Hercules

Service Manual

All 6 Cylinder Engines

Service Manual

HE-S-6CYL

SHOP SERVICE

MANUAL

FOR

YX SERIES ENGINE

Serial Numbers	110001	135000
	1200001	1250000
Specifications	See Page 5	

RX SERIES ENGINES

Serial Numbers	110001	135000
	1200001	1250000
Specifications	See Page 9	

TDX SERIES ENGINES

Serial Numbers	2500001	2550000
Specifications	See Page 7	

RXL SERIES ENGINES

Serial Numbers	135001	150000
Specifications	See Page 11	

CB preceding model (CB—RXC) denotes counter-balanced crankshaft.

M or MM following model (RXBM or RXLDMM) denotes Marine Engine.

C following model (RXCC-RXLDC-RXLDCM) denotes counter-clockwise engine.

O or T following model (RXCT-RXCO) denotes special specifications.

HERCULES MOTORS CORPORATION
CANTON, OHIO, U. S. A.

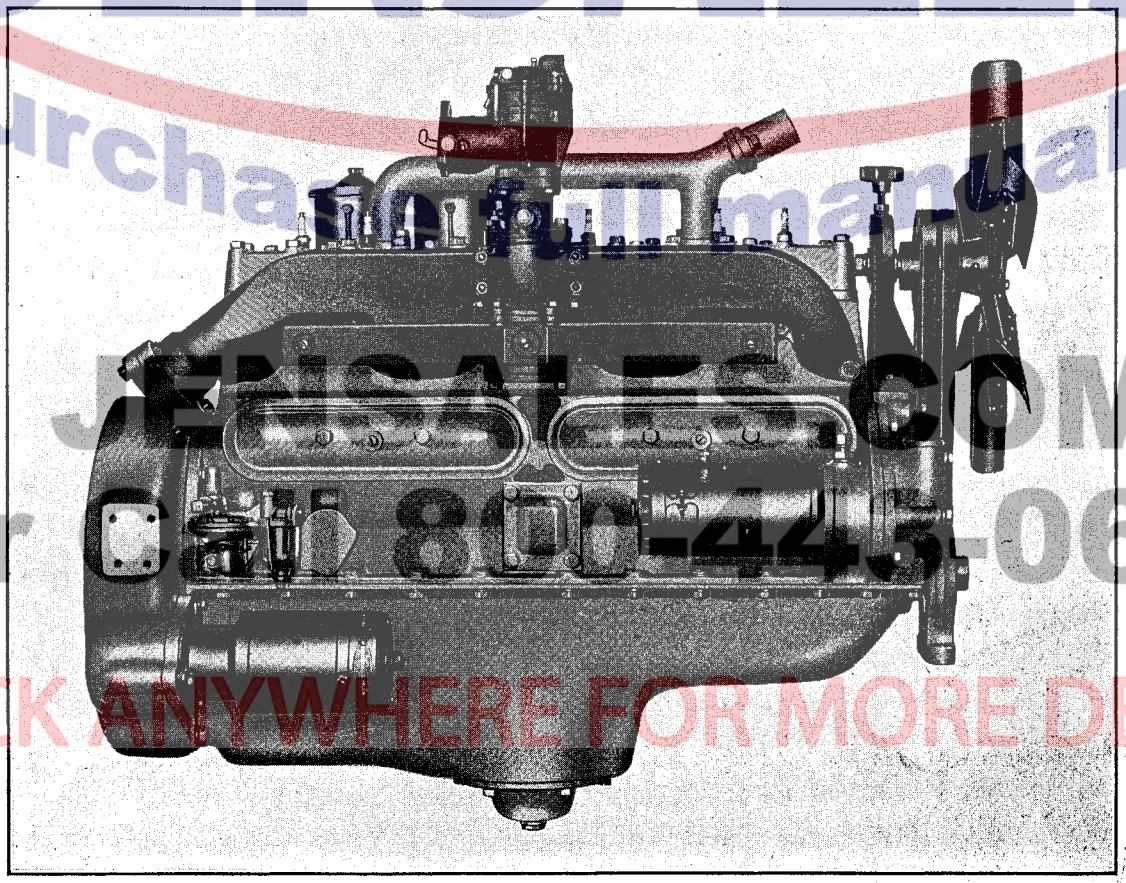
HE–S–6CYL

SPECIFICATIONS

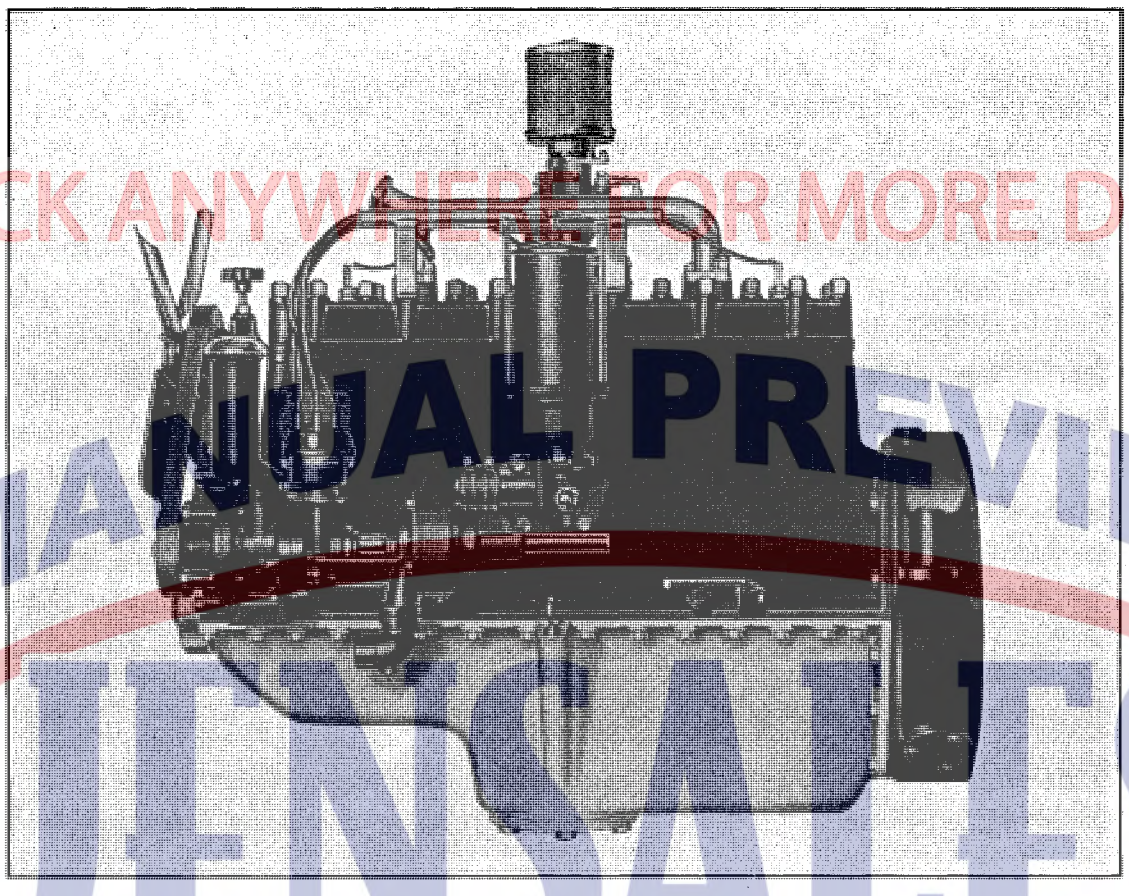
Models	YXB	YXC	YXC2	YXC3	Engines
	Model YXB	Model YXC	Model YXC2	Model YXC3	
Bore and Stroke	4″ x 4¾″	4⅜″ x 4¾″	4½″ x 4¾″	4⅝″ x 4¾″	
