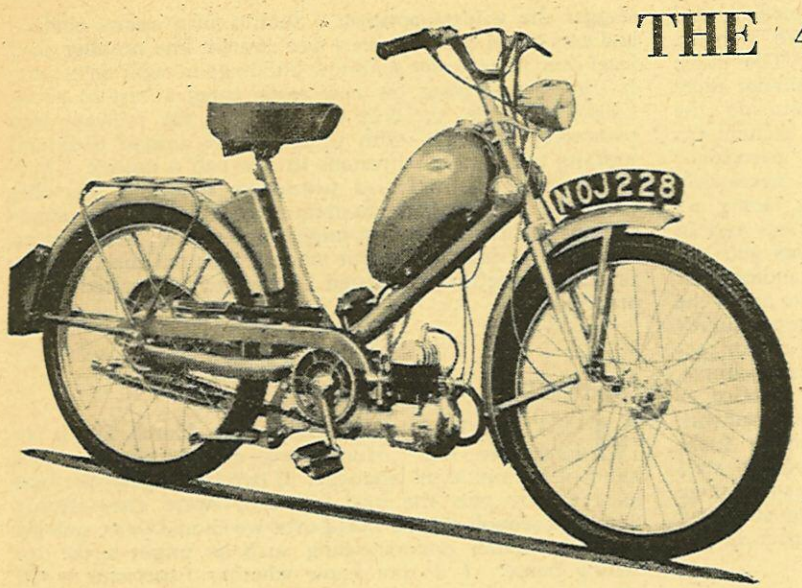
# THE 49 c.c. HERCULES

*An All-British Moped with an Ingenious Engine-transmission Unit and a Comprehensive Specification*




*The unusual mounting of the power unit brings its weight well forward*

INTRODUCED at the London Show last November, the 49 c.c. Hercules HCM is entirely British in design and manufacture and presents a strong answer to the continental challenge in the moped field. Features include a composite pressed and tubular steel frame of welded construction, a bottom-link front fork and a two-stroke J.A.P. engine with longitudinal crankshaft and employing enclosed shaft primary drive to a Burman two-speed gear box of ingenious design.

The engine was designed by G. J. Jones, the engineering consultant, in collaboration with the Hercules and J.A.P. concerns. Enclosing the shaft primary drive is a flange-fitting, light-alloy casting which is bolted to the rear of the crankcase and forward face of the gear-box shell. Thus the engine and gear box are formed into a unit, the gear-box end of which is attached to the frame below the bottom bracket housing the pedal-crank bearings. Advantages of the layout are that the width of the pedal crank can be maintained at a standard dimension and that the engine's weight is placed well forward.

Bore and stroke dimensions of the engine are considerably over-square at 42 × 35.5mm. Power output is stated to be approximately 1.5 b.h.p. at 4,500 r.p.m.—sufficient to propel the 80 lb (unladen weight) machine at 30 to 35 m.p.h. The built-up forged crankshaft employs the usual twin bobweights and has a pressed-in crankpin. The crankshaft is supported by two caged journal ball bearings which are provided with oil seals. A high-tensile steel stamping, the connecting rod has a single row of rollers at its big end. The small end is bronze bushed and the fully floating gudgeon pin is retained in the piston by circlips.

Lo-ex aluminium alloy is the material used for the piston which carries two compression rings and is flat at the top save for a shallow bevel; transfer openings are provided in the skirt. Twin transfer ports are formed integrally with the cast-iron cylinder barrel. The barrel and the cast-aluminium cylinder head, which has a shallow, dome-shape combustion space, are retained by nuts and four studs which pass right through from the crankcase.

Stub-mounted is an Amal type 360/4 carburettor (described and illustrated in *The Motor Cycle* for October 27 last) which embodies an air cleaner and also a self-cancelling rich-mixture device to facilitate starting the engine from cold.

Mounted at the forward end of the crankshaft is a Miller flywheel magneto incorporating lighting coils. A tongue on the rearward end of the crankshaft engages with a slot in the primary drive shaft which is of $\frac{7}{16}$in diameter between the larger-diameter ends. Rearward end of the shaft is supported in a ball bearing and carries the clutch drive member comprising a slotted housing and two Ferodo rings which are dogged at the periphery to engage with the housing slots. Hence the clutch is driven at engine speed and, further, it runs in oil.

Three steel plates comprise the driven members of the clutch; they are internally splined to mate with corresponding splines on the gear-box input sleeve. Foremost of the three driven plates is the pressure plate. Against its front face bears a large-diameter coil spring constrained at its forward end by a collar which, in turn, is held to the input sleeve by a circlip.

