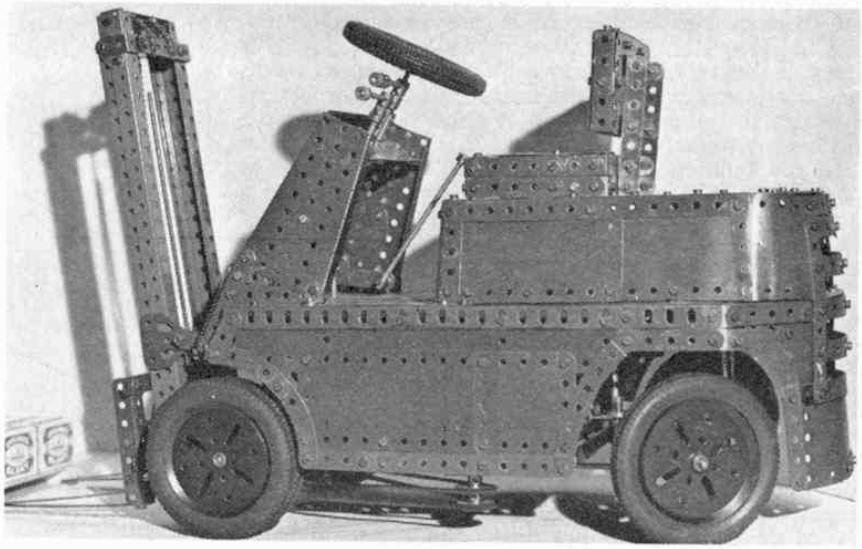
MECCANO FORK LIFT TRUCK



M.M. reader Roland Brown describes his model

IN THE world of full-size industry, one of the most common pieces of essential equipment is the Fork Lift Truck. Fork Lifts are found everywhere; in every branch of industry; in every part of the world, yet, despite their tremendous popularity in real-life, the modelling fraternity does not appear to give them a great deal of attention—judging, at least, by their rather infrequent appearances in the M.M. I am sure that modellers' interest in Fork Lifts is considerable, however, and this was one of the contributory reasons for my attempting the model illustrated here.

Fork Lift Trucks are available in a wide range from very small pedestrian-controlled units to large trucks capable of handling loads of many tons and, in some cases, able to travel over rough ground. The type of truck used as a basis for my model is a Hyster S40B which is capable of handling loads of up to 4,000 lb. but, with its small wheels, it is confined to well-laid surfaces such as can be expected in most factories and warehouses. This particular vehicle is diesel-powered, although petrol, L.P.G. and electrically-powered versions of trucks of a similar size are often available.

My model performs all the functions of the real truck:—

(a) the forks can be raised and lowered on sliding masts.
(b) the masts can be tilted both forward and backward.
(c) the model has two road speeds both in forward and reverse.
(d) the steering lock is specially large.

GENERAL ARRANGEMENT

All the road wheels are supplied by 3 in. Pulleys with Motor Tyres—a size which works out just right for the wheel base of 11½ in. The front axle, carrying a differential unit driven by a Worm Gear, is journalled in four chassis bearings to ensure rigidity of the assembly, while the rear axle, which incorporates Ackermann steering linkage, is pivoted at the centre allowing each wheel to lift and fall at least three-quarters of an inch from the central position. The lock of the steerable wheels is such that the inside front wheel will describe a circle of about 3 in. diameter.