No. of Cylinders	6	6	6	6	
N. A. C. C. Horsepower	38.4	45.94	48.6	51.34	
For Actual Horsepower—See Power Chart.					
Piston Displacement, cu. in.	358.1	428.4	453	478.8	
Firing Order—Standard Rotation	1-5-3-6-2-4	1-5-3-6-2-4	1-5-3-6-2-4	1-5-3-6-2-4	
CYLINDERS					
Cast	In Six	In Six	In Six	In Six	
CRANKCASE					
Material	Nickel Chrome Alloy	Nickel Chrome Alloy	Nickel Chrome Alloy	Nickel Chrome Alloy	
How Cast	Integral with Block	Integral with Block	Integral with Block	Integral with Block	
LUBRICATION					
Forced Feed	By Gear Pump to all Connecting Rods and Main Br'gs	By Gear Pump to all Connecting Rods and Main Br'gs	By Gear Pump to all Connecting Rods and Main Br'gs	By Gear Pump to all Connecting Rods and Main Br'gs	
CYLINDER HEAD					
Detachable					
Valve Arrangement	L-Head	L-Head	L-Head	L-Head	
Valve Diameter Clearance	1¾″	1¾″	1¾″	1¾″	
PISTON					
Material	Cast Iron	Cast Iron	Cast Iron (Optional	Cast Iron Aluminum)	
PISTON RINGS					