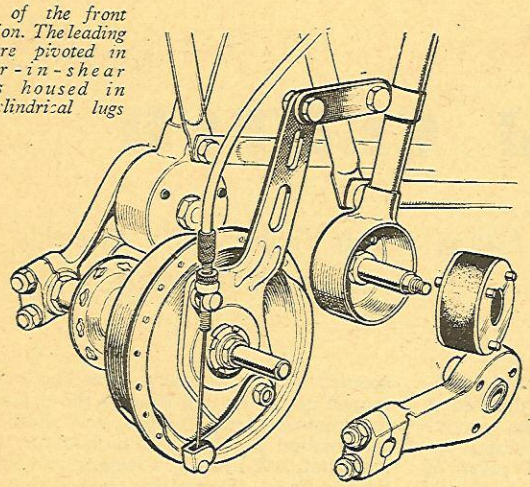
Clutch withdrawal is by means of cable pull on one side of a ring which is pivoted on the opposite side and is located behind the clutch co-axially with the input sleeve. The ring is shaped to have on its forward face two rounded projections which bear against the rearward face of the outer race of a ball thrust bearing. The bearing inner race rotates with the clutch, and its forward face contacts three pins which project forward through holes in two of the driven plates to bear on the rear face of the pressure plate.

In addition to the input sleeve the gear box contains three shafts which may be termed the mainshaft, the layshaft and the output shaft. The input sleeve is internally bronze-bushed at each end and floats on the mainshaft. As already mentioned, the input sleeve is also splined externally; the number of splines is seven.

The mainshaft is supported near its rear end by a ball bearing and at its front end is spigoted into the primary drive shaft which is bushed for the purpose. Locked to the mainshaft in a medial position is a member embodying seven involute teeth which are narrower than the input-sleeve splines but match them as regards radial spacing. (The member is made from a 14-tooth gear pinion which is reduced in diameter and has alternate teeth milled away.) The member is adjacent to the rear end of the input sleeve which is thus located endwise. A thrust washer is interposed between the forward end of the input sleeve and the rear (hollow) end of the primary drive shaft.

Two gears are carried by the mainshaft just forward of its rear bearing. The rearmost gear (that adjacent to the bearing) has 18 teeth and is locked to the shaft; the foremost has 14 teeth and is free to turn on the shaft. Integral with the 14-tooth gear is a dog-clutch comprising seven involute teeth identical with those on the mainshaft medial member. Indeed, the gear is twice as wide as its 18-tooth neighbour and its front half is reduced in diameter and has alternate teeth removed. Immediately behind its rear bearing the mainshaft terminates in a spiral-bevel pinion.

Mounted substantially below the mainshaft is the layshaft, which is overhung for just sufficient length to accommodate a pair of gears splined thereto. The larger gear has 18 teeth and is in constant mesh with the free (14-tooth) gear on the mainshaft. The smaller gear of the layshaft pair has 14 teeth and meshes with the mainshaft 18-tooth fixed gear. The layshaft is supported behind its gears by a long phosphor-bronze bush and is located endwise by a hardened steel strip bolted to the gear-box casing



*Details of the front suspension. The leading links are pivoted in rubber-in-shear bearings housed in cast cylindrical lugs*

Carrying a crown-wheel and the final-drive sprocket, the output shaft is arranged transversely at the rear of the gear box. The reduction between the bevel pinion and crown-wheel is 3.54 to 1.

Gear engagement is effected by a selector sleeve which slides on the input sleeve. Internally the selector sleeve has seven splines which mate with the seven on the input sleeve, but medially the selector splines are machined away for more than a third of their length to form a recess. When the selector sleeve is moved forward its splines rearward of the recess engage the seven-tooth medial member on the mainshaft, thus locking the input sleeve to the mainshaft, and providing direct drive for high gear. With the selector in mid-position there is no connection between the input sleeve and mainshaft and hence neutral is provided. When the selector is moved farther to the rear its splines rearward of the recess engage the seven involute teeth provided on the mainshaft 14-tooth free gear. In that way the drive is taken through the lay-shaft pinions (1.65 to 1 reduction for low gear).

A detail point is that the inner race of the clutch thrust bearing is extended considerably rearward and is supported by the selector sleeve on which it is a sliding fit.

