam on your brake except in emergencies, for if the wheel is locked and slides, it will wear off more rubber than many miles of riding.

MISCELLANEOUS

CHAIN ADJUSTMENT—Adjust the drive chain at least every 500 miles, gauging the tension by the tightest point found when turning the wheel. Then be sure to line up the rear wheel accurately with the front one before tightening the axle nuts. The chain alignment can best be checked by sighting along the chain from rear wheel to motor sprocket.

A tight chain will waste power, wear out the chain and

sprockets and put a severe load on bearings. If the chain is worn and too loose on the sprockets, it may jump. The happy medium is the course to follow in adjusting chains.

To adjust the chain, put the machine on the stand. Loosen axle nut on one side and turn adjusting screws until the surplus slack is removed from the chain. Test the chain all the way around by turning the back wheel, and make sure there is a little give even at the tightest point. After making the adjustment, tighten all nuts on adjusting screws and also the rear axle nuts. If you've moved wheel forward you've changed brake adjustment. Make sure it is OK.

For riding on boulevards and roads that are not dusty, it is well to oil the chain occasionally, by immersing in a pan of oil and draining off the surplus. On dusty roads a wet chain will gather dust and grit.

When the sprockets are badly worn, it is folly to put on a new chain. Obviously, both chain and sprockets should be replaced. An old, worn chain or a tight new one will waste power.

GEAR RATIOS—Many riders make the mistake of using solo gearing with sidecar outfits with the mistaken impression this is the way to get speed. To handle the increased load of a sidecar outfit, it is necessary to gear the machine low enough so that the motor may develop maximum power. In level districts, we recommend for the Henderson De Luxe Model a 16-tooth motor sprocket and a 41-tooth rear sprocket. In hilly sections of the country, the 41-tooth rear sprocket should be used with a 15-tooth front sprocket. We have found by actual test that Henderson sidecar outfits are faster on the level with the 16-41 combination than with the higher gears. Give your motor a chance. Gear it low enough so that it can turn over fast enough to develop maximum power. You will get more speed, greater flexibility, quicker acceleration and save a lot of wear and tear on your motor, transmission and chain.

The various gear ratios recommended for the Henderson are as follows:

	Teeth on small bevel gear	Teeth on large bevel gear	Teeth on engine sprocket	Teeth on rear wheel sprocket	High gear ratio
Standard solo	17	28	17	36	3.49
Solo, hilly country.....	17	28	16	36	3.71
Solo, mountainous country...	17	28	15	36	3.95
Sidecar, level country.....	17	28	14	36	4.24
Sidecar, level country.....	17	28	16	41	4.22
Sidecar, hilly country.....	17	28	15	41	4.50
Sidecar, mountainous country	17	28	14	41	4.83

The three-speed transmission provides a gear reduction from high gear of $1\frac{5}{8}$ to 1 on intermediate and $3\frac{3}{16}$ on low.

The low gear ratio can be obtained by multiplying the high gear ratio by $3\frac{3}{16}$. To find intermediate ratio multiply the high gear ratio by $1\frac{5}{8}$.

DON'T

DO NOT take a new machine right out of the crate and try to burn up the road. *It should not be run faster than 30 miles an hour* for at least the first 1,000 miles, to give the bearings, cylinder walls, pistons, etc., a chance to become polished.

Do not take any oil a garage man may offer you, in spite of his assurance that it may be just as good. Insist upon Valvoline, Mobiloil, Quaker State or Texaco oils. *You will ruin your motor if you use thin auto oils.*

Do not allow your drive chain to become slack. It may jump off and cause trouble.

Do not run with your chain too tight. It will waste power, spoil the chain and sprockets, and put a severe strain on the bearings.

When your chain is worn out, replace it with a new one.

Old worn-out chains waste power, are noisy, and may cause trouble by breaking at inopportune times. You can test your chain for wear by examining the play between links.

While running slowly do not open the throttle suddenly with the spark fully advanced. It puts a heavy strain on motor bearings. Retard the spark and accelerate gradually.

Do not run all the time with spark fully advanced. For slow running or hard pulling on hills or in sand, retard the spark. For all general running, about three-quarter spark advance will be found best. Advance the spark all the way only for high speed work.

