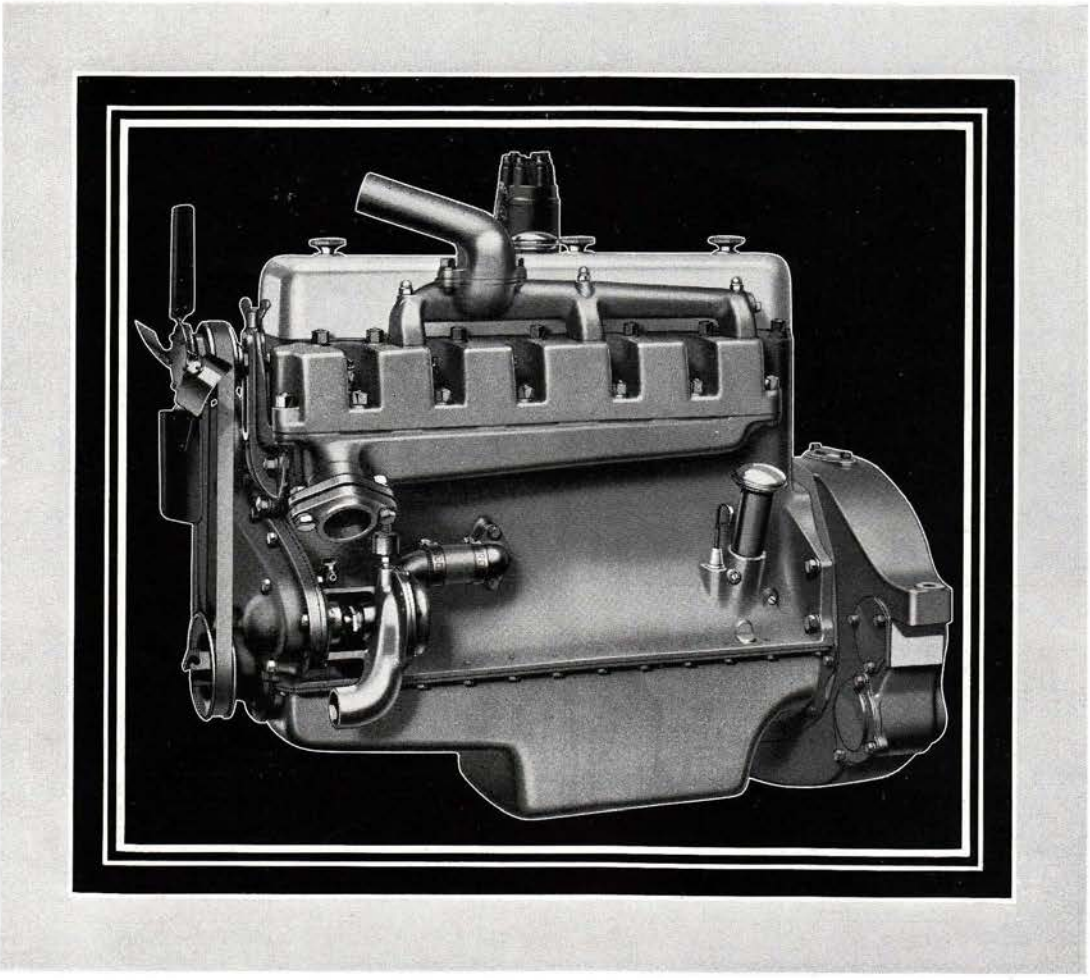
THE MARATHON SIX



SIX-CYLINDER

...WAUKESHA-HESSELMAN OIL ENGINES...

