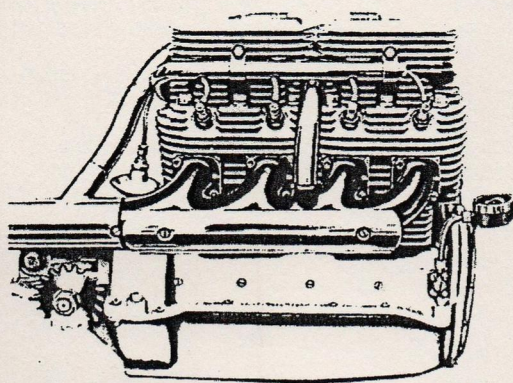
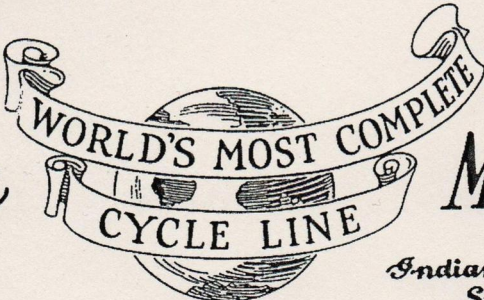


Indian 4

OVERHAUL MANUAL

1938 to 1942



Indian  *Motocycles*

WORLD'S MOST COMPLETE
CYCLE LINE

*Indian Motorcycle Company
Springfield Mass.*

Year and model	1928-1942 Four
Engine	Inline four-cylinder
1928-1935: overhead inlet valves, side exhaust valves	
1936-1937: side inlet valves, overhead exhaust valves	
1938-1942: overhead inlet valves, side exhaust valves	
Bore and stroke	2 1/4 x 3 1/4 in.
Displacement	77.21 ci, 1265 cc
Bhp	1928-1935: 30 (est.)
	1936-1937: 35 (est.)
	1938-1942: 40 (est.) With special tuning, 50 (est.)
Gearbox	three-speed, hand-shift, sliding-gear
engagement for 2nd, dog engagement for 1st and 3rd.	
Wheelbase	1928-1931: 59 1/2 in.
	1932-1939: 61 in.
	1940-1942: 62 in.
Wheels	1928-1942: 18 in. (early catalog references
were 25 or 26 in. but included tire diameter) 16 in. optional	
for 1940-1942	
Tires	1928: 18x3.85 (catalog called this 25x3.85)
1929-1939: 4.00x18 (early catalog refers to 26x4.00)	
1940-1942: 4.50x18 standard, 5.00x16 optional.	
Suspension	1928-1939: front, leaf spring; rear, rigid
1940-1942: front, leaf spring; rear, coil springs in plunge	
Weight	1928: 385 lb.
	1929-1931: 455 lb.
	1932-1937: 515 lb.
	1938-1939: 532 lb.
	1940-1942: 568 lb.
Mpg	50 (est.)
Top speed	1928-1935: 75 mph (est.)
	1936-1937: 80 mph (est.)
1938-1942: stock, 90 mph (est.); with heavy valve springs,	
polished ports and larger carburetor, 108.43 mph electri-	
cally timed, rider Max Bubeck	

reprint copy 2002

OVERHAUL INSTRUCTIONS FOR 438-442 INDIAN FOUR CYLINDER MODELS

INDEX

	PAGE
SECTION I SPECIFICATIONS	2
SECTION II TO REMOVE ENGINE FROM FRAME	5
SECTION III ENGINE DISASSEMBLY AND REASSEMBLY	7
SECTION IV SERVICING CRANKSHAFT, CLUTCH AND TRANSMISSION	14
SECTION V CLUTCH AND CLUTCH ASSEMBLIES	20
SECTION VI TRANSMISSION	27
SECTION VII CARBURETOR	29

SPARK PLUGS:

Indian Spark Plugs 14MM.

WHEELS:

Wire wheels drop center rims 16" and 18"

TIRES:

18 x 4.00 18 x 4.50 16" and 18"

GEAR RATIO:

Solo - 17 tooth motor sprocket
43 tooth rear sprocket

Sidécarr - 15 tooth motor sprocket
43 tooth rear sprocket

MOTOR:

Cylinders - "L" head cast iron

Heads - Aluminum alloy deep finned
Intake valves in head

Pistons - Cam ground Lynite pistons

Rings - 2 Compression Rings 1/16" wide
2 Oil Control Scraper Rings 3/32" wide

TAPPET CLEARANCES:

Intake tappet clearance - Cold motor .002
Exhaust tappet clearance - Cold motor .006

PISTON CLEARANCES:

Top land .026
Second & third land .022
Fourth land with small oil return holes .075
Piston skirt .005 - .006
Piston ring groove clearance .002 - .004
Piston ring end gap clearance .010 - .015

Two oil control rings assembled on piston with bevel towards top of piston.

OTHER CLEARANCES:

Piston pin in the piston	.0005 - .001
Spark advance	5/8" - 45°
Valve seat degree	45°
Cam shaft end play	.005
Crankshaft end play	.003
Connecting rod side play on crankshaft	.001 - .002
Transmission drive shaft end play	.004 - .008
Transmission Countershaft Gear end play (Spool gear)	.002 - .005
Bevel gear back lash	.005 - .006
Cam shaft bushing clearance	.0015 - .002
Piston pin clearance in rod	.0015 - .002
Connecting rod lower bearing clearance	.0015 - .002
Crankshaft bearing clearance	.0015 - .002
Spark plug gap	.025 - .030
Breaker point gap (distributor)	.018 - .020
Breaker point gap (magneto)	.015

VALVE TIMING:

Inlet opens 12° (.033) before top center
 Inlet closed 60° (.650) after bottom center
 Exhaust opens 60° (.650) before bottom center
 Exhaust closes 8° (.013) after top center

SECTION II

TO REMOVE ENGINE FROM FRAME

A. REMOVE GAS TANKS

(Clean the oil and dirt off the entire machine before starting work.)

1. Remove instrument panel on top of tank.
2. Disconnect gasoline line at tank.
3. Disconnect wires from coil.
4. Remove the three tank bolts.
5. Take tanks off frame.