Do not jam on your brake except in emergencies. Stop by applying a gradually increasing pressure on the brake pedal.

If necessary in an emergency to make a quick stop on a slippery street, apply the brake without releasing the clutch. If you release the clutch and jam on the brake under such conditions you'll probably lock the wheel and slide for a considerable distance. Braking with the clutch engaged, the motor will keep the wheel turning and you'll not lose traction and slide. This, of course, puts an added strain on brake, chain and motor and should not be done except in emergency stops.

Do not allow rear wheel to spin on wet road or in sand or mud. Close throttle sufficiently to stop spinning, and accelerate gradually.

Do not race motor at high speed on the stand for that is the worst abuse to which you can subject it.

Do not fill gasoline tank with motor running or with any open light near. In case of fire, shut off gasoline cock at tank and race motor to empty carburetor.

Do not pass a vehicle on the wrong side of the road. When passing blow your horn. When turning off the road or stopping, hold out your arm as a signal.

Do not attempt any extensive repairs on your machine unless you are competent. Take the machine to a capable repair man or forward to the factory.

Do not use imitation parts. Insist upon genuine parts made by the Excelsior Motor Mfg. & Supply Co.

Do not adjust wheel bearings too tightly. Replace front wheel with adjusting cone on left side.

Do not forget to grease wheel bearings two or three times a year. At the same time, the fork head bearings should be greased.

Do not tighten down head bearings too tightly.

Do not try to use heavy cylinder oil in the magneto or generator. Use a few drops of light sewing machine or "3 in 1" oil occasionally.

Do not put any grease in the gear case, for the timing gears are lubricated by the motor pressure feed oiling system.

Do not run any more than is necessary with the air choke closed.

Do not set valve tappets too close. Allow the intake tappet not less than .008 and the exhaust tappet .012 clearance.

Do not race motor when first starting in very cold weather. Give oil time to warm and start circulating.

SUGGESTIONS

K EEP your machine clean.

Keep all the nuts tight.

Clean holes in muffler cutout disc occasionally and keep muffler closed around town for ordinary riding. For speed work in the country, open muffler.

Keep tires properly inflated, especially for speed work.

Keep the interior of your motor clean. Remove carbon deposits for carbon is the enemy of motors.

After running for a considerable time on dusty gravel roads, some of the dust and grit may deposit on the valve stems and cause a squeak. Squirt a little oil on the valve stems with an oil can or gasoline gun will save wear and stop the squeak.

Examine spark plugs occasionally and be sure the gap be-

tween points is a trifle less than the thickness of a worn dime.

Keep the brakes adjusted and be sure they do not drag.

Look at your oil gauge occasionally. If same is not registering, ascertain the cause at once, for lack of oil will damage your motor. We recommend Valvoline, Mobiloil, Quaker State or Texaco.

After your machine has been run 500 miles, the old oil should be drained through plugs in the bottom of crankcase. The crankcase should be flushed out with kerosene and three quarts of fresh oil put in. It is not good practice to add fresh oil to the old oil in the crankcase except in emergencies. It is far better to drain out the old oil and fill up with new, fresh oil.

After covering the first 500 miles, it is well to call on your dealer and make sure everything about your machine is O.K.

In case of gasoline fire, do not use water. If Pyrene is not handy, smother fire with a blanket, rug or coat. Even weeds, sand or grass may be used.

If possible, shut off gasoline cock and run the machine rapidly down the road. The gasoline supply in the carburetor bowl will soon be used up and the force of the air current will often blow out the flame, or at any rate blow it back from the gasoline tank. Throwing the machine over on its side is the worst thing that can be done for gasoline will then spill out and burn all around under the tank. So long as the vent in the filler cap is open, there is little or no danger of the tank exploding. Racing machines often catch fire on the track and where the riders have presence of mind enough to shut off the gasoline cocks, but little damage is done.

WHEN YOUR ENGINE DOES NOT RUN PROPERLY

THERE is a reason for every form of engine trouble. Many of these reasons are very simple. When your machine does not operate properly, you will usually find some one simple fault rather than a combination of troubles.