FOR MOTOR COACHES, TRUCKS, PUMPS ELECTRICAL AND INDUSTRIAL MACHINERY

"6-BKH"

WAUKESHA MOTOR COMPANY

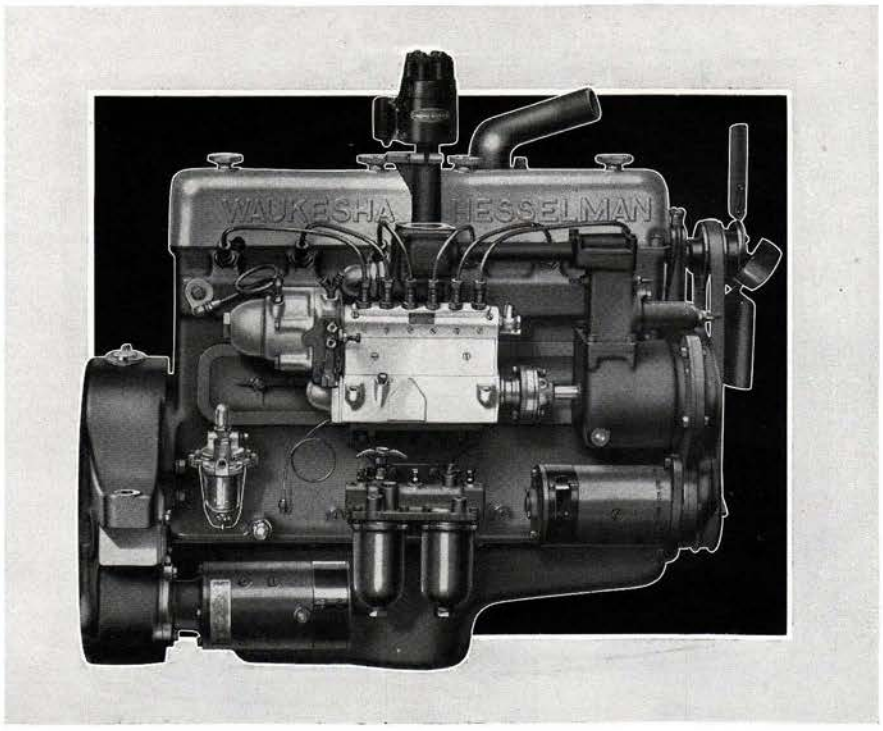
WAUKESHA « « « « « « « « WISCONSIN

Eastern Sales Office: Eight W. 40th Street, New York City

Mid-Continent Office: 313 East 2nd Street, Tulsa, Okla.

Pacific Coast Office: 939 Santa Fe Ave., Los Angeles, Calif.

ENGINE BULLETIN No. 978-A



Injection Side Showing Built-In Governor Twin Oil Filters, Special Hesselman Fuel System with Vacuum Controlled Injection Pump, Primary Fuel Pump and Electric Equipment, All as Arranged for Automotive Service.

Cover illustration shows exhaust side with gear driven water pump. Where magneto ignition is used, the magneto is driven by a shaft extension from the rear of the water pump.

THE HESSELMAN MARATHON SIX

An Automotive Hesselman The wide-spread popularity and universal success experienced with Hesselman engines in the industrial field driving tractors, air compressors, generators, excavators, and other equipment requiring a high performance has convinced many users that their trucks should be similarly powered. The Hesselman Marathon Sixes are the counterpart of the original gasoline Marathon Six with which the oil engine is substantially interchangeable as to size, mounting, and duty.

Hesselman Principle Hesselman engines are in no sense "semi-Diesel" engines. They are moderate compression—125-150 pounds per square inch—solid injection, spark ignition oil engines burning the modern "high-speed" Diesel fuels. They are so simple that any experienced gasoline operator will find them easy to understand and easy to maintain. In weight, Hesselman engines are approximately the same as their gasoline counterpart plus 30-50 pounds representing the weight of the injection apparatus.

Easy Starting One of the outstanding characteristics of Hesselman engines is the ease with which they can be started. Due to the moderate compression pressure, hand cranking is just as feasible as with gasoline engines of the same size and, like the gasoline engine, a conventional dash primer is used to facilitate starting. This sprays a small charge of gasoline into the intake manifold, the spark plug immediately fires the mixture, and as soon as the engine begins to rotate, the normal operating cycle on fuel oil begins. They have no hot bulbs or hot spots which require preliminary heating to start, and even in the coldest weather, Hesselman engines require no more priming than gasoline engines under similar conditions.