No. Above Pin	3	3	3	3	
No. Below Pin	1	1	1	1	
Ring Width	3/16″	3/16″	3/16″	3/16″	
PISTON PIN					
Diameter	1¼″	1¼″	1¼″	1¼″	
Bearing, Length	2⅜″	2¾″	2¾″	3″	
Bearing, Location	In Piston	In Piston	In Piston	In Piston	
No. of Bearings	2	2	2	2	
CRANKSHAFT					
No. of Bearings	7	7	7	7	
Bearings, Diameter	3″	3″	3″	3″	
Bearings, Length (front)	2″	2″	2″	2″	
Bearings, Length (center)	3″	3″	3″	3″	
Bearings, Length (rear)	3″	3″	3″	3″	
Bearings, Length (intermediate)	1½″	1½″	1½″	1½″	
CAMSHAFT					
Timing Gear Face Width	1½″	1½″	1½″	1½″	
Drive	Helical Gear	Helical Gear	Helical Gear	Helical Gear	
No. of Bearings	4	4	4	4	
Diameter front, center and rear	2⅛″	2⅛″	2⅛″	2⅛″	
Length (front)	1⅞″	1⅞″	1⅞″	1⅞″	
Length (center) 2 and 3	1¼″	1¼″	1¼″	1¼″	
Length (rear)	1⅞″	1⅞″	1⅞″	1⅞″	
Location—Right Hand Side Looking at Flywheel.					
CONNECTING RODS					
Connecting Rod Bearings, Diameter	2½″	2½″	2½″	2½″	
Connecting Rod Bearings, Length	1¾″	1¾″	1¾″	1¾″	
Connecting Rod Length, center to center	9⅝″	9⅝″	9⅝″	9⅝″	

