HARLEY-DAVIDSON
Rider's Hand Book

MOTOR
HARLEY-DAVIDSON
CYCLES

HARLEY-DAVIDSON MOTOR CO.
MILWAUKEE, WIS., U.S.A.

45 TWIN AND SINGLE
MODELS

INDEX

Foreword

THIS Hand Book contains the necessary information to enable you to give your Harley-Davidson the proper care. Follow instructions closely, and you will be sure of best performance from your motorcycle.

It is not intended that this Hand Book make a mechanic of every rider; therefore, it does not cover the overhauling of such units as the motor, generator, and transmission. Work of this kind requires the attention of a skilled motorcycle mechanic and the use of special tools and equipment. Your nearest Harley-Davidson dealer has the proper facilities for handling this work. He also has a complete stock of genuine Harley-Davidson parts.

If any questions arise that are not covered by this Hand Book, get in touch with your dealer.

Return your registration card to the factory promptly, and thus assure yourself of full benefit of the Harley-Davidson guarantee. Furthermore, when we receive this card, your name will be placed on our mailing list to receive the "Harley-Davidson Enthusiast," the magazine for Harley-Davidson riders.

License Data—45 (750 c.c.) Twin Model

Number of cylinders	2
Cylinder bore (69.85 mm.)	2¾ inches
Piston displacement (746.63 c.c.)	45.32 cu. in.
Stroke (96.85 mm.)	3 13/16 inches
Horsepower (N. A. C. C. Rating)	6.05
Wheel base	57½ inches
Weight	390 lbs.

License Data—30.50 Cu. In. (500 c.c.) Single Model

Number of cylinders	1
Cylinder bore (78.58 mm.)	3 3/32 inches
Piston displacement (493.28 c.c.)	30.1 cu. in.
Stroke (101.6 mm.)	4 inches
Horsepower (N. A. C. C. Rating)	3.82
Wheel base	57½ inches
Weight	360 lbs.

License Data—21 Cu. In. (350 c.c.) Single Model

Number of cylinders	1
Cylinder bore (73.024 mm.)	2⅞ inches
Piston displacement (345.73 c.c.)	21.098 cu. in.
Stroke (82.549 mm.)	3¼ inches
Horsepower (N. A. C. C. Rating)	3.31
Wheel base	56½ inches
Weight	320 lbs.

The Importance of Correct Lubrication

To insure long and satisfactory service from your motorcycle, lubricate it properly—especially your motor. The motor requires a special oil, because it is air cooled, and operates at high temperatures.

We recommend the use of genuine Harley-Davidson oil, which is refined to our specifications. We furnish this oil for the protection of Harley-Davidson riders. Your dealer can supply you. Don't take a chance with an oil of unknown quality.

Give New Motor Pumpful of Oil Before Starting

Inject a pumpful of oil into motor with hand pump, before starting. This applies only to starting a new motor the first time, as thereafter the mechanical oil pump will supply motor with all the oil required for ordinary service. See page 11.

Recommended Gasoline

Benzol blended gasoline (about 50% benzol), Ethyl gasoline, or other equally good "anti-knock" gasolines are recommended as better motor fuels than straight gasoline. Straight gasoline can be used satisfactorily for ordinary service; however, a motor will run much cooler with little if any detonating (heat knocking), and will perform better under all service conditions, using anti-knock fuel exclusively. This applies particularly to high compression motors.

Filling Gas and Oil Tanks

The right side tank is the main gas tank; left side rear tank is the reserve gas tank; left side front tank is the oil tank. Respective capacities are as follows:—17½, 6¼ and 6½ pints for the 21 cu. in. (350 c.c.) model; —22, 9 and 8½ pints for other models. The oil tank has no shut off. Each gas tank is provided with a shut-off cock. See that main tank cock is open before proceeding to start motor. Cock is open when handle is in alignment with gas pipe. The reserve tank is usually kept shut off for emergency use.

Use the Recommended Spark Plugs

Good motor performance depends on good spark plugs. The plugs furnished by the factory in new motors and for replacements are the best obtainable. It is strongly recommended that only this plug be used.

When a replacement plug is needed, obtain it from your Harley-Davidson dealer to be sure of getting the recommended plug.

Keep spark plugs clean and the gap between the points adjusted to about .030 inch.

It is not advisable to take a plug apart for cleaning, because of the possibility of imperfect re-assembly resulting in leakage around the core gasket, especially when the original gasket is re-used. A leaky plug will cause overheating and pre-ignition. Usually a fouled plug can be cleaned effectively by simply brushing the soot from the core end with a fine wire brush and then washing it out with gasoline. Take apart only when absolutely necessary.

Motor Number

The motor or serial number is stamped on left crank case. When ordering parts or making any inquiry regarding your motorcycle always mention complete motor number.

Gear Ratios

Model	Motor Sprocket	Clutch Sprocket	Countershaft Sprocket	Rear Wheel Sprocket	High Gear Ratio
45 cu. in. (750 c.c.) Twin					
Standard solo.....	26	63	16	30	4.54
High compression solo..	31	63	16	36	4.57
Standard sidecar.....	26	63	16	36	5.45
Single—30.50 (500 c.c.)	31	63	16	45	5.71
Single—21.09 (350 c.c.)	26	63	16	40	6.06

To Determine Gear Ratio

Gear ratio is the number of motor revolutions to one revolution of the rear wheel. It can be determined by dividing the product of the number of teeth on rear and clutch sprockets, by the product of the number of teeth on engine and countershaft sprockets.

$$\text{Example } \frac{63 \times 30}{26 \times 16} = 4.54 \text{ to 1 Gear Ratio}$$

Tire Inflation Pressures

Solo Service—3.30 inch tires—Front 15 lbs., Rear 18 lbs.

Solo Service—4.00 inch tires—Front 16 lbs., Rear 16 lbs.

Sidecar Service—4.00 inch tires
Front 16 lbs., Rear 20 lbs., Sidecar 16 lbs.

Tire inflation pressures given for solo service apply to a motorcycle used under normal conditions with a rider of average weight (150 lbs.).

Pressures given for sidecar service apply to a motorcycle used under normal conditions with a rider of average weight (150 lbs.), and an average sidecar load (150 lbs.).

Tire pressures should be increased in proportion to any increase in normal load.

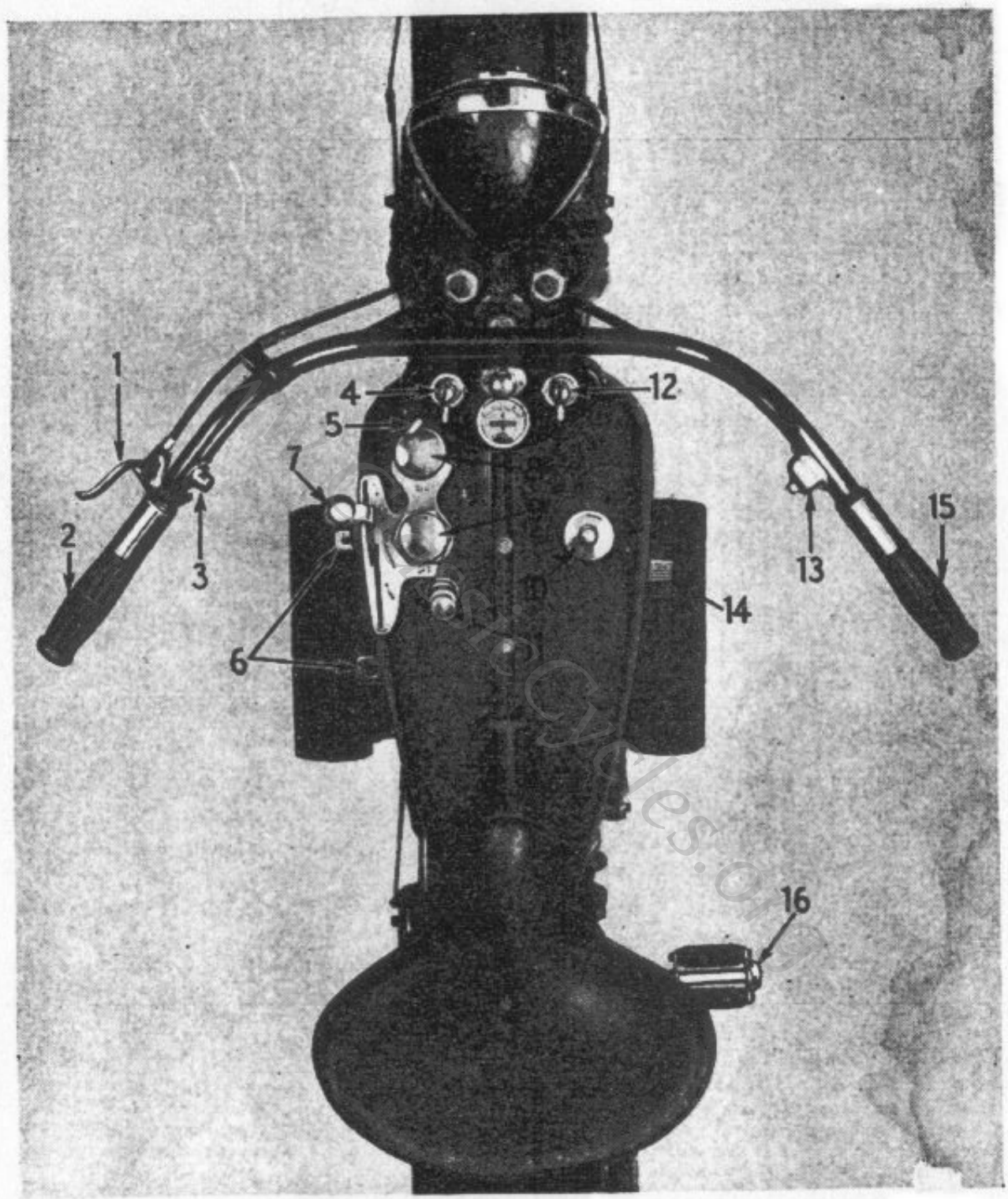
For continuous high speed driving, it is advisable to increase pressures, as given above, about 2 lbs. per tire.

Steering Head Lock

The steering head lock, located on right side of frame head, provides a means of protection against theft of motorcycle while parked. To lock, insert key and turn it to the left; at same time, turn handlebars to left until lock plunger drops into place. Handlebars, then cannot be turned. Form the habit of removing key immediately after locking or unlocking. In case both keys furnished with motorcycle become lost, others can be obtained from a Harley-Davidson dealer. NOTE—The 21.09 (350 c.c.) Single has no steering head lock.

OPERATING INSTRUCTIONS

Become Familiar With the Operation of All Controls Before Starting Motor or Riding Motorcycle.



Illus. 1—Controls

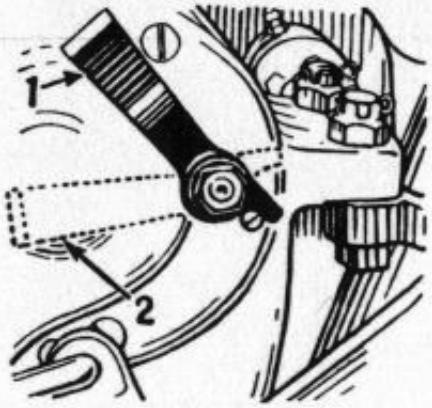
1—Front brake hand lever; 2—Spark control grip; turn inward to advance spark; turn outward to retard spark. Fully advanced is the proper normal running position. When motor is laboring under a hard pull, retard part way for better performance and to avoid knocking. Some motors start best with slight retard; 3—Horn button; 4—Ignition switch; insert key and turn as per markings on panel; 5—Steering damper **(special equipment)**; move to

right to increase steering friction; move to left to relieve steering friction; 6—Clutch pedal; rock backward to release clutch; rock forward to engage clutch; 7—Gear shifter lever must be in **neutral** position with clutch engaged when starting motor. Clutch must be fully released before shifting from one position to another; 8—Oil tank cap; 9—Reserve gas tank cap; 10—Main gas tank cap; 11—Hand oil pump; see "Use of Hand Oil Pump"; 12—Main lighting switch; insert key and turn as per markings on panel; 13—Handlebar thumb switch; see "The Ignition and Lighting Switches"; 14—Rear brake pedal; 15—Throttle (carburetor) control grip; turn outward to close throttle; turn inward to open throttle; 16—Starter crank pedal; kick downward with vigorous strokes when starting motor.

The Compression Release

On Single Model Only

Illus. 2 shows the running position of the compression release lever, located at front end of timing gear case. Moving lever to its downward position 2 raises the exhaust valve and completely releases compression in cylinder, allowing the motor to be cranked easily when necessary to turn it over a few times to break the oil seal, preparatory to starting in cold weather. Motor cannot be started or run with lever in downward position.



Illus. 2
Compression Release Lever Single Model

1—Lever in running position; 2—Move lever to this position to release compression.

To Start Single Motor

1. Always start with throttle closed or almost closed and do not twist it open when operating the starter. Spark should be fully advanced or nearly so.

2. TO START A COLD MOTOR—Raise the lift button of carburetor low speed needle 5 (Illus. 13), and set it on the highest (second) step 7.

Then, *In Moderate Weather*, turn the ignition switch ON, and start motor with vigorous strokes of starter.

In *Cold Weather*, in addition to lifting needle 5, set choke lever 1 at closed (inward) position, and before turning ignition switch ON, kick the starter down once or twice to prime cylinder. Then move choke lever 1 to half open position, turn ignition switch ON, and start motor.

CAUTION—Motor will not run with choke lever set at closed (inward) position.

3. As soon as motor starts, open the throttle just far enough to keep motor running while warming up, or until ready to set motorcycle in motion.

Soon after starting, depending on the weather, drop needle lift button to its first step 8; *also, if choke was used for starting, move choke lever to open (outward) position.*

After running ½ to 2 miles (.8 to 3.2 km.), depending on the weather, drop needle lift button to its normal running (lowest) position.

4. STARTING A HOT MOTOR—Do not use the carburetor choke, nor is it usually necessary to raise the needle lift button. Ordinarily a hot motor can be started readily by simply closing the throttle, turning ignition switch ON, and giving the starter a quick stroke.

To Start 45 (750 c.c.) Twin Motor

1. Except when priming *with choke fully closed* as explained below, keep the throttle closed or almost closed while starting motor. Do not twist the throttle open when operating the starter. Spark should be fully advanced or nearly so.

2. TO START A COLD MOTOR—Set choke lever 1 (Illus. 12) at two-thirds closed or fully closed (PRIME) position, depending on weather conditions, and before turning ignition switch ON, kick the starter down once or twice to prime cylinders. Then with choke set one-third or two-thirds closed, depending on weather, turn ignition switch ON and start motor with vigorous strokes of starter.

CAUTION—Motor will not run with choke lever set at PRIME position.

3. As soon as motor starts open the throttle just far enough to keep it running while warming up or until ready to set motorcycle in motion.

The choke should be left at one-third closed position until motor has thoroughly warmed up, and then moved to OPEN position (all the way down).

4. STARTING A HOT MOTOR—It usually is not necessary to use the choke lever. Ordinarily a hot motor can be started readily by simply closing the throttle, turning ignition switch ON, and kicking the starter down quickly. When a hot motor does not start readily, it is most often due to an over-rich (flooded) condition, and the proper procedure is to open the throttle wide so that more air can enter, closing it quickly as motor starts.

Cold Weather Starting

To facilitate starting *in very cold weather*, when it becomes difficult to crank motor, prime the cylinders by injecting about one-half priming gunful of gasoline directly into each cylinder, through priming cocks.

To Stop Motor

Stop motor by turning the ignition switch OFF. If motor should be stalled or stopped in any other way than with the switch, turn the switch OFF at once to prevent the battery from being discharged through the circuit breaker points.

To Start and Stop Motorcycle on the Road

(See "Become Familiar with the Operation of All Controls," and "To Start Motor")

After motor is started, keep gear shifter lever in NEUTRAL and clutch engaged until you have straddled the motorcycle.

1. Release clutch and set gear shifter lever in forward position marked LOW; then with spark fully advanced, engage clutch very slowly and at the same time open throttle slightly. *Note—In shifting into LOW, it will often be found that the gears will not go into mesh readily, due to their alignment. In this case, either operate the starter, or move the motorcycle until the gears line up properly.*

2. After motorcycle has run 40 to 50 feet in low gear and has gained a little momentum, shift into SECOND gear. To do this, release clutch fully and at same time close throttle; then quickly pull shifter lever back to position marked SECOND. In shifting from low to second, you will find that if you hold shifter lever against outside of slot in shifter gate, a step machined in shifter gate will stop lever at proper position. It is not necessary to take your eyes off the road. After shifting, engage clutch slowly and at same time open throttle slightly.

3. After motorcycle has attained a speed of not less than fifteen miles per hour (depending on road conditions), shift into HIGH gear. To do this, release clutch fully and at same time close throttle. Then, pull shifter lever all the way back to HIGH and steady it in this position with left hand until clutch starts to engage or you feel the high gear go into mesh. Engage clutch slowly and at same time open throttle slowly until desired speed is attained.

4. When you wish to stop motorcycle, close the throttle, release the clutch and apply brakes. As soon as motorcycle comes to a standstill, shift to NEUTRAL and engage clutch.

With a little practice, you will handle the clutch and shift gears with ease. You will find that you can shift from HIGH to lower gears without difficulty, when you have occasion to do so.

