INSTRUCTIONS

For the Care and Operation of the

Henderson

STREAMLINE AND DELUXE MODELS

EXCELSIOR MOTOR MFG. & SUPPLY CO.
3701 Cortland St. **Chicago, Ill., U. S. A.**

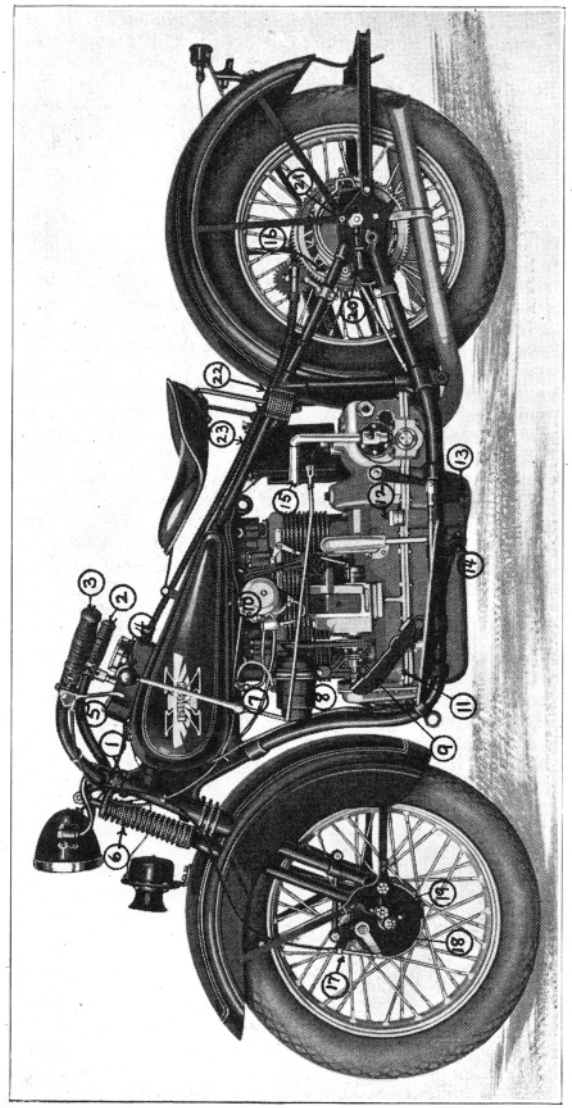
TO OBTAIN the best results with any piece of mechanism it is necessary to understand it thoroughly and to give it proper attention and care. Really, the four-cylinder Henderson is very simple in construction, and very easy to maintain in proper operating condition. The workmanship and finish of Henderson 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. If you attempt any speeding before your machine is thoroughly limbered up, it 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. While these instructions are intended primarily for the new Streamline models, still they will apply generally to previous DeLuxe models.

SETTING UP—In case your dealer does not turn over the machine to you fully assembled, after removing from the crate, put the handlebars in place and secure with the handlebar cap screws. The brake pedal is reversed and the rocker clutch pedal removed in packing. The control wires should be connected to the magneto and carburetor. The left grip is intended to control the spark timing and the right grip controls the throttle. Adjust so that the throttle opens and closes all the way and be sure movement of the left grip gives full travel to the magneto timing lever. Install the lamp bracket and lamp. The large wire lead from the headlight contains two (2) smaller cables—one for the bright and one for the small bulb. Connect these wires to the control switch on the instrument panel. To do this the panel must be removed from the top of the gasoline tanks after taking out the two large screws from the sides of the panel. A wire is connected to the switch on the left handlebar and this comes out of the front of the handlebars and has to be connected to the horn. The other wire connected to the right handlebar switch is to be connected to the ground terminal of the magneto for a magneto cutout. The red current supply wire connects to the positive (+) terminal of the battery. Batteries shipped to points in the U.S.A. contain electrolyte and are ready for use. Check the level of the solution, though, and add distilled water if necessary, to cover the plates. *Never add anything but distilled water to a battery.* Ordinary water contains minerals and impurities which deposit on the plates and impair the battery efficiency and shorten its useful life. The negative terminal of the battery is grounded. When properly connected, the ammeter should show discharge on blowing the horn.

(Printed in U.S.A.)



1—Head Bearings—Disassemble and pack with grease once each season. 2—Throttle control and 3 is the spark control—turn both grips in to accelerate. 4—Gear shift lever in low gear position. 5—Hand brake control—Use frequently and oil operating cable often to keep in good operating condition. 6—Recoil spring barrel—Pack with grease once each season. 7—Gasoline shutoff Valve. 8—Generator requires several drops of light oil every 500 miles—use adjustable bracket to take up slack in generator belt. 9—Rocker Clutch Control Pedal. 10—Carburetor Choke. 11—Oil Level Gauge. 12—Oil Filler Plug. 13—Oil Drain Plug. 14—Oil Strainer Elbow. 15—Kick Starter Pedal. 16—Rear Brake Adjusting Clevis. 17—Front Brake Adjusting Clevis. 18—Front Brake Operating Lever. 19—Fork Rocker and Front Brake Alemite Fittings—lubricate with an Alemite Gun every 250 miles. Front and Rear Hubs, lubricate with Alemite Gun every 2500 miles, being careful not to inject an excessive amount that will work out on brake drums. 20—Rear Axle Adjusting Screws. 21—Remove this bolt on either side to pivot rear mudguard for easy wheel removal. 22—Location of pivot on which rear guard swings. 23—Remove Battery Box Cover and add distilled water to the battery every week

Check up on your gearing. Do not try to pull a sidecar with solo gear.

Check up on controls and make sure throttle opens all the way, also that magneto control permits full advance.

Muffler may be clogged with carbon and ends of tail pipes may need a little more opening.

DIFFICULT STARTING—Excessive amount or too heavy oil in the motor.

Weak kicking of the starter. This calls for a hefty powerful swing and often requires some practice to acquire the knack. When everything is right, Hendersons are the easiest machines to start.

Poor carburetor adjustment—too thin a mixture.

Spark plugs dirty or too wide a gap.

Air leak in manifold.

Magneto points burned, pitted or dirty.

Worn intake valve guides.

Low grade gasoline may cause difficult starting in cold weather.

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 using the proper gear ratio.

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 or tailpipe may be clogged with carbon. Clean out the holes in it.

Improper adjustment of the idling jet, cutting the mixture down too thin, may cause stalling.

Burned or pitted magneto points, a weak interrupter arm spring in the magneto, or accumulation of carbon dust on the distributor may cause misfiring.

The air vent in the gasoline filler cap may be clogged.

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

Magneto or wiring may be water soaked and if so, the only remedy is to dry it out.

There may be a break in the insulation, somewhere in the high tension wires.

A valve spring may be broken, a valve stem may be bent or one or more of the valves may be sticking in the guides. Intake or exhaust valve tappets may be too tight, holding one or more of the valves open.

One of the carburetor jets may be clogged or partly clogged with foreign matter of some kind.

MOTOR KNOCKS—Low grade gasoline will cause a knock in high compression engines if the throttle is opened suddenly, particularly if there is any considerable amount of carbon in the cylinder. We recommend the use of Ethyl gasoline which contains a chemical compound that prevents fuel detonation knocks. When accelerating rapidly, retard the spark which also helps.

Too lean a gas mixture may also cause a knock. Try a little richer mixture on the high speed jet by screwing out the knurled head a few notches more.

A heavy carbon deposit makes the motor sluggish, tends to cause overheating and may cause a knock when the motor is hot.