B. REMOVE CARBURETOR

1. Remove gasoline line at carburetor.
2. Remove air cleaner from carburetor.
3. Disconnect control at throttle lever.
4. Remove the three nuts from carburetor and manifold studs.
Take off carburetor. If gasket is damaged, replace at assembly.

C. REMOVE GENERATOR

1. Disconnect generator wire.
2. Remove belt guard (if magneto ignition).
3. Take out the two bolts at the bottom of generator bracket and remove generator from support bracket.

D. REMOVE IGNITION WIRING

1. Remove spark control cable.
2. Disconnect spark plug wires at plug and at distributor (remove distributor cap with wires attached).
3. Take wires and housing from motor.
4. Take out the four spark plugs.

E. REMOVE ROCKER BOX COVERS AND TAPPET BOX COVER

1. Take out the cap screw in each rocker box cover.
2. Slide off both rocker box covers.

3. If gaskets are damaged, replace with new gaskets at assembly.
4. If felt pads in housings are dry or hard, replace with new felts soaked in oil at assembly.
5. Remove exhaust valve tappet box covers.
6. If gaskets are damaged or leak, replace with new gaskets at assembly.

F. REMOVE EXHAUST MANIFOLD

1. Remove tail piece from exhaust manifold.
2. Take off the eight nuts from exhaust manifold and disconnect manifold heater bypass valve control.
3. Slide exhaust manifold off cylinder studs and remove inlet manifold heater pipes from motor.
4. If manifold gaskets are burned or damaged, replace at assembly.

G. REMOVE INTAKE MANIFOLD AND SHIFTING ROD

1. Take off inlet manifold.
2. Remove gear shifting rod from hand shift lever and gear box lever.

H. REMOVE BATTERY AND BATTERY CRADLE

Remove the following parts:

1. Battery and Cradle
2. Kickstarter Crank
3. Chain and Chain Guard
4. Brake Pedal and Spring
5. Oil Pressure Gauge
6. Clutch Pedal and Rod
7. Four Motor Base and Frame Bolts

I. REMOVAL

1. Straddle machine and slide motor forward off the base pads. Lift motor free of frame and rotate to the right 45° angle and slide out of frame, front end of motor slightly in advance of rear. (Install motor by reverse action.)

SECTION III

ENGINE DISASSEMBLY AND REASSEMBLY

A. REMOVE CYLINDER HEADS

1. The cylinder heads may now be removed using special head wrench with extension socket to take out the nine head bolts in each twin cylinder head, front and rear.
2. Mark head gaskets front and rear.
3. Clean carbon from combustion chamber and valve pockets.

B. REMOVE INLET VALVES

1. Take off valve spring collar and taper keys from valve stem.
2. Remove valve spring and check for free length (2-3/16" new spring). If old spring free length measures 2" or less, replace with new spring.
3. Mark with pointed punch intake valve heads, starting at front cylinder.

C. REMOVE ROCKER ARMS

1. The intake valve rocker arms operate on needle bearing. (21 needles to each rocker bearing.)
2. If rocker arm bearings are loose with up and down play in bearing, remove bushing bolt and replace needles and center bushing in rocker arm. It may be necessary to replace rocker arm.
3. When assembling rocker arm and needle bearings in rocker bracket, check rocker for side play. There should be .002 clearance between rocker and clevis with center bushing clamped tight in clevis.

NOTE: Center bolt must be tight in clevis. Too much side play will cause a rocker arm click noise. If thrust washers are worn on sides, replace with new washers.

D. REMOVE VALVES AND VALVE GUIDES

1. Remove intake valves.
2. Clean carbon off valve and heads.
3. If intake valve stem or valve seat face is worn, replace with new valve and grind in with light pressure.

NOTE: Lift valve often while grinding with valve grinding compound.

E. REMOVE INTAKE VALVE GUIDE

1. Place cylinder head in boiling water or on electric or gas plate until heated to approximately 212° F.
2. Press out old valve guide while head is hot.
3. Replace with new guide.
4. Oil valve stems and guides and reassemble.

NOTE: Always reface valve seat in head after replacing guides. The inlet valve seat is 45°. Bronze inserts must be tight in aluminum head.

F. REMOVE CYLINDERS AND PISTONS (WITH HEADS OFF)

1. Pull out intake push rods and mark 1 to 4 starting with front cylinder push rod. Mark push rod with a light file mark, so that rods may be assembled in their position.
2. Rotate motor so that No. 1 and 2 pistons are equal distance in No. 1 and 2 cylinder blocks.
3. Disconnect generator or magneto drive shaft coupling.
4. Remove generator or magneto from motor base pad with brackets attached.
5. Take out two bolts under motor base pad. Note shim under bracket.
6. Remove cylinder base nuts, using flexible socket wrench with extension.
7. The two nuts in the valve tappet compartment.
8. Lift front cylinder block up, tilting block towards valve side and slide block up and off pistons.
9. Repeat same method on rear cylinder block to remove.

NOTE: Be careful that valve push rods do not slide out of guides in block; best to keep them placed in their assigned places. Mark push rods and guides if removed.

10. If cylinder base gasket is damaged or leaks, replace with new gasket.

G. REMOVE VALVES

1. Remove valve collars and taper keys.
2. Slide valves out and mark valves 1 to 4 so they may be assembled in original cylinders, - a light prick punch mark on head of valve while in cylinder, thus -- 2 marks, 3 marks and 4 marks. (If exhaust valve seat is burned or stem worn, fit new valve.)

H. REMOVE VALVE GUIDES

1. If valve guides are worn, remove and replace new guides. Use punch with pilot so as not to damage guide hole.
2. Clean carbon out of tappet box and valve ports.
3. Reseat cylinder valve seat 45° . If valve face is pitted, reface to 45° .
4. Grind valves into cylinder seat.

NOTE: Use light pressure, rotate valve and lift often to flow grinding compound under seat surface. Be sure to clean all compound from cylinder and valve.

5. Oil valve stem and guide and assemble.
6. Check valve springs for length; refer to intake valve springs. (Same valve spring used on intake and exhaust valves.)

