THE WOLSELEY "VIPER" AERO ENGINE.
(Hispano-Suiza W.4.A*)

General description.

The engine referred to in this article is the Hispano-Suiza 180 hp W.4.A* Aero Engine, as made by Wolseley Motors Ltd.

The engine was of the Vee type, with 8 cylinders, 120 mm bore x 130 mm stroke. All cylinders were water-cooled. The propeller was mounted on an extension of the main shaft and therefore revolved at engine speed. Normal speed of this engine was 1,800 crankshaft rpm, but a maximum of 2,l00 rpm was possible for short periods of operation. A double thrust bearing of the ball type in the nose of the crankshaft was arranged to the up the thrust of the propeller, either pusher or tractor.

Cylinders.

Four cylinders, together with their jackets, were built up to form the block, each cylinder and cylinder head being enclosed of a steel liner. The head was formed by the closed-over end of the liner. The combined water jacket & jacket head consisted of a special aluminium alloy casting, with the water space self contained within the casting itself. The jacket was stove-enamelled by a special baking process both within and without.

The steel lines, or cylinders, were screwed into the aluminium jacket, the screw thread being continued along the entire length of the liner coming into contact with the aluminium, thus providing sufficient surface for the conduction of heat from cylinder to jacket, and thence to the circulating water. As the combustion chamber was totally contained between the cylinder head and the liner, explosion pressure therefore did not act upon the aluminium head.

Inlet and exhaust passages were cast into the head, and corresponding holes cut into the steel liners, with their edges bevelled to form the valve seats. The blocks were attached to the crankcase by studs and nuts.

Camshaft and Valve Gear.

Valves were all overhead, placed side by side, and operated, directly from the camshaft, which lay over the tops of the cylinders. Cast iron valve guides were screwed into the aluminium jacket and machined true in place, to ensure relation to the valve seats. Valves then seated onto the steel cylinder head, & were placed into position by being passed up through the cylinder barrel. The large diameter valve stems were hollow, and screwed internally at the top to take adjusting heads or mushrooms, which were acted upon directly by the cams with out the interposition of tappets or rockers.

This valve adjusting head, of hardened steel, had a serrated edge, and the clearance between the cam and the head was adjusted by screwing the latter in or out of the valve stem. A spring cap was fitted immediately under the adjusting head, locking the latter in position by means of corresponding serrations & slots in the valve stem. Two springs were fitted to each valve.

Two camshafts were provided, one for each block. These shafts were hollow, & were each carried in 3 bearings secured to the aluminium jacket castings by studs. The drive to the camshaft was through diagonal shafts with bevel gears at each end, these shafts running up at the rear of each cylinder block at right angles to one another. These, diagonal shafts, and gears and the camshafts with the valve mechanism, were totally enclosed within aluminium covers.

Magnetos were at the rear end of the engine, and driven by spiral gears and spring couplings. A vertical bevel drive was also arranged at the same end of the engine for oil and water pumps.

Pistons.

The pistons were cast from special aluminium alloy. Four rings were used on each piston as pressure holding rings, being placed in pairs in grooves near the top of the piston. A similar groove lower down the piston, just beneath the gudgeon pin, contained a scraper ring designed to preclude any excessive amounts of oil passing the piston and entering the combustion chamber. This scraper ring was different from the others, having a bevelled upper edge, and was thus not interchangeable with the upper rings.

A hardened steel gudgeon pin was held in place as described by a set pin, passing through the gudgeon and entering the wall of the piston on the other side. The set pin was in turn secured by a, split pin passing through it, the hole for which was drilled, through the hole, for the scraper ring.

Level with the centre line of the gudgeon pin, a groove was cut half way round the top side of the piston to collect oil from the walls of the cylinder and passing it into the centre of the hollow gudgeon. Oil holes were further drilled in the gudgeon to allow the oil so collected to reach and lubricate the connecting rod small-end bush.

Connecting Rods.

Cylinders on either side of the Vee were positioned directly opposite one another, so that, consequently, opposing connecting rods convey pressure from their respect, give pistons to the same part of the crankshaft. One rod of each such pair, called the "Inside Rod", was a main rod, with a big end bearing onto the full surface of the crankpin, the bearing being lined with white metal. The outside surface of the inner big-end was also white-metal lined to, take the big-end of the opposite rod, called the "Outside Rod". This took the form of a fork, with a divided forked cap bolted on. The big end of the outside rod was slotted, so that the lower part of the inside rod shank could pass through the gap so formed. Shanks of both rods were tubular in section. The small ends were fitted with phosphor bronze bushes.

Crankshaft.