An overheated motor, due to low oil supply or to poor quality of oil, may knock. A motor in which the spark has been given too much advance, may knock. There is a difference between knocks caused by fuel disturbances and those caused by loose bearings. A piston pin knock is generally a high pitched sound with a metallic ring. A connecting rod bearing is a duller note than a piston pin knock and sounds somewhat like a hammer blow. A main bearing knock is a dull pounding thump, particularly noticed at slow speeds. Detonation knocks caused by chemical disintegration of the fuel are manifest by a sharp "ping" when swinging the throttle open suddenly.

MOTOR OVERHEATS OR LACKS POWER—Often an indication of insufficient or poor quality of oil.

Excessive carbon deposits.

Too thin a mixture.

Spark retarded or too wide a gap in the setting of the breaker points of the magneto.

Dragging brakes or too tight a chain.

Burned or pitted valves or improper adjustment of the valve tappets—weak or broken valve springs.

Overoiling will make a motor sluggish.

If the connections are reversed, the polarity of the battery will be changed and it will be ruined. On long trips during hot weather, the water will be evaporated from the battery more rapidly than in the winter, particularly if the charging rate is high. Inspect the level every week and add enough distilled water to keep the plates covered. If you do not drive much at night, ask your dealer about reducing the generator output which will conserve the battery. Batteries for machines shipped to foreign countries are "dry charged." In other words, they are fully charged, then the electrolyte is removed and the plates are dried. To put such a battery in service, it is only necessary to fill it up again with standard electrolyte solution, obtainable at any battery service station.

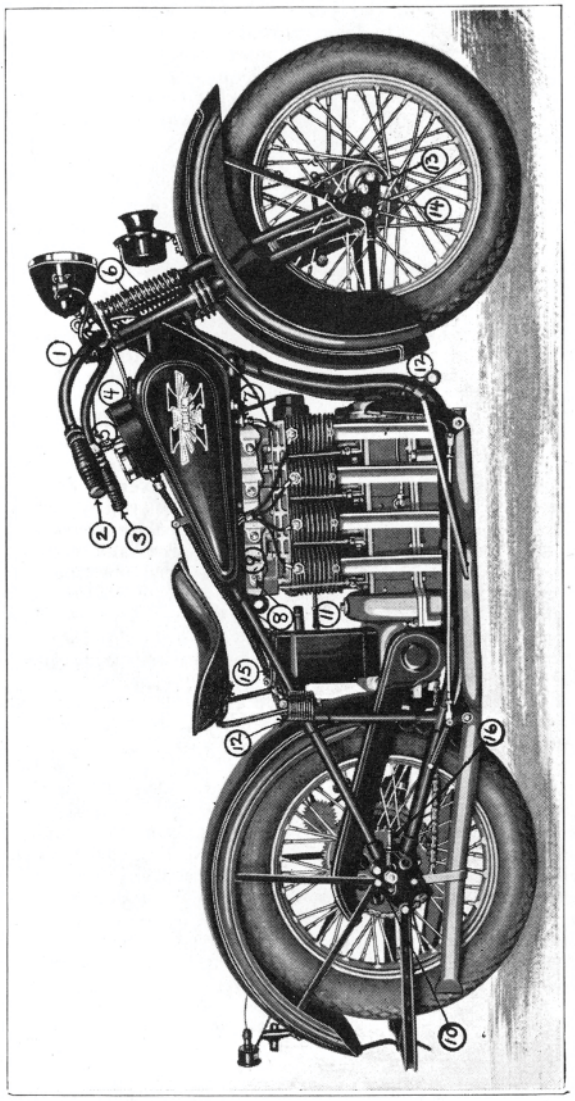
In the tool box will be found a registration card which should be filled out and mailed to the factory, to complete our file records and make the guarantee on the machine effective.

See that the tires are properly inflated with about 30 pounds pressure in the rear and 25 in the front. Fill the tanks with Ethyl or other high grade gasoline and pour three quarts of Valvoline Heavy Oil into the crankcase.

PREPARATIONS FOR STARTING—The gear shift positions with the new streamline models are reversed from those of the DeLuxe models. When the gear shift lever is all the way back toward the saddle, the low speed gears are engaged. When the lever is all the way forward, the high speed gears are engaged. Of course when the lever is in the middle position, second, or intermediate gears are engaged. There are two neutral positions between low and second, and second and high, either of which may be used when starting the motor. Reverse gear when this is supplied is controlled by another lever mounted outside the regular gear shift lever. *Before shifting into reverse, be sure the other gear shift lever is in the neutral position.* If reverse and low gears are engaged at the same time, you will stall the motor or may even break the drive chain.

In the new model the gasoline tank is divided into two sections with separate shut off valves for each. Gasoline may be drawn from either tank or both at the same time. If one tank is used at a time and the supply in the other held in reserve, shut off the valve in the pipe from the empty tank, at the same time you turn on the reserve supply. Otherwise, some of the gasoline from the full tank will back up into the empty tank, equalizing the gasoline in both tanks.

The late model Hendersons are equipped with Schebler carburetors, whereas the earlier model Hendersons used Zenith carburetors. The Schebler carburetor has variable jets for high and low speed adjustments. Both carburetors are equipped with choke arrangements for cutting down the supply of air and thus giving a richer mixture for starting. When the choke is completely closed, the mixture is excessively rich and if the machine is repeatedly kicked over, the cylinders will be flooded with a mixture of raw gasoline that is too rich to burn. Then it becomes necessary to open the choke and



1—Head Bearings—Disassemble and pack with grease, once each season. 2—Throttle Control. 3—Spark Control. 4—Gasoline Filler Openings. 5—Hand Brake Control. 6—Recoil Spring Barrel—Pack with grease once each season. 7—Gasoline Shutoff Valve. 8—Intake Rocker Arm Alemite Fittings—Lubricate with Alemite Gun every 250 miles. 9—Remove Aluminum Rocker Arm Cover every 500 miles or so and pack grease cups surrounding intake valve springs with "D.A. Lubricant No. 3." 10—Remove mudguard support bolt on either side and swing up rear mudguard on pivot 12 for easy wheel removal. 11—Inspection peep hole for motor timing. 12A—Foot Brake Control. 13—Front and rear hubs—lubricate with Alemite Gun every 2500 miles, being careful not to inject an excessive amount of grease which will run out on brake drums. 14—Fork Rocker Alemite Fitting—lubricate every 250 miles. 15—Remove Battery Box lid and inspect battery solution level every week, adding sufficient distilled water to cover the plates. 16—Rear Axle Adjusting Screws.

In figuring other gear combinations, there are 17 teeth in the small bevel gear of the primary reduction and 28 teeth on the large bevel gear. The gear reduction when running on second may be determined by multiplying the high gear ratio by 1⅝. Multiplying the high gear ratio by $3\frac{3}{16}$ will give the low gear ratio.

MISCELLANEOUS HINTS

CHAIN ADJUSTMENT—Check adjustment of the drive chain at least every 500 miles, turning the wheel and making sure there is a little play in the chain all the way around. A tight chain will waste power, put a severe load on the bearings and wear out both sprockets and chain. If the chain is too loose on the sprocket, it may jump off. Chain adjustment is made by loosening the axle nuts and moving the wheel forwards or backwards as may be required. Be sure to line up the rear wheel in the frame before tightening the axle nuts. Sighting along the chain from the rear to the front sprocket, you can easily see whether or not the wheel is straight in the frame, in which case the chain should run in a straight line. You can easily straighten the position of the wheel in the frame by means of the adjusting screws just in front of the rear axle. If you move the wheel any considerable amount, remember that you have at the same time altered the brake adjustment. Moving the wheel forward loosens the brake and moving it backwards has the opposite effect.