How It Works In the same manner as a Diesel engine, the intake stroke of the Hesselman engine admits air only, and no fuel is present until compression is nearly completed. Towards the end of the compression stroke, a conventional Diesel injection pump delivers fuel to the charge of compressed air. The form of the combustion chamber promotes a definite turbulence pattern in the air charge which continues throughout both the intake and compression strokes. Thus, the finely atomized fuel from the injector is distributed throughout the entire volume of air and swept as a highly combustible mixture past the spark plug which ignites the charge. Immediately follows the power stroke, and then the exhaust as with a conventional Otto cycle gasoline engine. It is to be noticed that neither the air nor the fuel is carbureted or pre-heated so that the delivered power and volumetric efficiency are correspondingly high.

Speed Control The Waukesha built-in governor, a product of almost 20 years' development and refinement, is a major feature of this engine. It is connected to a simple butterfly throttle valve which controls the air inlet, and which is also actuated by the foot or hand accelerator. The amount of fuel fed is proportioned to the volume of air by a vacuum controlled piston connected to the fuel volume control rod of the injection pump. Thus, when the throttle is closed and a high vacuum is created, the piston moves in one direction, and reduces the quantity of fuel; with a wide open throttle and reduced vacuum, the piston moves in the opposite direction and feeds more fuel.

Seven-Bearing Crankshaft Hesselman Marathon Sixes have large seven-bearing crankshafts supported in 2⅝-inch steel backed babbit lined precision bearings. With 2-inch crankpins overlapping the main bearings and thick, heavy cheeks, there is no perceptible vibration throughout the normal speed range of the engine.

Pressure Oiling Every major moving part of the Marathon Sixes is lubricated under pressure from the positively driven submerged gear type oil pump. The main, connecting rod, piston pin, camshaft, rocker arm shaft, and idler gear bearings are positively

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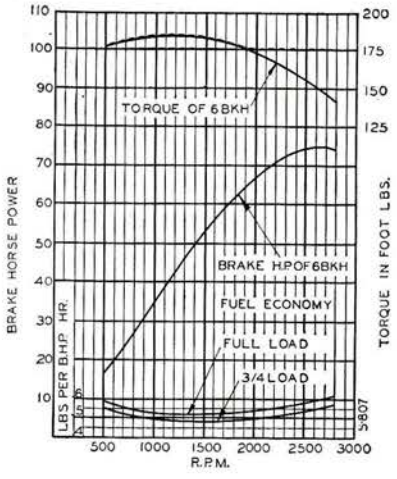
oiled in this manner. Flood oiling from the crankpin throw-off lubricates the cylinders and pistons, and crankcase mist oils the governor mechanism. The Waukesha developed Duo-Flo oil filter adds life to the oil supply and effectively reduces the crankcase sludging so common in engines burning fuel oil. Oil pressure adjustment is made from the outside, and the patented Oil Level Equalizer insures a positive delivery of oil at all temperatures and oil levels.

Upkeep Due to the low maximum pressures and the absence of violent stress reversals, maintenance is reported by users to be on a par with gasoline engines of the same size, and in the same service. The driven mechanism, clutches, universal joints, transmissions, also being relieved of high stresses, offer no special problem. The maximum compression pressures are the same compression pressures obtained in most modern gasoline engines so that moderate weight flywheels can be used which promote quick response to the demands of acceleration and power output with equal smoothness and flexibility.

Your Requirements Waukesha-Hesselman engines are not offered as a substitute for compression ignition full Diesel engines, but rather as supplementary to the Diesels—an engine that expands the field of economical application of fuel oil power, and that will fit into many places where Diesel engines cannot be economically purchased or economically used. The Waukesha Motor Company can furnish gasoline engines operating on the Otto cycle, oil engines on the Hesselman cycle, and full compression ignition Comet Diesel engines, all for automotive service. Our recommendations will be gladly given if you will tell us your requirements. The engine that best meets your needs will be the one proposed.

Performance Characteristics

"6-BKH"



I. C. E. I. "Standard Net Stripped Engine" Curve.

The manufacturer guarantees that production engines, after a run to reduce the friction to the same as that on the laboratory standard, will develop 95% of the horsepower shown above. Curves are corrected to 29.92" of mercury (sea level, barometer reading), and a temperature of 60 degrees F.