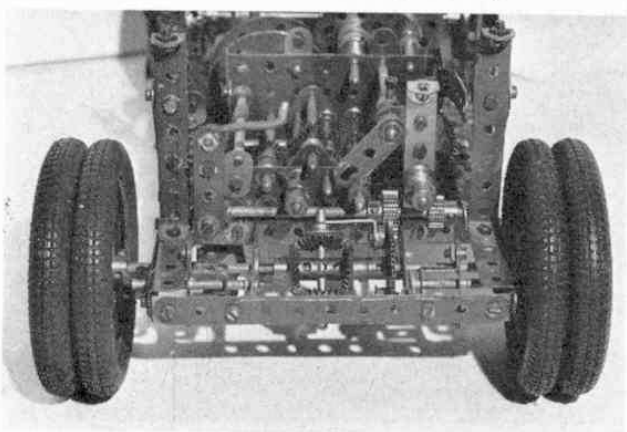
Power for all movements comes from two obsolete E20R Electric Motors mounted in front of and over the rear axle. These Motors, which could be replaced by two current E15R Motors, are connected together by a Chain drive, the transmission to the road wheels being taken directly from the forward Motor through a clutch and the gearing system described later.

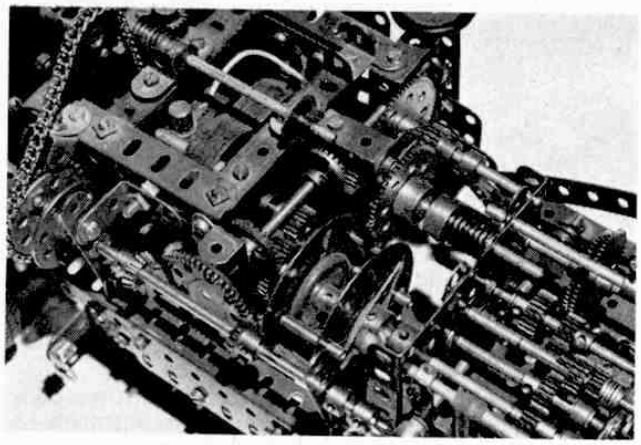
An auxiliary drive is taken from the Chain drive connecting the Motors through gearing and a double belt system to a Screwed Rod actuating the lifting movement of the fork. A cross shaft fitted with Cranks and connecting Strips and working through high reduction gearing operates the tilting movement of the mast.

Gear levers are situated to the left of the steering column and a single lever on the right-hand side, operating through an "H" pattern gate, controls the mast tilt and fork hoist/lower movements. A hand-brake lever on the right-hand side is used to engage and disengage the Worm drive to the Road Wheels. The clutch pedal for the road transmission is to the left-hand side of the steering column.

MAST AND HOIST

In the case of the mast itself, this is constructed in two channel sections, one sliding inside the other. Within the inner channel the carriage for the fork runs on four ¾ in. Flanged Wheels. Each inner channel section is produced from two 12½ in. Angle Girders





arranged so that the flange carrying the circular holes of one girder is secured to the flange carrying the elongated holes of the other girder. The outer channel section allows the inner section to slide freely within it, but without undue clearance. The 12½ in. Angle Girders forming the outer section of the mast are fastened together with Fishplates angled to give the correct spacing between the girders. The mast is pivoted at the bottom stub axles just ahead of the front axle.

As mentioned earlier the fork hoist is actuated by an 11½ in. Screwed Rod running through two opposite tapped bores in a Universal Coupling " spider " secured to the bottom of the inner section, the Rod itself being journalled at the base of the outer section of the mast. Chains fastened to the top brace of this outer section are passed over loose Sprockets mounted in the top of the inner moving section and are attached to the fork carriage. The drive to the Screwed Rods is through an auxiliary pair of ½ in. Bevel Gears, engaging with a 1½ in. Bevel Gear to give the raising and lowering movements (this reversing gear is also the initial part of the drive to the tilt mechanism of the mast), and then through a ½ in. Pinion which meshes with a ¾ in. Contrate Wheels on a shaft driving the twin belts. The selector lever engages one or other of the ½ in. Bevels; pushing forward with the lever held over to the left lowers the fork; pulling backwards with the lever to the left raises the fork.

This same selector lever controls the tilt mechanism. When the lever is held over to the right it disengages the drive to the twin belts for the hoist and engages the high reduction gears for the mast tilt mechanism. Pushing the lever forward engages one of the ½ in. Bevels causing the mast to tilt forward, whereas pulling the lever backwards while still held over to the right causes the mast to tilt backwards. The tilt arms are attached to the mast 4 in. above its bottom end, being pivoted on a cross beam clamped—not bolted—to the mast so as to avoid interference with the inner sliding section of the mast.