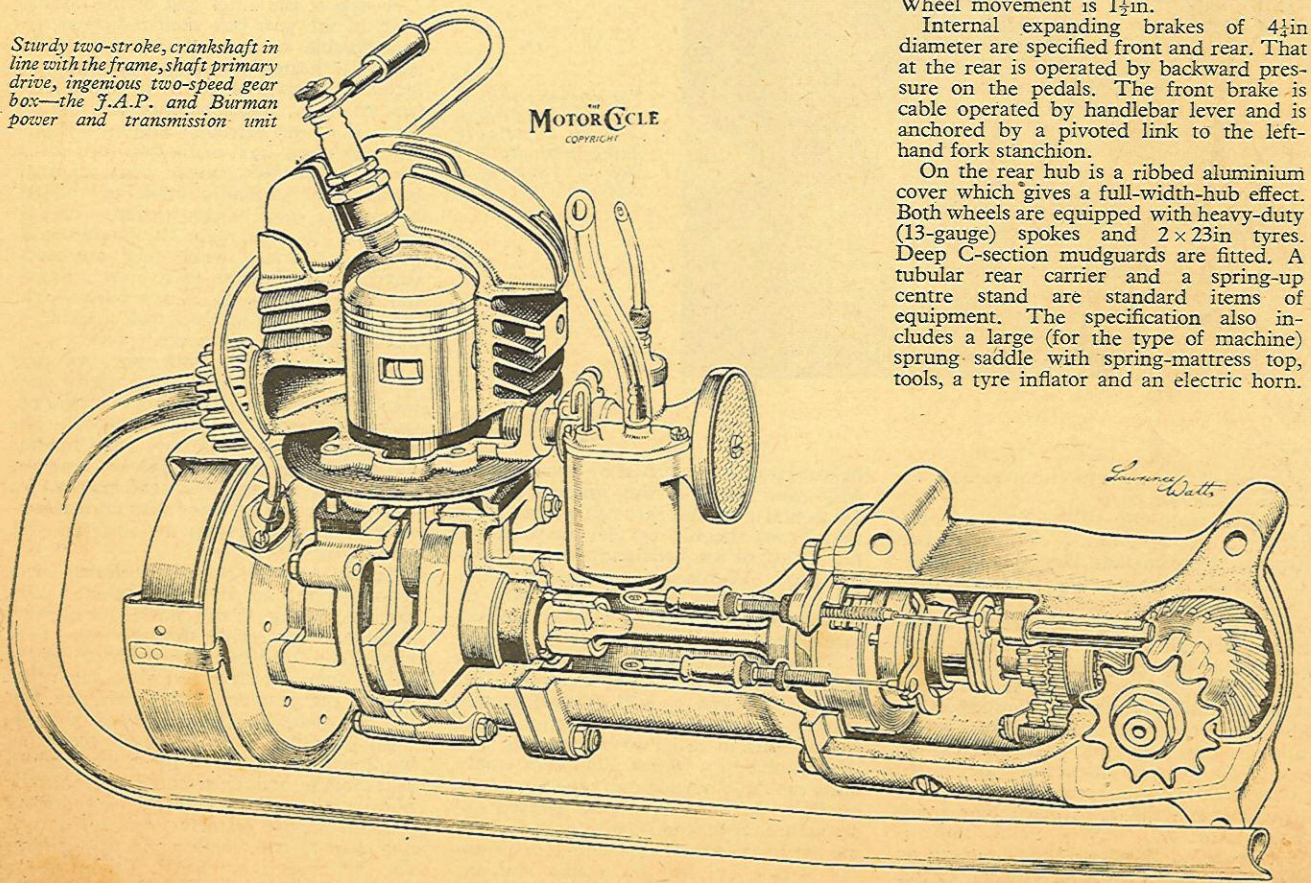
Externally the rear of the selector sleeve is of bobbin shape to receive a striker fork employed to impart axial movement to the sleeve for gear changing. The fork embodies a rearwardly extending rod which slides within a long phosphor-bronze bush accommodated in a lug within the gear-box shell. Striker-fork forward movement is effected by cable pull from a twistgrip on the left of the handlebar. Inside the gear box the cable is loaded by a co-axial coil spring which is compressed when the selector mechanism is moved forward from the low-gear position.

Main member of the welded open frame comprises two taper-drawn, D-section tubes; dimensions are $2\frac{1}{2} \times \frac{3}{4}$in $\times$ 17 gauge. At the steering head the tubes are mitred and gusseted; at the base of the seat pillar they divide to form the chain stays. The dividing point is reinforced by a triangular fabricated member carrying the seat pillar. Below the joint is welded the bottom bracket, a box-section member which, as mentioned previously, houses the pedal crank bearings and forms the mounting for the power unit. A wedge-shape tool box is carried between the seat pillar and the rear mudguard.

Of leading-link type, the front fork utilizes as stanchion members D-to-O-section, heavy-duty, carrier-pattern fork blades bridged at the top by a cast malleable yoke or crown. To the lower ends of the stanchions are brazed cylindical, cast malleable lugs which house bonded rubber-in-shear bearings in which the cast-aluminium links are pivoted. Each bearing features two steel thrust faces from each of which project three integral steel pegs. The pegs locate in corresponding holes in the housing on one side of the bearing and in the link on the other side. The whole assembly is pulled up by a hardened-steel spindle, nut and lock nut. Wheel movement is $1\frac{1}{2}$in.

Internal expanding brakes of $4\frac{1}{2}$in diameter are specified front and rear. That at the rear is operated by backward pressure on the pedals. The front brake is cable operated by handlebar lever and is anchored by a pivoted link to the left-hand fork stanchion.

On the rear hub is a ribbed aluminium cover which gives a full-width-hub effect. Both wheels are equipped with heavy-duty (13-gauge) spokes and $2 \times 23$in tyres. Deep C-section mudguards are fitted. A tubular rear carrier and a spring-up centre stand are standard items of equipment. The specification also includes a large (for the type of machine) sprung saddle with spring-mattress top, tools, a tyre inflator and an electric horn.




*Sturdy two-stroke, crankshaft in line with the frame, shaft primary drive, ingenious two-speed gear box—the J.A.P. and Burman power and transmission unit*