I. REMOVE PISTONS AND RINGS

Remove pistons

1. Tap wrist pins thru piston and connecting rod bearing.

NOTE: A lock ring in a groove in connecting rod bearing locks around the groove in the center of wrist pin, holding the wrist pin in location. A tap on wrist pin opens this spring ring lock out of the groove around wrist pin, allowing pin to slide thru piston. Hold hand pressure against side of piston to support force of blow when tapping pin out.

2. Mark pistons 1 to 4 so that they may be assembled to original cylinders. Put mark on top of piston at valve side.
3. Remove piston rings.
4. Clean carbon off piston.
5. Break an old ring in two -- use broken end to clean carbon from ring grooves in piston, being careful not to nick ring grooves.
6. Clean out oil return holes in piston.

J. PISTON RING ASSEMBLY

1. Two $1/16$ " compression rings and two $3/32$ " oil control rings are used on each piston. The bevel on oil control rings faces up towards top of piston.
2. Fit piston rings about halfway down cylinder bore.

3. End gap clearance .010 to .015.

4. Piston ring groove and ring clearance .002 - .004.

K. PISTON CLEARANCE

1. Piston and cylinder clearance .005 to .006.

2. Standard bore 2-3/4" or 2.750. Standard piston 2.644 giving skirt of piston .006" clearance under the cylinder bore.

3. Measure piston across thrust face of skirt.

NOTE: When thickness gauge is used with piston in cylinder feeler gauge should be inserted between thrust side of piston and cylinder wall, with piston in running position in cylinder.

4. Cylinders may be honed to accept oversize pistons. Piston sizes oversize - .005 - .010 - .020 - .030 semi-finished pistons to .060 oversize.

L. PISTON PIN FIT

1. Free slide fit in connecting rod.

2. Free sliding thumb press fit in piston.

3. Piston pin size is 11/16" standard, with .002 - .003 - .005 - .010 - .015 - .020 oversize for replacement.

M. ASSEMBLING PISTON TO CONNECTING RODS

1. Start pin one side of piston.

NOTE: Wrist pin is beveled on either end.

2. Place piston over rod, start pin in rod until it strikes the lock ring.

3. Rotate wrist pin until lock ring centers in its groove and beveled end of wrist pin has started true in lock ring.

4. Then, with a quick light tap with hammer, drive wrist pin thru piston.

5. Check the wrist pin for central location in center by pushing wrist pin both ways in rod, making sure spring lock ring is in the groove around center of wrist pin.

N. ASSEMBLE CYLINDERS

1. With piston and rings assembled on rods, rotate motor until front piston is slightly above the No. 2 piston. Space ring gaps evenly around piston and cover with oil.
2. Take front cylinder block, start No. 1 piston in cylinder first, being careful not to break piston rings. Rotate slightly and start No. 2 piston in cylinder.

NOTE: A piston ring clamp or guide tool makes the operation easier.

3. Slide cylinder block down on motor base studs. Repeat same operation on rear cylinder block. After motor has been run in, check cylinder base stud nuts for tightness.

O. ASSEMBLE CYLINDER HEADS

1. Cracked or burned head gaskets must be replaced.
 2. The six shorter head bolts go on the piston side of head (left side).
- NOTE: Be sure there is a heavy steel washer under each bolt head.
3. Have intake push rods in place of tappets.
 4. Keep push rods separated so they will slide in rocker arm cups when placing head assembly on cylinder.

5. Check push rods so that they are not crossed before bolting head down.

NOTE: Before tightening head bolts, slide intake manifold into place and tighten several intake manifold nuts. This will line cylinder head flanges up with flanges on manifold.

6. With manifold nuts tight, tighten down several cylinder head bolts to hold head in location. This will eliminate breaking ears off manifold flanges.
7. Remove manifold and proceed to tighten all cylinder head bolts evenly around heads. Start with center row of bolts and then alternate bolt tightening on each side of head. Pull head bolts to 55 to 60 foot pounds with torque wrench. Proceed with complete assembly in reverse order of taking apart.

P. IGNITION TIMING

1. If timing gears have been removed, replace according to marks on gears.
2. Reassemble generator and distributor to motor if distributor and generator drive gears have not been disturbed.

3. Rotate motor until piston in No. 1 front cylinder is top dead center compression stroke firing position.

NOTE: Both valves will be on their seats, tappets free, 5/8" spark advance. Assemble generator on motor base.

4. Rotate generator shaft until distributor rotor is pointing at No. 1 spark plug wire. With spark lever in retard position, lever all way back.

NOTE: The breaker points will be ready to open. The holes in hose coupling and generator shaft will line up. Do not tighten coupling bolt and nut so tight as to squeeze coupling out of shape. If hose coupling is torn or damaged, use new coupling.

Q. ASSEMBLE WIRES IN DISTRIBUTOR CAP.

NOTE: Sitting on machine, looking down at the top of distributor, No. 1 front cylinder spark plug wire plugs in the right front hole in distributor cap and clockwise (to the right) the next hole is No. 3 cylinder spark plug wire, the third hole No. 4 cylinder plug wire; the fourth hole No. 2 cylinder plug wire. The hole in center of cap is coil wire. Firing order -1-3-4-2. CAUTION: Always check spark plug wire location from distributor cap to the plugs in cylinders before dismantling ignition equipment. For firing order -1-3-4-2. It is possible to change ignition timing so that No. 1 cylinder plug wire would be in any one of the four holes in cap. If breaker points are timed with any one of the four lobes on cam for No. 1 cylinder and changing the location of plug wires so that rotor and points are timed for their respective cylinders, the motor would fire correctly.

R. TO RETIME DISTRIBUTOR HEAD ON MOTOR (IF REMOVED FROM GENERATOR)

1. Rotate motor until No. 1 piston is 5/8" from top dead center in cylinder on compression stroke.
2. Advance spark control lever.
3. Slide distributor head down in housing ready to mesh with drive gear in generator.
4. Set cam lobe ready to open points with rotor pointing towards No. 1 cylinder spark plug wire block of distributor cap.
5. Tighten binding clamp on body.

NOTE: The points should be ready to open. One or two attempts to mesh with proper tooth may be necessary. A final close setting may be made by loosening advance lever body clamping screw and rotating distributor head slightly to arrive at proper spark setting with breaker points ready to open. Spark may be timed with piston top dead center and with spark retarded.