TRANSMISSION TO ROAD WHEELS

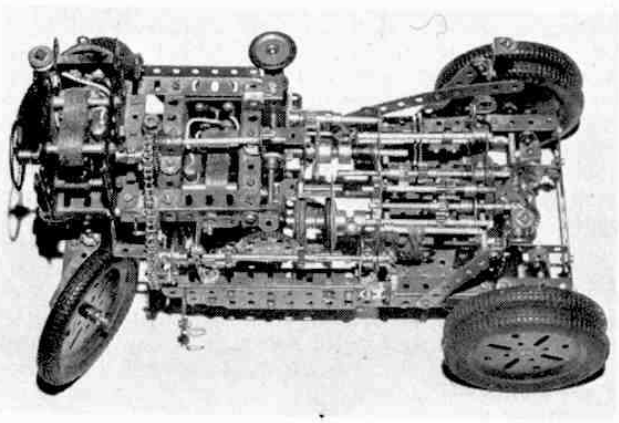
Transmission to the Road Wheels is first taken to a 2-plate clutch driven at half the motor speed. The driving plates are supplied by two Face Plates, one locked to the input shaft and the other free to move axially but driven by the first Plate via two short Screwed Rods fixed to the first Plate and projecting into Rod Connectors fitted into the slotted holes of the second Plate. Secured to the boss of this second Plate is a Socket Coupling which provides a withdrawal facility. A Rubber Band passed round the two Plates provides the necessary spring pressure to give a positive drive. The driven plates, on the other hand, are 1 in Pulleys, fitted with Tyres and locked boss to boss on the output shaft which is allowed a little end float to ensure complete disengagement of the clutch

From the clutch, the drive is taken through a reversing gearbox, made up of ½ in Pinions, to the main 2-speed gearbox. It then travels through a Worm Gear on to a cross shaft behind the front axle, this shaft being free to slide under the control of the handbrake lever. A ¾ in. Pinion on the shaft meshes with a 57-teeth Gear incorporated in the differential, this carrying the drive to the front axle. When the handbrake is moved to the " off " position the Pinion and Gear Wheel disengage, allowing the model to run " free."

BODYWORK AND CONTROLS

The bodywork of the model is produced as a separate complete item from various Strips, Girders and Plates and is fixed to the chassis by four Bolts. The stub shafts for the gear selectors and steering gear are located in a Girder Bracket fixed to the chassis and are aligned so that the bodywork drops over them, this also applying to the handbrake. The mast/fork control lever projects through a hole in the toe-board of the bodywork, the lever being fixed through the centre transverse bore of a Coupling. Projecting rearwards from the longitudinal bore of the Coupling is the Rod actuating the reversing movement, while, fixed in the front transverse bore of the Coupling, at right angles to the control lever, is the Rod which actually engages the tilt or hoist drive. The Coupling pivot is very simple indeed being merely the shank of a Bolt projecting into the forward end of the longitudinal bore of the Coupling. A Compression Spring on the rear projecting Rod bears on the lever to which it is connected, thus ensuring that the Coupling is always forced on to the Bolt forming the pivot point. The arrangement of the Rods connected to the Coupling results in the control lever moving in an " H " pattern.

As regards the steering and gear selector Rods, these are journalled on the dash panel being connected to further Rods, projecting through the bodywork, by Universal Couplings. Removal of these controls and the four fixing Bolts allows the complete body to be lifted clear of the chassis for easy access to the interior mechanisms. With the body in place, operation of the various working features of the model is most realistic and highly satisfying.



Heading photograph shows the truck ready to lift a load. Left: A close-up view of the final drive system. Above: A close-up view of the clutch and gearbox. Right: A general view of the model showing the complex interior.