NOTE: The Hercules Motors Corporation reserves the right to change design or specifications, without notice.

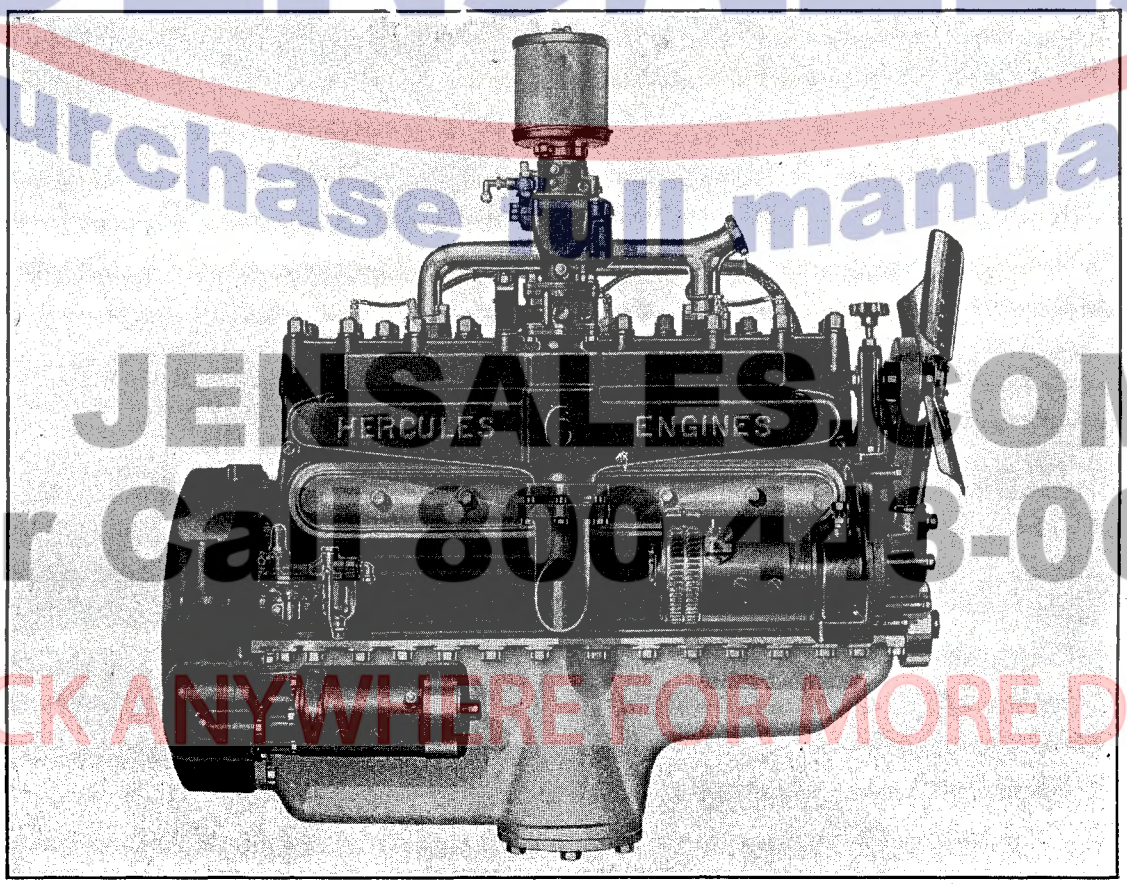
RX Series Water Pump Side



RX Series Manifold Side



RXL Series Water Pump Side



RXL Series Manifold Side

GENERAL DESCRIPTION AND FEATURES OF DESIGN

OF HERCULES YX, RX, TDX, AND RXL SERIES ENGINES

The Hercules six cylinder engines of the YX, RX, TDX and RXL series are very similar in design, the chief difference being in size; other differences will be discussed under various sections. All description and remarks will apply to all of the above mentioned series except where a certain series is mentioned.

CYLINDER BLOCK AND CRANKCASE

The cylinder block and crankcase are cast in one piece in order to permit more efficient cooling by extending the water jacket down lower on the cylinders. This construction also results in a very rigid unit, which provides a sturdy support for the crankshaft. The water jacket slopes inward toward the top and outward toward the bottom which increases the lateral rigidity. The crankshaft is supported on seven main bearings of very liberal dimensions. (See Illustration No. 4).

MAIN BEARINGS YX, TDX AND RX

Each of the seven main bearing caps is a steel forging held in position by heavy alloy steel cap screws. There are two types of bearing construction used, depending on the requirements of the service to which the engine is applied.