S. MAGNETO TIMING - EDISON TYPE C -C.D. - R.M.H.

1. Magneto rotates counterclockwise looking at drive end.
2. The distributor rotates counterclockwise looking at distributor end of magneto.
3. Spark advance control lever location (up for advance).
4. Points gap .015.
5. Spark advance $5/8$ ".
6. No. 1 front cylinder spark plug wire plugs into lower right-hand hole in distributor cover.
7. Rotate motor until No. 1 piston (front) is top dead center of compression stroke in cylinder.

NOTE: Both valves will be on their seats.

8. Rotate magneto in direction of rotation until distributor rotor (metal plate end) is pointing to lower right-hand corner of magneto, spark retarded. The points will be open or nearly ready to open. The coupling disc holes will then line up.
9. Insert bolts and nuts and tighten.
10. Assemble distributor cover.

T. TO ASSEMBLE SPARK PLUG WIRES IN DISTRIBUTOR COVER

1. Lower right-hand hole No. 1 cylinder
2. Upper right-hand hole No. 3 cylinder
3. Upper left-hand hole No. 4 cylinder
4. Lower left-hand hole No. 2 cylinder

NOTE: Use same caution on wiring as instructed on distributor ignition.

WIRING ORDER
1-3-4 2



ROTOR

SECTION IV

SERVICING CRANKSHAFT, CLUTCH AND TRANSMISSION

A. DISASSEMBLY

1. Take off tanks, carburetor, battery and bracket, kickstarter, chain and chain guard, brake pedal and spring, oil pressure gauge and exhaust manifold.
2. Drain off from motor base, flywheel and transmission.
3. Remove motor (with cylinders and heads attached) from frame.
 - a. Remove the four motor base and frame bolts.
 - b. Straddle machine and slide motor forward off base pads.
 - c. Lift motor free of frame and rotate to the right 45° angle slide out of frame, front end of motor slightly in advance of rear. (Install motor by reverse action:)
4. Remove lower half of crankcase.
 - a. Place motor on repair stand upside down.
 - b. Remove screws from timing gear cover. Remove cover and gasket.
 - c. Turn motor upside down (as specified in Item 2:)
 - d. Remove 18 screws around motor base flange. Remove oil level gauge stick.
 - e. Lift lower base from upper half, remove gaskets. If gaskets are damaged, replace with new.
 - f. Check cork inserts in lower base, at oil bypass hole and on each side of transmission cover at bearing caps. If dried out replace.

B. DISASSEMBLY OF TRANSMISSION

NOTE: Crankshaft and flywheel cannot be removed from crankcase without first removing transmission gears and clutch release fingers.

1. With motor upside down and standing on the kickstarter side of the motor opposite the camshaft side, the transmission will be on your left. The transmission bearing caps are numbered 1-2-3-4 and near the bearing cap on crankcase corresponding numbers to match. 1 and 4 bearing caps support the gear case main shaft. 2 and 3 bearing caps support the spool gear bearings.

2. Before disturbing No. 1 and 4 bearing caps, check shaft for end play. Use thickness gauge. If more than .008 end play, it will be necessary to install thickness shims back of bronze bushing to reduce excess play. Correct end play .004 to .008.

3. If bushings and shaft are worn, replace with new parts.

C. TO REMOVE TRANSMISSION MAIN SHAFT WITH GEARS

1. Loosen shifter fork and remove.
2. Loosen bearing caps on 1 and 4. Remove caps and lift shaft up and rotate flywheel clockwise to help lift out shaft.

D. BEARINGS

NOTE: Do not remove any bearings, or bearing caps, without first making sure they are marked in such a manner that they may be returned to their exact original positions.

1. With motor upside down and standing at side with transmission at left, number connecting rods and caps 1 to 4 from right to left on side opposite camshaft. In old machines with removable bushings, number upper and lower half bearings near shims towards right. A small file, or center punch will be suitable for this purpose and by removing one-half bearing at a time for marking, there will be no question as to position and location when assembling. Both shims of each bearing should be marked on top toward right, to prevent turning around or over.
2. Standing on same side with transmission to the left, number all main bearing caps from 1 to 6 on side opposite camshaft. The upper and lower half main bearings together with shims should be marked in same manner as described above.
3. Mark transmission bearings and caps in following order. Standing at rear of transmission, number beginning at right main shaft bearing #1, right countershaft bearing #2, left countershaft bearing #3, and left main shaft bearing #4. Mark bearings on right side as before. If for any reason camshaft is removed, make sure and mark center bearing same as main bearings.

E. TO REMOVE CRANKSHAFT

Make sure caps and bearings are marked on side opposite camshaft. The bearings should have a small punch mark on both halves near the shim toward the front of motor.

1. Remove connecting rods.
2. Remove bearing cap stud nuts.
3. Lift off caps and lower half bearing.

NOTE: Shims are reamed with bearings and must be replaced in their original positions. Before removing shims, see that they are stamped in pairs from one to six reading from side opposite camshaft. By pairs, is meant that each bearing has two shims

stamped with the same number, making it easy to replace shims correctly for, if wrong, the numbers would be upside down.

4. Turn shaft until two flywheel bolt nuts will clear flats on bearings.
5. Lift out and remove upper half bearings.

F. TO REMOVE CLUTCH FOR INSPECTION

NOTE: When crankshaft is out for any reason, it is well to disassemble clutch for cleaning and inspection.

1. Hold crankshaft near flywheel in vice, but do not clamp more than one section of shaft, if springing is to be avoided.
2. Remove eight screws in flywheel plate, using "C" clamps to relieve strain on screws.
3. Clutch may now be removed.

G. TO REMOVE CAMSHAFT

1. Remove tappets.
2. Rear bearing is positioned and fitted at the factory, and should not be removed.
3. Remove center bearing set-screw, and bearing halves may be removed one at a time over backs of cams.
4. Remove camshaft gear with gear puller.
5. Take out front bearing set-screw and drive bushing out with $\pm$ brass drift against one of the cams. Use care not to damage shaft.