When the sprockets are badly worn and the teeth are thin and sharp, it is folly to put on a new chain without renewing the sprockets. An old worn chain or a tight new one will waste power.

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

Cylinders may be flooded with raw gasoline due to excessive priming.

Mixture may be too lean. Open the idle needle valve a little more.

See that each cylinder is getting a good spark and that spark plugs are clean and that spark plug gaps are not wider than .020".

If you have had the ignition wires disconnected from the plugs, make sure the proper wire goes to the proper plug.

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

Be sure the handlebar magneto cutout switch or wire is not short circuited.

See that the controls are working properly when the handlebar grips are turned.

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

MOTOR MISFIRES OR STALLS—Gasoline pipe may be clogged or there may be an obstruction in the jets.

Air leaks in the manifold, carburetor joint, or valve guides will cause erratic running.

protect the rims. The tire manufacturers recommend 30 lbs. pressure. The front tire may be a little softer than the rear and it is well to examine the tires frequently and notice if they flatten out appreciably with your weight in the saddle. If so, you are riding them too soft and will pay the penalty in reduced mileage. On wet, slippery pavements, though, it is safer to ride with tires a little bit soft which permits more of the tread to grip the road surface and reduces the likelihood of skidding. Most skids are caused by hitting the corners too fast or by attempting to change the direction of movement too suddenly. When the pavement is wet, be careful.

CAUTION—Note that in removing straightside tires from the rims, it is necessary to work the beads of the tire well down into the dropcenter channel of the rim for at least half of the circumference of the wheel. This should give enough slack to the beads on the other half of the circumference, so that it will slip over the edge and off the rim. Two or three small straps encircling the tire and holding it down into the dropcenter will greatly facilitate removing the tire. These straightside tires have steel cables vulcanized in the beads and consequently will not stretch. If you attempt to pry them off the rim in the same way you used to remove Clincher tires, you will certainly ruin them.

TIMKEN HUBS—Alemite fittings are provided in the hubs for injecting lubricant, although this should not be necessary oftener than every 3,000 miles. Do not use heavy grease for this purpose. Use regular Alemite compound or 600-W Oil, and be moderate as to the quantity of lubricant injected. Remember you are forcing this lubricant into the hubs under pressure and any excess of it will be forced out and into your brakes.

In adjusting Timken bearings, remember that they must have a reasonable running clearance. In other words, the wheel must have a slight amount of give in its bearings. If the bearings are set up too tightly, there will be a tendency to crush the rollers.

GEAR RATIOS—Many riders have the mistaken impression that the way to get more speed is to put on a higher gear. Some of them attempt to drive sidecar outfits with solo gears and the result is generally disappointing. Now, to develop a certain horsepower output, the motor must turn over a certain number of revolutions per minute. If geared too high, the motor is loaded down so that it cannot turn over fast enough to develop its maximum power and it never can deliver the maximum speed of which it is capable. The old Hendersons used to develop their maximum power at about 3400 R. p. m. The power peak on the latest Hendersons comes at about 4000 R. p. m., showing that these latest models require lower gears.

For solo riding, we recommend and ordinarily furnish a 16-tooth engine sprocket and a 39-tooth rear sprocket, giving a gear ratio of 4.01 to 1. For sidecar service, we use the same 39-tooth rear sprocket with either a 14 or 15-tooth engine sprocket. The former combination gives a ratio of 4.59 to one and the latter, 4.28 to one.

kick the motor over several times to work some air into the cylinders. After you once get the knack of starting a Henderson, you usually will be able to get the machine running on the first or second kick. On the latest Henderson, the choke lever of the Schebler carburetor is located just in front of the large, round, nickel plated air bell.

Four positions are marked for the choke lever which are fairly obvious—"Prime", "Start", "Warm-up" and "Open". Turn the motor over with the throttle open and the choke lever in the "Prime" position to work gas into the cylinders. Then move the lever down to the "Start" position, close the throttle until it is just barely open, then machine should start on the first kick. As soon as the motor fires, open the choke lever to the "Warm-up" position. In cold weather it will be necessary to leave the choke in this position longer than in the summer time, but as soon as possible, open the choke all the way. Otherwise, you will be burning an unnecessarily rich mixture that wastes gasoline and may cause dilution of the crankcase oil. (See instructions on Pages 16-17 for carburetor adjustment.)

When starting, gear shift lever should, of course, be in the neutral position and the clutch should be fully engaged. With the motor running, depress the toe end of the rocker pedal clutch control all the way. With a firm, quick pull, move the gear shift lever back toward you, engaging low gear. The clutch can be locked all the way or part of the way out by means of the ratchet on the clutch pedal. Depressing the heel end of the pedal, locks the ratchet. Pressure on the toe end of pedal releases the ratchet. By using only the toe end of the pedal, it will operate like the spring return pedal used on earlier models.

After engaging low gear, open the throttle slightly and allow the clutch to engage gradually, opening the throttle a little wider to keep the motor from stalling, if this is necessary. Operation of the clutch is a knack that is soon acquired, although it may be a little bit difficult at first for a new rider. The object is to get the machine under way with the least possible amount of racing of the motor and slipping of the clutch. If the clutch is allowed to engage too suddenly, it will cause a sudden jerk which may stall the motor.

When a speed of from six to ten miles an hour is attained in low gear, again depress the foot clutch pedal and push the gear shift lever forward to the center, engaging second or intermediate gear. Then allow the clutch to engage fully. Run along in second gear until you are entirely familiar with the controls. Then depress the foot clutch pedal again and shove the gear shift lever all the way forward into high gear and gradually re-engage the clutch. The great flexibility of the Henderson motor obviates a lot of gear shifting which is necessary with a Twin. When you want to slow down in traffic or at a corner, it is seldom necessary to shift gears because the Henderson will usually throttle down and pick up in high. If the motor gives the slightest evidence of laboring or working hard in high gear, it is always advisable to shift to second. That is the

purpose for which the gear box is provided. There is nothing so hard on a motor as to force it up difficult hills in high gear. You'll find that you can fly over tops of hills in second gear on which the motor would have to labor if forced over in high gear. *Whenever it is necessary to shift from high to second gear or from high to low gear, be sure to slow the machine down first to eight or ten miles an hour and always release the foot clutch fully before changing gears.*

When the machine is standing still, if the gears do not shift readily, do not attempt to force the gear shift lever. Move the machine backward a couple of feet or if machine is on the stand, turn the 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 move the dogs around so that they can mesh.

When accelerating or getting away from a standing start retard the spark timing by turning the left grip outwards. When the motor is working hard on a hill, it also helps to retard the spark. Long continued running with the spark retarded will tend to overheat the motor.

