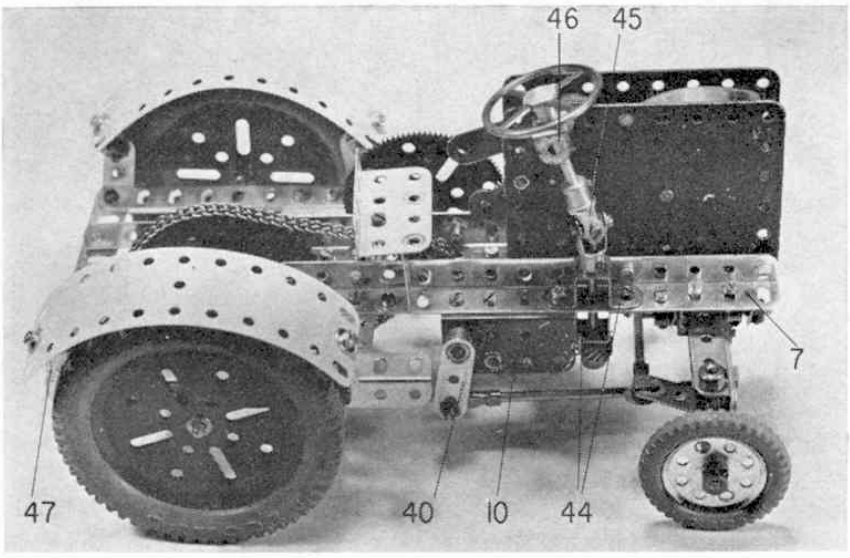


Agricultural Tractor

'Spanner' describes a working model built by reader D. R. Cowdrey

AYLESBURY in Buckinghamshire besides being famous for Aylesbury Ducks, is also a delightful little market town situated in beautiful countryside. Farming is a major industry, therefore it is reasonable to assume that Meccano modellers in the area would have an interest in agricultural equipment—an assumption which is borne out by the Agricultural Tractor illustrated here. It was designed and built by Mr David Cowdrey of Weston Turville, Aylesbury and it is, I might add, a remarkably smooth-running model. Power is supplied by a No. 1 Clockwork Motor.

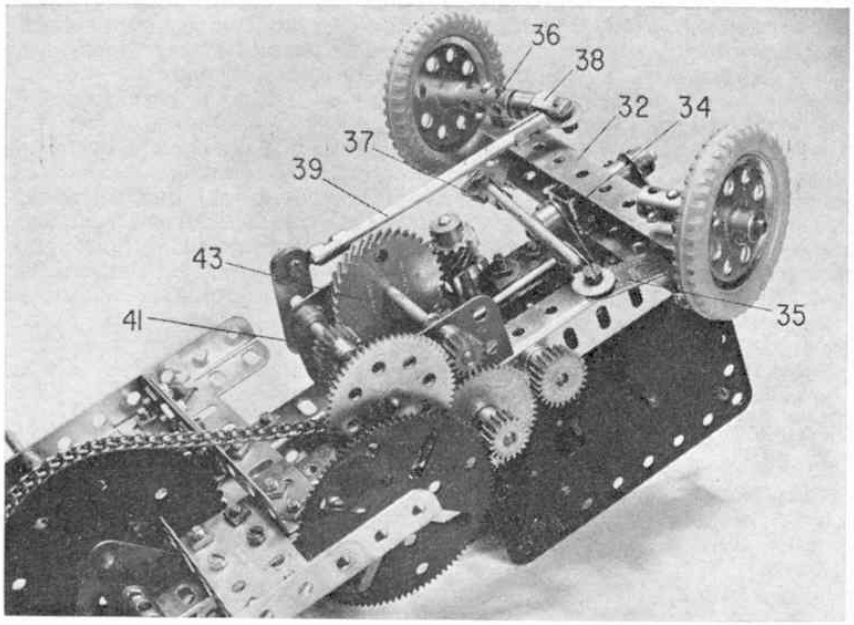
The smooth-running characteristic of the model owes a lot to the differential incorporated in the back axle. Instead of being the usual type of mechanism so often featured in these pages, it is, in fact, a spur differential, considerably different in design from the usual. Mr Cowdrey, however, hastens to disclaim all credit for this particular section, pointing out that the mechanism was originally designed by a Mr J. A. Blacklin and featured in the March 1940 issue of the M.M.