H. TO ASSEMBLE CAMSHAFT

1. Place front bushing on camshaft and drive bushing into proper position.
2. Turn bushing to align with set-screw.
3. Replace center bearing
4. Install camshaft gear.
5. Tighten and lock nut with cotter pin.

I. INSPECT CRANKSHAFT

1. If badly worn, replace with new shaft.
2. If bearings are more than .001 out of round, true with long strips of emery cloth.
3. Clean shaft thoroughly to remove emery.

J. FITTING OF MAIN BEARINGS

NOTE: Never attempt to take up main bearings by merely reducing the thickness of shims, for breakage of crankshaft, or burned out bearing may result. First, it is necessary to remove crankshaft and scrape upper half bearings until the shaft makes contact with all bearings.

1. All lower half bearings must project slightly (.002" - .003") above bearing cap, in order that cap will tighten bearing securely in case.

K. ALIGN AND FIT MAIN BEARINGS

NOTE: If bearings are badly worn, they must be replaced and fitted to the crankshaft.

1. Clean bearings and crankcase.
2. Assemble upper half bearings with care according to marks and scrape high spots until shaft or test bar makes contact with all bearings.

NOTE: Clutch body should be in place on shaft extension in order to align with shaft bearings.

CAUTION: The bearing scraper should be sharp, and used with care to prevent cutting deep grooves, which would result in loss of oil pressure.

3. Replace shims, numbers up, and in correct position.
4. Replace lower half bearings and caps according to marks and numbers.
5. Righten stud nuts firmly and rotate shaft to locate tight spots.
6. Reduce thickness of shim by moving back and forth across a flat file, to tighten bearing.
7. Scrape high spots if binding.

NOTE: It will be necessary to remove the caps at least two or three times before the work is complete. Bearings and shaft should be dry.

L. FITTING OF BEARINGS IN CASE

1. To best, tap bearings sharply on sides.
2. If loose, file cap a little at a time until cap clamps bearing tightly.

NOTE: New machines are fitted with .0015" - .0025" clearance. When scraping of bearings is finished, the shaft should be absolutely free, but there should be no undue clearance.

M. CRANKSHAFT END PLAY

1. If more than .005", take up with use of special thicker thrust bearing race.
2. Inspect for end play before assembling the clutch.
3. With clutch body and thrust bearings in position on shaft, the end play can be easily determined with a thickness gauge.
4. Make sure the two bronze babbitt lined bearings are in position against flanges before inspecting end play.

N. ASSEMBLE THE CLUTCH, (SEE CLUTCH) --

Section 5 -- Page 20 -- Paragraph E.

O. INSTALL CRANKSHAFT

1. With bearings removed, clean crankcase and oil passages thoroughly. (See oiling system.)
2. Clean and inspect bearings to make sure all oil grooves and holes are free and open.
3. Oil all bearings.
4. Beginning at the front, replace the first four upper half bearings; also clutch upper half bearing.
5. Assemble large thrust bearing in position on clutch shaft.
6. With number five upper half bearing held in place on crankshaft, lower shaft in position in case.
7. Replace shims and lower half bearings with caps.
NOTE: Make sure shims are up to shaft.
8. Tighten stud nuts and lock with wire.

P. FIT CONNECTING ROD BEARINGS

1. File cap.
2. Scrape high spots if tight.
3. Realign if twisted or bent.
4. Assemble on crankshaft.
5. Tighten nuts on bolts, tap lightly with small brass hammer to centralize, then tighten securely and lock with cotter pins.

NOTE: Clearance .001" - .0015".

Q. TO CLEAN AND INSPECT OILING SYSTEM

1. Clean oil screen every 1000 miles with a small brush thru large drain screw opening at bottom of crankcase.
2. Oil suction pipe must be free of dents to provide full volume.
3. Fittings must be tight to prevent air leaks.
4. Never disturb suction pipe unless necessary.

R. INSPECT PUMP GEARS

NOTE: Oil gear pumps are simple in design but must be constructed within very close limits.

1. Should not be more than .002" between gears and pump body cover.
2. Should not be more than .001" between gears and pump body.

S. INSPECT OIL OUTLET PIPE

1. Should have not less than 1/2" clearance between bearing cap, stud nuts and gears.
2. Replace if dented or leaking.

T. INSPECT OIL DISTRIBUTING PIPE

To clean -

1. Remove oil hole sealing screws on outside of crankcase; also plug in front of pipe thru hole in camshaft gear.
2. With compressed air, blow thru all openings, including those at upper half main bearing.
3. Replace plug, and screws with fibre washers and tighten securely.

U. OIL GAUGE

NOTE: Run motor slowly when cold to prevent damage to gauge from excessive pressure. If hand of gauge sticks, or does not return to "0", replace at once. Always have a new gauge in first-class condition to check pressure when in doubt

SECTION V

CLUTCH

A. CLUTCH THRUST BEARINGS

1. Ball raceways must be smooth and free of defects.
2. Balls must have high polish and no rough or flat spots.
3. Retainer must be in good condition and hold the balls in their respective position.

B. CLUTCH RELEASE BEARING

1. Inspect cone for looseness or cracks.
2. Test bearing for smoothness by turning or spinning pressure plate while holding ball cup with hand.

C. CLUTCH BODY

1. Bushing must be tight in body.
2. Ball race should fit securely on bushing extension.
3. Ground hole in bushing must be concentric with body shaft to within .0005.
4. To inspect, place body on crankshaft extension and test it with indicator gauge.
5. Rim of body must clear flywheel by not less than $1/32$ ", and not more than $3/64$ "; to adjust, use special ball race.

D. CLUTCH ASSEMBLIES

(Refer to Indian Service Shot No. 144 also included in this manual beginning on Page 22.)

E. TO ASSEMBLE CLUTCH

1. Place small ball race and ball retainer with balls on crankshaft extension.

NOTE: Oil shaft extension and ball thrust bearing.

2. Assemble body in position on crankshaft.
3. Assemble plates and discs according to Service Shot No. 144.
4. Assemble springs into pressure plate counter-bores and on pins of flywheel plate.

NOTE: The punch mark on flywheel plate should line up when Assembled.