When running at speeds below fifteen miles per hour, retard the spark or shift into second gear to eliminate any tendency of the motorcycle to jerk. Always shift to a lower gear rather than permit motor to labor and knock.

Don't let motor race when shifting gears. Learn to operate clutch and throttle at the same time. As clutch is released, throttle must be closed.

Don't look down at your motorcycle when shifting; it is a dangerous practice.

Don't keep motor running for more than one or two minutes at a time, while the motorcycle is stopped.

IMPORTANT SUGGESTIONS FOR CARE OF MOTORCYCLE

Use only the recommended spark plug and renew occasionally if motor performance should become unsatisfactory. See page 3.

When filling oil tank, be careful that no foreign matter that might plug up mechanical oil pump gets into tank.

Don't over-oil motor by excessive use of hand oil pump. Too much oil causes plug fouling, overheating, sticky valves, and forms carbon rapidly. See page 11 for proper use of hand oil pump.

Drain and flush crank case and give it a supply of fresh oil at least every 750 miles. If motorcycle is in service on dirt roads where some road dust is likely to be drawn into motor through the carburetor, drain, flush, and give case a supply of fresh oil oftener, in order to keep it free from any road dust that may work by the piston rings. See page 11.

Use genuine Harley-Davidson oil in motor and transmission.

Don't adjust the carburetor extremely lean, because this will cause overheating.

Keep the muffler outlet cleaned out and open. See page 30.

Don't run a new motor for long distances in low and second gear, or faster than 30 miles per hour, during first 500 miles.

Never shift gears until clutch has been fully released.

Keep drive chains properly adjusted. See page 24.

Follow carefully the instructions on care of battery. See page 39.

Because of the danger of fire, if gasoline is spilled when filling tanks, wipe motorcycle off thoroughly or allow it to stand until gasoline has evaporated, before starting motor.

After a new motorcycle has been run about 500 miles, tighten as tight as possible the nuts on the four bolts that secure the motor in the frame.

Cleaning and Polishing Motorcycle

Wash enameled parts with a sponge and cold or luke warm water, or if very dirty, use soap and water. Do not use hot water or steam as either is injurious to enamel—varnish finish. To avoid scratching of enamel when motorcycle is in muddy condition, apply water liberally before starting to wash with sponge and also while washing. When soap is needed, use a soap especially prepared for enamel washing, or at least one that contains no lye—Ivory Soap is suitable. Carefully rinse off all traces of soapy water with clear water.

After washing is completed, dry thoroughly with a chamois, and polish with a good quality enamel polish.

Gasoline or kerosene may be used for cleaning motor, transmission, wheel hubs, and other miscellaneous fittings that accumulate considerable oil or grease. Do not, however, use either gasoline or kerosene on principal enameled parts.

What To Do Every Day

Make sure that you have plenty of oil in tank for the day's run. As long as you keep oil in the tank, the mechanical oil pump can be depended upon to supply motor with all the oil required for ordinary driving. See page 10.

What To Do Every Week

Check over motorcycle for loose bolts and nuts.

Adjust drive chains, if necessary. See page 24.

Add distilled water to battery, if needed; don't overfill. See page 39.

Grease or oil all bearings requiring periodic lubrication, as per Lubrication Charts on pages 45 to 48. Do this oftener than once a week, if weekly driving totals over 500 miles.

What To Do Every Two Months

Inspect and if necessary, adjust valve tappets. See page 15.

Inspect, clean, and if necessary adjust ignition circuit breaker points. See page 38.

Inspect, and where necessary tighten wheel spokes.

Clean rear drive chain, and treat with Harley-Davidson Chain Lubricant. See page 24.

Drain old oil out of crank case and replace with fresh oil. This should be done at least every 750 miles. See page 11.

Empty and clean gasoline strainer 45 (750 c.c.) model. See page 20.

To keep a motor performing at its best, it is necessary to remove carbon and grind valves at intervals depending upon kind of service motorcycle is

used for and mileage covered. The need for this attention will be indicated by heat knocking and loss of power and speed.

Cleaning carbon and grinding valves are minor operations that can be done in a short time at a Harley-Davidson service station or, if desired, the rider can easily give this attention. See "Removing Carbon" and "Grinding Valves".

What To Do Every Year

Remove and clean muffler thoroughly. See page 30.

Have battery inspected and tested by a competent battery man.

Have the motor, transmission, and other units thoroughly inspected and adjusted, and any worn parts replaced, at an authorized Harley-Davidson service station.

MOTOR LUBRICATION

Motorcycle motors, because they are air cooled and work at very high temperatures, must be lubricated with an oil prepared especially for them. The proper oil for you to use, to get the best performance from your motor for the greatest length of time, is GENUINE HARLEY-DAVIDSON OIL. This oil is refined to our specifications. We supply it for the protection of Harley-Davidson riders.

Few of the many brands of oil on the market will lubricate your motor as well as Harley-Davidson oil. Many oils that are very satisfactory for automobile motors would cause serious damage to a motorcycle motor in a short time; so don't take a chance.

Most Harley-Davidson dealers sell Harley-Davidson oil. You can purchase it by the quart as needed, or in one and five gallon sealed and trade-marked cans. If your dealer doesn't have Harley-Davidson oil in stock, he can order it for you. If you are so located that you can't get to a dealer, you can order oil directly from the factory.

NOTE—To Overseas Riders: If your dealer cannot supply you with genuine Harley-Davidson oil, he can supply you with an oil that meets with our oil specifications.

Harley-Davidson oil is furnished in two grades—*Regular Heavy*, and *High Speed Special*. The *Regular Heavy* grade is recommended for all ordinary service involving the normal amount of high speed driving. The *High Speed Special* grade is intended for lubrication of motors subjected to considerable high speed driving or unusually hard service otherwise.

Important Things To Remember About Cold Weather Lubrication

In extremely cold winter weather, attention has to be given to the matter of possible congealing of lubricating oil. Harley-Davidson oil, either Regular Heavy or High Speed Special, can be depended upon to circulate until the temperature reaches about 10° F. (above zero). With motorcycles in every-day winter service in localities where the temperature goes down to 10° F. (above zero) and remains quite consistently at or below this point for a time, the matter of thinning lubricating oil as necessary to avoid congealing should be taken up with the local dealer.

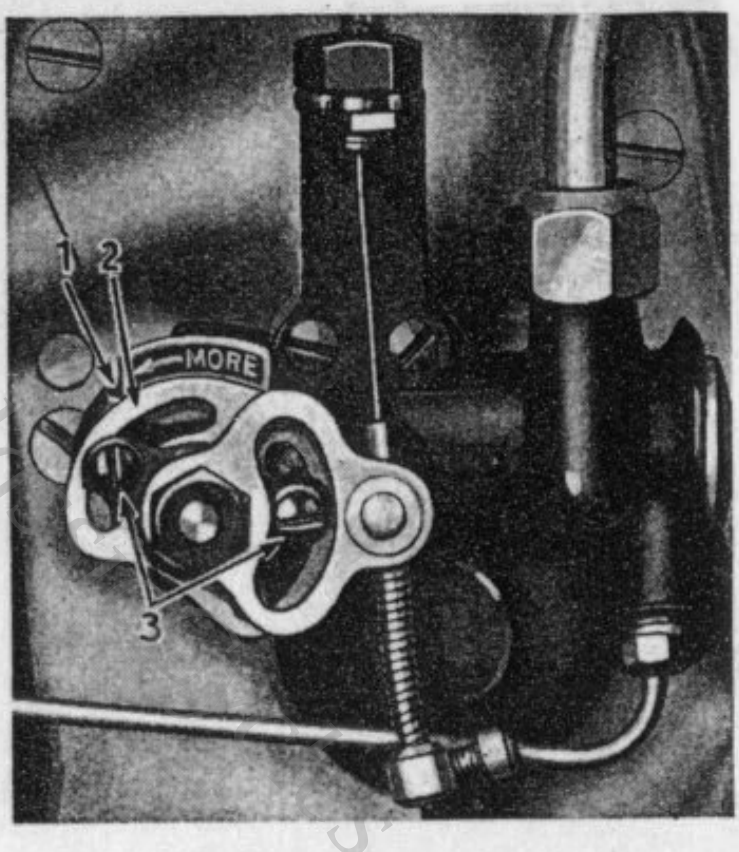
In cold weather run motor slowly until it is thoroughly warmed up, to avoid possible damage to pistons, rings, and other parts before oil is warm enough to circulate freely.

There is more crank case oil dilution in winter than in summer because the carburetor choke is used more for priming and starting, and also cylinders are often primed directly through priming cocks. Naturally more gasoline gets by the piston rings and into crank case. The crank case should, therefore, be drained and given a supply of fresh oil at frequent intervals.

Mechanical Oil Pump

The mechanical oil pump is in operation whenever the motor is running. It is throttle regulated and furnishes the right amount of oil to motor for any normal service condition. (See "Use of Hand Oil Pump.") The pump requires no attention from the rider other than an occasional inspection to be sure that its control wire is properly connected and adjusted. (See "To Connect and Adjust Throttle, Oil Pump, and Spark Controls.")

There is no shut-off in oil line between tank and pump, and therefore, if tank is kept supplied with oil, the motor will always be properly lubricated. Be careful that no dirt or foreign matter gets into oil tank, because if this happens, the oil line may become clogged, shutting off the oil supply.



Illus. 3—Mechanical Oil Pump, Single Model

1—Mark indicating original setting; 2—Adjusting eccentric; 3—Adjustment lock screws.

The pump can be adjusted to feed more or less oil by loosening screws 3 (Illus. 3 and 4) and shifting adjusting plate 2 as per markings on indicator. The original factory setting is indicated by mark 1. It is not likely that any re-adjustment will be found necessary.

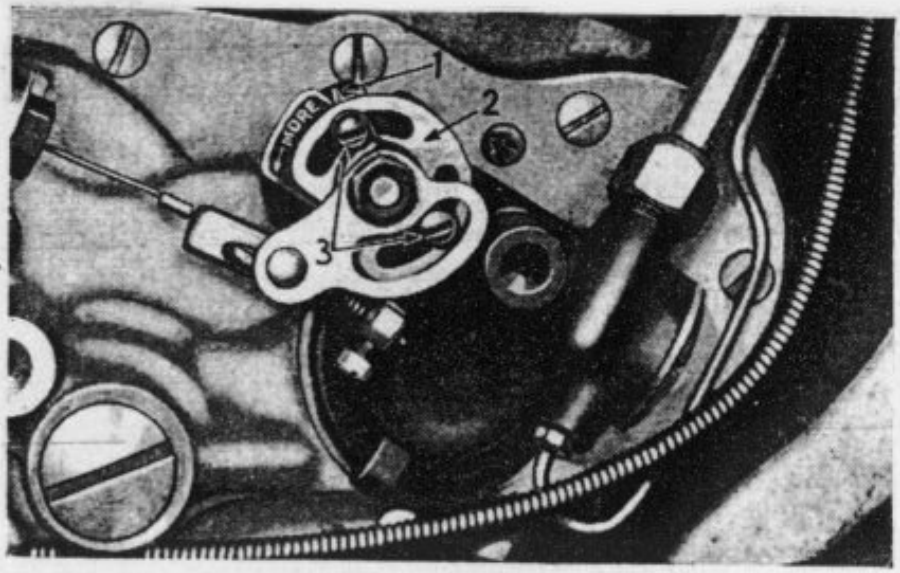
In addition to supplying the motor with the proper amount of oil, the mechanical pump also supplies, through a secondary outlet and line, the oil required for lubrication of the front drive chain. This oil line terminates in the breather pipe, and the oil is blown on the chain by the breather exhaust. The amount of oil fed through this line is governed by openings of fixed size, and cannot be regulated independently of motor supply.

Mileage per gallon of oil depends entirely upon driving speed. A motorcycle driven at low speeds the majority of the time may give 800 miles or

more; while a motorcycle driven considerably at high speeds may give only 400 miles or less. The average is about 600 miles per gallon.

Use of Hand Oil Pump

When a motorcycle is used in average service, it is only necessary to use the hand oil pump for flushing crank case and injecting supply of fresh oil after draining.



Illus. 4—Mechanical Oil Pump
45 (750 c.c) Twin Model

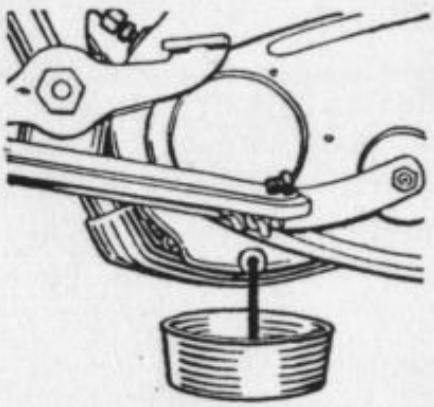
1—Mark indicating original setting; 2—Adjusting eccentric; 3—Adjustment lock screws.

It should not be necessary to supply motor with extra oil with hand pump for a normal amount of high speed running; however, as a safety factor, when running at high speed for a long distance, it is advisable to supply a little extra oil with hand pump—about ½ pumpful every two miles.

Draining and Flushing Crank Case

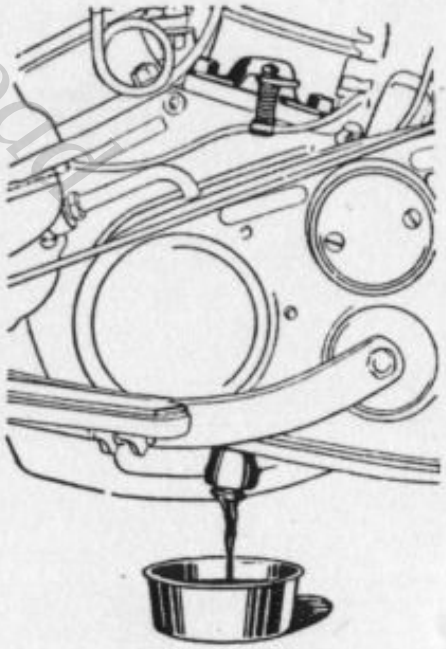
Drain and flush the crank case and give it a supply of fresh oil at least every 750 miles. Do this while the motor is hot.

To drain oil from Single motor, remove the drain plug as shown in Illus. No. 5.



Illus. 5
Draining Crank Case
Single Model

To drain oil from 45 (750 c.c.) Twin motor, simply press downward on drain valve rod at base of rear cylinder and turn lever on top end until it catches under bracket attached to cylinder base as shown in Illus. 6.



Illus. 6
Draining Crank Case
45 (750 c.c.) Twin Model

After draining off the old oil, close drain and inject about 3 pumpfuls of fresh oil into crank case with hand oil pump. Start motor and run for one or two minutes; then drain case again. This will flush all the old oil out of case.

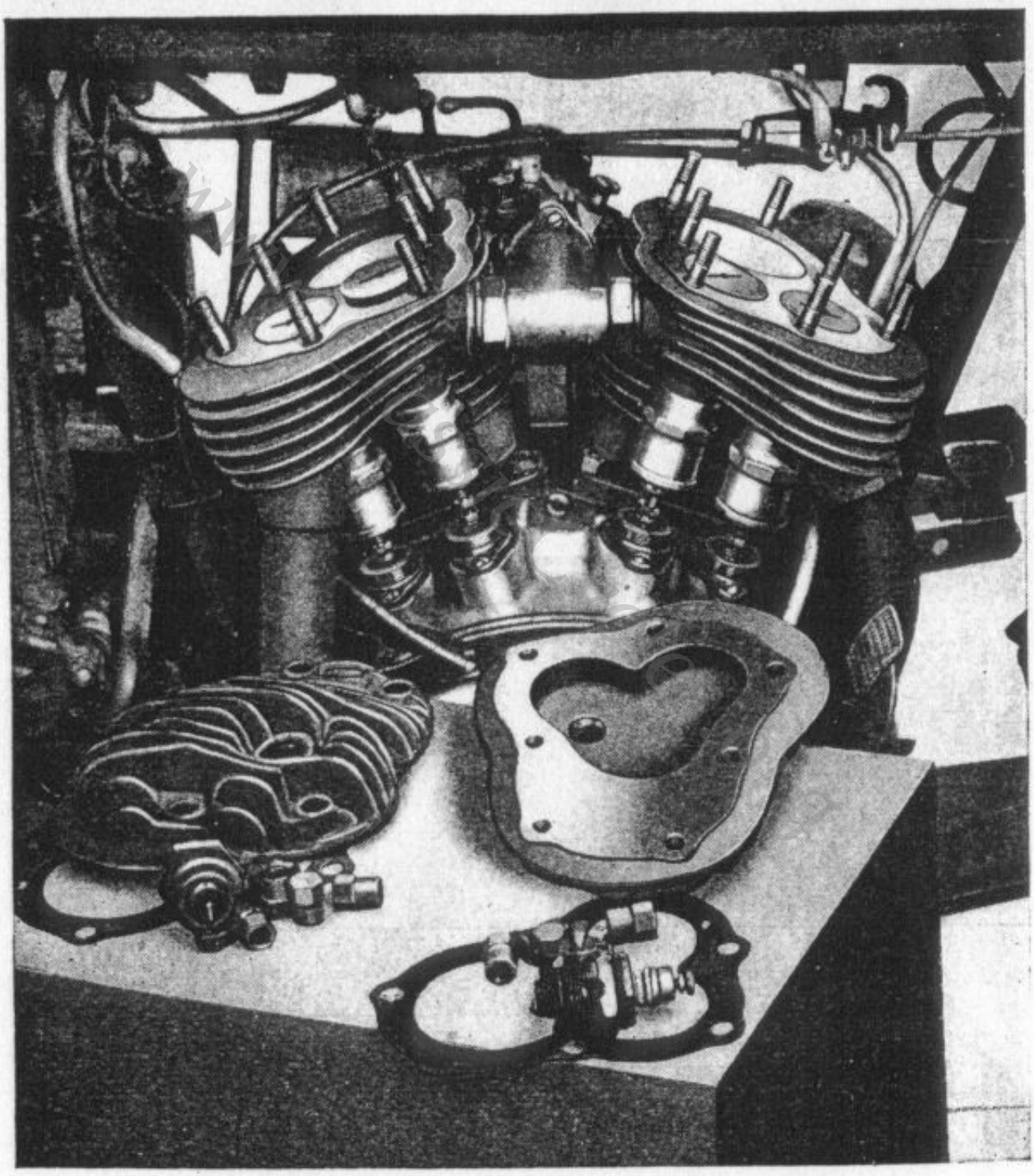
Close drain, inject 2½ pumpfuls of oil into case and motor is again ready for service.