The rear chassis section is supplied by two 5½ in. Angle Girders 1 connected together at their rear ends by a 4½ in. Angle Girder 2. Attached to Girder 2 through its third hole is another 4½ in. Angle Girder 3, its forward end connected to right-hand Girder 1 by a 3½ in. Angle Girder 4 and to left-hand Girder 1 by a Girder Bracket 5.

A 7½ in. Angle Girder 6 is now bolted to Girder Bracket 5 and Angle Girder 4, as shown, another 7½ in. Angle Girder 7 being bolted to Girder 4 and to a 2 in. Angle Girder 8 secured to right-hand Girder 1. Girders 6 and 7 are separated by a distance of one hole and both project 12 holes forward beyond Angle Girder 4. At their forward ends Girders 6 and 7 are connected by two Trunnions 9, flanges together, secured through the second and third holes of the Girders. Two Girder Brackets 10 are also bolted, one to each Girder in the positions shown, these later serving as part of the gearbox mounting.

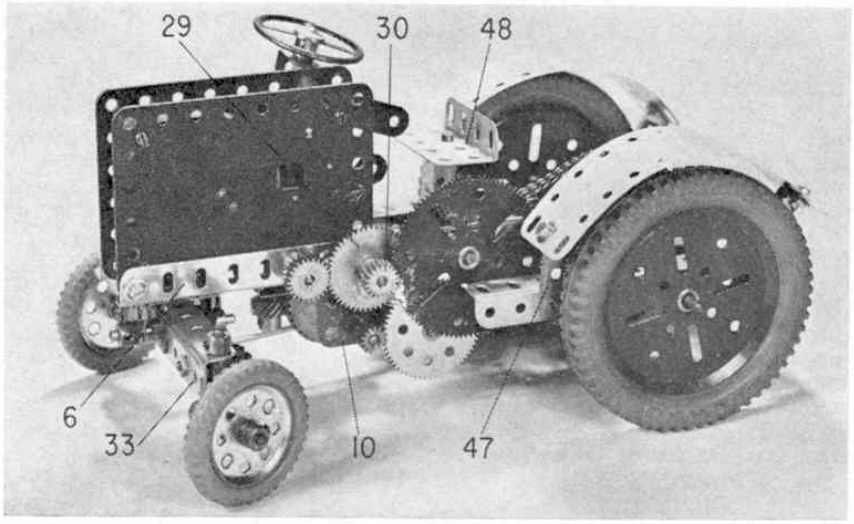
Back axle

As already mentioned, the back axle incorporates a neat and extremely smooth spur differential, as opposed to the common type of differential. This is built up on a 3 in. Sprocket Wheel 11, in diametrically opposite holes in the face of which two 2 in. Screwed Rods are each securely held by two Nuts screwed tightly against each side of the Sprocket. Note that the boss of the Sprocket is on the opposite side to the greater parts of the screwed Rods. Fixed by further Nuts on one of the Screwed Rods $\frac{3}{16}$ in. from the Sprocket are a 1½ in. Strip 12 and a 1 in. Triangular Plate 13, one on top of the other, the protruding end of the Strip being attached, together with another 1 in. Triangular Plate 14, to the other Screwed Rod again using Nuts. The two Triangular



Top, full credit for this smooth-running Agricultural Tractor goes to Mr David Cowdrey of Weston Turville, Aylesbury, Bucks. Left, in this close-up underside view of the forward section of the model the layout of the drive and steering systems is clearly shown.

Right, another general view of the Tractor showing its realistic outlines Below, two close-up views of the rear chassis sections showing the spur differential from top and bottom.



Plates are arranged so that their inner corner holes coincide with each other and with the centre hole in Strip 12. Part of the rear axle will later pass through these holes.