MISSING AT HIGH SPEED—Gasoline pipe or shut-off valve may be partly clogged with foreign matter. Inspect and clean. Remove gasoline cock and flush dirt out of tank.

Air vent in the filler cap may be plugged. A bit of foreign matter may be lodged in the carburetor jet.

Spark plug points may not have the proper gap, or plugs may be dirty or defective.

There may be water or impurities in the gasoline.

Gasoline supply in the tank may be running low.

The valves may be in bad condition and may need regrinding.

Piston rings may be burned or worn out.

Weak or broken valve springs sometimes cause missing.

Magneto breaker points may be improperly adjusted or in poor condition.

Magneto breaker lever may be sticking.

There may be an accumulation of carbon dust on the magneto distributor.

Spark plugs may be pre-igniting.

MISSING AT LOW SPEED—Idling jet may be clogged or partly clogged. Remove and clean jet.

Idling jet may not be properly adjusted.

There may be an air leak in the intake manifold which can be located by squirting gasoline on flange connections while motor is running.

Gummed valves, weak or broken springs may cause missing.

Sticking magneto breaker, burnt points, or improperly adjusted gap may cause missing.

Improper adjustment of valve tappets may cause missing, particularly if one or more of the tappets is too tight.

Defective or fouled spark plugs may cause missing; also, improper gap of spark plug points.

IF ENGINE DOES NOT RUN SMOOTHLY—Find first if the trouble is in one or more cylinders, or if it is occurring intermittently in all cylinders. Short the plug terminals one

after the other with a wooden-handled screw-driver, noting the effect of this carefully. Better yet, mark the spark plug wires with little notches cut in the rubber so that they may be replaced on the proper plugs. Then remove the nuts from spark plug terminals, leaving the wires in place. While the motor is running, remove the wires from the plugs one at a time, noting the effect. This should reveal the cylinder that is misfiring, for the cylinders can be run one at a time.

Hold the spark plug wires one after the other about 1/16" from the spark plug terminals. Observe if the spark occurs regularly and if it is healthy.

Make sure valve stems are not bent, and that tappets are not too tight.

IF MOTOR REFUSES TO RUN—See if there is gasoline in the tank and make sure it is reaching the carburetor.

See that each cylinder is getting a good spark.

See that plugs are clean and properly adjusted.

See that magneto breaker is opening and closing properly and that platinum points are clean.

Be sure carburetor jet is not clogged.

Drain some of the gas in a can and see if there are any globules of water in it.

If you've had ignition wires disconnected from plugs, make sure they are properly replaced.

See that controls are working properly when handle-bar grips are turned.

If handle-bar magneto cutout is fitted, make sure switch and wiring are not "shorted."

See that cutout switch on magneto breaker cover is not shorting on crankcase.

If it is impossible to turn the motor over, the trouble is likely due to running the machine without oil or with improper oil until pistons or bearings have seized. This is a job for a properly equipped repair shop.

LACK OF POWER—Be sure brakes are not dragging. Put machine on stand and turn over the rear wheel by hand, making sure it is perfectly free.

Check up your gearing. Do not try to pull a sidecar with solo gear. You will get more speed, quicker pick-up, better handling in traffic and save wear and tear on your motor by gearing sidecar machines 14-36 or 16-41 in level country and 15-41 or 14-41 in hilly or mountainous sections.

Be sure all of the valves are seating.

Turn over motor and check up valve tappet clearances.

Remove carbon deposits and 'grind valves when needed.

Be sure piston rings are not burnt or worn, or gummed in piston grooves.

Use the oils recommended. You will ruin your motor if you use cheap, thin auto oils.

Be sure throttle opens all the way and that you get full magneto advance.

Be sure magneto breaker is operating properly and that points are clean.

Do not run with chains too tight. Turn the chain all the way around and make sure there is some play at the tightest point. Worn-out chains and sprockets will eat up power.

In rare instances, a small particle of foreign matter may partly plug carburetor jet. Make sure it is clean. Gasoline pipe may be partly clogged.

If you have had machine apart, it may not be properly timed. Check timing again.

Muffler cutout may be clogged with carbon. Clean out the holes in it.