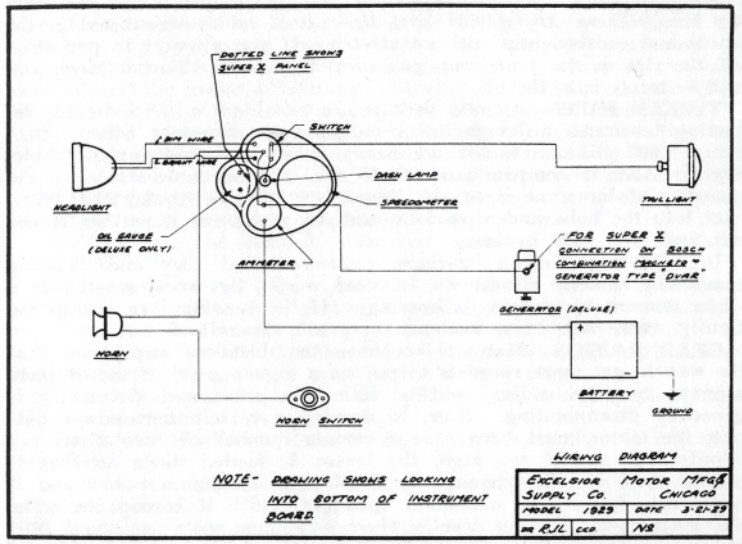
If you are an experienced rider and have had other motorcycles, of course a lot of these instructions may seem superfluous. If it is your first machine, though, you should be careful and take no chances until you are thoroughly familiar with the machine and operate the controls almost automatically. While learning to ride, bear in mind that it is just as important to stop as to start, and above all things remember that in any emergency you can bring the machine to a short stop by depressing both of the foot pedals, i. e., the left pedal releases the clutch and the right pedal applies the brake on the rear wheel. By also using the hand brake which controls the front wheel, you can stop in an even shorter distance. The throttle controlled by the right grip, should be turned all the way out, at the same time to prevent racing of the motor.

If the motor is accidentally stalled in traffic, throw the gears in neutral, move the choke lever up to the "Start" position, and use the kick starter. Do not forget to open the choke again as soon as the motor starts. When stopping for any length of time at a corner with the motor running, form the habit of throwing the gears in neutral and let the clutch in. The Henderson clutch is sturdily built to withstand a lot of usage but unnecessary slippage, of course, will in time mean wear of the clutch parts.

The reverse gear, which is furnished as extra equipment, is very useful for sidecar or commercial delivery work. When reversing, be sure to have the regular gear shift lever in one of the neutral positions. With the clutch released, push forward on the reverse lever; then allow the clutch to engage the same as when starting on low gear. When shifting into reverse or to any of the forward gears, the lever should be moved with a quick, positive throw.

freeze as soon as the temperature becomes low enough to freeze water. If not using your machine during the winter, the safest plan is to remove your battery and leave it with your dealer or with a regular battery service station.

WIRING—The lighting control switch is mounted in the instrument panel on top of the gasoline tank and the accompanying Wiring Diagram shows the hook-up very plainly. No fuse is used in the wiring system although there is a small fuse in the generator. The negative terminal of the battery is grounded while the positive terminal is connected through the ammeter to the switch and generator. The battery will fit in the battery box only one way and the terminals project out through holes in the box. You can check the battery connections by means of the ammeter. If the ammeter pointer swings over on the "charge" side when you blow the horn, it shows that the battery connections are wrong and you will reverse the polarity of the battery and ruin it unless you change the connections.



WHEELS

THE latest models are equipped with the new, straight-side tires mounted on dropcenter rims. To get maximum mileage be sure to keep your tires properly inflated. Insufficient air pressure causes undue flexing and weakening of the side walls, and it is also likely to cause dents in your rims because the tires are not hard enough to

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 will give but little trouble.

BATTERY—The service given by your battery depends largely upon the care it receives.

Batteries for machines shipped to foreign countries are usually sent "dry charged." In other words, these batteries are fully charged during which all of the acid is driven out of the plates and into the electrolyte. This is poured out of the battery which is then dried and made ready for shipment. To put the battery in service it is only necessary to pour in sufficient standard electrolyte solution obtainable from any battery service station, to cover the plates.

Batteries shipped to points in the U. S. A. are fully charged and contain the electrolyte all ready to put into service. It is well to check the level of the solution in your battery, though, and make sure that it covers the plates. If the plates are not covered, add distilled water until the liquid appears in the lower end of the tubes, leading down into the battery through the filler openings. Do not fill the tubes clear up or the battery will slop over and the solution will corrode the battery box. The battery terminals should be coated with vaseline or grease to prevent corrosion. Never pour anything but distilled water into your battery. Ordinary city water contains chemical impurities and mineral matter which will in time impair the plates. *Never add any acid.* The acid does not evaporate from the battery solution and if you add any, the solution will be too strong and it will attack the battery plates.

The battery should fit tightly in the box and if necessary, use a piece of an old inner tube as packing. Do not cover the filler plugs because these have vent openings to permit the escape of gas from the battery.

Do not allow the battery to stand in a discharged condition. If the machine is out of service during the winter, the battery should be charged at least once a month. If the battery is fully charged, there is little danger of freezing for the solution then contains a high proportion of acid which requires a very low temperature to freeze. As the battery discharges, the acid is absorbed by the plates so that a fully discharged battery contains practically pure water and will

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 brakes for quick emergency stops.

At the tops of most dangerous hills, nowadays, you will see signs, warning car drivers to use second gear and save their brakes and unless you know the hill, it is well to be on the safe side. The motor exerts considerable braking effect even in high gear if you hold down the button on the right handlebar and short circuit the magneto. You can then use the brakes in steep places and on corners to decelerate enough to keep within the limits of safety. Use the front wheel brake regularly for this will help keep it in good operating condition. Use Alemite lubrication on the several joints and fittings provided for the purpose and use a light oil frequently on the hand lever and operating cable.

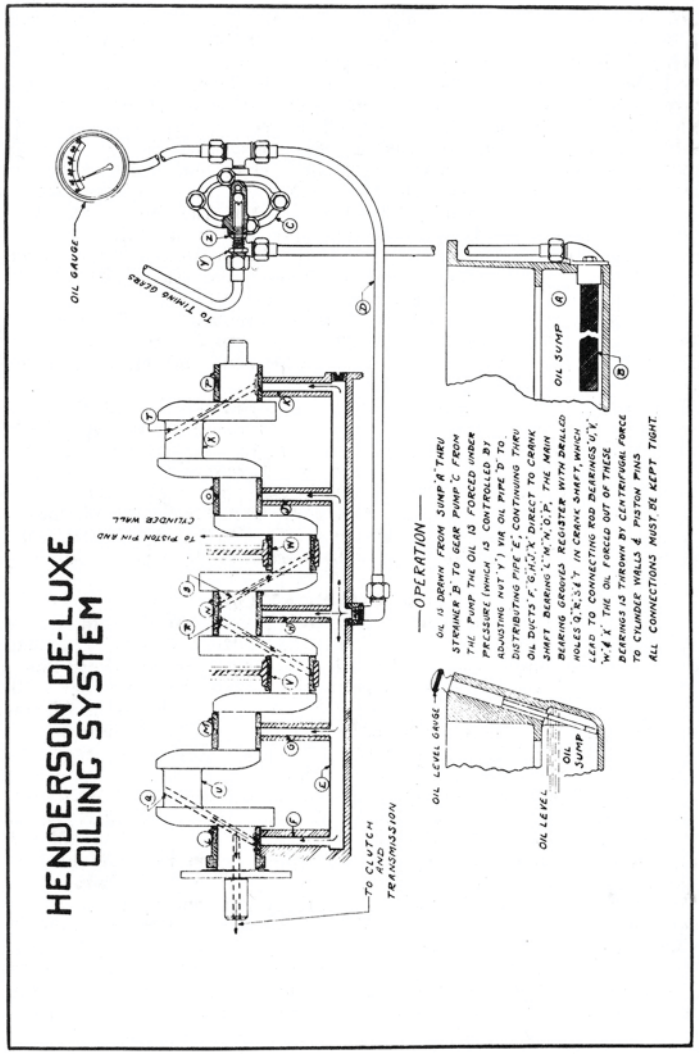
Front wheel brake is adjusted by a threaded clevis which acts directly on the operating cable. When you reach the limit of adjustment on this clevis, remove the brake arm and move it around one-eighth of a turn on the brake cam.