5. In positioning the assembly, (pressure plate, springs and fly-wheel plate), use "C" clamps to compress the springs.
6. After eight screws are tightened securely in place, lock screws by driving a portion of flywheel plate into screw slots with center punch.
7. Test springs to make sure the ends are in bottom of counter-bores.
8. Release clutch by moving release collar back with substantial flat bars, and turn clutch body to see if clutch frees properly.

F. ASSEMBLE CLUTCH RELEASE SHAFT AND FINGERS

1. Oil shaft.
2. Assemble key tight in shaft.
3. Assemble shaft thru bearing in base.
4. Slide notched washer on over shaft key. With spring enter shaft thru right finger.
5. Place left finger in position and slide shaft thru with key lined up with slot in fingers.
6. Space the fingers even on both sides of release bearing and tighten in place, allowing about .015" clearance between release bearing and end of finger pads.
7. Tighten screws.
8. Inspect clearance.
9. Tighten screws securely.

**CLUTCH, PLATE, DISC AND FLYWHEEL ASSEMBLY
INSTALLATION INFORMATION FOR INDIAN FOUR**

(1932-1941 Models)

(Reprinted from Indian Service Shot
No. 144, as of September 25, 1944)

Below are listed all the clutch and flywheel assemblies used for Indian Four models from 1932 to 1941. Assemblies are listed according to model. Any of these complete clutch and flywheel assemblies are interchangeable as a unit assembly in any four cylinder model from 1932 to 1941. "Out-of-stock" parts are no longer available as they can be replaced by parts used in later models.

These assemblies are standard factory equipment on the models listed but may have been changed in the field.

CLUTCH PLATE, DISC AND FLYWHEEL ASSEMBLY

<u>MODELS</u>	<u>PART NO.</u>	<u>NAME AND DESCRIPTION</u>	<u>NO. USED</u>	<u>ORDER OF ASSEMBLY INTO FLYWHEEL</u>
<u>ASSEMBLY #1</u>				
403 to 437 Except 435	35D167	Flywheel	1	
DCC, DCG	35C329	Outer disc (large steel)	5	1,3,5,7,9
DCD, DCF, DCG	35C208	Inner disc (small steel)	4	2,4,6,8
	35C207X (OUT OF STOCK)	Clutch pressure plate assy. (With release bearing) No Raybestos lining required.	1	10
	35D117X	Clutch Flywheel plate assy. (Spring carrier)	1	11

<u>ASSEMBLY #2</u>				
435 ONLY	35D167	Flywheel	1	
DCE ONLY	35C329	Outer disc (large steel)	5	1,3,5,7,9
	35C208	Inner disc (small steel)	4	2,4,6,8
	74751 (OUT OF STOCK)	Clutch pressure plate assy. (With release bearing) No Raybestos lining required.	1	10
	85572 (OUT OF STOCK)	Clutch flywheel plate assy. (Spring carrier)	1	11

<u>MODELS</u>	<u>PART NO.</u>	<u>NAME AND DESCRIPTION</u>	<u>NO. USED</u>	<u>ORDER OF ASSEMBLY INTO FLYWHEEL</u>
<u>ASSEMBLY #3</u>				
438 to 440 DCH, DCI DDO	35D167	Flywheel	1	
	75186	Outer end disc assy. Raybestos lining (#75185) riveted on. Steel disc 7-5/8" outside diameter, 5/32" thick.	1	1
	35C208	Inner disc (small steel)	2	2,4
	35C329	Outer disc (large steel)	1	3
	75183 (AVAILABLE)	Clutch pressure plate assy. (With release bearing) Raybestos lining (#75185) riveted on. 7-5/8" outside diameter, 5/32" thick.	1	5
	85999 (AVAILABLE)	Clutch flywheel plate assy. (Spring carrier)	1	6

NOTE: FLYWHEEL #35D167 CAN BE USED WITH CLUTCH ASSEMBLIES NO. 1, 2, or 3.

<u>ASSEMBLY #4</u>				
441	86533	Flywheel Raybestos lining (#75868) 8-3/16" outside diameter, 3/16" thick, riveted on flywheel. Splines on inside of rim.	1	
	75872	Inner disc (small steel)	2	1,3
	75871	Outer disc (large steel) Splines on outside edge	1	2
	75869	Clutch pressure plate assy. (With release bearing) Raybestos lining (#75868) riveted on. 8-3/16" outside diameter, 3/16" thick. Splines on outside edge.	1	4
	86535	Clutch flywheel plate assy. (Spring carrier) 12 springs used.	1	5

NOTE: THIS CLUTCH ASSEMBLY (#4) CAN ONLY BE USED WITH #86533 FLYWHEEL.

INDIAN FOUR CLUTCH GROUP

Below are listed all Indian Four clutch parts with descriptions which will enable you to identify individual parts used in the Indian Four clutch. Indented parts are sub-assembly parts to the main parts. Refer to this descriptive listing when making up clutch assemblies to insure the proper parts being used in an assembly.

<u>MODELS</u>	<u>PART NO.</u>	<u>PART NO. SUB-ASSY.</u>	<u>DESCRIPTION</u>	<u>NO. PER M/C</u>	<u>NO. PER ASSY.</u>
403 to 437 Ex- cept 435	35C207X (OUT OF STOCK)		Clutch pressure plate assy. (With release bearing. No lining used)	1	
435 ONLY	74751 (OUT OF STOCK)		Clutch pressure plate assy. (With release bearing.)	1	
438 to 440	75183*		Clutch pressure plate assy. (With release bearing and lining.)	1	
*NOTE: 75183 WITH LINING REMOVED REPLACES 35C207X and 74751.					
441	75869		Clutch pressure plate assy. (With release bearing and lining.)	1	
438 to 440	75183		Pressure Plate (Round slots on outside diameter.)		1
403 to 437	35C207X (OUT OF STOCK)		Pressure Plate (Round slots on outside diameter.)		1
441	75868		Lining, pressure plate Outside diameter 8-3/16" 3/16" thick, Raybestos		1
441	75868		Lining, Flywheel, Outside diameter 8-3/16"-3/16" thick, Raybestos		1
438 to 440	75185		Lining, Pressure plate Outside diameter 7-5/8" 5/32" thick, Raybestos		1
438 to 441			Rivet		8
403 to 437 Except 435	35D117X (AVAILABLE)		Clutch flywheel plate assy. (Spring carrier) 1/8" thick steel, 8 spring studs, 8 guide pins	1	