GENERAL MAINTENANCE

When and How to Remove Carbon and Grind Valves

(NOTE: While Illus. 7, in connection with the following instructions is of a 45 cu. in. Twin, and also there is reference to two cylinders rather than only one, these instructions apply to the Single model as well.)

Remove carbon from the cylinder and piston heads and, if necessary grind valves, when the motor indicates by heat knocking and loss of power that this attention is needed. Without removing the motor from the frame



Illus. 7—45 (750 c.c) Twin Motor with Cylinder Heads Off to Allow Removing Carbon.

or disturbing gas and oil tanks, the cylinder heads can be taken off in a short time, exposing the piston heads and valves.

The valves can then be taken out, if desired. The cylinders also can be lifted off, if desired to inspect pistons and rings. The operations connected with removing carbon and grinding valves are explained below.

Removing the Cylinder Heads

Illus. 7 shows better than words can explain how cylinder heads are removed: After removing the spark plugs, remove the seven head clamp nuts from each cylinder. The cylinder head and copper gasket can then be lifted off. Before removing the copper gasket, mark it in some way so that you can replace it as it was originally fitted.

CAUTION—Remove cylinder heads very carefully to avoid damaging the copper gasket and the smoothly ground surfaces of the cylinder and head joint. Any scratches or other damage to gasket or joint surfaces will make it difficult to obtain a compression and oil tight joint, when head is re-assembled on cylinder.

Removing Carbon

After the cylinder heads are off, carefully scrape all carbon from them. Turn the motor until first one piston and then the other is at its highest position in the cylinder; and scrape all carbon from the piston heads and from around the valves. A screw driver, a knife or some other sharp edged instrument will serve as a carbon scraper. Be careful that the ground surfaces of the cylinder and head joint are not scratched or nicked. While scraping carbon, some carbon dust will work down between the cylinder and piston above the top piston ring. To remove this, lower the piston about an inch and with a clean cloth, wipe the cylinder wall clean. Repeat this operation until certain that all carbon dust has been wiped out.

Next, inspect the valves as explained below.

To Remove and Examine Valves and Valve Springs

Ordinarily, valves will not need attention oftener than when cylinder heads are removed for carbon cleaning, and probably not as often; however, if at any time the motor loses its compression, first make sure that it is not due to tappets being adjusted too tight, and then remove cylinder heads and inspect valves, seats, and springs.

To take out a valve, loosen and lift valve spring cover, pry spring collar upward with a screw driver, and remove the key or split retaining ring that keeps the spring collar in place. The valve can then be lifted out of cylinder. With valve out, the spring and collar can be removed. Be careful that the paper gasket between valve spring cover and tappet bushing does not become lost or damaged.

The inlet valve is next to the carburetor, and it is marked "IN"; exhaust valve is marked "EX". The valves are of different materials and therefore, are not interchangeable.

Examine valves and seats closely. Valves must seat perfectly for good motor performance. Any leakage by them means overheating and loss of power. If there are any carbon deposits on valves or seats, or if valves appear burned and pitted, they should be ground in. If, however, valves and seats appear clean and free from carbon, and valves seem to seat perfectly, it is not necessary to grind them.

If any of the valve springs appear weak or measure less than 2⅜ inches long, replace them with new ones.

Grinding Valves

First, thoroughly clean and polish each valve, particularly the stem. Put a small amount of grinding compound (a carborundum and oil compound preferably Harley-Davidson—is recommended) on valve face. Make sure that valve tappet is in its lowest position and then drop valve back into its place in cylinder. Using a screw driver in slot in valve head, and pressing down lightly, turn the valve back and forth, lifting it occasionally, and dropping it back onto its seat. It is important that valve grinding be done in this manner to avoid cutting rings or grooves in valve face and seat. The grinding is somewhat easier if a very light coil spring, just strong enough to lift the valve away from its seat, is fitted over the valve stem between the valve head and the guide in cylinder.) It may be necessary to add fresh grinding compound several times, depending on the condition of the valve.

If valve faces and seats are in very bad condition—burned and pitted or warped out of true, it is advisable to have them refaced at a Harley-Davidson service station where necessary refacing tools are at hand. Cylinders must be removed for this operation.

Grind each valve until, when washed off with gasoline, both the valve face and the valve seat are smooth and bright all the way around. Wash every particle of grinding compound from the valves and valve seats, and flush out valve guides with gasoline or kerosene. After wiping all parts clean and dry, put a little oil on valve stems and re-assemble valves in cylinders.

After the valves are re-assembled in cylinders, replace cylinder heads and adjust valve tappets.

Replacing Cylinder Heads

With a piece of very fine emery paper or sandpaper, rubbing with a rotary motion, thoroughly clean and polish the ground surfaces of each cylinder head joint. Use the same method to clean the copper gasket. Before doing this polishing, insert a cloth into the cylinder above the piston to keep dust from getting into cylinder. After polishing is completed, carefully blow and wipe all traces of sand or emery dust from the cylinder and the joint surfaces. Give the gasket a light coat of motor oil on both sides and place it on cylinder. If old gaskets are being used again, fitting them on the same cylinders from which they were removed will assure best results in getting head joints compression tight. If new gaskets are being fitted, they may be fitted on either cylinder the first time. It is not necessary to renew gaskets every time heads are removed. Ordinarily with careful treatment, they may be used several times.

Next, place the heads on the cylinders and after putting a little oil on the studs, turn the nuts on. The heads must be tightened down evenly and carefully in order to get tight joints. First, turn all of the nuts up just snug; then tighten each of them ⅛ to ¼ turn at a time until they are pulled up tight.

After the motor has been run a few miles, go over the head clamp nuts again and see that they are all tight. Do this while the motor is normally hot.

Valve Tappet Adjustment

To get the maximum power and best all around performance from a motor, keep valve tappets properly adjusted. They must be adjusted after grinding valves, and should be inspected and if necessary, re-adjusted about every 1000 miles thereafter.

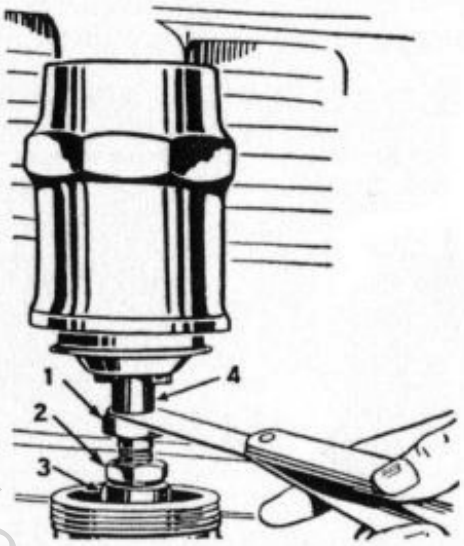
The important things to be remembered when adjusting tappets are: Motor must be cold. The compression release lever on Single model must be in upward position (Illus. 2). To be sure that a valve is fully closed and its tappet at the lowest position when adjusting clearance, turn a twin cylinder motor until the like valve in the other cylinder is held wide open. Turn a single cylinder motor until the remaining valve is fully open. Before replacing valve spring covers, inspect the paper gasket between each cover and tappet bushing. If broken or damaged, fit a new gasket to prevent an oil leak.

To Adjust Valve Tappets

The inlet valves are those nearest the carburetor.

Adjust tappets so that there is .004 to .005 inch clearance between inlet valve stems and tappets, and .006 to .007 inch clearance between exhaust valve stems and tappets. An accurate thickness gauge should be used to measure these clearances. If no gauge is available, use one thickness of ordinary writing paper to gauge the inlet tappet clearance, and two thicknesses of the same paper to gauge the exhaust tappet clearance.

To adjust a tappet, loosen lock nut 2 (Illus. 8) slightly; then turn adjusting screw 1 in or out of tappet body as may be necessary to obtain proper adjustment. When adjustment is completed, securely tighten lock nut 2. If a Single model, it will be necessary to hold tappet body with a wrench while making adjustment.



Illus. 8
Valve Tappet
1—Tappet adjusting screw; 2—Adjusting screw locknut; 3—Tappet; 4-Valve stem.

Valve and Ignition Timing

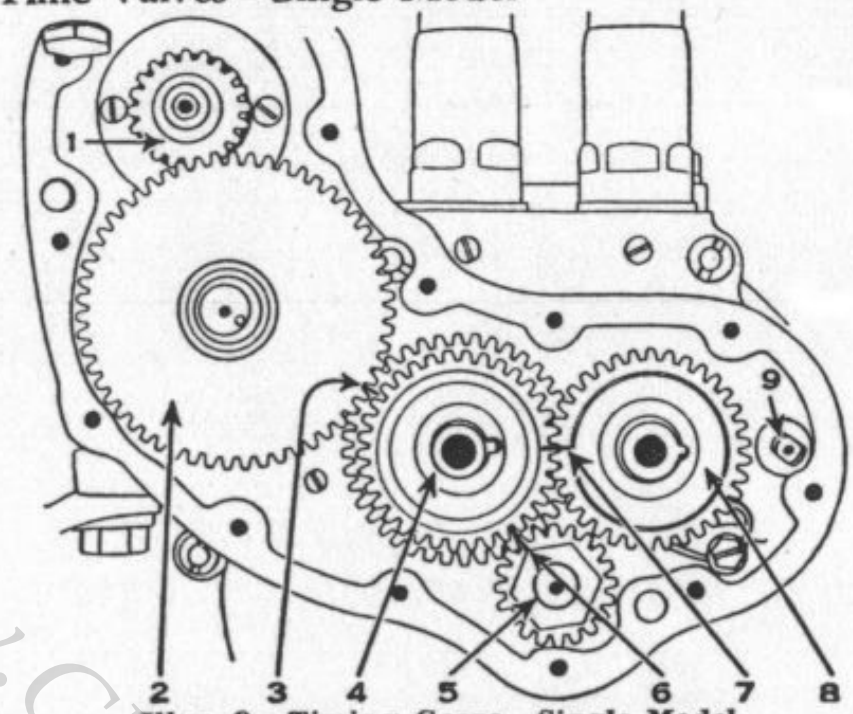
The valves are opened and closed at the proper time for each valve, and the ignition unit is timed to deliver a spark at the right moment, by means of a series of gears (Illus. 9 and 11) in timing gear case. Motor cannot get out of time unless some of the gears are removed or their setting disturbed. Of course, removing the circuit breaker and timer base assembly of the Single model will also put ignition out of time, but with the 45 (750 c.c.) Twin, simply removing and then replacing the circuit breaker and timer assembly as a unit will not affect ignition timing.

Should motor for any reason become out of time, it can be retimed according to the instructions below. To get at the timing gears of the Single model, disconnect oil pump control, and remove oil supply pipe, carburetor, breather pipe, and gear case cover. On the 45 (750 c.c.) Twin, remove oiler cover, oil supply pipe, circuit breaker assembly, foot board, and front exhaust pipe, disconnect oil pump and spark controls, and remove gear case cover.

All valve timing gears are marked so that if removed, they can be replaced with timing correct, as shown in Illus. 9 and 11.

To Time Valves—Single Model

Inlet cam gear 4, (Illus. 9) which is a compound (double) gear, is marked in three places, 3-6-7. Assemble gears in case with one of the marks on gear 4 in alignment with mark on pinion gear 5, another mark in alignment with the mark on exhaust cam gear 8, and the third mark facing gear 2. The valves are then timed correctly. Assemble the other two gears 1-2 which are not marked, as per instructions under "To Time Ignition."

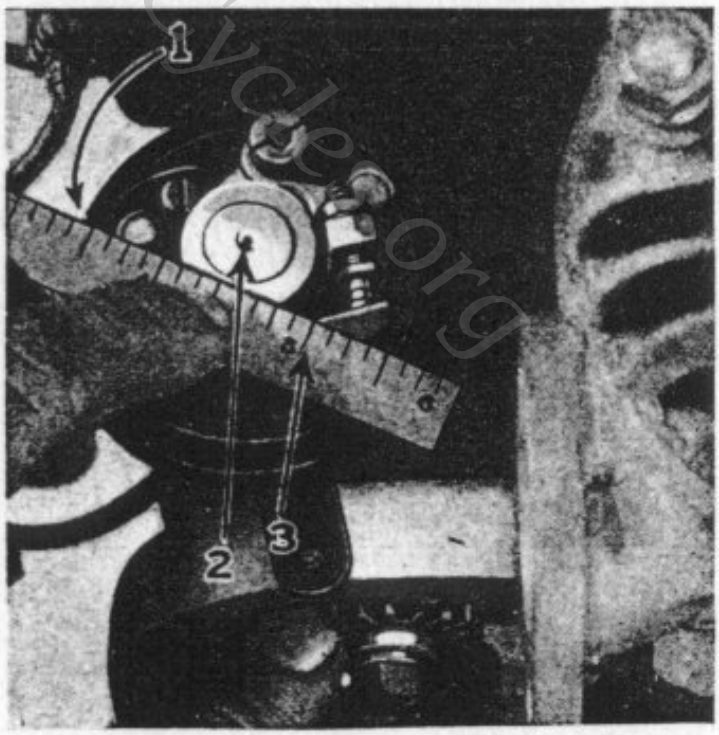


Illus. 9—Timing Gears—Single Model
1—Generator gear; 2—Intermediate gear; 3—This mark on gear 4 does not register with any other mark; 4—Inlet cam gear; 5—Pinion gear; 6—Marks on pinion gear and inlet cam gear correctly aligned; 7—Marks on inlet and exhaust cam gears correctly aligned; 8—Exhaust cam gear; 9—Compression release lever stud.

To Time Ignition
Single Model

Generator gear 1 (Illus. 9) and intermediate gear 2 are not marked, so time ignition as follows: Assemble pinion and cam gears 5-4-8 in the gear case with their marks in perfect alignment as shown in Illus. 9, and explained under "To Time Valves." Fit generator gear 1 to the armature shaft. This gear is located in position on the armature shaft with a key, and is provided with three keyways, so that it can be located in a position that will allow accurate timing. Fit any one of the keyways over the key temporarily. Turn the armature shaft nut (left hand thread) up lightly.

Next, hold a scale 3 (Illus. 10) or some small straightedge, tight and



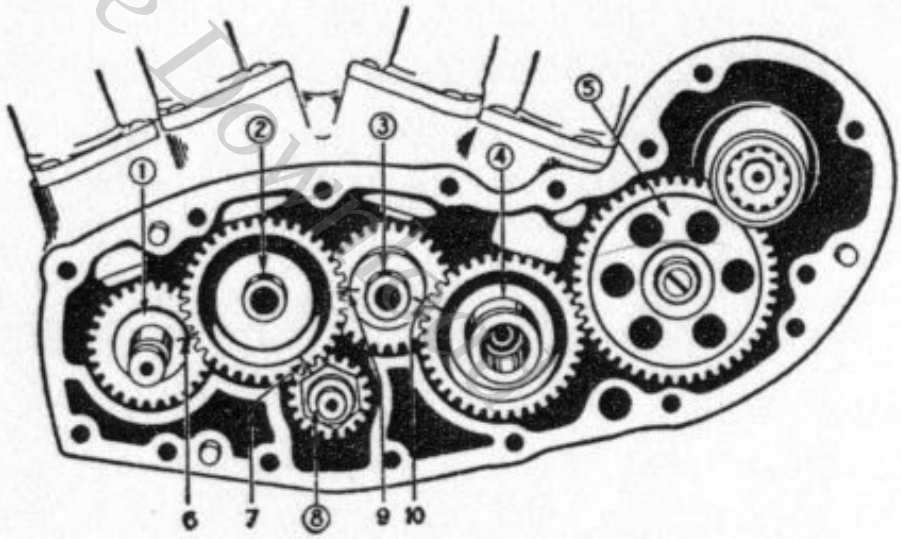
Illus. 10—Setting the Circuit Breaker to Time Ignition—Single Model
1—Timing mark cut in timer base; 2—Circuit breaker cam; 3—Six-inch scale used as straight edge.

squarely against the flat side of circuit breaker cam 2, and turn generator until the scale or straightedge is in alignment with mark 1, cut in the top edge of timer base. Steady the generator in this position, and after observing that marks on pinion and cam gears are still in alignment as explained above, fit intermediate gear 2 (Illus. 9) into the case. Do not move either the generator gear or cam gear, in order to allow gear 2 to slip into mesh. If it slips freely into mesh, timing is completed. If it will not slip freely into mesh on first attempt, because of its teeth not registering properly with the teeth on the gears with which it must mesh, change the position of generator gear 1 on the armature shaft, by removing gear and turning it so that one of its other two keyways registers with the key in shaft. Then, go through the complete timing operation again. It may be necessary to remove and shift generator gear to its third position, before the gears will line up so that intermediate gear 2 can be slipped freely into mesh.