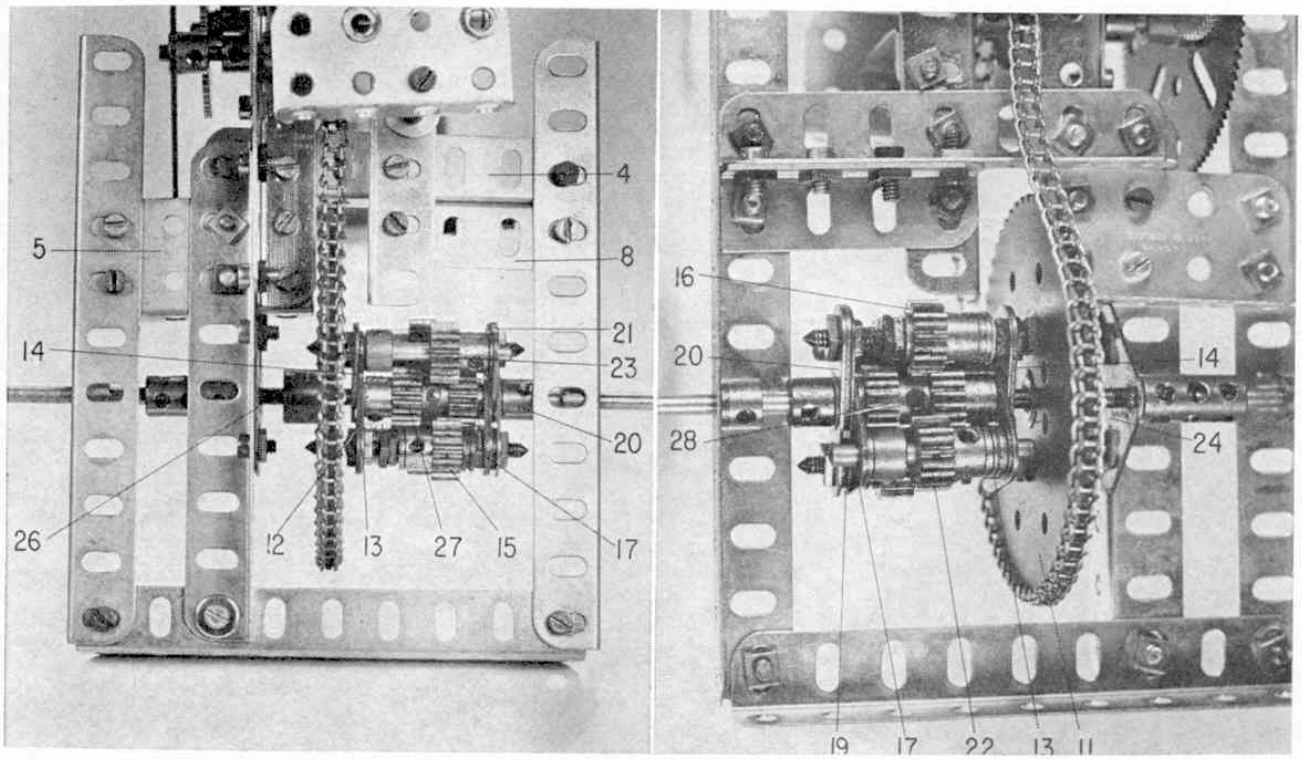
Now mounted on the first Screwed Rod in the positions shown are two lock-nuts, followed by a Washer, a loose ½ in. Pinion 15, boss pointing towards the Sprocket, three more Washers and a Nut. This Nut must not grip the other parts tightly, and so prevent them from turning, but it should, together with the lock-nuts, prevent the Pinion from moving up and down along the Screwed Rod. Mounted on the other Screwed Rod, in order, are an electrical Thin Washer, two ordinary Washers, a ½ in. Pinion 16, boss towards the Sprocket, another Washer and two further lock-nuts, the latter again preventing the Pinion from sliding on the Screwed Rod, while allowing it to revolve freely.

Added to the outside end of the first Screwed Rod are another 1 in. Triangular Plate 17, overlaid by a 1½ in. Strip 19, a Washer and a Double Arm Crank 20, the Screwed rod passing through the elongated hole of the Crank and the whole assembly locked together by the Nut already on the Rod and another Nut added to the outside. The other ends of the Crank and 1½ in. Strip are locked, together with another 1 in. Triangular Plate 21, by Nuts on the second Screwed Rod. As before, the inner corner holes of the Triangular Plates coincide with the centre hole in Strip 19, and in this case, they also coincide with the hole in the boss of the Double Arm Crank.