<u>MODELS</u>	<u>PART NO.</u>	<u>PART NO. SUB-ASSY.</u>	<u>DESCRIPTION</u>	<u>NO. PER M/C</u>	<u>NO. PER ASSY.</u>
438 to 440		75185	Lining, outer end disc Outside Diameter 7-5/8" 5/32" thick, Raybestos		1
438 to 440		37836	Rivet		8
436	40438 (OUT OF STOCK)		Clutch weight assy. Heavy weights 1-1/2" long.	4	
436 to 437	41005		Clutch weight assy. Light weights 3/4" long.	4	
436 to 437	40213		Clutch weight retaining spring	4	
441	86533		Flywheel - Raybestos lining riveted on.	1	
441	37846		Rivet	8	
403 to 440	35D167		Flywheel	1	

SECTION VI

TRANSMISSION

A. TO ASSEMBLE TRANSMISSION

NOTE: If for any reason gear shifter finger has been removed, oil the shaft and be sure when assembling, spring washer is in place between shifter lever and shifter shaft bushing.

1. Place upper half countershaft bearings in proper position; also shims.
2. Oil countershaft bearings and assemble with large gear in line with clutch shaft.
3. Assemble bearing caps with lower half bearings, and tighten stud nuts securely.
4. Lock with wire, making sure to pass wire underneath bearing flange next to small gear.
5. Assemble small bevel gear. (Drive on with special driver.)
6. Tighten nut, and lock with cotter pin.

B. TO ASSEMBLE MAIN SHAFT SUB-ASSEMBLY

1. Oil shaft bearings.
2. Install shifter gear on main shaft with shifter slot toward taper end of shaft.
3. Place two small hardened steel thrust washers on main shaft next to splines.
4. Place high speed and bevel gear assembly over taper end of shaft; bevel gear out.
5. Next, place heavy thrust washer, shims and main shaft bearing over tapered end of shaft. Oil grooves in thrust washer facing the gear.

NOTE: Make sure felt washer is in place.

6. Assemble low speed gear on other end of shaft with dogs in.
7. Assemble light thrust washer, grooves in; shims and left main shaft bearing.

C. TO INSTALL MAIN SHAFT ASSEMBLY

1. Place in position.
2. Turn flywheel to help assembly to drop into place.
3. Make sure holes in bearings for dowels are up.

4. If necessary, use shims to adjust bevel gear mesh and main shaft end play.

5. Replace bearing caps according to numbers.

6. Tighten stud nuts, and lock with wire.

7. Assemble gear shifter fork and shaft.

NOTE: Fork in place over lever.

8. Insert shaft and turn until thread is flush with fork. (left)

9. Replace gear shifter lock assembly.

10. Tighten guide.

NOTE: See that guide clears shaft.

11. Tighten guide securely.

12. Replace ball and spring.

13. Tighten screw.

D. TO ADJUST SHIFTER FORK

1. Adjust for equal engagement of dogs in high and low speed position

2. Tighten screw.

3. Inspect adjustment.

4. Tighten screw securely.

5. Replace shifter shaft cap nuts.

E. TO COMPLETE TRANSMISSION ASSEMBLY

1. Install sprocket.

NOTE: Key must be a good fit in shaft and sprocket.

2. Tighten nut securely.

3. Replace starter jar.

4. Tighten nut and lock with cotter pin.

5. Install new cork gaskets and replace lower half of crankcase.

SECTION VII

CARBURETOR

A. TO CLEAN

NOTE: It is well to remove the carburetor float chamber or bowl once or twice each season in order to clean out any water or sediment.

1. Remove the gasoline line.
2. Remove the nut under the bowl.

NOTE: In the carburetor, a spring is used to hold the main nozzle in place, and if for any reason this is removed, make sure when replacing it that the small end of the nozzle is up and projects thru the venturi.

3. Wash bowl in gasoline and replace.

NOTE: Before tightening the bowl nut securely, it is well to turn on the gasoline and tap bowl lightly to make sure float valve seats properly.