After timing is completed, securely tighten the armature shaft nut, and replace gear case cover.

To Time Valves—45 (750 c.c.) Twin Model

Rear inlet cam gear 2 (Illus. 11) is marked in 3 places, 6-7-9. Front inlet cam gear 3 is marked in 2 places, 9-10. The other two marked gears have only one mark each. Generator drive gear is not marked at all because it does not affect timing in any way. Note that some marks are on or between gear teeth, while others are on gear hubs.



Illus. 11—Timing Gears
45 (750 c. c.) Twin Model

1—Rear exhaust cam gear; 2—Rear inlet cam gear; 3—Front inlet cam gear; 4—Front exhaust cam gear; 5—Generator drive gear (not marked); 6—Marks on rear inlet cam gear and rear exhaust cam gear correctly aligned; 7—Marks on rear inlet cam gear and pinion gear correctly aligned; 8—Pinion gear; 9—Marks on rear inlet cam gear and front inlet cam gear correctly aligned; 10—Marks on front inlet cam gear and front exhaust cam gear correctly aligned.

Assemble gears in case with all marks in alignment, as shown in Illus. 11. The valves are then timed correctly. After noting that fiber washers are in place on the shafts of gears 1-2-3, the gear case cover and other fittings can be replaced.

To Time Ignition—45 (750 c.c.) Twin Model

Timing the valves according to gear marks also automatically times ignition, provided the two clamp screws 12 (Illus. 25) in face of circuit breaker have not been loosened, allowing the circuit breaker to shift its position in relation to the advance and retard plate. As long as these screws are not loosened, the circuit breaker and timer assembly as a unit can be removed and replaced without affecting the original timing.

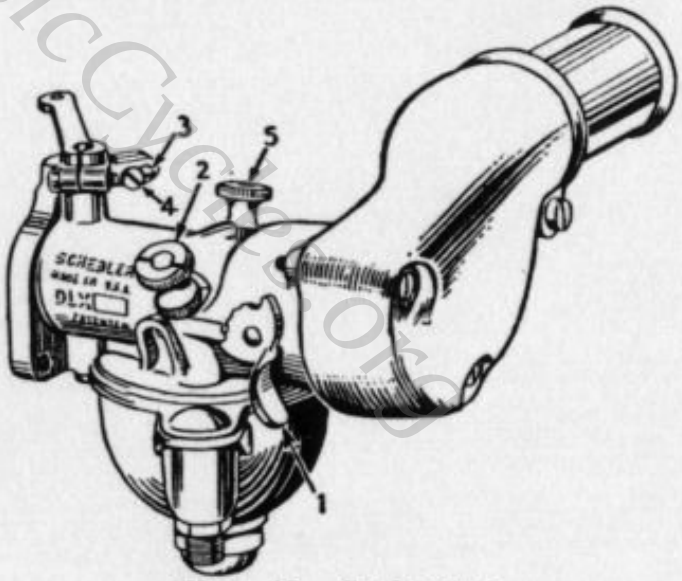
If at any time it becomes necessary to take the circuit breaker and timer assembly apart, before doing so, inspect for a file mark 1 (Illus. 25) across the edge of assembly, indicating the original factory setting. If none is found, make one to enable reassembling as originally set, thus maintaining correct timing.

With the circuit breaker and timer assembly taken apart or loosened and thereby the setting disturbed, re-setting for accurate ignition timing, without following marking as described in preceding paragraph, requires first getting *front* piston on compression stroke (directly after inlet valve closes) and in exact position for ignition—¼ inch before top center. Late motors are provided with a flywheel mark and an inspection or timing hole in left crank case, near top, by means of which correct piston position can readily be found; however, with earlier motors, cylinder head must be removed. Ignition is always set with timer assembly in fully advanced position. Narrow cam of timer shaft is for front cylinder—wide cam for rear cylinder. Spark occurs just as points separate.

Should it become necessary to re-time motor by another method than following the markings as explained above, it is advisable to have it done, or at least checked at a Harley-Davidson service station.

The Carburetor

Don't continually tamper with carburetor adjustment. If motor doesn't start and run right, first look for trouble elsewhere than in carburetor. Particularly, see that spark plugs are clean, properly adjusted, and that the porcelain cores are not damaged. Try new plugs. See "Use the Recommended Spark Plugs", page 3.



Illus. 12—Carburetor
45 (750 c.c.) Twin Model

1—Choke lever; OPEN position (all the way down) is normal running position of lever; 2—High speed adjusting needle; 3—Lock screw; 4—Throttle stop screw with which the closed throttle motor speed is regulated; 5—Low speed adjusting needle.

Check the adjustment of valve tappets. Make sure that motor has good compression. See that the throttle and spark controls are properly adjusted. Also refer to "Summary of Motor Troubles and Their Motor Troubles and Their Causes," page 41.

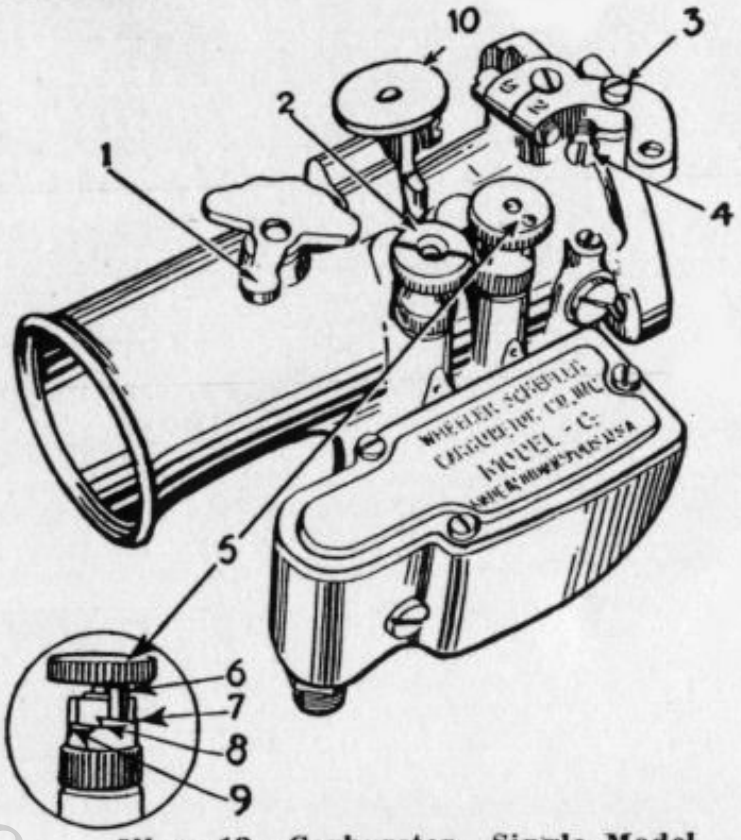
We suggest having carburetor adjustments made at a Harley-Davidson service station.

Adjustments Provided on Carburetor

While the Single model and 45 (750 c.c.) Twin model carburetors differ somewhat in construction and outward appearance, the methods of adjusting are very much the same for both. Rear needle 5 (Illus. 12 on the 45 (750 c.c.) Twin carburetor—or needle 5 (Illus. 13) on the Single carburetor (needle nearest cylinder) adjusts the mixture for low and idling speeds. These needles control the mixture for their respective motors below 15 miles per hour and affect the mixture up to 25 miles per hour.

The other needle 2 on each carburetor adjusts for higher speeds. This needle affects the mixture above 15 miles per hour and controls it entirely above 25 miles per hour.

All needles turn down (to right) to make mixture leaner at the respective speeds for which they adjust. Backing them out (to left) makes mixture richer. Needles are held in whatever position they may be turned to, by a spring and plunger which drops in to notches in the needle adjusting screw.



Illus. 13—Carburetor—Single Model

1—Choke lever; open at outward position as shown—closed at inward position; 2—High speed adjusting needle; 3—Lock screw; 4—Throttle stop screw with which the closed throttle motor speed is regulated; 5—Low speed adjusting needle (has a screw adjustment; also can be lifted to enrich mixture temporarily for easy starting); 6—Needle lift button locating pin; 7—Second (highest) step to which needle can be lifted; 8—First step to which needle can be lifted; 9—Normal running position of needle lift button (all the way down); 10—High speed shutter, 30.50 (500 c.c.) model only.

How To Adjust the Carburetor

For starting instructions, see pages 5 and 6.

A carburetor once properly adjusted, requires little, if any, re-adjusting. At the most it should not be necessary to adjust the needles more than one or two notches richer or leaner to correct the mixture for a change in weather conditions.

A carburetor that is badly out of adjustment may be re-adjusted as follows: Turn both the low and high speed needles all the way down (to right). Then, back up (to left) low speed needle about 2½ turns, and high speed needle about 1½ turns. With needles in these positions, motor will start, but mixture will probably be too rich. Start motor, and after choke lever 1 (Illus. 12-13) has been moved to OPEN position (also, if a Single model, lift needle 5 (Illus. 13) dropped to its lowest position), and motor is normally hot, correct the adjustment of both needles.

Adjust for low speed first. Turn low speed needle 5 down (to right) one notch at a time until mixture becomes so lean that motor misses and is inclined to stop; then, back needle up four or five notches or until motor hits regularly with throttle closed and spark advanced. Next, adjust throttle stop screw 4 as may be necessary to make motor idle at proper speed with throttle closed. Turning screw to right makes motor idle faster. Turning screw to left makes motor idle slower. Don't idle a motor at the slowest possible speed, because an extremely slow idling adjustment causes hard starting. Before making this idling adjustment, be sure control is adjusted to fully close throttle.

After low speed adjustments have been completed, run motorcycle on the road to make high speed adjustment. Run at various speeds between 20 miles per hour and wide open. Have spark fully advanced. Turn high speed needle 2 down (to right) a little at a time until mixture becomes so lean that motor doesn't respond to throttle, and backfires (spits) through carburetor; then, back needle up a notch at a time until motor responds to throttle, accelerates without backfiring (spitting), and hits evenly at high speeds or with wide open throttle.

Carburetor High Speed Shutter

This shutter 10 (Illus. 13), with which the size of the 30.50 (500 c.c.) model carburetor opening can be increased when maximum speed is desired, should be kept in closed position (pushed in) for all ordinary service. Open it (pull out) only when more speed is desired after throttle is fully open.

Gasoline Strainer

The carburetor bowl of the 45 (750 c.c.) model is kept clean by a gasoline strainer attached to bowl, which accumulates any water and sediment in gasoline supply. Empty strainer and clean screen at least once a month, or oftener if need of cleaning is indicated by irregular carburetion.

To take strainer apart for cleaning, shut off gas tank cocks, turn off lower cover of strainer, and take out screen. When re-assembling, note that gaskets are in good order.

Care of Transmission

The only periodic attention the transmission requires is to keep it filled to the correct level with oil. Check the oil level every week and add oil if necessary (Illus. 14). Add as much oil as the height of the filler opening on the front of case will allow. Use the same grade of oil used in the motor. Don't use heavy auto-transmission grease. *Note—Motorcycle should be standing on a level surface when adding oil to transmission. If a solo motorcycle equipped with "Jiffy Stand", do not have it leaning on stand.*

A little oil may work out through the bearings of transmission, so don't be alarmed if, when motorcycle is left standing after a run, a few drops of oil drip from various parts around the case. However, should oil leakage become so bad that little oil can be kept in case, the oil retaining washer on each side of case should be renewed. One of these washers is

back of the clutch; the other, back of the countershaft sprocket. These washers can be changed in a few minutes at a Harley-Davidson service station, where the necessary special wrenches are at hand.

Keep the transmission clamped down tight to the frame, to prevent the two bottom studs from working loose and damaging the case.

NOTE—When the transmission and also the shifter control joints are properly lubricated, hard shifting and clashing of gears when shifting are almost invariably due to improper clutch adjustments rather than trouble in the transmission.

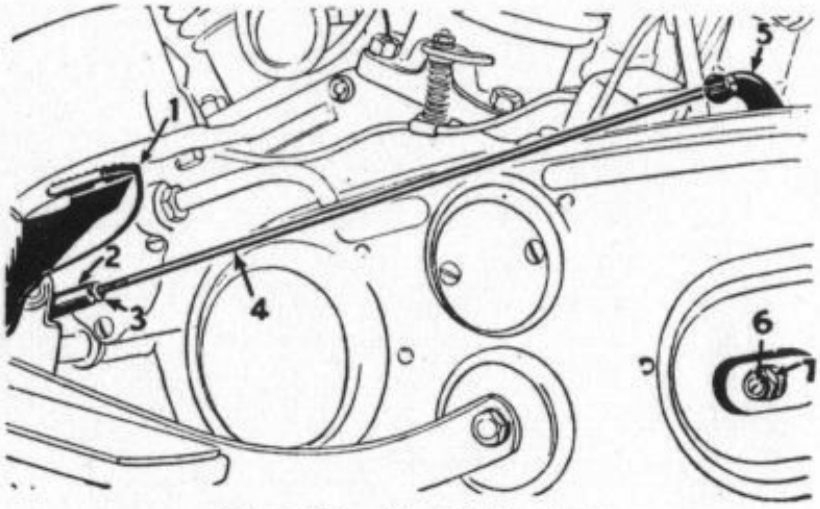
Illus. 14—Putting Oil in Transmission

Adjusting the Clutch

When a clutch is in need of adjustment or repairs, it is because it either does not hold under a load, or it drags when in released position. In either case the first things to be checked up are the adjustments of clutch footpedal rod 4 (Illus. 15) and push rod thrust screw 6. Clutch trouble is usually due to improper adjustment of these controls.

To Adjust Clutch Footpedal Rod and Push Rod Thrust Screw

If, with clutch footpedal rocked forward as far as it can go, the end of clutch lever 5 (Illus. 15) has a small amount of free movement back and forward (about $\frac{1}{16}$ to $\frac{1}{8}$ inch) and also when lever is moved backward it strikes its stop bracket on top of transmission case with only slight clearance left between head of footpedal rod 4 and end of clutch lever, the adjustments of rod 4 and thrust screw 6 are all right and require no



Illus. 15—Clutch Controls

1—Footpedal; 2—Clutch rod end; 3—Lock nut; 4—Clutch footpedal rod; 5—Clutch lever; 6—Push rod thrust screw; 7—Thrust screw lock nut.

attention. If, however, a check up as just explained indicates that adjustments are not right, correct them as follows:

Bear in mind that clutch footpedal must be rocked all the way *forward while making adjustments.*

Loosen lock nut 3, and by turning rod 4 further into or out of rod end 2, adjust rod just a trifle longer than actually required to permit moving clutch lever 5 back tightly against its stop bracket on top of transmission case. Then tighten lock nut 3.

Next, loosen lock nut 7 and re-adjust thrust screw 6 so that end of lever 5 has $\frac{1}{16}$ to $\frac{1}{8}$ inch free movement back and forward. Turn screw 6 inward (to right) for less free movement of lever—outward (to left) for more free movement. When correct adjustment is obtained, hold thrust screw 6 with screw driver while securely tightening lock nut 7.

CAUTION—If clutch lever 5 has no free movement as explained above, clutch will not hold properly. If too much free movement is allowed, clutch will drag when in released position, and consequently the gears will shift hard, clash, and eventually become damaged.