The poured babbitt type bearing is commonly used and considered standard in most YX engines and some of the first RX engines. In this type of bearing the upper half of each bearing is a babbitt lined, bronze shell. In this type the bearing caps have the babbitt bearing metal poured directly in contact with the steel cap, the caps being first tinned to insure a good bond of babbitt to steel.

The alternate type bearing, (now considered as standard on the RX and TDX engines) is known as the shell type and in this construction there is a removable shell in each cap as well as for the upper bearing. In this type of construction, the upper shell is interchangeable with the lower shell for each bearing. These shells are of the precision type and are completely finished before being put in place and reaming or scraping is not required. This allows renewal of bearings to be accomplished with ease. The precision type shells each have a small ear or projection which fits into a recess which allows the ear to rest against the adjoining case or cap to prevent the shell from rocking or rotating. The precision type bearing shells for the RX engines are .0855″ thick and are not interchangeable with the upper shells used with the poured babbitted type caps. The bearing metals commonly used in the precision shell type bearings are alloys and have a higher melting point than ordinary babbitt metal and this requires the use of a crankshaft which is made from special alloy steel or one which has been surface hardened. The bearings are reconditioned by replacing the bearing shells. For proper clearances, see discussion under Maintenance Suggestions; also see Table of Clearances.

MAIN BEARINGS RXL

The bearings in the RXL series are of unusually large diameter and the bearing caps are extremely rigid forgings attached to the case with large diameter studs and the caps are also doweled in place. This series engine may be equipped with either the poured babbitted type or the shell type bearings. The poured babbitted bearings in this series are adjustable for wear by removing shims, but the precision shell type bearings are usually fitted without shims and to compensate for wear replace the shells. For proper clearances, see discussion under Maintenance Suggestions.

CONNECTING RODS RX AND TDX

The connecting rods used in the RX and TDX engine are of special design. The two cap bolts in this connecting rod are integral parts of the rod forging. This construction results in an extremely strong and rigid big end and it is practically free from any possible distortion. The rods commonly used are of the removable shell type, the poured babbitted type were used on some of the first RX series engines.

CONNECTING RODS RXL

The connecting rods used in the RXL series are of a different design due to the extremely large diameter of the connecting rod journals. In order to use a large diameter bearing and still permit assembling the connecting rod through the cylinder bore, when the connecting rod cap is removed, the cap is parted from the rod on an angle. In this construction the connecting rod caps are attached to the rods with special cap screws. Most engines of the RXL series have precision shell type bearings and with the cap on an angle, the cap is mated to the rod with a ring dowel construction. This construction relieves the cap screws of any shearing strain and accurately locates the cap on the rod. In this type of rod no shims are used. The shells are prevented from rotating by ears or lugs on the shells which fit into notches in the rod and cap at the parting line. Since two types of pistons are used in RXL engines one type uses the rod with clamp construction to hold piston pin, the other type rod is drilled, permitting oil to pass from the connecting rod journal bearing at the big end of the rod up through the rod to the full floating piston pin.

Some engines of the RXL series have babbitted type bearings and with the rod cap on an angle, the cap is mated to the rod with collar dowels to relieve the cap screws of any shearing strain and to accurately locate

the cap on the rod. This type of rod is adjustable for wear by removing shims. For proper clearances, see discussion under Maintenance Suggestions; also Table of Clearances.

PISTONS YX AND RX

Pistons in these engines may be either cast iron or aluminum depending on the requirements of the operation. The cast iron pistons have bronze bushings in the piston pin bosses. The metal of the aluminum alloy pistons forms a suitable bearing for the pin and no bushings are required. The piston pins are made of special alloy steel and heat treated and accurately ground to size. The pins are clamped in the upper end of the rod and have a working fit in the piston. There is a minimum of four rings in each piston, three compression and one oil ring. Some of the larger bore sizes have five rings in each piston. For clearances, see discussion under Maintenance Suggestions, also see Table of Clearances.