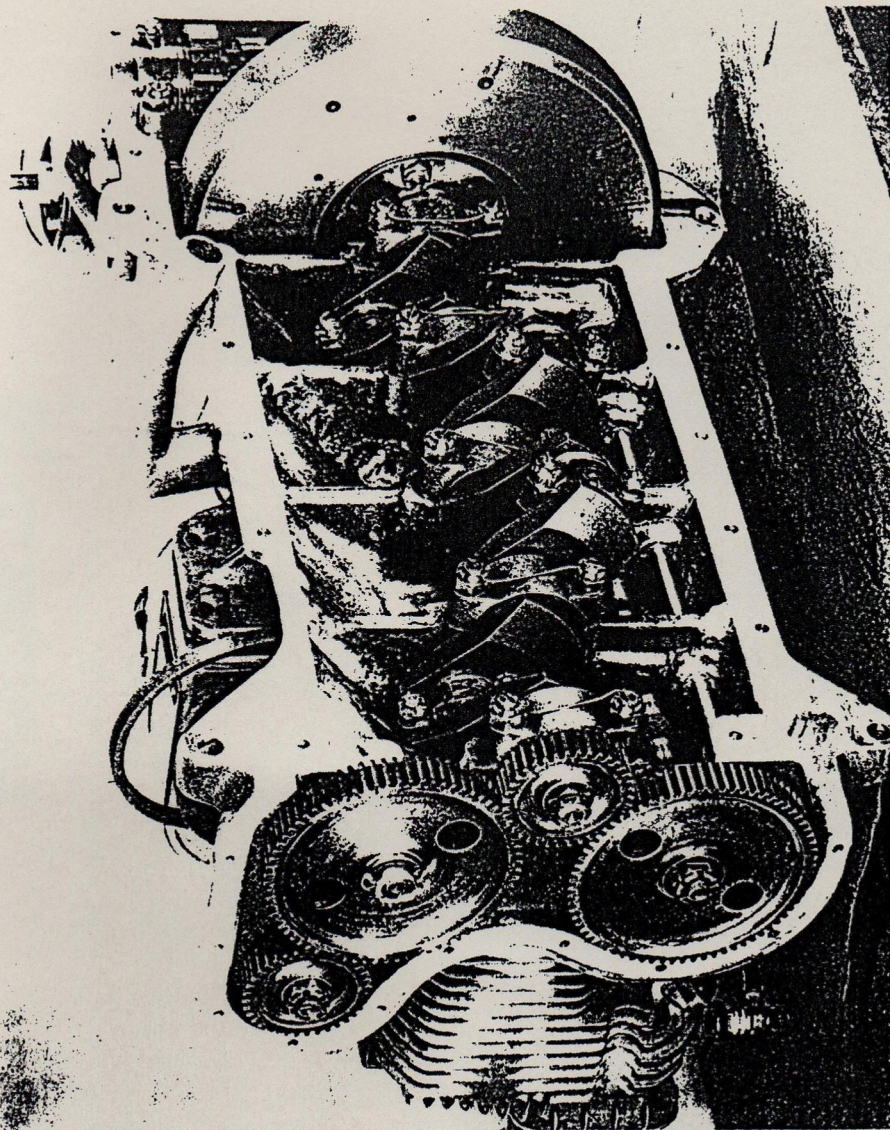
B. TO ADJUST

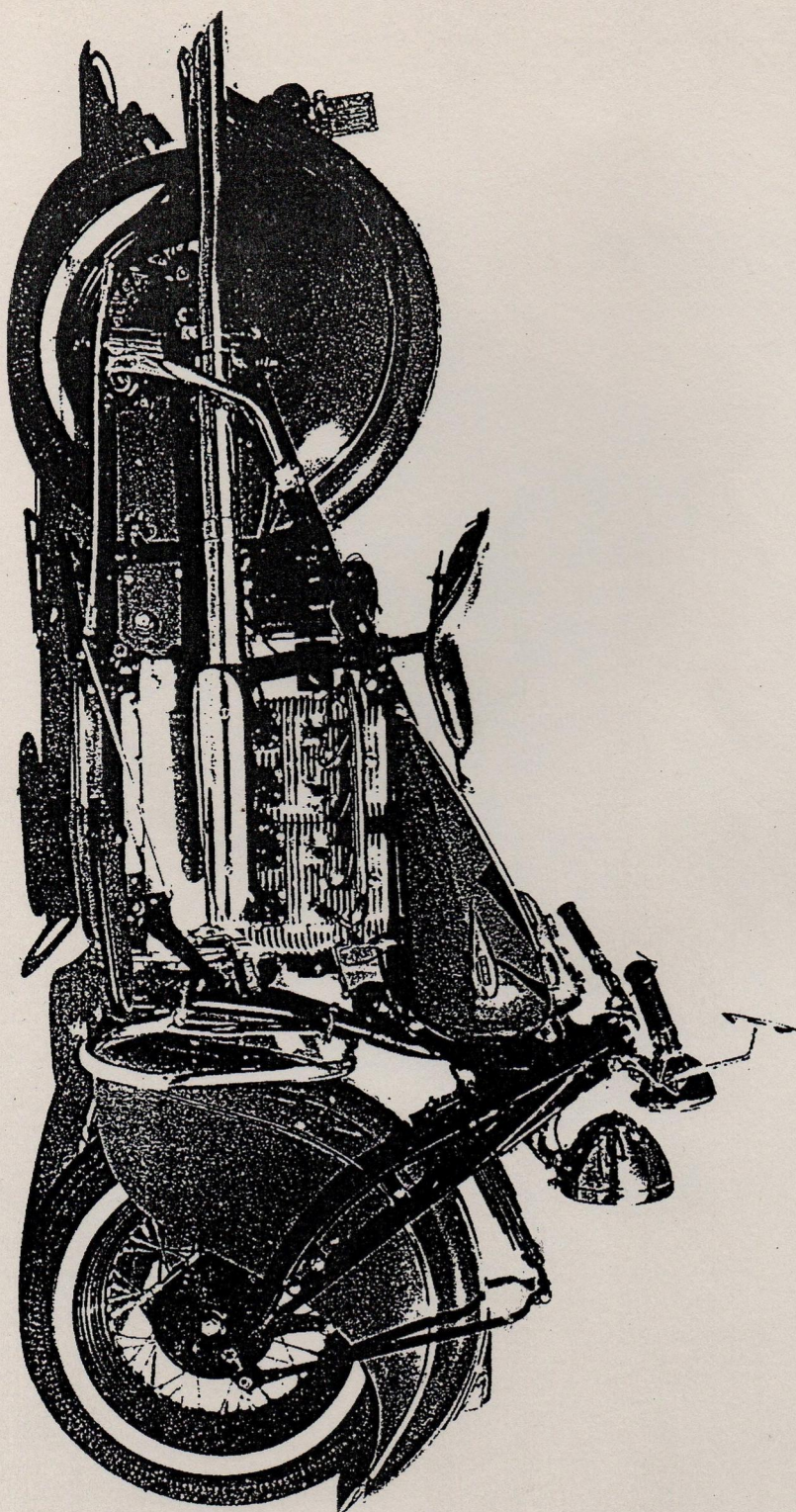
NOTE: The Indian 4 engine must be thoroughly warm before making adjustments or the work will be wasted. Further, never alter a carburetor adjustment until you are certain it is at fault. If entirely out of adjustment, proceed as follows:

1. Turn both needles down so that they seat lightly.
2. Turn high speed needle, up 1-1/2 turns.
3. Turn low speed needle, up 3 turns.
4. Start motor, let it warm up well and adjust low speed so that engine fires evenly when idling and running at small throttle openings.
5. Adjust high speed needle, turning it down a few notches at a time, until the engine backfires thru the carburetor when the throttle is snapped wide open for a fraction of a second; then turn the high speed needle up 1/4 turn.
6. Check low speed adjustment again.

NOTE: When carburetor is properly adjusted, the motor should run even at low speed, and should fire evenly and not backfire when throttle is opened quickly.

7. High speed adjustment -- should be slightly rich, never run machine with lean mixture.






Indian