CONTINUOUS SERVICE—For continuous full load service, use a load factor of not more than 80 per cent of the power shown on the curve.

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PERMISSIBLE SPEEDS are: For Continuous Operation, 2000 rpm. maximum. For Intermittent Service during Acceleration and Similar Duty, 2500 rpm. maximum.

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Consult the Waukesha Motor Company regarding permissible speed for your service.

DIMENSIONS

	"6-BKH"
Bore and stroke	3¾ x 4¼
Displacement, cubic inches	282
Valve diameter, intake	1⅝
Valve diameter, exhaust	1¼
Connecting rod bearing, diameter x length	2 x 1½
Front main bearing, diameter x length	2⅝ x 1¼
Center main bearing, diameter x length	2⅝ x 2
Intermediate main bearings (4), diameter x length	2⅝ x 1¼
Rear main bearing, diameter x length	2⅝ x 2
Piston pin, floating, diameter x length	1 x 3 3/16
Connecting rod length	8
Number piston rings	4
Timing gears, face	1
Exhaust flange	2¼
Fan diameter (extra equipment)	18
Approximate weight, pounds	750
Installation Drawing No.	L-2044

NOTE — All dimensions are given in inches.

SPECIFICATIONS

Crankshaft—S.A.E. 1045 steel, heat treated. Seven 2⅝ inch main bearings.

Crankcase—Special cylinder alloy casting, integral with cylinders, with heavy top and bottom diaphragms, baffles, and ribs for directing water circulation.

Connecting Rods—Rifle drilled S.A.E. 1045 heat treated steel. Waukesha bearing alloy cast directly into big ends. Floating piston pins.

Main Bearings—Steel backed, babbit lined, precision type bushing.

Valves—In cylinder head; intake, chrome nickel steel; exhaust, chrome-silicon.

Push Rods — Mushroom type. Large diameter, hollow, case hardened, and ground.

Pistons—Hesselman type, aluminum, heavily ribbed without slots or inserts. Full-floating piston pins.

Cylinders—Waukesha cylinder alloy, bored and honed to close limits.

Cylinder Heads—Single casting, removable, held by heat treated studs. Injector nozzles, spark plugs, and valve gear carried in cylinder head.

Timing Gears—Helical cut gears of mild steel and cast iron, flood oiled.

Cooling—High-duty water pump with nitralloy pump shaft delivers water in directed paths. Large, clear passages surround valve seats.

Lubrication—Full pressure by positive gear pump; oil header, drilled into solid metal of crankcase delivers oil to every main, camshaft, connecting rod, piston pin, rocker arm, oil pump and water pump drive shaft bearing, and to idler gear stud and gears. Oil mist lubricates governor, cylinders, and pistons.

Oil Filters—Radial flow, waste-packed lubricating oil filters—efficient, simple, and easy to maintain. Shunt connection.

Fuel System—Single unit, six-plunger solid injection pump with Hesselman nozzles and drawn steel high-pressure lines.

Fuel Filter—Fuel injection pump and nozzles protected by twin unit fuel filters in series. The first is an edge type which may be cleaned without interrupting the operation of the engine. The second is cloth backed up by a metal screen.

Fuel Feed Pump—Positively driven diaphragm type pump with hand priming lever delivers fuel from storage tank to injection pump.

Primer—Gasoline primer and tank for starting only.