The crankshaft had 4 throws, and was carried in 3 bearings - the centre, intermediate and front end bearings were of phosphor bronze lined with white metal - the rear end bearing was a single row ball bearing, - and the shaft was extended at the front to carry the propeller hub and ball thrust bearing.

Crankcase.

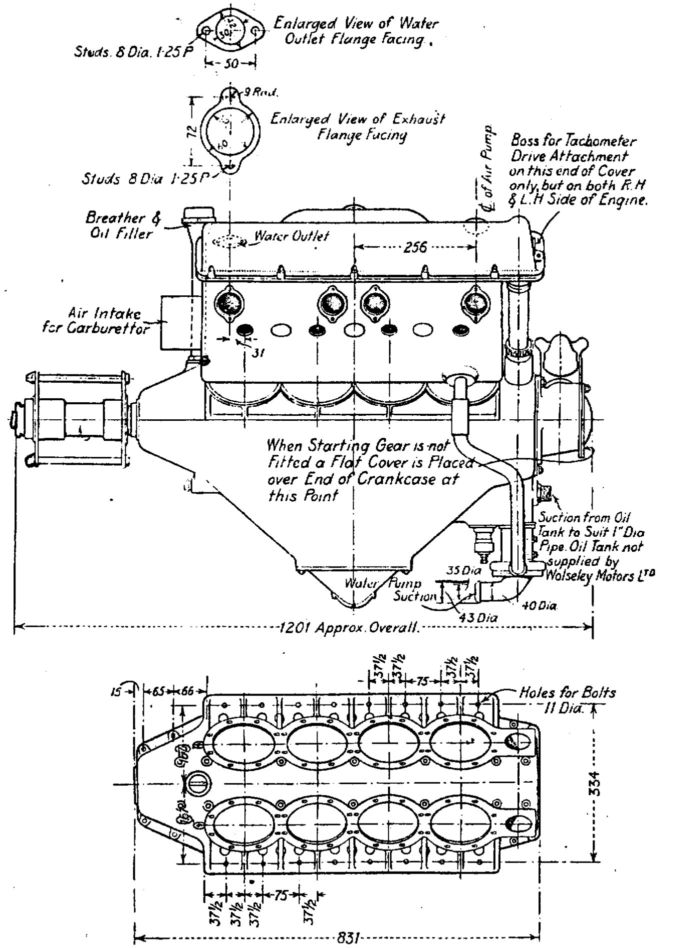
The crankcase was an aluminium casting divided horizontally along the centreline of the crankshaft, thus forming upper and lower halves. The upper half carried the cylinder blocks, these being arranged at right angles to one another, while the lower half formed an oil base and carried the water pump, oil pumps, oil filter and oil pressure relief valve.

The crankshaft bearings were fitted half into the upper case and half in the lower case. The load was taken on long studs secured in the lower half and projecting through to the top of the case between the cylinder blocks. The ball bearing was fitted with a gun-metal housing.

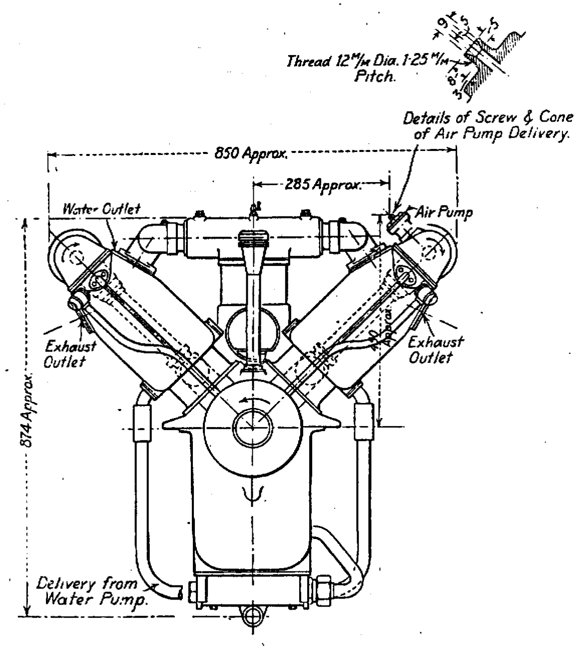
Support of the engine was accomplished by an overlapping flange on the top half of the crankcase, running the full length of the case, the under side of which was placed on the centre line of the shaft.

Cooling.

Cooling water was circulated by means of a centrifugal water pump driven by the vertical shaft that also drove the oil pumps situated at the rear of the engine.



INSTALLATION PLAN FOR "VIPER" (W.4.A.* TYPE) ENGINE.