The rear wheel brake is tightened by turning down on the brake clevis cap nut. A turn or two on this will make a very appreciable difference. Keep brakes adjusted so that they are effective, but at the same time, do not have them so tight that they will drag. A dragging brake wears the lining and wastes a lot of power.

If the rear wheel is moved forward or backward in adjusting the chains, try your brake before starting off. Moving the wheel, alters the brake adjustment and it may be necessary to tighten or loosen the clevis.

MOTOR LUBRICATION

The Henderson is equipped with a true pressure-feed oiling system. The entire oil supply is carried at the bottom of the crankcase. The new oil pump is larger than that furnished on previous models and consists of a pair of spur gears, meshing within a close fitting housing. This pump forces oil directly into all of the main bearings and through the hollow crankshaft into all of the connecting rod bearings. A variable orifice in the oil supply line from the pump permits regulation of the oil supply and the oil pressure gauge immediately indicates the effect of any such adjustment. (Diagram of Oiling System on Page 8.) The oil filler cap is located on the left side of the crankcase next to the flywheel housing. An oil level gauge is provided in the front of the crankcase on the left side, just underneath the clutch control pedal. Pull out the gauge, wipe it off, re-insert it in the crankcase and again upon removing it, the oil level will be indicated. The top mark on the gauge indicates the proper oil level. Carrying the oil level any considerable amount above this, will cause overoiling with the penalty of rapid carbon accumulation and frequent fouling of the spark plugs. Over-oiling also results in sluggish motor performance and a positive loss of speed. The lower mark on the gauge is the danger point and indicates that the oil supply should be replenished as soon as possible.



LIGHTING SYSTEM

THE generator is a separate belt-driven unit designed to operate in connection with a 6-volt battery. The commutator may be inspected by removing the end cap. The carbon brushes should last an entire season without attention, but should be inspected at least once a year. If worn too short for proper contact on the commutator, they should, of course, be replaced. If the brushes are removed for any purpose, be sure to replace them in their original position, for they wear to conform to the contour of the commutator. The design and arrangement of brushes is such that when they are properly seated, there is no arcing.

Oilers are provided at either end of the generator and it is important that four or five drops of "3-in-one" oil or Finoil be placed in each of the cups every 500 miles. An excessive amount of oil poured in the commutator end may cause gumming of the brushes, so be careful not to overoil.

The generators used on the early Hendersons had centrifugal regulators. The modern instruments, though, are equipped with magnetic regulators to control the speed at which the generator commences to charge and to break the circuit and prevent discharge of the battery through the generator when the machine is standing idle. If it is found necessary to increase the charging rate, move the center or so-called third brush in the direction of rotation. (Viewed from the commutator end.) After doing this, the commutator should be polished with a piece of No. 00 sand paper supplied on the end of a small flat stick, when the generator is running. Do not use emery cloth because it is an electrical conductor.

Often if the generator output is insufficient it may be due to a loose belt; to overloading the battery by burning too many large lamps; contact points in poor condition or too wide a gap between the contact points in the regulator which only allows the generator to charge the battery at high speeds, or the spring tension on the contact breaker may be too great. If the points are set too close together, trouble may be experienced with sticking or arcing and contact may be made sometimes at idling speeds when the generator is not turning over fast enough to charge the battery. These points pass low voltage current and for this reason must be clean and make good contact. Burned or pitted points offer enough resistance to the low voltage current to reduce the charging rate and occasionally may prevent the generator from charging at all. On the new models, the generators are mounted on an adjustable bracket which permits taking up slack in the generator belt.

When running for several consecutive days on a long trip, there is danger of overcharging the battery unless the lights are kept burning to hold battery charging rate down to an ampere or so. Long continued charging of the battery at a low ampere hour rate is beneficial, while rapid overcharging at a high rate will boil away the water and shorten the life of the battery.

siderable care so do not move bearing more than a quarter-turn at a time, being sure 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. The small bevel gear should be adjusted by adding or removing shims as may be required. The faces of gear teeth must be flush or even, with from .004″ to .006″ backlash.

GEAR SHIFTER—In the new style gear shifter shaft and fork the shaft is stationary and has notches for the different gear shift positions. One end of the shaft projects through the transmission case permitting adjustment of the gear shift positions from the outside of the crankcase. This adjustment should be made by a mechanic who understands what he is doing and this is no place for hit-or-miss experimenting.

The gear shifter fork or finger slides on the shaft and is equipped with a spring lock that drops into the different notches in the shaft and holds the sliding gear in its different shift positions. This new style gear shift is entirely free from complications and has no parts that can work loose and cause trouble, so it will seldom need attention.

The old style gear shift had the fork clamped to a movable shaft. This construction never gave any trouble so long as the shifter fork remained tightly clamped to the shaft. In rare instances, the clamp worked loose which interfered with gear shifting.

In adjusting the gear shift, engagement of the dogs should be the same in both high and low when the shifting gear is in either position.

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

The gear shift positions are just the reverse of those used on the older models. High gear is engaged when shift lever is forward—low gear when the lever is pulled all the way back.

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.

If you find the oil level low, run slowly and carefully to the nearest Filling Station, for operation at high speed under such conditions may result in damage to your motor. The safest plan is to check your oil level regularly every 250 miles or less. When the machine is new, we recommend draining the oil after covering the first 250 miles and filling with fresh oil. Also drain and fill with fresh oil after covering the first 500, 750 and 1,000 miles. Thereafter, drain and refill after every 500 miles. During the process of breaking-in, small particles of metal will be worn from the cylinder walls, bearings, etc., which are carried down to the crankcase with the oil. Frequent draining of the oil when the machine is first placed in service, will flush these metal particles out of the crankcase. It is far better to drain and refill with fresh oil than to keep adding new oil to the old. After running 500 miles, a considerable amount of dirt has worked into the motor through the carburetor and into the oil and in some localities this dust is of an abrasive nature and will cause premature wear of motor parts. Draining and refilling with fresh oil helps to eliminate most of this abrasive material. Whereas, if you continue to use the old oil and add to it from time to time, you will accumulate a dangerous amount of sediment in the crankcase, some of which is bound to work into the oiling system and be distributed through the motor. A drain plug is provided on the left side of the crankcase at the bottom of the oil filler passage for draining out the old oil.

The oil suction supply to the pump is drawn out of the crankcase through a screen strainer and in time this strainer may be clogged with dirt and foreign matter. If at any time this oil gauge ceases to indicate oil pressure, disconnect the suction line and remove the oil elbow from the side of the crankcase to which the screen is attached. If you find the screen clogged with dirt, it is probable that this obstructed the oil flow and caused the pressure to drop. Running at high speed with low oil pressure is a pretty sure way of damaging the motor bearings. If the screen is O.K., then it is possible that the oil is thinned out and has lost its body. This is characteristic of inferior oils. They do not stand up. They wear out and thin out rapidly. It is important that all connections in the oil suction pipe be air-tight. Air leakage here will reduce the capacity of the pump, drawing in air instead of oil.