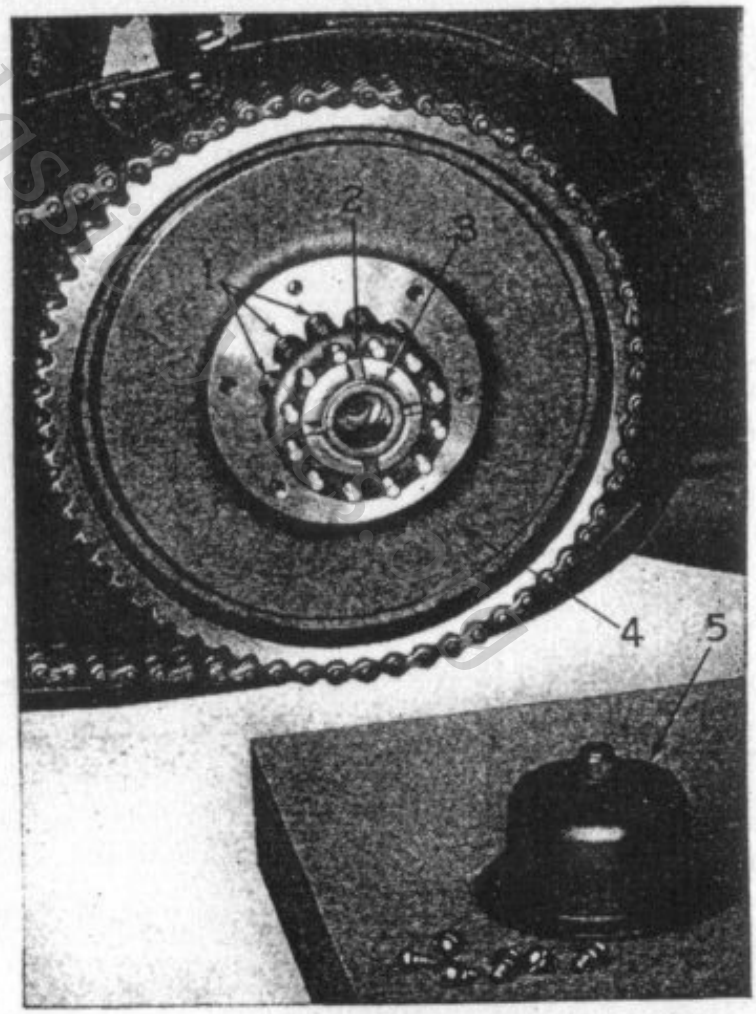
To Adjust Clutch Spring Tension

If clutch slips, *after footpedal rod and push rod thrust screw adjustments are correct,* increase the spring tension as follows: After removing the front chain guard, remove thrust cap 5 (Illus. 16), exposing the clutch springs 1 and adjusting nut 3. Tighten nut 3 (turn right) one-half turn at a time until clutch holds, testing clutch after each half turn of nut.

A good way to test a clutch is to crank the motor. Usually a clutch that will hold to crank the motor will hold on the road.

Do not increase the spring tension any more than necessary to make clutch hold. In any case do not tighten nut 3 to the extent of compressing springs shorter than $1\frac{5}{16}$ inch. If compressed shorter, the spring coils will be so near tight together that clutch probably cannot be fully released.

If increasing the spring tension will not make the clutch hold, disassemble it and inspect the friction discs.



Illus. 16
Clutch With Thrust Cap Removed
1—Clutch springs; 2—Spring collar; 3—Spring tension adjusting nut; 4—Outer clutch disc; 5—Thrust cap.

To Disassemble Clutch

After removing chain guard and thrust cap 5 (Illus. 16), turn nut 3 all the way off. The clutch is then free to come apart.

Inspect the fibre composition friction discs. If they are oil soaked but otherwise in good condition, drop them in a pan of clean gasoline for a few minutes; then, burn off the gas and oil and dry them with a blow torch or over an open flame. Clean the glazed surfaces of the discs with sandpaper and wipe them clean and dry.

After washing all oil and dirt from the metal parts with gasoline, and drying them thoroughly, re-assemble the clutch. Apply a few drops of oil or a small amount of grease to sprocket roller bearing. Turn nut 3 on clutch shaft and adjust it so that springs are compressed to about $1\frac{1}{16}$ inch, measuring from face of outer disc to inside face of spring collar 2.

Before replacing thrust cap 5, put a little grease on the ball inside the cap. After clutch is assembled, check the adjustments of footpedal rod and push rod thrust screw.

To Adjust Clutch Footpedal Friction

The clutch footpedal is fitted with friction discs and a spring which will hold it in any position. Some pressure with the foot should be required to rock the pedal either forward or back. If the pedal works too freely, or requires too much effort to operate it, change the spring tension as may be necessary, by means of the large hexagon headed adjusting screw in face of pedal.

Before the adjusting screw can be turned, the projecting lip of lock washer fitted under screw head, found turned up against side of screw head, must be bent away. After adjustment is completed, bend one of the lips of lock washer up tight against the side of screw head, to lock the adjustment.

To take the pedal assembly apart, first remove footboard, and the nut and stud by means of which footpedal rod is attached to pedal. Then turn the adjusting screw all the way out.

To Adjust Gear Shifter Lever

Correctly adjusted, the shifter lever will stand $\frac{1}{16}$ to $\frac{1}{8}$ inch from the end of slot in shifter gate when the gears are shifted into HIGH. This adjustment must be accurate, otherwise gears will not mesh fully, gear locking device will not align properly, and difficulty will be experienced in engaging the clutch after shifting.

To adjust, disconnect shifter rod where it connects to shifter lever, and then shorten or lengthen the rod as may be necessary, by loosening lock nut and turning rod end farther on or off rod.

Care of Drive Chains

Inspect the adjustment of chains every week and re-adjust them, if necessary. Adjustment of front chain can be checked through inspection hole provided in chain guard. Chains should not be allowed to run loose

enough to strike the chain guards, because when that loose, they cause machine to jerk when running at low speed, and there is excessive wear of chains and sprockets. The rear chain requires more frequent re-adjustment than front chain.

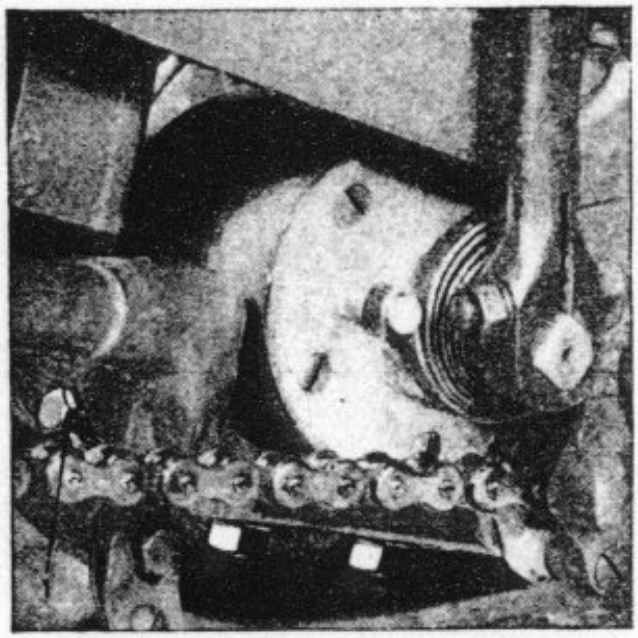
Adjust chains so that they have about ½ inch free movement up and down, midway between sprockets. Do not adjust tighter, because running chains too tight is even more harmful than running them too loose. As chains stretch and wear in service, they will run tighter at one point on the sprockets than at another; always check the adjustment at the tightest point.

Inspect chains occasionally for links in bad condition. If any are found, make repairs or renew the chain. The rear chain can be taken apart and removed after locating and taking out the spring locked connecting link. The front chain is not, however, originally provided with such a connecting link and unless one has at sometime been fitted in making repairs, it will be necessary to remove the engine sprocket before chain can be taken off.

At least every 1000 miles, brush off dirt that has accumulated on rear chain, and apply Harley-Davidson Chain Lubricant to its surface. The composition of this lubricant is such that it will work into the chain bearings. The front chain is supplied with necessary lubrication by the mechanical oil pump (see "Mechanical Oil Pump," page 10).

To Adjust Front Chain

The front chain is adjusted by moving the transmission backward or forward, by means of adjusting screw 1 (Illus. 17). After loosening the two nuts 2 which clamp the transmission to the frame, turn adjusting screw 1—*to the right* to tighten chain—*to the left* to loosen chain. When correct adjustment is obtained, securely tighten clamp nuts 2. Adjusting front chain changes the adjustment of rear chain; so both must be adjusted.



Illus. 17—Transmission Clamp Nuts and Adjusting Screw
1—Adjusting screw; 2—Clamp nuts.

After adjusting front chain a few times, check the adjustments of clutch footpedal rod and push rod thrust screw. See page 21.

To Adjust Rear Chain

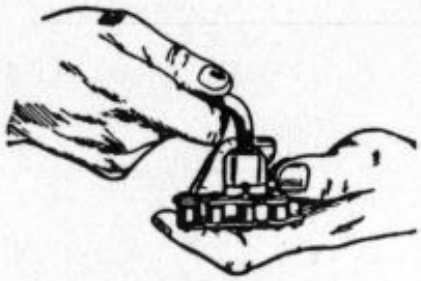
Loosen the rear wheel axle nuts, the two axle adjusting screw lock nuts, and brake arm clamp bolt. Then, by means of the axle adjusting screw in frame at each end of axle, move the axle as much as necessary to adjust the chain properly. Turn each of the adjusting screws

an equal number of turns in order to keep rear wheel aligned. Check for correct alignment of wheel by noting that rear tire runs about midway between rear frame forks and also that rear sprocket aligns with chain and countershaft sprocket.

After adjusting the rear chain, the rear brake may be too tight and if a speedometer is used, the gear teeth may be out of proper mesh. Adjust brake rod and speedometer gear as may be necessary. See "To Adjust Rear Wheel Brake."

To Repair a Drive Chain

When necessary to repair a chain, remove damaged links by pushing out the riveted link pins, with chain repair tool (Illus. 18). Then fit the necessary repair links. A duplex chain is used for the front drive and a single width chain for the rear, however, the chain tool furnished in tool kit is designed to take care of both.



Illus. 18
Repairing a Chain

The Cushion (Motor) Sprocket

The cushion sprocket absorbs the shocks of the power impulses, and thus affects maximum smoothness of operation, at low speed. Sprocket is fitted with eight rubber blocks which may need to be renewed occasionally. Worn out rubber blocks will allow sprocket to act so freely that a jerky action will be noticeable at lower speeds and when accelerating. The sprocket bearing is automatically lubricated by the motor.

To dis-assemble sprocket so that its bearing may be inspected or the rubber blocks renewed, remove sprocket from motor, and remove the spring ring and thrust washer from the back side of sprocket. Sprocket will then come apart.

To Adjust Rear Wheel Brake

Turn self-locking adjusting nut on rear end of brake rod—*to the right* to tighten brake—*to the left* to loosen brake.

Adjust brake so that it does not start to take effect until footpedal is pushed downward about one inch. Turn rear wheel to make sure that brake is not too tight and dragging.

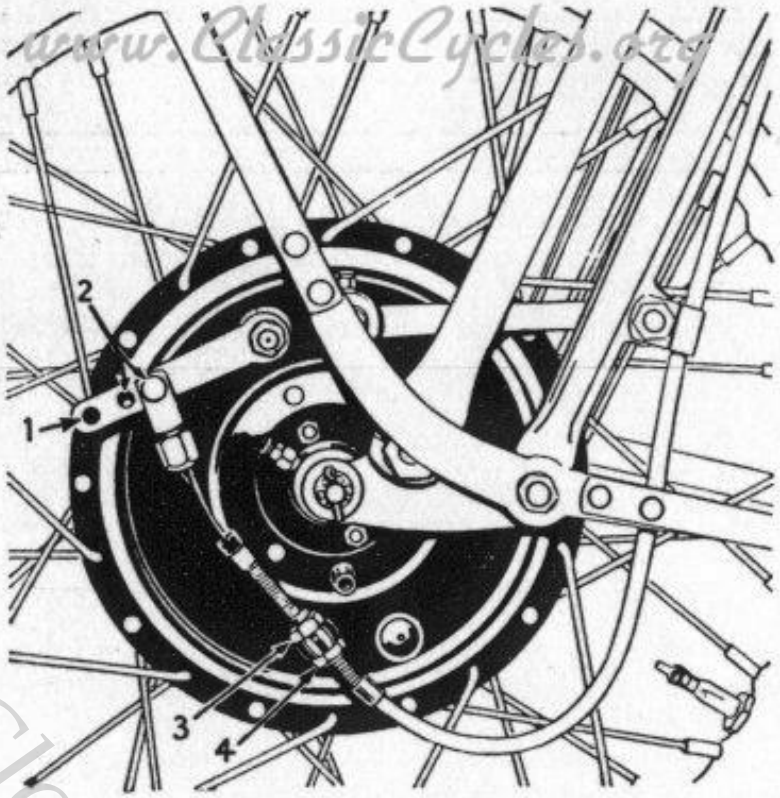
Wheel Hubs

Wheel hubs normally require little attention other than ample lubrication. All hubs are fitted with Alemite grease gun connectors and should be lubricated about every 1000 miles, see Lubrication Chart in back of book. Inspect the adjustment of bearings two or three times a year and re-adjust, if necessary. Adjustment is all right when only a very small amount of side shake can be found at rim of wheel.

To Adjust Front Wheel Brake

Loosen lock nut 3 (Illus. 19) and turn adjusting sleeve 4—*to the left* to shorten control coil and thus tighten brake—*to the right* to loosen brake. With control coil properly adjusted, hand lever will move freely about one-quarter of its full movement before brake starts to take effect. It is advisable after adjusting brake, to raise front end of motorcycle, and turn wheel to be sure that brake is not too tight and dragging. After adjustment is completed, be sure to securely tighten lock nut 3.

Oil control often to keep it working freely. Alemite brake bearings regularly as per Lubrication Chart, to assure smooth braking and also free fork action while brake is in operation.



Illus. 19—Front Wheel Brake

1—Connect control at this hole for sidecar service; 2—Connect control at one of these holes for solo service (Note—21.07 (350 c.c.) Single has only one hole in brake lever); 3—Adjusting sleeve lock nut; 4—Control coil adjusting sleeve.

Adjusting Front Wheel Bearings

Remove wheel from motorcycle, and then remove cone lock nut and washer from right side of hub. Cone can then be turned to obtain proper adjustment. Adjust so that just a trifle play or shake can be detected, and wheel turns freely. Check the adjustment after cone lock nut has been replaced and securely tightened. To remove and inspect cones and balls, turn right side cone all the way off axle bushing. The 21.09 cu. in. (350 c.c.) single model is fitted with a front hub requiring 28, ¼ inch balls—14 on each side. The front hub of other models requires 26, $\frac{5}{16}$ inch balls—13 on each side.

Adjusting Rear Wheel Bearings

Loosen the right (sprocket) side axle nut, and cone lock nut (left thread). Re-adjust cone so that just a trifle play or shake can be detected, and wheel turns freely. Check adjustment after cone lock nut and rear axle nut have been securely tightened. To remove and inspect cones and balls, remove wheel from motorcycle and turn right side cone all the way off axle. There are 22, ⅜ inch balls in hub, 11 on each side.

Removing Wheels

Wheels will have to be removed when it is found necessary to inspect or adjust bearings, change tires, etc. While it is possible in some instances to make minor tire repair, such as applying a tube patch, without removing wheel, it is more satisfactory to remove wheels for all tire repairs.

To remove front wheel, raise front end of motorcycle by means of front stand or blocking under frame loop. Then, disconnect brake control, take out fork side brake shackle bolt, and remove axle.

To remove rear wheel, raise motorcycle on rear stand, disconnect rear chain, take out brake arm bolt, turn off brake rod nut, loosen and raise rear end of mudguard, and remove axle nuts and collars.

To Remove and To Apply Straight Side Tires To Drop Center Rims

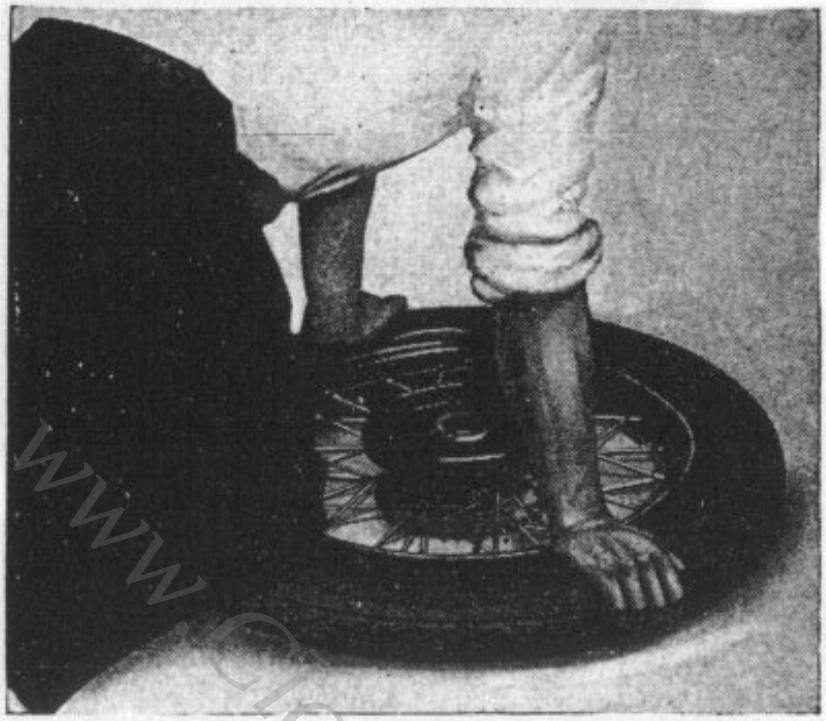
45 (750 c.c.) and 30.50 (500 c.c.) Models

Lay wheel on its side when removing or applying tire.

To remove tire; first remove valve cap, valve inside, and valve stem nut. Press the bead of upper side of casing into the well, or drop center of rim, to within a short distance of each side of valve. Using a tire iron, start bead of casing over edge of rim, at valve. *Don't use force when starting bead over edge of rim with a tire iron, because, the bead wire may be broken and the tire ruined. See that the bead is in rim-well on one side of wheel, as explained above, and the bead at opposite side of wheel can easily be started over edge of rim.* After the bead is started over the edge of rim, the casing can be taken the rest of the way off without further aid of a tire iron. If necessary to completely remove casing, the lower bead can be taken off the rim in the same manner as just described for upper bead. It isn't always necessary to completely remove casing. Removing one side only, allows the inner tube to be removed and replaced, and also allows the inside of casing to be inspected.