Journalled in the remaining corner holes in Triangular Plates 13 and 17 is a 1½ in. Rod, which carries, in order from the Sprocket end, an electrical Thin Washer, three ordinary Washers, a ½ in. fixed Pinion 22, 1 Collar and another Washer, all inside the Triangular Plates. The Collar and Pinion hold the Rod in position.

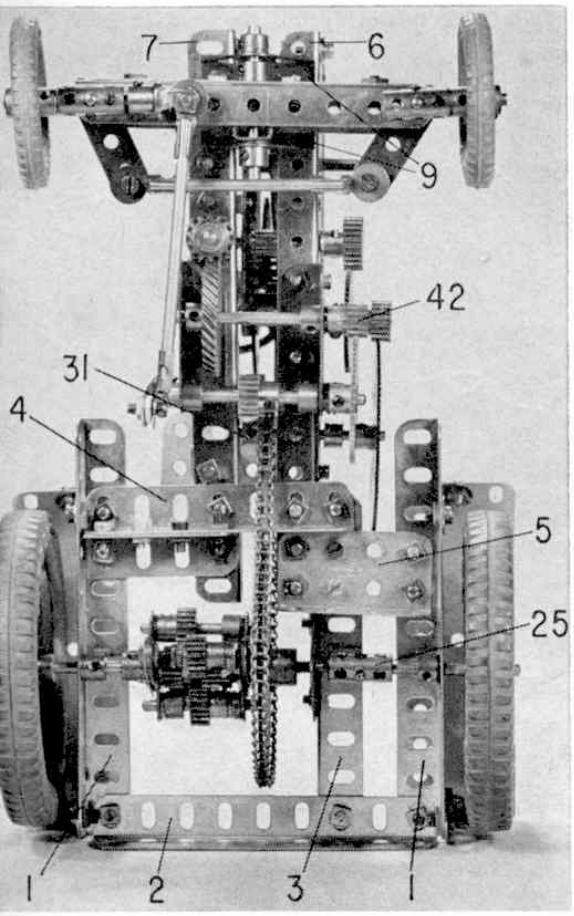
Journalled in the remaining holes of Triangular Plates 14 and 21 is another 1½ in. Rod which carries, in order from the Sprocket end, a Washer, a Collar, a further ½ in. fixed Pinion 23 and a final Washer. The Collar and Pinion again hold the Rod in position.

Now journalled in left-hand Girder 1 and in a Flat Trunnion 24 bolted to Girder 3 is a 2 in. Rod which is extended, via a coupling 25, by a Flexible Coupling Unit 26. This Unit passes through the boss



of Sprocket Wheel 11, through the inner corner holes of Triangular Plates 13 and 14 and half-way into the bore of a ½ in. Pinion 27. This Pinion and the Sprocket are of course fixed on the Coupling Unit, while the 2 in. Rod is held in place by a Collar, spaced by a Washer. Running loose in the remaining half of the bore of Pinion 27 is a 2½ in. Rod, journalled in the inner corner holes of Triangular Plates 17 and 21 and in right-hand Girder 1. Fixed on the Rod, inside the Plates, is another ½ in. Pinion 28, spaced from the Plates by a Washer, the Rod being held in place by a Washer and Collar against the Girder. Note that the boss of Pinion 28 faces the 3 in. Sprocket Wheel.

Naturally, the positioning of the various Pinions in the differential is vital. With half their faces, Pinions 16 and 22 mesh with Pinion 27 on the Flexible Coupling Unit, the remaining half of Pinion 16 meshing with Pinion 23 and the remaining half of Pinion 22 meshing with Pinion 15. Part of Pinions 15 and 23 also mesh with Pinion 28 which in fact means that, when the differential is correctly assembled, each Pinion meshes with two other Pinions.



An underside view of the Tractor showing construction of the girder-built chassis.

This description may sound rather complicated, by the way, but by studying the illustrations carefully, successful completion should not be difficult. Note, however, the 7/64 in. Grub Screws, Part No. 69c, should be used to secure Pinion 15, 16, 22, 23 and 28 as standard Grub Screws will catch on the teeth of the meshing Pinions.

The rear road wheels are supplied by two 3 in. Pulleys with Motor Tyres mounted on the ends of the 2 in. and 2½ in. Rods.