The whole theory of motor lubrication is based on interposing between moving surfaces a film of oil. If you were to look at polished metallic surfaces under a microscope, you would find that they actually were quite rough, with miniature ridges and mountain ranges running in every direction. A film of the right kind of oil separates these surfaces and enables them to slip over one another with a minimum of friction. If the oil is insufficient in quantity and too thin in body, it permits metallic contact of the surfaces, resulting in excessive friction which wastes power and causes rapid wear. All of this emphasizes the necessity of proper lubrication of the wearing parts of your motorcycle. There is no factor more important in

the operation and care of your machine. You must use the right kind of oil and plenty of it. Motorcycle engines are air cooled and therefore operate at higher temperatures than water-cooled automobile engines. Heat thins out oils and for this reason, motorcycles must use heavier oils than automobiles. It is poor economy to use the oil too long and it is even worse to use cheap oils which thin out and lose their body within 100 miles or so. The difference between the first cost of thin automobile oil 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.* After extensive tests, we recommend Valvoline Heavy for summer use and Valvoline Medium for winter use. In extremely hot weather or in tropical climates, it may be advisable to use Valvoline Extra Heavy. If the oil is too heavy, it will tend to gum the clutch and valve stems. In below zero weather, even lighter grades must be used, bearing in mind that the Henderson is lubricated by a circulating pressure system and if it is cold enough to solidify the oil there naturally will be no circulation. Without circulation, there can be no lubrication and you cannot run very far without damaging your motor. If Valvoline oil is not obtainable, use S.A.E. specifications viscosity No. 50 for summer oil, and viscosity No. 40 for winter. Gargoyle Mobiloil, Quaker State, Veedol, Hyvis, Havoline, Pennzoil and Kendall Oils are reliable brands. Mobiloil "BB" is recommended for summer and Mobiloil "A" for winter use. In subzero weather use Mobile "Arctic." Some other oils may also be suitable, but you experiment at your own risk. Do not take some garage man's word that his oil is just as good. *Our guarantee will not cover damage resulting from using oils other than recommended.*

CAUTION—When first starting up the motor in extremely cold weather, allow it to run very slowly for a short while until you are positive the oil supply is circulating properly. If you are using oil that is too heavy, the gauge may indicate pressure for a minute or so at first and then drop to zero because the oil is solidified and cannot flow to the pump. Run the motor slowly when first starting on very cold mornings and watch the oil gauge after it has been running several minutes to be sure proper oil flow remains established. If you continue to run without any oil pressure, you are almost sure to damage or burn out some of the bearings. In an emergency to start the oil circulating, you can add a pint or so of Finoil to the heavy oil in the crankcase. This Finoil is sold by the Standard Oil Company Filling Stations. Bear in mind, though, after diluting the oil in the crankcase it will be unsafe to run for any length of time or at any considerable speed, should the weather suddenly become warmer.

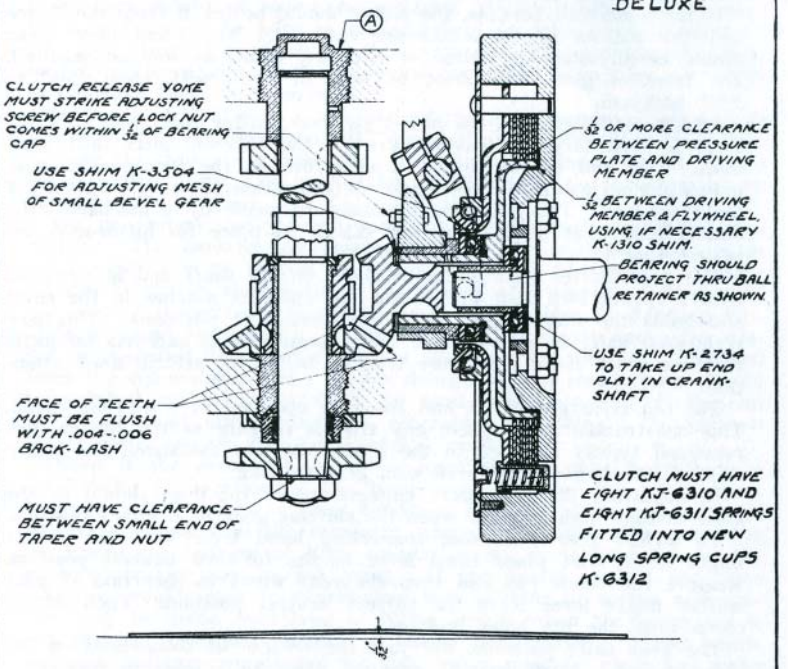
TO REGULATE OIL SUPPLY—Refer to the sectional view of the oiling system on Page 8. Loosen the connection "T" and the locknut "U". Screw in the adjusting fitting "X" which reduces the orifice

EXCELSIOR MOTOR MFG & SUPPLY CO CHICAGO. JAN 5-21

SERVICE BULLETIN N° 3

CLUTCH AND TRANSMISSION

MODEL K AND DELUXE



INSIDE DISCS (4) WHEN PLACED ON A SURFACE PLATE SHOULD HAVE NOT MORE OR LESS THAN 1/32 WARP AS SHOWN ABOVE.
OUTER DISCS (5) MUST BE PERFECTLY FLAT

ENGINEERING DEPARTMENT

Baffle plates are used under cylinders to regulate the oil supply. Make sure baffle plates are tightly secured in place for trouble will ensue if they are carelessly replaced and foul the connecting rods. The bolts holding the baffle plates in place should be tightly wired to prevent any possible chance of working loose. The holes in the oil pan underneath the crankshaft have been enlarged to facilitate return of the oil to the sump.

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.

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 means of the ratchet clutch pedal, 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.*

Double nested clutch springs are now used, mounted in longer spring cartridges which greatly lengthens the life of the springs and eliminates chance of clutch slipping.

TRANSMISSION

NOTE adjustment diagram on Page 23. 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. This adjustment requires con-

in the oil bypass line. Do not screw the fitting "X" all the way in because this might shut off the supply of oil to the timing gear case, which would cause noisy operation and wear of the gears. After replacing the connection "T" and tightening the locknut "U", remove the oil bypass line to the gear case and make sure that at least a small amount of oil will be delivered through this pipe into the gear case. When operating on the road at high speed, the oil pressure gauge should indicate a pressure of from 25 to 50 lbs. after the machine has been run far enough to warm up the oil. When first starting out, of course, while the oil is cold, higher pressures will be indicated than after the oil is heated.

To reduce the pressure, the same procedure is followed as outlined in the foregoing except that the adjusting connection "X" is screwed out which in turn, enlarges the orifice and bypasses more of the oil into the gear case.

If the machine is left standing for a few days after oil lines have been removed, it may be necessary in some instances to prime the pump. To do this, disconnect pipe from the oil gauge and pour oil down through it into the pump.

LUBRICATION OF INTAKE VALVES—Additional lubrication naturally prolongs the life of intake valve stems and guides and also gives snappier motor performance and quieter valve operation. To provide for this, the new machines are equipped with grease cups which partially enclose the intake valve springs. After testing a large number of lubricants for this purpose, we have found that "DA Lubricant No. 3" is the best adapted for this purpose, and this is obtainable from the factory in one, three and five pound cans. This grease is heavy enough not to run over the motor when heated and yet it lubricates the valve stems properly.

The aluminum rocker arm cover should be removed every 500 miles or so and a supply of grease worked down into the grease cups with a piece of wood or injected with a grease gun.

The rocker arms should be lubricated at least every 250 miles by means of the Alemite gun through the fittings mounted on the rocker arm shafts. At the same time, you should go over all the Alemite fittings on the front fork rockers and front brake, using the regular Alemite grease or a heavy oil such as 600-W.

Use the front brake regularly to maintain it in good operating condition and work some light oil down into the brake operating cable occasionally to keep it from rusting.