Before applying casing, see that the rubber rim strip is in place around the rim, and that the valve hole in rim strip aligns with valve hole in rim. Start either bead of casing over rim, pressing it into rim-well and working around wheel until the complete bead is on rim. Then, place the inner tube in casing. *(NOTE: It makes no difference whether inner tube is placed in casing before or after the first bead of casing is placed on rim.)* Insert valve through hole in rim, and start valve stem nut. Starting directly opposite valve, push remaining bead over rim and press it into rim-well. Work both ways around the wheel toward the

valve. Possibly there will be a short section of the bead that will not push over the rim readily by hand, and in that case finish with a tire iron.



Illus. 20—Applying Tire

Bear in mind that the main point in removing or applying a tire, is to press the tire bead into the rim-well on one side of wheel, while working it over the edge of rim at the opposite side of wheel, as shown in Illus. 20.

To Remove and Apply Clincher Tires
21.09 (350 c.c.) Model

The procedure described above for straight side tires applies also to clincher tires, except, that there is no "bead wire or rim-well" to be considered. Simply stretch tire beads over rim by means of tire irons when either removing or applying.

Care of Tires

Giving careful attention to tires, is essential, not only to riding safety and best motorcycle control, but also to greatest efficiency in mileage. Tire neglect, especially as concerns inflation, involves both unnecessary risk and expense.

Check tires for proper inflation, and if necessary, re-inflate them about once a week, and before going on a long trip. See "Tire Inflation Pressures," page 2. If tires are run in an under-inflated condition continually, rapid tread wear and damage to the fabric will be the result.

Every few days inspect tire treads and side walls. Very often a tack or a piece of glass will be found imbedded in the tread, and if not

removed, it may eventually work its way through the casing, and puncture the inner tube. Both the casing and tube may be seriously damaged.

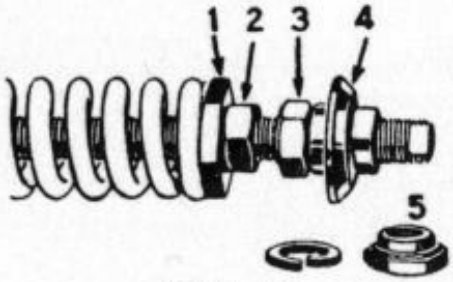
If a puncture is experienced on the road, repair it immediately, rather than run the tire flat for some distance, thus probably damaging tire beyond repair, and also damaging rim. Always carry a tire patching kit and pump.

To Remove Seat Post

After raising saddle, remove seat post clamp nut 5 (Illus. 21) which is located underneath frame at bottom end of seat post tube. Seat post assembly can then be pulled out. When seat post assembly is inserted back into frame tube, see that flat side machined on seat post rod nut 4 registers in flat sided hole in bottom of tube.

To Adjust Seat Post Spring Tension

If seat post spring tension is not suited to weight of rider, it can be re-adjusted as follows: Remove seat post and after loosening lock nut 2 (Illus. 21), turn adjusting nut 1 to increase or decrease the tension of cushion spring combination (three lower springs).



Illus. 21
Seat Post
1—Spring tension adjusting nut; 2—Adjusting nut lock nut; 3—Rod nut lock nut; 4—Seat post rod nut; 5—Seat post clamp nut.

With standard seat post adjustment the three lower cushion springs are twelve inches long. This adjustment will be found suitable for a saddle load of approximately 150 pounds. For heavier saddle load requiring increased tension, adjust spring combination shorter, a little at a time, until desired tension is obtained. Securely tighten lock nut 2, after adjustment is completed.

Rod nut 4 should be set and locked with the end of rod extending about ½ inch through it. With this setting, when seat post assembly is inserted in frame, the end of rod will extend just far enough through frame so that lock nut 5 can be turned completely on.

To Adjust Throttle, Oil Pump, and Spark Controls

The main point in adjusting control wires is to adjust them so that carburetor lever and oil pump control lever open and close fully, and circuit breaker advances and retards fully. If controls are not adjusted for full range of operation, motor cannot be expected to perform at its best.

To be sure that motor gets correct lubrication, it is very important that the carburetor-oil pump control wire be adjusted so that oil pump control lever operates in proper relation to carburetor control lever. When carburetor control lever strikes its full-open stop, the oil pump control lever should at the same time strike its full-open stop; however, when carburetor control lever strikes its fully closed stop, the oil pump control lever lacks about $\frac{1}{16}$ to ⅛ inch of striking its fully closed stop. It is the relation between carburetor and oil pump control levers in fully open positions, that is to be considered in adjusting the control wire.

To Replace a Broken Control Wire or Control Coil

When a control wire or control coil becomes damaged or broken and a replacement is required, it is advisable before removing the damaged part, to carefully note how it is passed between the forks and other fittings to its point of connection; and also note just how connections are made. It will then be an easy matter to install and connect the new wire or coil exactly as the original.

First, free the control at all its connections below the handlebars. Back out handlebar end screw and remove grip sleeve. The slot in handlebar end screw is wide enough so that the edge of a tool kit wrench will serve as a screw driver. Remove roller and block, and then pull out the roller pin. The plunger to which wire is attached can then be pushed out through open end of bar. The control coil can be removed, if necessary, after taking out lock screw concealed underneath handle bar light or horn switch on right or left handlebar respectively. It is not necessary, however, to remove coil in order to replace only the control wire.

A new control wire or control coil will be found overlength and must be cut to exact length at the time of installing. The correct length can be determined from the damaged wire or coil that is being replaced.

After installing the necessary new parts, re-assemble grip and adjust control. See "To Adjust Throttle, Oil Pump and Spark Controls."

Cleaning Muffler

A clogged muffler causes back pressure and consequently, overheating and sluggish motor performance. To get maximum efficiency from motor it is important that muffler outlet be kept clean and free from the soot and road dust that gradually accumulates. The outlet can be cleaned easily with a piece of stiff wire. Do this often.

Once or twice a year remove muffler outlet and scrape the inside as clean as possible with a long piece of wire.

Do not pry muffler outlet farther open because doing so only increases the exhaust noise and attracts undesirable attention, without bettering motor performance.

THE HARLEY-DAVIDSON LIGHTING AND IGNITION SYSTEM

A 6-8 volt, one wire or ground return system. The different units of the electrical system are supplied with the required current from two sources—the generator and the battery. When motor is not running, when starting, and when running in high gear at very low speeds, the battery is supplying the current required. At average driving speeds, the generator supplies the current needed for operation, with a surplus charging the battery. The charging rate varies up to its maximum with motor speed.

To keep the electrical system in perfect working order, observe the following rules:

1. Give battery the required care. See page 39.

2. Look the system over occasionally, especially at battery terminals, for loose wiring connections, broken wires, and damaged insulation on wire.

Loose wiring connections may cut the battery out of circuit. This must not be allowed to occur while motor is running, because the battery not only accumulates the surplus current generated, but also acts as a governor, and keeps the voltage of the entire system between 6 and 8 volts. If battery should become disconnected from the circuit, the generator voltage will go much higher than 6 to 8 volts, which is likely to cause serious damage to generator, relay switch, and other units.

3. Lubricate the commutator end armature bearing occasionally as per instructions under "To Lubricate Commutator End Armature Bearing". Care should be taken to avoid getting oil or grease on commutator or brushes.

4. Lubricate timer shaft bearing of Single model generator as per Lubrication chart on page 46.

To Inspect or Replace Brushes

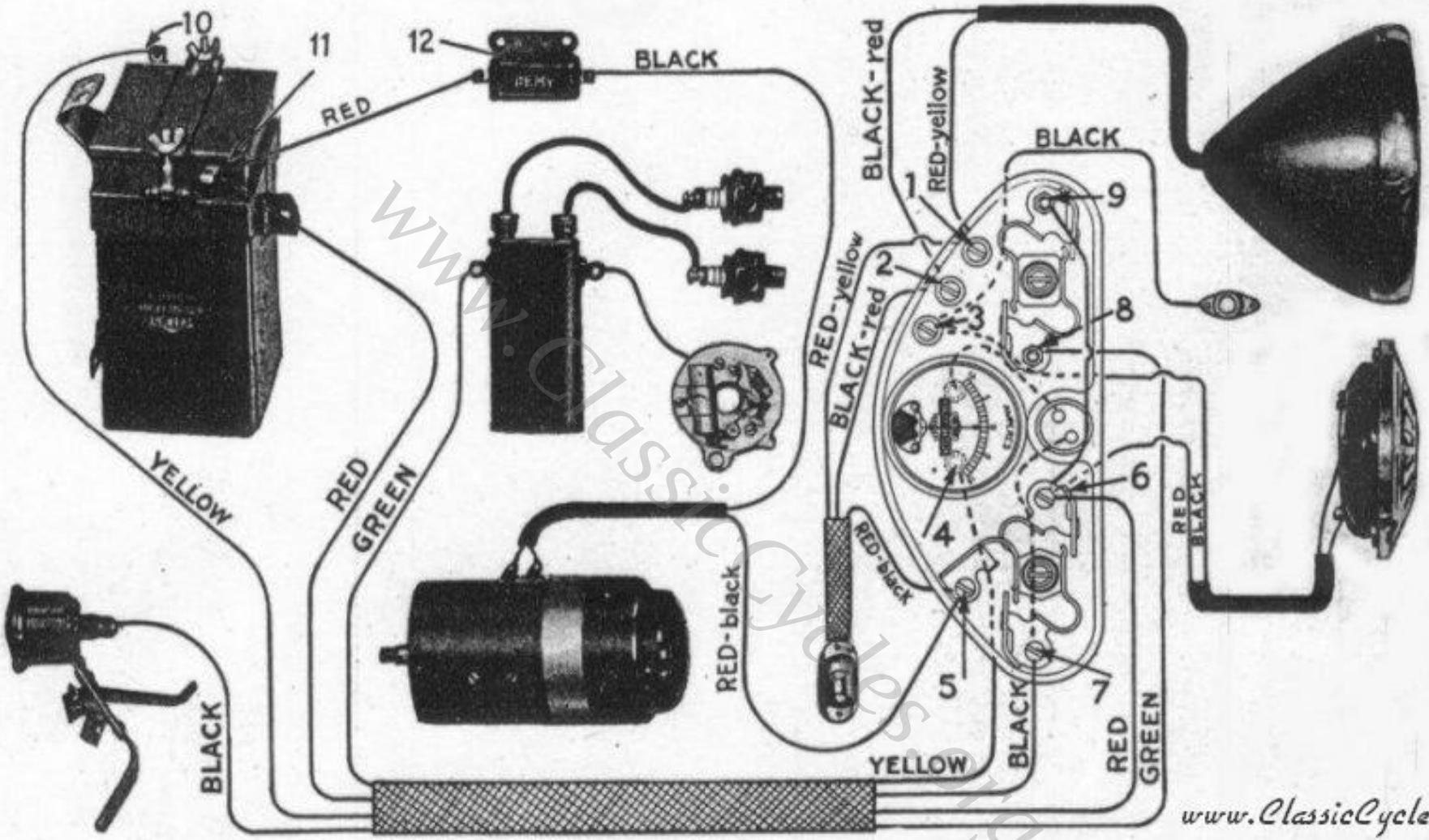
Remove the generator end cover. To remove brushes (excepting the two large brushes of the late 45 (750 c.c.) model generator) unfasten brush spring retainers by pressing lightly downward and outward. The retainers of the two excepted brushes are secured with one screw each. With spring retainers unfastened, brushes can be taken out.

Brushes are worn out and should be renewed when longest side of brush measures 3/8 inch or less. Be sure to insert brushes into holders so that concave face of brush fits curve of commutator.

To Lubricate Commutator End Armature Bearing

Lubricate this bearing two or three times a year with a few drops of motor oil, and once a year with a good grade of grease (preferably Harley-Davidson Grade A). The Single model generator is provided with an oil cup on the outside of generator end cover; however, the end cover and the bearing cover of the 45 model generator must be removed and oil or grease worked directly into bearing.

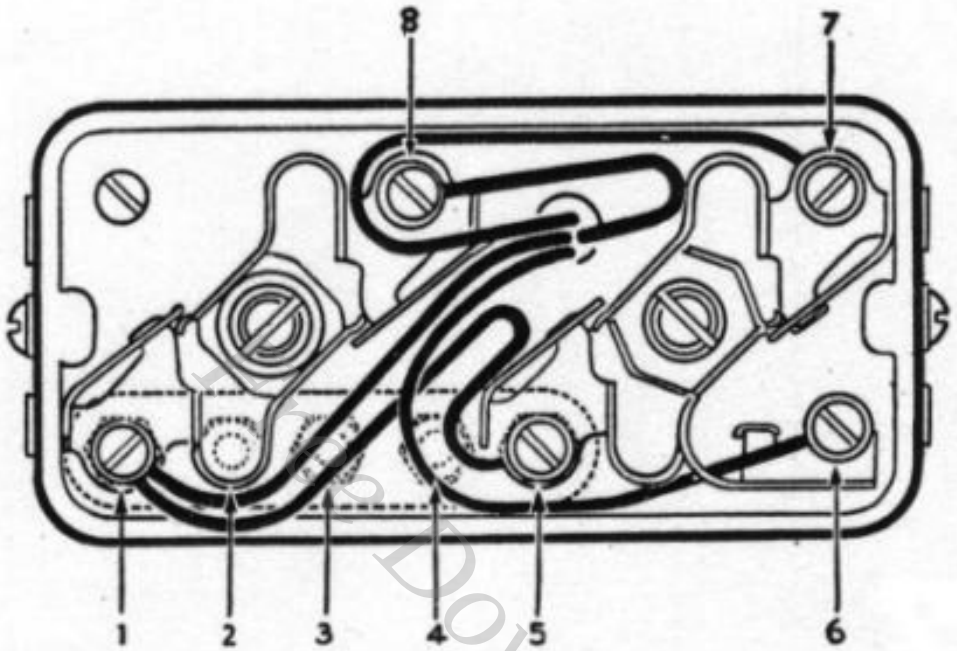
Do not over-lubricate this bearing because excess oil or grease will very likely work out of bearing and some may get onto commutator and brushes.



Illus. 22—Wiring Diagram 45 (750 c.c.) Twin Model

Key To Wiring Diagrams—Illus. 22 and 23

1—Red wires with yellow tracers—one from handlebar light switch, and one from headlamp; 2—Black wires with red tracers—one from handlebar light switch, and one from headlamp; 3—Black wires—one from handlebar horn switch, and one from horn; 4—Yellow wire from battery; 5—Red wires with black tracers—one from handlebar light switch, and one from generator; 6—Red wire from battery, red wire from horn, also wire from No. 9; 7—Black wire from tail lamp,



(Illus. 24)

21.00 (350 c.c.) Single Model Ignition and Light Switch (Top view with cover removed)

Note—30.50 (500 c.c.) model electrical equipment and wiring (Illus. 23) apply also to the 21.09 (350 c.c.) model, excepting switch connections as indicated in Illus. 24 and described below, and ground connection at negative terminal of battery (grounded directly to frame with short wire, unless ammeter is attached).

1—*Internal connection only*—Red wire from battery, and black wire from No. 5; 2—*External connection only*—Red wires with yellow tracers—one from handlebar light switch, and one from headlamp; 3—*External connection only*—Black wires with red tracers—one from handlebar light switch, and one from headlamp; 4—*External connection only*—Green wire from horn, and black wire from handlebar horn switch; 5—*External connection*—Red wire from horn. *Internal connection*—Black wire from No. 1; 6—*External connection*—Red wire with black tracer from handlebar light switch. *Internal connection*—Yellow wire from generator terminal marked "switch"; 7—*External connection*—Terminal for extra equipment (speedometer lamp, spot lamp, etc). *Internal connection*—Black wire from tail lamp; 8—*Internal connection only*—Green wire from ignition coil

Generator Charging Rate

A maximum charging rate of about 4 amperes, as indicated by ammeter (with regular equipment lamps lighted) is the standard factory setting. This should be sufficient to keep battery in a good state of charge under normal service conditions. At average driving speeds, the charging rate is about the same with lights either ON or OFF, because, when lighting switch is turned ON, the generator output is automatically boosted enough to take care of the standard lighting equipment. The charging rate can be re-adjusted higher or lower as desired to meet unusual service conditions, but bear in mind, that a higher than normal charging is likely to overcharge, overheat, and damage battery.

When it is found necessary to re-adjust charging rate, proceed as follows: Remove generator end cover, and loosen screws that hold the regulating brush (small brush) plate assembly to generator frame. Then, shift regulating brush *to the right,* to increase charging rate—*to the left,* to decrease charging rate. Shift brush only a little at a time, until desired maximum charging rate is obtained.

It is advisable to have generator re-adjusting done at a Harley-Davidson service station.

If Generator Stops Charging

1. Inspect brushes and commutator. See that brushes are not worn short and held away from commutator by brush stops. They must seat firmly on commutator. If oil or grease has worked out of bearing and onto commutator, wipe it off with a rag moistened with gasoline and clean it out from between segments with a knife point.

2. See that the short wires that connect brushes with spring retainers are not broken, and that other generator wiring connections are tight.