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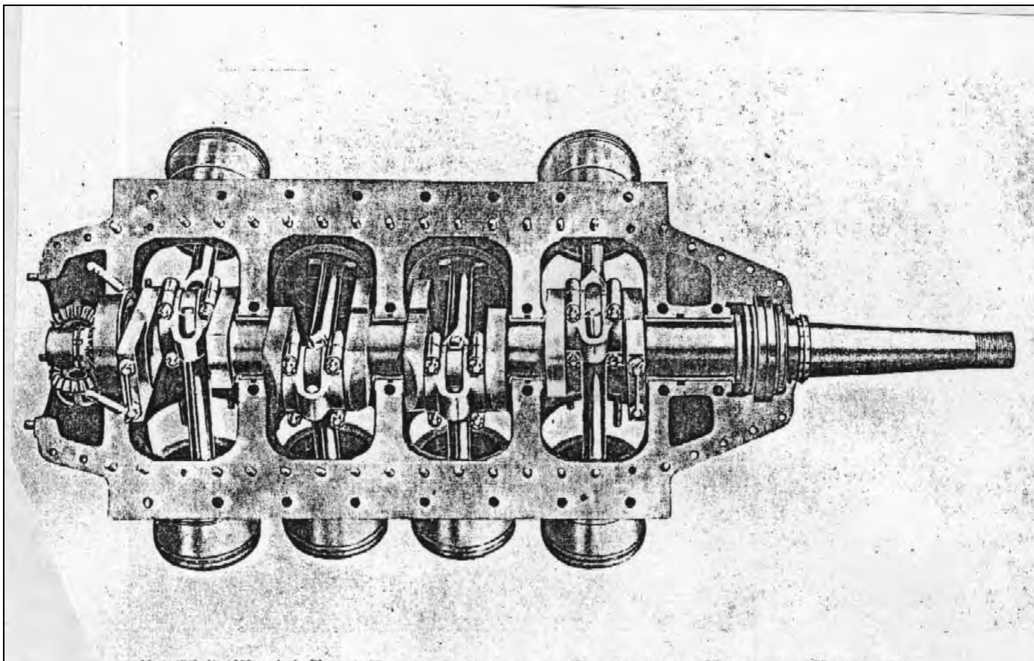
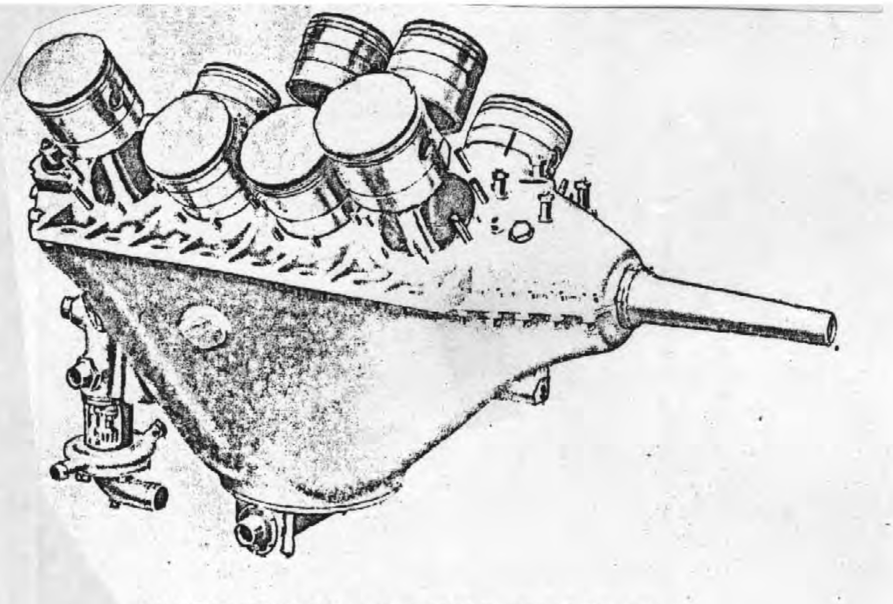
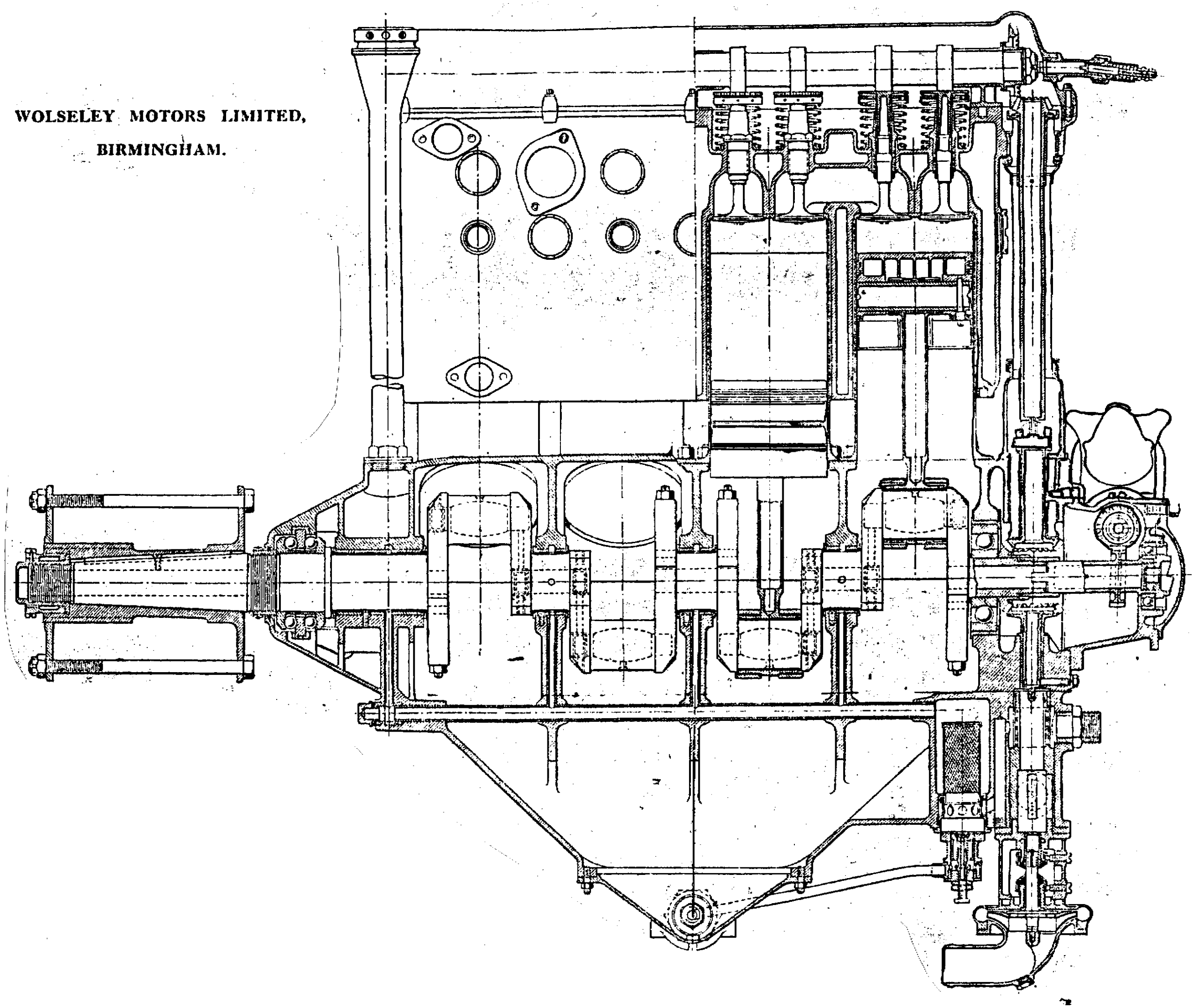