IGNITION

The Henderson is equipped with the latest two unit electrical system with a Bosch high tension magneto for ignition and a separate belt-driven generator-battery lighting system. A flexible coupling is provided which facilitates removal of the magneto, should this be necessary at any time. Before removing the magneto, though, place a mark across both halves of the coupling with a file or a piece of chalk and when reassembling, see that the coupling is connected up

in accordance with these marks, otherwise, the magneto may be replaced half a revolution out of time.

It is not advisable for the average motorcycle rider to undertake any complicated magneto adjustments or repairs. Such work should be done by a competent service station with experience and equipment for this work. Therefore, our instructions here will be confined to cleaning and minor adjustments.

The Bosch magnetos have the bearings packed with a special high temperature lubricant sufficient for 35,000 to 50,000 miles of operation, therefore do not attempt to lubricate the main bearings, for this is only necessary when the magneto is taken apart for general overhauling at a Bosch Service Station. Robert Bosch Grease U. S. 505 must be used for this purpose and trouble will result from the use of any other lubricant.

The distributor shaft bearing is fitted with a large wick oiler which holds sufficient lubricant for a long period. Every 5,000 miles, sufficient light motor oil should be added through the top oil cup to fill the reservoir to the top. In extremely cold weather, lighter oil should be used which will not solidify, such as Robert Bosch Magneto Oil, U. S. 506.

The distributor plate and distributor segments must be kept clean to prevent the possibility of electrical leakage between segments and across the insulation. Remove the distributor plate once every 2,000 to 3,000 miles and wipe away with a clean cloth, any carbon dust which may have worn from the distributor brush. In case of a heavy deposit, clean the inside of the distributor plate with a cloth dipped in gasoline. After cleaning in this manner, give the segments a light touch of oil to prevent wearing of the distributor brush.

The high tension cables are fastened in the distributor plate by a pointed set screw. When installing new cable insert the evenly cut end without removing the installation into its hole in the distributor plate as far as it will go. Fasten by tightening the pointed set screw, using a lock washer under the screw head.

About every 2,000 miles remove the interrupter end cap and inspect the condition and adjustment of the contacts. The maximum gap between contacts when open, should not exceed .015″. Check this with the gauge on a magneto wrench and adjust if necessary by means of the contact screw. Clean and flatten dirty, uneven or pitted contacts carefully with a magneto file. Do not use emery paper for this purpose. The contacts are made accessible by removing the interrupter housing and can be opened by depressing the interrupter lever. *Do not permit oil to get on the interrupter contacts.* This will cause improper contact, faulty operation, and rapid contact wear. The interrupter points pass low voltage current and for this reason must be smooth and bright. When filing the points, slip the magneto file between the two contacts and file them both together. Do not file more than is absolutely necessary to insure good contact because the material in these contact points is platinum, one of the most valuable

have .012″ clearance when the motor is cold. If tappets are adjusted closer than specified, the motor will not run smoothly and there is serious danger of burning the valves and valve seats.

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″.

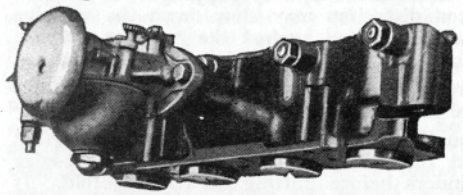
The proper way to fit the bearings is to remove the caps. Take out crankshaft and clean the oil thoroughly from all the bearings. Use Prussian Blue or Lamp Black for marking the bearings and then replace the shaft. Do not press heavily on the shaft when turning it over to mark the high spots. Then remove 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 all the other 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 by bending at the proper place and in the right direction with a large wrench.

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 in the same position as before. This is important because in service the pistons are naturally lapped in to fit their respective cylinders.

GRINDING VALVES—The intake valve cages of the late models are integral with the intake manifold. Removal of the manifold makes grinding of the intake valves an easy job. The exhaust valves are mounted in the cylinders. In the older models the valves were arranged side-by-side and valve springs secured by a hardened pin fitting in a hole in the valve stem. To remove the valves, hold down the head of the valve and pry up on the washer below bottom end of spring extracting the split lock rings or pin as the case may be from the valve stems. 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. Wipe off valve seat and apply a small amount of fresh grinding compound frequently. During the grinding, the valve should be worked around on its seat occasionally 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 ¼" 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. Compare the old valve springs with a new one and if noticeably shorter, install new springs. 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 reseating.



The "Down-Draft" Intake Manifold and valve cages are integral and easily removable, facilitating grinding of intake valves.

TAPPET CLEARANCES—After regrinding valves, it will of course be necessary to readjust the tappets. The intake push rods of the new Henderson should be adjusted so as to be just free when cold, having say, about .002" clearance between the end of the rocker arm and end of the valve stem. The exhaust tappets should have .008" clearance.

In the case of an older model side-by-side valve engine, the intake tappets should have not less than .008" clearance (cold) between the tappet and end of the valve stem. Exhaust valve tappets should

of metals. Make sure the interrupter lever moves freely and easily. If it is tight and sluggish, remove it and clean out the fiber bushing, being careful not to enlarge the hole in which it pivots.

The gap between the spark plug electrodes should be from .019 to .023". A larger gap than this may cause difficult starting and erratic running.

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 $\frac{1}{16}$" from cylinder. 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 plug afterwards. If no spark is obtained from any of the wires 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 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 crack or 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 be set from .019" to .023". A little more than the thickness of a worn dime is about right. Too small a gap may be caused by melting of the electrodes, or 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 cylinder, the trouble can be located by shorting the plugs with a wooden-handled screw driver from the manifold to the spark plug terminal and noting the effect of this on the operation of the motor. Also by feeling the cylinders. The missing cylinder will be cooler than the ones which are doing all the work.

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. On some of the older models 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 or to a regular magneto service station.

TIMING

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

Before making any change whatever in the existing setting, check it up in accordance with the diagram on Page 15. 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 advanced position, the magneto points should be closed but just ready to open with the slightest advance of the breaker when the letter "S" appears in 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 timing 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. Timing instructions for the old DeLuxe Models were the same as the foregoing except that magneto was timed with breaker in the retarded position.

VALVE TIMING—The exhaust valve tappet of No. 4 (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 ⅜″ before or past center on fly-wheel is allowable. A change of one tooth on the camshaft gear is equal to approximately 1¼ inch on the fly-wheel. With the two-keyway crankshaft gear (K-1305) shown on Page 15, 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.

When burning out carbon with oxygen, be careful to have the pistons at the top of the stroke and valves fully seated. Removal of the intake manifold will enable you to make sure that piston is on top, 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.

Be 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 openings 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. If the slots in the bottom oil scraper rings are filled with dirt or carbon, the rings should be removed carefully and the slots cleaned. Handle these rings with care because they are easily broken.

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. 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 the instructions for fitting bearings on Page 21.

Before tightening down on the cylinder flanges, it is very important to check up the alignment of the cylinders. Use a straight-edge across the tops of the cylinders before putting on the manifold. If one of the cylinders is a little lower than the rest, it should be raised by inserting the necessary paper shims between the bottom cylinder flange and the crankcase. Use new manifold gaskets and tighten the manifold tentatively to the cylinders before tightening the cylinder flanges to the crankcase. Bear in mind that unless the manifold-cylinder joint is a good fit on all of the cylinders, there will be danger of air leakage which will impair the performance of the machine. Also the joint between the manifold and some of the cylinders may be cramped, putting an undue strain on some of the flanges.

to an accumulation of dirt or sediment in the gasoline tank. A surprising amount of foreign matter is carried into the tank with the gasoline and it is a good plan once a year to flush out the debris.