3. Inspect relay switch (see "The Relay Switch").

If these inspections show everything apparently all right, but the generator still refuses to charge, take motorcycle to a Harley-Davidson service station and have generator tested.

The Relay Switch

The relay switch 12 (Illus. 22 and 23) mounted directly in front of battery case on the Single model, and on crank case at base of rear cylinder on the 45 (750 c.c.) Twin model, automatically opens and closes the generator-battery circuit, at the proper time. When the generator is turning fast enough to produce current, the relay contacts automatically close and connect the generator in circuit with the battery and other electrical equipment. When the motor is stopped, or at any time when the generator is not producing current, the relay contacts open and disconnect generator from the circuit; this prevents the battery discharging through generator. The relay operates at about 15 miles per hour. It is entirely automatic in operation and requires no periodic attention.

The relay is connected in the generator-battery circuit as follows: A red wire from positive post of battery is connected to relay terminal marked

"BAT." Black wire from generator terminal marked "Relay" is connected to unmarked relay terminal.

The relay has absolutely nothing to do with ignition circuit, or starting and stopping of motor. The ignition circuit is controlled by ignition switch on fork triple clamp (see "The Ignition and Lighting Switches").

If relay fails to operate properly, look for one of the following troubles:

CAUTION—When necessary to inspect relay, remove cover carefully to avoid disturbing the adjustments of fittings inside. Use a screw driver to pry cover loose, then pull it straight off.

1. Wires leading from battery and generator must be correctly connected to relay, as explained above and shown in Illus. 22 and 23.

2. Inspect for loose wiring connections at relay and battery terminals.

3. The relay must be grounded to frame to operate; therefore, see that its base is securely clamped to mounting.

4. The proper gap between relay contact points is .015 to .025 inch. This adjustment is made by bending the stop above contact blade.

If, after making these inspections, relay still does not function properly, have it inspected and tested at a Harley-Davidson service station. Also have the generator tested, see "If Generator Stops Charging."

The Ammeter

The ammeter in switch panel indicates whether battery is being charged or discharged, and at what rate. When the indicator registers to the right of center (o) the battery is being charged—to the left of center (o) a discharge is being drawn from battery. The graduations on ammeter dial indicate the rate of charge or discharge, which varies with driving speed. Should the ammeter fail to indicate charge at average or fast driving speeds, see "If Generator Stops Charging."

NOTE—The 21.09 (350 c.c.) Single model does not include an ammeter; however, one can be attached.

The Ignition and Lighting Switches

The switch box, mounted on fork triple clamp, houses both the ignition switch and the main lighting switch. The left hand switch is for ignition and the right hand switch is for lights. To operate either switch, insert key and turn lever as per the markings on panel. Switch levers may be turned either way and all the way around without damage to switch.

CAUTION—Ignition switch must be turned to one of its OFF positions when motor is not running; otherwise, battery will be discharged through the circuit breaker points.

After main lighting switch has been turned ON, headlamp can be "dimmed" (beam tilted downward) whenever desired, by means of thumb switch on right handlebar. Push thumb switch upward for "bright" and downward for "dim."

Turning lighting switch lever to PARK, lights the tail lamp and also permits lighting the switch panel lamp; but headlamp is not lighted. The

switch panel lamp is directly controlled by a lever at its base; however, it can be lighted only when main lighting switch is at either PARK or ON position.

**NOTE*—The 21.09 (350 c.c.) single model has no switch panel lamp.

Switch box must be securely clamped to fork triple clamp, for it is necessary that it be grounded. If switch is not grounded, the entire electrical system is disabled.

To get at internal wiring connections or inspect switch contacts, remove switch levers and switch box cover. Switch levers can be lifted off after removing a small screw in each lever. A screw at each end and one at the rear secure the cover. To make wiring connections at switch, see wiring diagrams on pages 32 to 34.

To Adjust Headlamp

To get the greatest efficiency from headlamp and to meet the requirements of the law, adjust as follows: Adjustments must be made in a darkened room or at night. Have machine standing on a level surface about 25 feet away from, and headed toward a wall or screen upon which a horizontal line has been drawn at exactly the same height as lamp center.

After removing lamp glass (lens), turn main lighting switch ON (handlebar thumb switch must be in upward position) and focus lamp by turning adjusting screw in back of lamp to right or left as may be necessary to make the light appear smallest and brightest on wall or screen. When focusing is completed, replace lamp glass. The main beam of light should now appear as a horizontal band, free from dark spots.

Next, check the adjustment of lamp as to direction of light beam. Motorcycle must be resting on both wheels and front wheel must be in straight ahead alignment. The top of main beam of light should register on wall or screen even with, but no higher, than the horizontal line mentioned above. After loosening the lamp clamp nut underneath lamp bracket, lamp can be tilted up or down to properly aim it in relation to horizontal line, and at the same time can be turned right or left to direct beam of light straight ahead.

Light Bulbs

The standard lighting equipment requires the following sizes and types of bulbs: Headlamp bulb, *2 filament, 32-21 candle power, double contact* — Tail lamp bulb, *3 candle power, single contact* — Switch panel lamp bulb, *3 candle power, double contact.*

To Adjust Horn

Ordinarily, the horn as originally adjusted will give satisfactory service for a long time before re-adjustment is required. To re-adjust, loosen lock nut on adjusting screw on back of horn, and turn adjusting screw to right or left as necessary to give desired tone. Change the adjustment only a little at a time, tightening the lock nut and testing tone after each change. If unable to obtain satisfactory re-adjustment, consult the nearest Harley-Davidson or Remy service station.

Circuit Breaker Points

Clean points with a tungsten point file or a piece of fine sandpaper, when hard starting or misfiring indicates the need of cleaning.

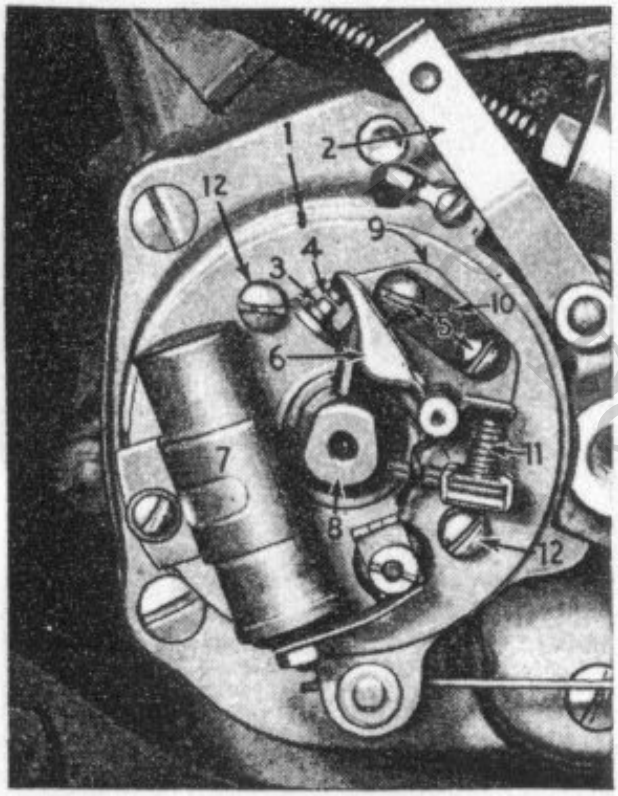
Correct point gap —.020 to .024 inch; re-adjust as follows:

Turn motor until circuit breaker cam is holding points at their widest opening.

45 (750 c.c.) Twin model, Illus. 25—loosen screws 5 and shift point 3 as necessary.

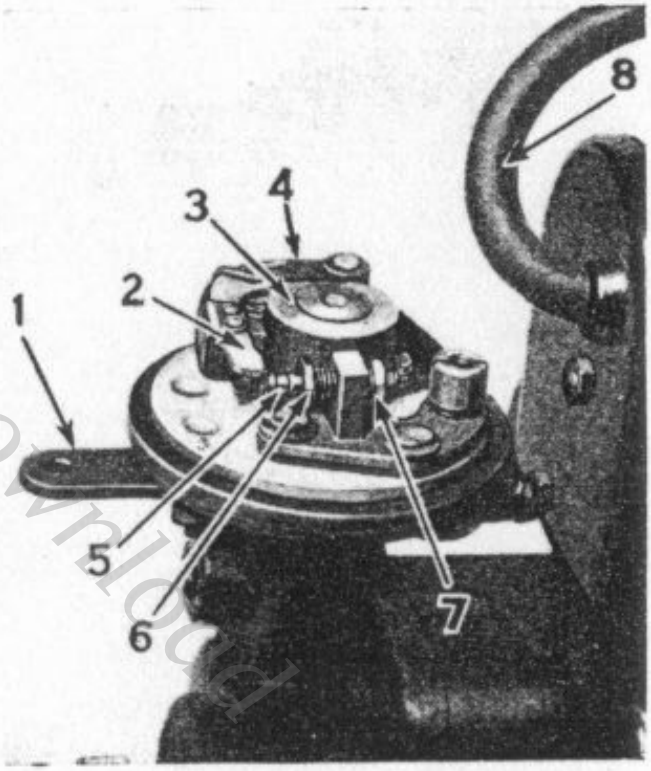
Single model, Illus. 26 — loosen lock nut 7 and turn adjusting screw 6 as necessary.

Securely tighten lock screws or lock nut, after adjustment is completed.



Illus. 25
Circuit Breaker and Timer Assembly

1—Mark indicating original timing; 2—Breaker cover retainer; 3—Adjustable contact point; 4—Breaker lever contact point; 5—Contact point adjustment lock screws; 6—Breaker lever; 7—Condenser; 8—Circuit breaker cam; 9—Adjustable contact point plate; 10—Contact point plate spring washer; 11—Breaker lever spring; 12—Circuit breaker and timer assembly clamp screws.



Illus. 26—Circuit Breaker
Single Model

1—Spark advance and retard lever; 2—Circuit breaker lever; 3—Circuit breaker cam; 4—Circuit breaker lever retaining spring; 5—Circuit breaker points; 6—Adjustable contact screw with which the gap between the points can be adjusted; 7—Adjusting screw lock nut; 8—Spark plug cable.

Starting Motor with a Discharged Battery

If battery is completely discharged or disabled, but generator is in good condition, it is possible to start motor as follows:

Disconnect the wire attached to negative terminal of battery, turn ignition switch ON, set transmission in second gear, and release the clutch. Then get towed, coast down hill, or push motorcycle and after it is in motion, engage clutch. With motorcycle moving fast enough to start generator charging, motor will start. *After motor starts, connect wire to negative terminal of battery; otherwise generator may be seriously damaged.*

Care of Storage Battery

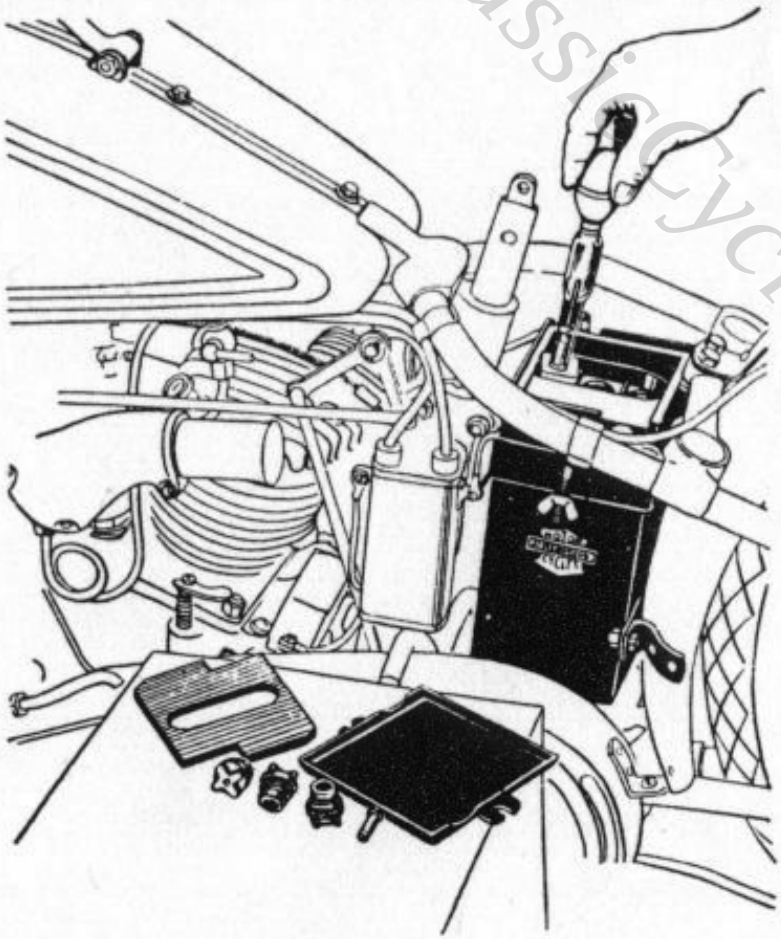
The care given a battery determines its life much more than the amount of time and miles in service. Don't neglect it.

1. Inspect battery every week. Add pure distilled water as often as necessary to keep the solution above the plates. (See "To Add Water To Battery".)

2. Remove battery and have it given a charge from an outside source. when the hydrometer shows that this attention is needed. (See "Use of Hydrometer".) Allowing battery to remain in a discharged condition for any length of time shortens its life.

3. Keep battery clean, and terminal connections tight. Apply a little petroleum jelly (vaseline) to battery terminals occasionally to prevent corosion from forming on terminals and their wiring connections. If terminals and their connections should become corroded, scrape them clean and bright before applying vaseline.

To Add Water To Battery



Illus. 27
Adding Water to Battery

Motorcycle should be standing on a level surface when adding water to battery—if a solo motorcycle equipped with "Jiffy Stand," do not have it leaning against stand.

Remove saddle clevis pin and raise saddle; then loosen wing nuts, at top of case, and remove case cover and rubber mat. Take out the three screw-in filler plugs, and with a hydrometer or syringe (Illus. 27.) add enough water to each cell to raise the level of the solution about ⅜ inch above the plates and separators.

CAUTION: If filled to a higher level, some of the solution will be forced out through vent holes when battery is charging. This will damage battery case and ruin its enamel.

To Remove Battery

The battery can be lifted from case, after raising saddle, removing case cover, and disconnecting the terminal wires.

Do Not Add Acid

Only the water evaporates from battery solution. No acid should be added, except in case some of the solution has been spilled out. In that case, the amount of acid necessary to balance the solution can be determined only by a competent battery repairman.

Use of Hydrometer

The hydrometer reading indicates the state of charge of a battery. Take a reading of each cell occasionally, *just before adding water.* After reading is obtained, return the solution to cell from which it was taken. 1.275 or above indicates full charge; 1.200 to 1.225 indicates half charge; 1.150 to 1.175 indicates discharged. If hydrometer readings repeatedly indicate that battery is in a low state of charge, adjust the generator to a higher charging rate, see "Generator Charging Rate." It is also advisable to have battery fully charged from an outside source. If the generator, even when adjusted for higher than normal output, doesn't keep battery in a fair state of charge, have an inspection made at a Harley-Davidson service station to determine just what may be wrong.

Charging From An Outside Source

Charging from an outside source requires a special device to control the charging current. When your battery needs charging, take it to a Harley-Davidson service station or some other reliable battery service station.

Normal Charging Rate 2 Amperes

When charging a battery from an outside source, the charging rate is constant and should not be allowed to go over 2 amperes. A higher rate will heat and damage the battery. *CAUTION—Therefore, don't allow your battery to be charged in the same line with automobile batteries, at a high charge rate.*

Winter Care of Battery

A battery must be kept in a fair state of charge in cold weather, because of the danger of damage by freezing. A fully charged battery will not freeze, but a fully discharged battery is very likely to freeze. A frozen battery is worthless and beyond repair. Take hydrometer readings often, and check them against the table of freezing points below:

Specific Gravity	Freezing Point
1.150 discharged	16° F. (above zero)
1.215 half charged	— 4° F. (below zero)
1.275 fully charged	—56° F. (below zero)

When Adding Water in Winter

Do not add water to battery while motorcycle is idle, for water may freeze before it is mixed with solution. When necessary to add water, always do it just before starting for a ride, so water will be thoroughly mixed with solution.

Winter Storage

If a motorcycle is taken from service for more than a month, remove battery, have it fully charged, and store it in a cool, dry place. While battery is out of service, have it given a freshening charge at least every two months. Inspect it occasionally to see that solution is above the plates.

SUMMARY OF MOTOR TROUBLES AND THEIR CAUSES

The following information will serve as a guide when trying to locate the trouble in a motor that doesn't start or run right.

Missing at High Speed

Missing at high speed is usually due to poor carburetion—carburetor not properly adjusted or some of the vital parts loose or worn out; however, it may be due to any one of the following causes.

Defective spark plugs—porcelain cracked, point gaps adjusted wrong, or fouled and in need of cleaning. Try new plugs.

Gasoline not getting to carburetor due to pipe being clogged with dirt, or overheated and vapor locked from being bent against or too close to cylinder.

Air vent (small hole) in gasoline filler cap plugged.

Sticking valves, due to carbon in valve guides.

Broken or weak valve springs.

Valve tappets improperly adjusted. See page 15.

Circuit breaker points out of adjustment. See page 38.

Circuit breaker points worn badly.