"VIPER" (W.4.A.* TYPE) ENGINE IN COURSE OF DISMANTLING—VIEW FROM UNDERSIDE.



"VIPER" (W.4.A * TYPE) ENGINE IN COURSE OF DISMANTLING.

WOLSELEY MOTORS LIMITED,
BIRMINGHAM.



Starting.

Provision was made for hand starting gear to be attached to the rear end of the engine. This consisted of a starting handle and supporting bracket bolted to the crankcase cover, the handle having a dog clutch to engage with a similar clutch on the crankshaft, in exactly the same way car engine would be started, though considerably geared down.

Starting gear also included a small starting magneto, operated by hand and independent of the engine. After the engine had been turned over to prime the cylinders with explosive mixture, and stopped with one of the cylinders just over the top of the compression stroke, the starting mag. was turned on and then, when turned by hand, provided the necessary spark to ignite the mixture and start the engine, which then continued to run on its own magneto.

Carburettor and Inlet Pipes.

These were arranged in the centre portion of the engine between the cylinder blocks. Inlet pipes were of cast aluminium. Side branch pipes fitted to the cylinder blocks were attached by a central pipe, on the under side of which was carried the dual carburettor. This central pipe was jacketed, and heated by branch pipes from the water circulation system. A Zenith Carburettor was employed.

Air Pump.

This item was fitted onto one of the camshaft covers and driven off the camshaft, enabling a "pressure-fed" petrol tank to be used.

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From material loaned by Harold Thomas.