PISTONS RXL

Pistons in the RXL engines are aluminum alloy and have five rings in each piston. Those pistons used with rods having shell type bearings and floating piston pin have snap rings in pin bosses to retain pin. Pistons used with poured babbitted type rods and some shell type rods having pin clamped in rod do not have snap ring groove in pin boss but have holes drilled into boss on an angle, as well as an oil groove in boss to provide lubrication to piston pin. Each type of piston must be used with its respective type of connecting rod design. See discussion under Maintenance Suggestions for clearances and fitting of pins and rings.

PISTONS TDX

Pistons in the TDX engines are aluminum alloy and have four rings in each piston. Piston pins are the full floating type with snap rings in the pin bosses to retain the pin. See Illustration No. 70.

CYLINDER HEAD

The Cylinder heads are of conventional "L" head design and are easily removed for service operations on valves, pistons, rings, etc.

CAMSHAFT AND IDLER SHAFT

The camshaft is supported on large diameter bearings in the crankcase. These bearings are removable and can be renewed. The idler gear is supported on a shaft which in turn is supported in a bushing pressed into the crankcase. This bushing is removable and can be renewed.

On the YX and RX series two different types of idler shafts have been used. The following dimensions might be of help in ascertaining the type in one particular engine and it is necessary that replacement parts be ordered for the particular type as parts are not interchangeable except as complete sets of shaft, gear and bearing. The bearing length of the first type was $2\frac{3}{4}''$ long while the second type is $3\frac{5}{16}''$ long. The first type shaft had a dimension of $2\frac{3}{4}''$ for that part which fits into the bearing while the second type has a $3\frac{7}{16}''$ dimension. The gear for the first type had a hub thickness of $1\frac{7}{16}''$ while the second type has a $\frac{15}{16}''$ thickness. The first type bearings were not flanged while the second type have a 3″ flange at the outer end. The thrust provision in the gear cover is not changed, this still being a fiber plug pressing against a steel plug in the end of the shaft.

VALVES

The valve guides are removable bushings pressed into the cylinder block. The valves are forged from special steel. The exhaust valve steel is a special alloy designed to withstand high temperature. An intake valve should never be used in place of an exhaust but where intake and exhaust are the same size, an exhaust valve can be used in place of an intake. Valve tappets are of the mushroom type and are guided in removable clusters bolted to the crankcase in the YX, RX and RXL series. (Late type RXL engines have tappet guides pressed in the cylinder block). See Illustration No. 13. The TDX series has individual tappet guides pressed into the cylinder block casting. For service information, see Maintenance Suggestions.

ACCESSORY DRIVE

The accessory drive for water pump and distributor or magneto is located on the side of the engine opposite the camshaft side. The accessory drive shaft is supported in a removable sleeve casting. This permits easy removal for service operations. The accessory drive sleeve with shaft can be removed without removing the front gear cover of the engine. See Illustrations No. 91 and No. 92.

GENERATOR DRIVE AND GOVERNOR DRIVE

These engines all have a provision for a gear driven generator on the camshaft side. The generator is sleeve mounted and the generator gear meshes with the camshaft gear. When no generator is used the sleeve opening is closed with a suitable cover.

When these engines are equipped with a governor it may be either one of two types. Either type operates on the centrifugal weight principle and the mounting is on the gear cover. One type is mounted in a vertical position and the alternate type is in a horizontal position on the front of the cover. In the vertical type, the governor is driven from a helical gear which is bolted to the front face of the generator gear. This gear then meshes with and drives a gear on the governor. In case no generator is used, a suitable shaft is mounted in its place to drive

the governor. In this type the rod which connects to the arm on the throttle valve shaft is enclosed. In the horizontal type the governor is driven by a gear on the governor shaft which meshes with the camshaft gear. When this type of governor is used and a generator is also used, the generator gear must be of a special narrow type to allow space for the governor gear as each of these gears are meshed with the wider faced camshaft gear.