Insufficient breaker lever spring tension.

Defective ignition coil.

Faulty condenser.

Discharged or broken down battery.

Loose wiring connections around battery, generator, ignition coil or circuit breaker.

Chafed or poor insulation on wiring, causing a short circuit.

Missing at Low Speed

May be due to any one of the causes described under "Missing at High Speed," but more likely due to one of the following:

Loose manifold connections.
Carburetor throttle shaft badly worn.
Carburetor loose on manifold or cylinder.
Leaky cylinder head joints.
} .....Causing air leaks.

Spark plugs fouled, or their gaps improperly adjusted. See page 3.

Carburetor adjusted too lean or too rich.

Too much oil in crank case.

Poor compression, due to condition of piston rings and valves.

If the Motor Refuses To Start

Failure to start is likely due to one of the following causes:

Compression release lever in wrong position (Single model only, see Illus. 2).

No gas in tank, or gas not getting to carburetor.

Carburetor loose on manifold or cylinder.

Carburetor adjusted too lean.

Fouled spark plugs; clean and adjust.

Defective spark plugs; try new plugs.

No spark; see if spark will jump from ends of plug cables.

Dirty, worn out, or improperly adjusted circuit breaker points.

Storage battery discharged; see if lamps will light.

Storage battery disconnected; look for loose wiring connections or broken wires; crank motor with ignition switch ON and see if ammeter indicates discharge, as it should, when circuit breaker makes contact.

Switch box not grounded. See page 37.

Damaged insulation on wiring causing a short circuit. (Ammeter would indicate heavy discharge).

Defective ignition coil.

Faulty condenser.

Valves or ignition timed wrong.

Clutch slips and prevents motor from being turned.

It is impossible to turn the motor over with the starter, the trouble may be that the motor has been run without enough oil, until the pistons or piston rings have become seized in the cylinders.

See if you can locate any of the faults mentioned under "Missing at High (Low) Speed."

If the Motor Shows Loss of Power and Overheats

Overheating and loss of power are likely due to one of the following causes:

Spark lever does not advance all the way.

Improper carburetor adjustment; probably adjusted too lean.

Excessive carbon deposits in combustion chambers.

Poor compression due to bad valve seats, worn out piston rings, or scored cylinders.

Weak valve springs.

Valve tappets not adjusted properly, probably too close.

Defective spark plugs.

Clutch slips or brake drags.

A poor grade of lubricating oil being used.

Either too much or not enough oil in crank case; drain and give fresh supply. See page 11.

Bad air leak around carburetor, manifold or cylinder head joints.

Muffler clogged; clean the outlet. See page 30.

Valves or ignition improperly timed.

Back Firing or Popping in the Carburetor

Motor not sufficiently warmed up.

Carburetor choking device set in running position too soon after starting.

Carburetor adjustment wrong; mixture too lean.

Inlet valve tappets adjusted too tightly.

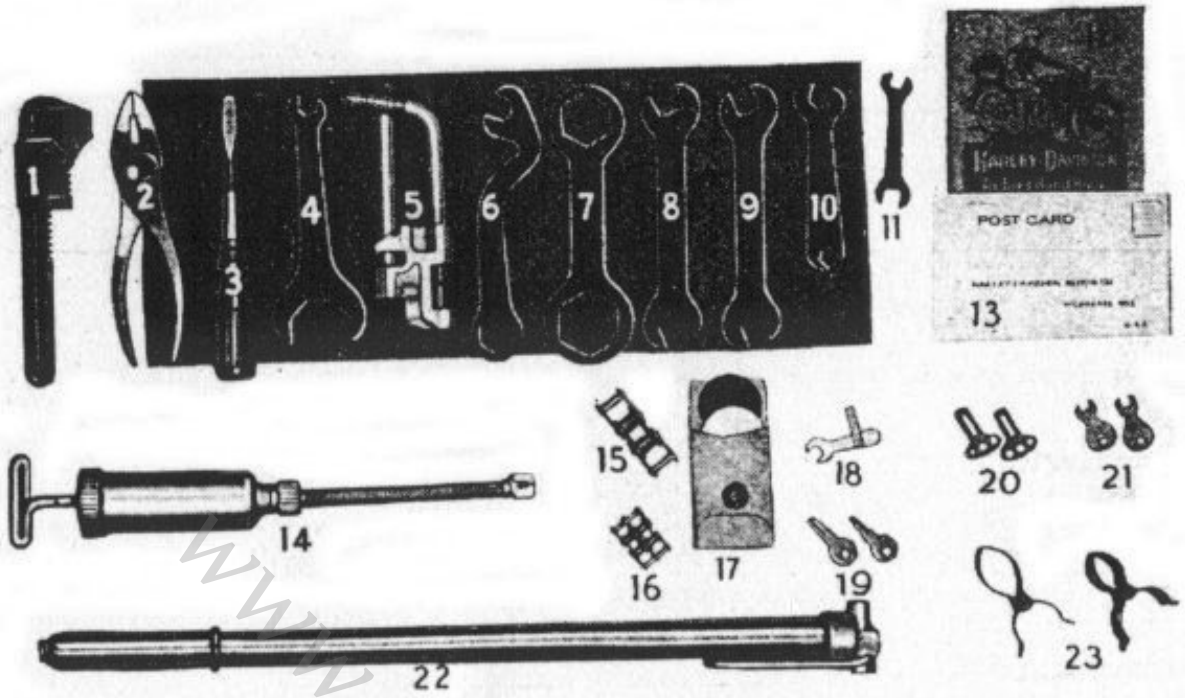
Exhaust valve tappets adjusted too loosely.

Weak inlet valve springs.

Faulty ignition or ignition timed wrong.

Muffler clogged.

Circuit breaker points too close.



Illus. 28—Tool Kit Furnished with New Motorcycle

1—Monkey wrench; 2—Pliers; 3—Screw driver; 4—Wrench for valve spring covers, valve tappets, and various small nuts; 5—Chain repair tool; 6—Wrench for cylinder nuts and rear wheel axle nuts; 7—Spark plug wrench; 8—Wrench for transmission clamp nuts and other nuts; 9—Wrench for cylinder head and base nuts, front wheel axle nuts, motor clamping nuts, transmission adjusting screw, transmission filler plug, rear wheel axle adjusting screw lock nuts, and several other bolts and nuts; 10—Wrench for valve tappets, also fits various small nuts; 11—Wrench for rear wheel axle adjusting screws, also fits various small nuts and bolts; 12—Rider's Hand Book; 13—Registration card; 14—Alemite gun; 15—Double repair link for rear chain; 16—Double repair link for front chain; 17—Tire patches; 18—Circuit breaker point adjusting screw wrench, furnished with Single models only; 19—Steering head lock keys, all models excepting the 21.09 (350 c.c.) single; 20—Ignition and light switch keys; 21—Tool box keys; 22—Tire pump; 23—Tire pump clips.

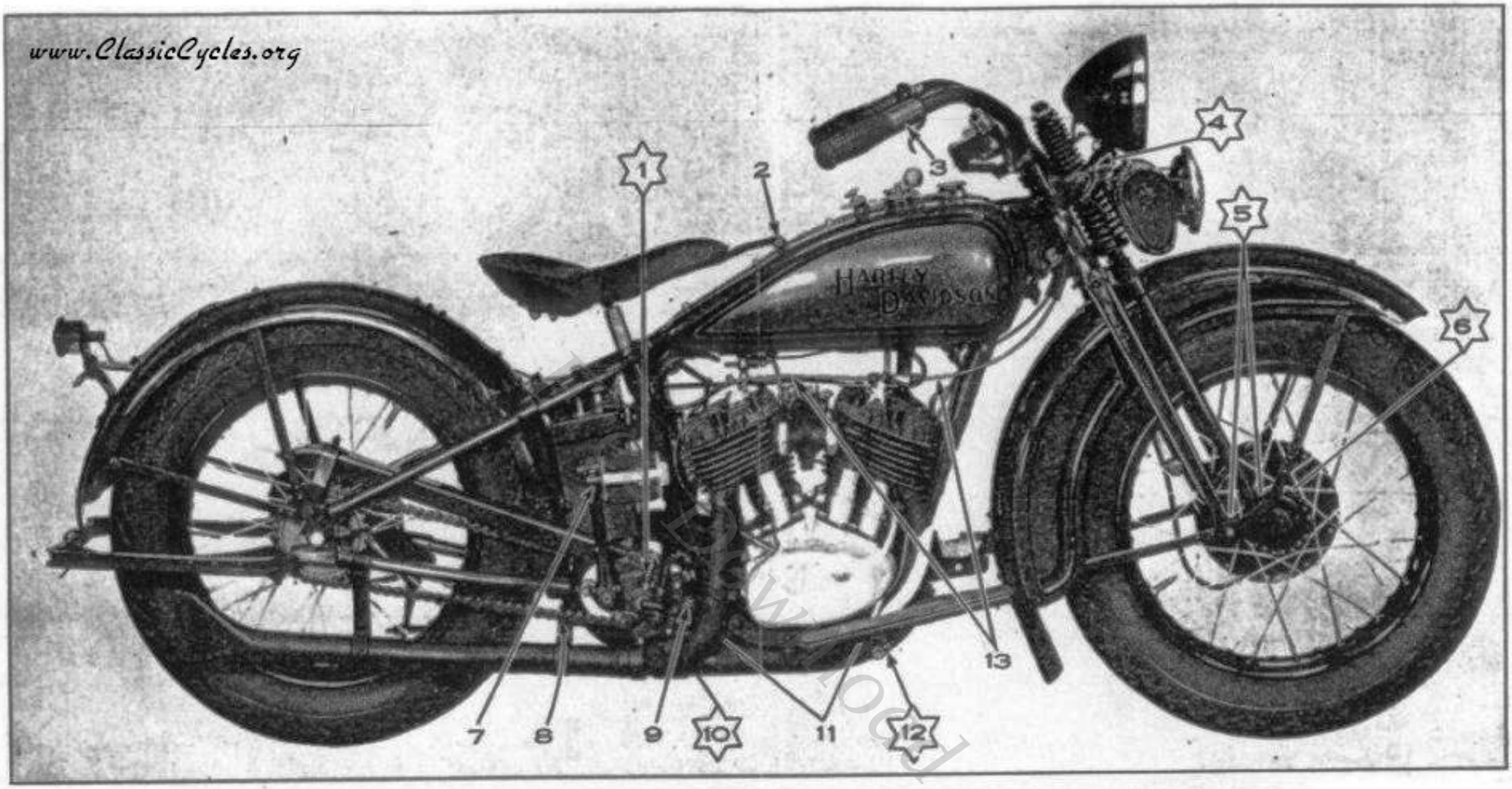
Greasing Motorcycle

Illus. 29
Filling Alemite Gun

All bearings best lubricated with grease are fitted with Alemite grease gun connectors. A grease gun is furnished with each motorcycle. Lubricate as per charts on following pages.

There are 18 Alemite connections on the 45 (750 c.c.) model—19 on 30.50 (500 c.c.) model —16 on 21.09 (350 c.c.) model. Their exact locations are indicated by stars (*) on the lubrication charts. Use 30.50 (500 c.c.) Model lubrication chart as a guide when greasing 21.09. (350 c.c.) Single.

Illus. 29 shows how Alemite gun is filled. If gun connection becomes leaky, renew the leather washer in hook-on connector. Alemite grease can be purchased from any Harley-Davidson dealer.

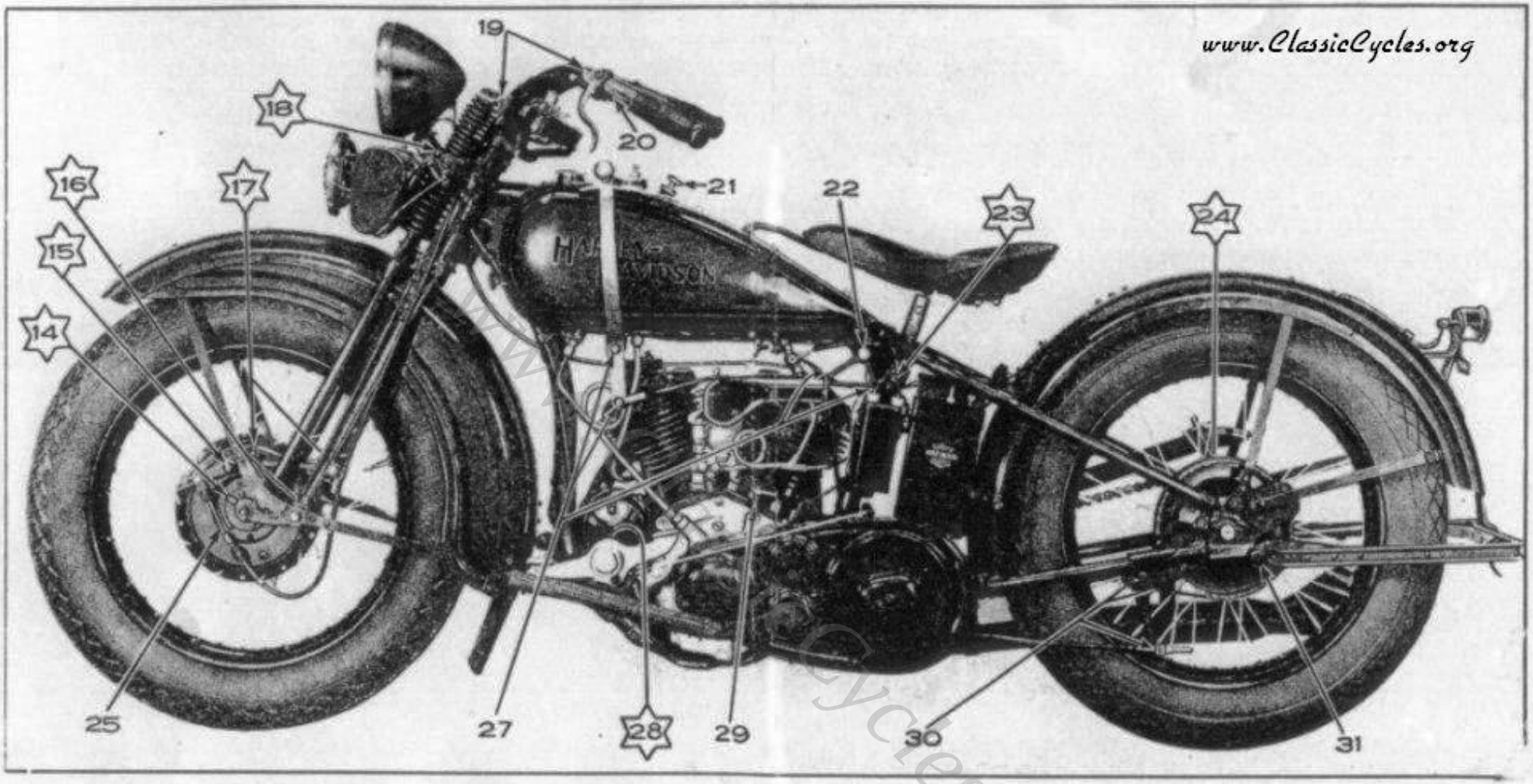


Illus. 30—Right Side Lubrication Chart—45 (750 c.c.) Twin Model *Stars Indicate Alemite Connectors

Lubricate With	No.	Part of Motorcycle
Alemite Once a week—or at 500 mile intervals when this mileage is covered in less than a week	1	Clutch thrust bearing
	4	Spring fork plunger bearing
	5	Fork rocker bearings
Alemite Every two weeks—or at 750 mile intervals when this distance is covered in less than two weeks.	10	Brake shaft bearing
	12	Brake pedal bearing

Lubricate With	No.	Part of Motorcycle
Alemite Every 1000 miles	6	Front wheel hub
Grease ..... Once or twice yearly	3	Right handlebar grip (See page 30)
Harley-Davidson Chain Lubricant Every 1000 miles	8	Rear chain (See page 23)
Motor oil..... Every week	9	Transmission case (See page 20)

Lubricate With	No.	Part of Motorcycle
Motor Oil.....	2	Seat bar hinge
	7	Starter Pedal Bearing
	11	Brake rod joints
Every 500 miles	13	Throttle and oil pump control cable



Illus. 31—Left Side Lubrication Chart—45 (750 c.c.) Twin Model *Stars Indicate Alemite Connectors

·ricate With	No.	Part of Motorcycle
	14	Front brake cover bearing
Alemite a week—or 500 mile in- als when this eage is cov- l in less than eek.	15	Front brake operating lever stud
	16	Fork rocker bearings
	17	Brake shackle bearings
	18	Spring fork plunger bearing
	23	Seat post
Alemite two weeks—at 750 mile rvals when mileage is ·red in less ı two weeks.	28	Clutch pedal bearing

Lubricate With	No.	Part of Motorcycle
Alemite Every 1000 miles	24	Rear wheel hub
Grease ..... Once or twice yearly	20	Left handlebar grip (See page 30)
See page 11	21	Hand oil pump

Lubricate With	No.	Part of Motorcycle
Motor oil	19	Front brake hand lever [illegible] control ca- [illegible]
Every 500 miles	22	Shifter shaft crank bearing
	25	Front brake control cable
	27	Shifter control joints and shifter lever bearing
	30	Brake lever bearings and band connections
Motor oil..... Occasionally	31	Stand hinge bearing
See page 11	29	Crank case drain valve