Water in the gasoline may cause trouble particularly in the winter. It can be detected easily by draining some of the gasoline into a cup. Water being heavier than gasoline, will lie in globules at the bottom. If the carburetor is removed from the manifold, be sure when it is replaced that the joint is air tight.

Occasionally a gasoline pipe may become plugged with dirt. On rare occasions the float valve may remain stuck in the closed position, or the float may even come loose. Occasionally sufficient dirt may accumulate in the carburetor bowl, making it necessary to remove the bowl and clean it out. Once in a while a particle of dirt will lodge in the float valve and cause the carburetor to drip. Most carburetor troubles and their remedies are fairly obvious.

CARE OF THE MOTOR

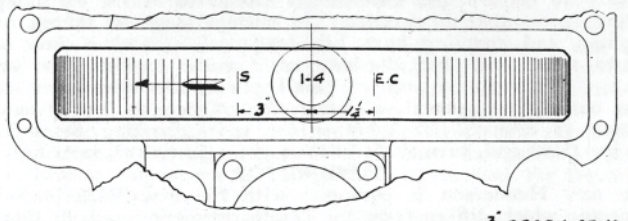
A NEW motor can be improved or ruined by the treatment it receives during the first 1,000 miles. In any new piece of fine machinery the fit of working parts is snug, and clearances are close. Careful running during the first 1,000 miles will give all of these close-fitting parts a chance to wear-in, polish, and accommodate themselves to one another, and this is the reason for the stiffness of new motors. After being limbered 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. In reality, the so-called "carbon" is a mixture of incombustible road dust and burned oil. It is a fact that carbon deposits accumulate more rapidly in sections of the country where the roads are very dusty. For this reason, no set mileage can be specified for decarbonizing. Carbon deposits prevent proper heat radiation, raise the compression and make a motor sluggish. Carbon is the enemy of gasoline engines and should be removed as often as enough accumulates to have any perceptible effect on the performance of the engine. Carbon removal from the Henderson is easy. It may be burned out with oxygen after removing the intake manifold. Burning out carbon without grinding the valves is only half-way doing the job. If desired, the cylinders may be removed without taking the motor from the frame. Removing half of the tank gives easy access for grinding the exhaust valves. Intake valves can easily be ground in the removable intake manifold.

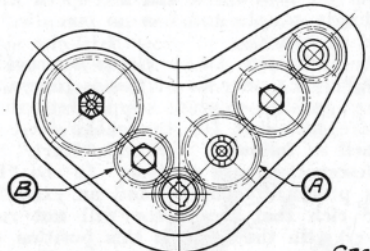
EXCELSIOR MOTOR MFG. & SUPPLY CO. CHICAGO, ILL. SEP. 24-1929

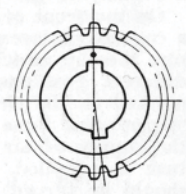
SERVICE BULLETIN N°1

HENDERSON TIMING - KJ MODEL



3/8" SPARK ADVANCE





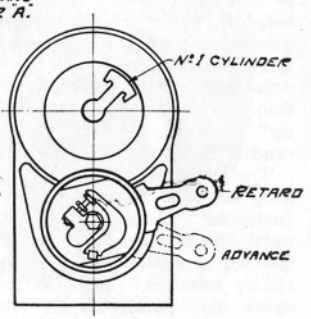
CRANKSHAFT GEAR K-1305

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 ADVANCE CIRCUIT BREAKER AND HAVE POINTS CLOSED BUT READY TO OPEN WITH THE SLIGHTEST ADVANCE OF THE FLYWHEEL. 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'



ENGINEERING DEPARTMENT.

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 shaft to the right. To retard, turn left.

CARBURETOR

The new Henderson is equipped with the new DLX-76 Schebler Carburetor which differs from the Zenith, formerly used, in that variable jets are provided for high speed and low speed adjustments. The carburetor is exceedingly simple and has no complicated parts which are likely to get out of order.

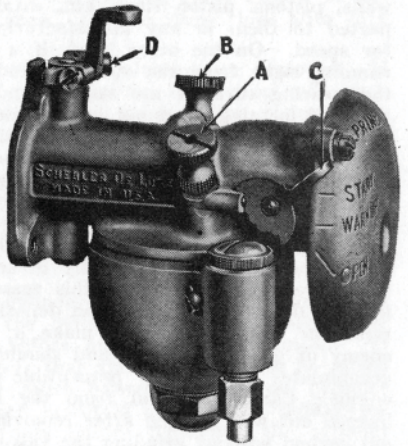
On the front of the carburetor an air choke is provided operated by a convenient lever "C". The purpose of this is to reduce the air supply, thereby enriching gasoline mixture supplied to the engine. Four different positions are provided for the choke lever and these are marked on the air bell as follows: "Prime," "Start," "Warm-up" and "Open" and these designations are obvious. In the "Prime" position, the supply of air is practically cut off and an exceedingly rich mixture is supplied, so rich that the motor will not run. The motor should be turned over with the lever in this position once to work a plentiful supply of gasoline into the cylinders. Then, with the lever set in the "Start" position, the motor should fire on the second time it is turned over. If the motor is repeatedly kicked over with the lever in the "Prime" position, the cylinders will be flooded with raw gasoline and the mixture will be too rich to fire. Turn the choke to the open position and kick over the motor a couple of times to work some air in the cylinders. Then close the choke to the "Start" position. As soon as the motor fires, set the choke lever in the "Warm-up" position. It will usually be found that the machine starts most readily with the throttle just barely cracked open.

The variable idling jet "B" should be set when the machine is running at just a trifle faster than idling speed. The high speed adjustment "A" is best made on the road and should be turned down until the machine just commences to lose speed and from this point, the jet should be backed up a very few notches to give just a little richer mixture. Bear in mind that too thin a mixture will tend to cause overheating of the motor. An approximate adjustment can be made on the stand by retarding the spark fully, opening the throttle and making the mixture barely rich enough to run in this condition without misfiring. Wide open, continued high speed running requires a slightly richer mixture than for normal operation. If an attempt is made to idle the motor below a reasonable limit, trouble may be

experienced with stalling before the motor is thoroughly warmed up.

In case the carburetor adjustment has been changed so that the motor will not run, turn both the high speed "A" and low speed needle valve "B" to the right until each needle is seated, being careful not to use force after the needle touches its seat. Then turn the high speed needle to the left about 1¼ turns and the low speed jet, about the same amount, from which the correct adjustment can be obtained by trial. Bear in mind that the idling adjustment controls the lower speed range of the motor and if cut too lean, will sacrifice acceleration. Speeds above 30 miles an hour are controlled by the high speed needle. Turning the needles to the right, cuts down the supply of gasoline. Turning to the left, enriches the gasoline mixture. The throttle stop screw "D" should be set so that the throttle does not close entirely.

The Zenith Carburetor used on older models had fixed jets and the only adjustment was in connection with the idling jet. This adjustment was effected by a set screw or by turning a sleeve which encircled the jet. This admitted more or less air into the mixture supplied through the low speed jet. If a machine refuses to throttle down and run slowly, it generally is due to the clogging of the idling jet with a bit of foreign matter. The remedy, of course, is to remove and clean the jet with compressed air, a needle point or a piece of very fine wire.



The New Henderson Schebler Carburetor—"A" is the High Speed adjustment. "B" is the idling jet adjustment. "C" is the choke control for easy starting. "D" is the stop screw which keeps the throttle from closing completely.

Cleaning of the jets of the Schebler carburetor can easily be effected by screwing up the needle valve a few notches, allowing the obstruction to be sucked through the jet.

Persistent trouble with clogging of the jets will often be found due