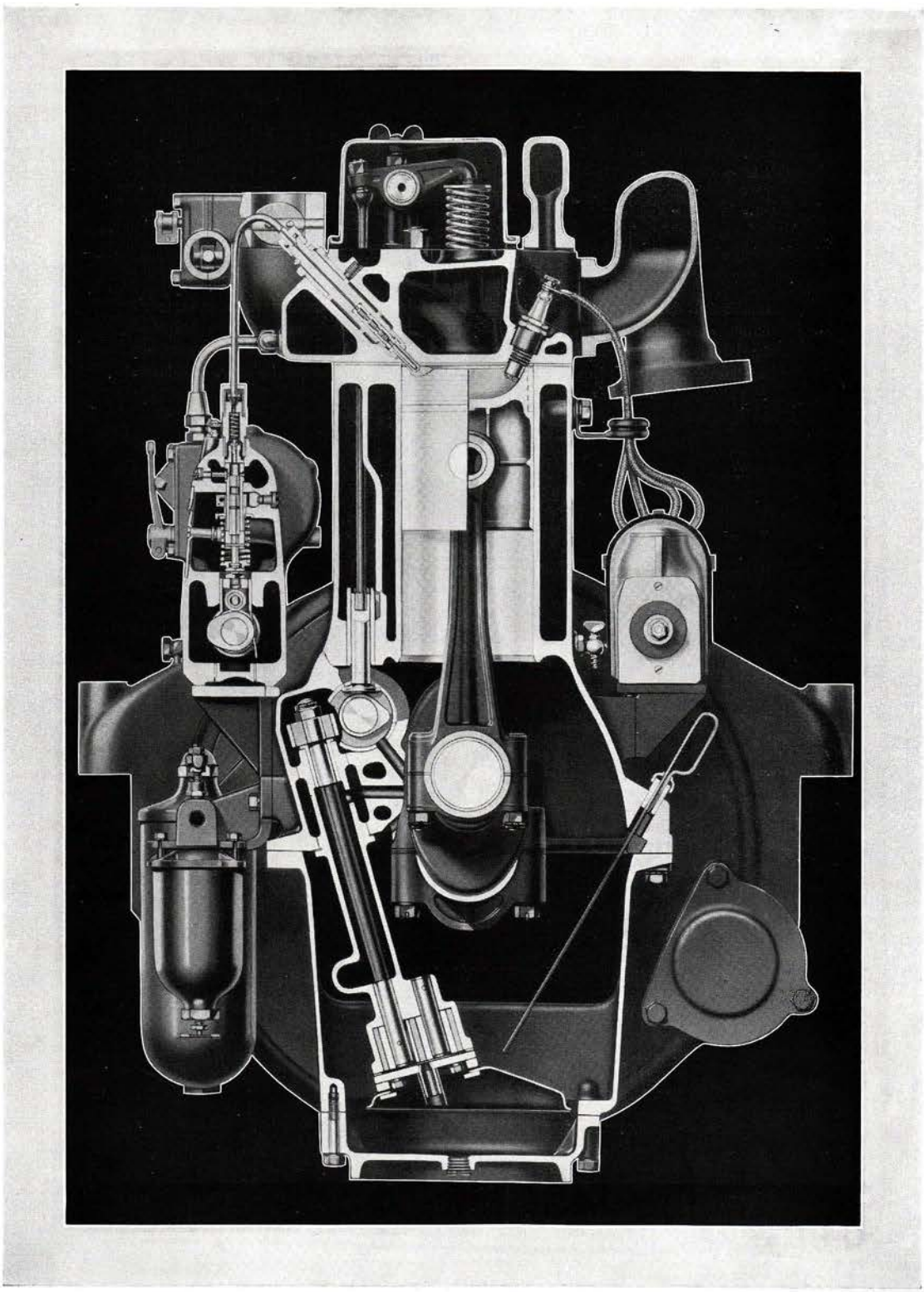
Ignition—Hot spark, heavy-duty magneto or distributor ignition with generator coil and distributor.

Air Cleaners—Oil type air cleaner for intake manifold is standard equipment.

Electric Starting Equipment—(Extra)—Starting motor with voltage regulator, generator, starting switch, and ring gear, 12-volt system, battery not furnished.

Fan and Belt—(Extra)—18-inch fan with V-belt.

Starting Crank—(Extra)—Hand crank furnished when required.



Cross section of typical Waukesha-Hesselman engine showing fuel pump and injection nozzle; combustion chamber in piston head with ring location which promotes free travel of heat from piston head to skirt; rifle drilled connecting rod supplying oil to piston pins; submerged oil pump intake and Oil Level Equalizer.

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