OILING SYSTEM YX AND RX

The oil pump is located in the crankcase and is driven by a spiral gear at the center of the camshaft. The oil pump driving gear on the camshaft is an integral part of the shaft. The oil pump is below the level of the oil in the crankcase and needs no priming. The oil is delivered from the pump through a short copper tube to a suitable passage in the case which delivers the oil to the lubricating oil filter and through another passage back to the main discharge line or header. This header has a branch connecting to each main bearing. Thus, there is force feed lubrication to all main bearings. The crankshaft is drilled to permit oil from the main bearings to be delivered under pressure to the connecting rod bearings.

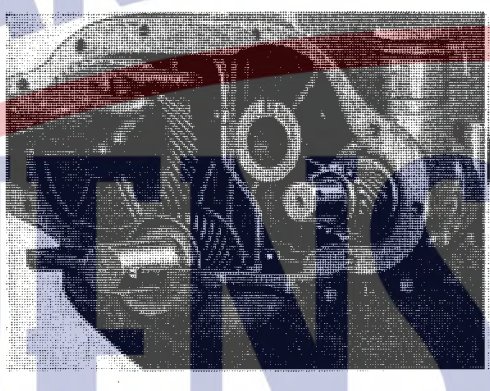


Illustration No. 1

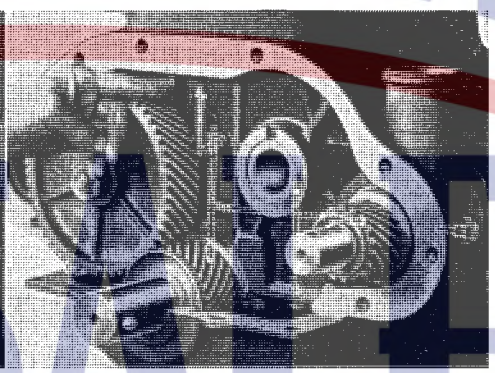


Illustration No. 2

In some early engines a branch of the main oil header delivers oil to the timing gear compartment and oil is distributed over the timing gears through metering holes. See Illustration No. 1. In later engines suitable drilled passages in the case deliver oil to the timing gears, idler gear bearing and accessory shaft bearing. See Illustration No. 2. Cylinder bores, tappets and valve stems are lubricated by the oil thrown off around the connecting rod bearings. The camshaft bearings are lubricated by gravity feed from oil collected in pockets. Also see Illustration No. 3 for another view of the old type oiling system on the YX series engines.

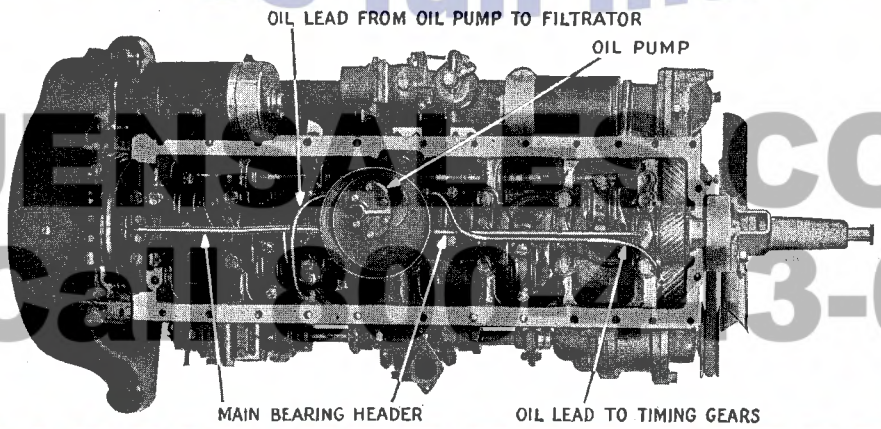


Illustration No. 3

OILING SYSTEM RXL AND TDX

The RXL and TDX oiling system is similar to RX except that there are fewer oil pipes and more drilled passages. See Illustration No. 4. The oil is delivered from the oil pump through a short flexible tube to a drilled passage in the crankcase which delivers the oil to the filter and then through a drilled passage which extends