Motor and Drive

The No. 1 Clockwork Motor can now be bolted between Girders 6 and 7, Nuts or Washers being used for spacing purposes, as required, and the output shaft projecting through the sixth hole of Girder 6. A ¾ in. Pinion fixed on the output shaft meshes with a 50-teeth Gear Wheel 29 mounted, along with a ½ in. Pinion 30, on a 2 in. Rod journalled in the lower rear corner holes in the Motor sideplates. Pinion 30 meshes with a 2½ in. Gear Wheel, fixed on a second 2 in. Rod held by Collars in Girders 6 and 7, a 1½ in. Strip being bolted to Girder 6 to provide an extended bearing for the Rod. Secured on the Rod, between the Girders, is a ¾ in. Sprocket Wheel 31 which is connected by Chain to Sprocket Wheel 11.

Front Axle and Steering Gear

In the case of the front axle, a 4½ in. "U"-section channel girder 32 is built up from two 4½ in. Angle Girders, with the back of the "U" being overlaid by a 4½ in. Strip 33. Bolted to the centre inside of the "U" is a Double Bent Strip 34. Two 1½ in. Rods are each held by a Collar and a Crank 35 in opposite end holes of the channel girder, the Crank being positioned between the flanges of the girder. Fixed on the lower end of each Rod is a Coupling 36, the Rod passing through the centre transverse bore of the Coupling. In the longitudinal bore of the Coupling a 1 in. Rod is secured, a loose 1½ in. Pulley with Motor Tyre being held by a Collar on this Rod to serve as one of the front Wheels. Cranks 35 at each side are connected by a 2½ in. Rod 37 held in Rod and Strip Connectors lock-nutted to the arms of the Cranks.

The front axle assembly can now be mounted in the chassis, this being achieved simply by a 1½ in. Rod passed through Double Bent Strip 34 and channel girder 32 and held by Collars in the apex holes of Trunnions 9. A third Collar spaces the channel girder from forward Trunnion 9. A 1 in. Rod is then fixed in the inside end of the longitudinal bore of right-hand Coupling 36 and on this Rod an End Bearing 38 is mounted. Lock-nutted to this Bearing is a Rod and Strip Connector on one end of a 3½ in. Rod 39, on the other end of which another Rod and Strip Connector is mounted. This second Connector is lock-nutted to the arm of a Crank 40 fixed on one end of a 2½ in. Rod held by a Collar in Girder Brackets 10.

Secured on the Rod, mid-way between the Girder Brackets, is a ½ in. Pinion 41 which meshes with another ½ in. Pinion immediately below it on another 2½ in. Rod also held by Collars in the Girder Brackets. A 60-teeth Gear Wheel is fixed on the end of this second Rod and this meshes with a 7/16 in. Pinion 42 on yet a further 2½ in. Rod held by a Collar in the Girder Brackets. Also fixed on this Rod is a 1½ in. Helical Gear 43 which meshes with a ½ in. Helical Gear on the lower end of a 2½ in. Rod journalled in two Double Bent Strips 44 bolted to Angle Girder 7. A universal Coupling 45 is mounted on the upper end of the Rod, this being extended by a 2 in. Rod journalled in a Double Bracket 46 bolted to the Motor sideplate. A 1¾ in. Steering Wheel is fixed on the upper end of the Rod.

Two rear mudguards are each provided by a 5½ × 1½ in. Flexible Plate, curved to shape and attached by Angle Brackets to two 1½ in. Strips 47 bolted to nearby Angle Girders 1. Last of all, the driver's seat is supplied by a final Girder Bracket 48, attached to Angle Girder 7 by a 1½ × ½ in. Double Angle Strip bolted through the fourth hole of the rear end of the Girder.

PARTS REQUIRED

1—2a	3—18b	1—48	2—142b
8—6a	2—19b	18—59	2—142d
2—8b	2—21	3—62	4—161
2—9	1—25	1—62b	1—166
3—9a	9—26	3—63	1—175
1—9b	1—26c	4—77	2—182
1—9e	1—27	1—94	1—185
1—11	1—27c	1—95	1—211a
4—12	1—27d	1—96a	1—211b
1—16	81—37a	4—111c	4—212
7—16a	60—37b	2—126	1 No. 1
4—17	32—38	1—126a	Clock-
4—18a	3—45	1—140	work
			Motor