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MAP HOBBY MAGAZINE

FRONT COVER

The cover photograph of a display, built by James Yule of Perth, Scotland, shows a Napoleonic battle scene. Gunners of the Foot Artillery and French Imperial Guard around the year 1807 (they are very distinguishable by their uniforms of imperial blue trimmed with red) handling an eight-pound Gribeauval cannon. The cannon and soldiers are made from Historex kits. See page 310 for full details.

NEXT MONTH

Our cover for July has a Police Patrol Car painted in action to tie in with a feature on the Hertfordshire Police, detailing just how the Force operates. Meccano Models include a Plastic and Standard Meccano Swing Bridge, Among the Model Builders, and the final part of Bone Shaker. There will also be two pages of Dinky Toy News by Chris Jelley. For the balsa builders we have half-size plans for a rubber powered, propeller-driven car, and full size plans for an electrically operated Cable Car. This is not a gimmick, it will go from the garden to the bedroom window with ease. Chemistry is back again—this time on invisible ink, an all time favourite. A.B.C. of Model Railways, Trackside Construction, Have You Seen, and many other interesting features, make the July Meccano Magazine an issue you must not miss.

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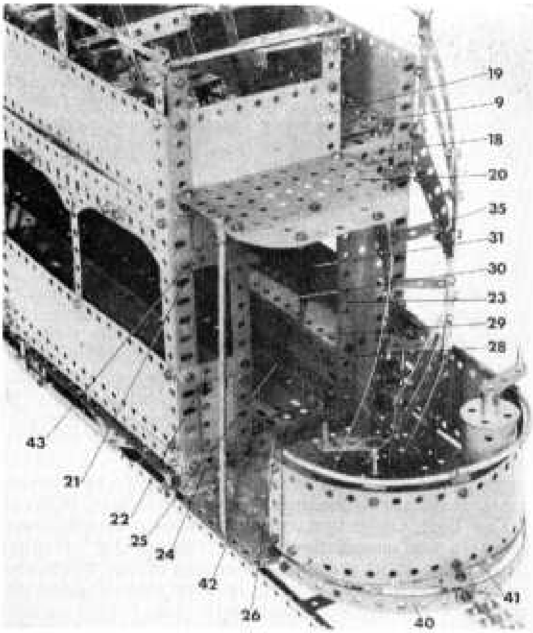
13-35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTFORDSHIRE



Above, as on real trams, the Meccano model is equipped with two identical driving platforms, one at each end, carrying an external stairway to the top deck as well as the driving control. This view shows one of the platforms in detail.

BONE SHAKER

by Spanner

Try building this advanced Meccano model based on an old 1903 tramcar used by Bradford City Tramways early this century. To be concluded next month.

DURING THE first quarter of this century virtually every major town and city in Britain established an electric tramway system. Trams, in actual fact, were the first-ever means of mass urban public transportation and there are many people, even today, who maintain (perhaps with good reason !) that they would still have advantage over the buses that have replaced them. Nonetheless, they have been replaced, but I venture to suggest that just about everybody mourns their passing to some extent. Most Meccano model-builders, having a mechanical bent, certainly do so, but we, at least, are in a position to recreate the glory of the old tram days in model form, which is what our model-builder has tried to do with the excellent advanced model featured here. It is based on a 1903 tramcar used for many years by Bradford City Tramways with complete success.

Construction, although lengthy, is not difficult.

Chassis

Bolted to one end of an 18½ in. Angle Girder 1 is a 5½ × 5½ in. compound flat plate 2, edged by a 5½ in. Angle Girder 3 and built up from one 5½ × 3½ in. and one 5½ × 2½ in. Flat Plate. The assembly projects a distance of nine holes past the end of Girder 1. A second 5½ in. Angle Girder 4 is bolted to the underside of the plate, as shown, the securing Bolts also fixing a 4½ × 2½ in. Flat Plate 5 to the top of the plate. Bolted to the underside of this last Plate is a 2½ × 1½ in. Flexible Plate 6.

Another entire Girder/Plate arrangement is now similarly built up and the two are joined at each end by a 3½ in. Angle Girder 7 bolted between compound flat plate 2 and the opposite Angle Girder 1. The "truck," incorporating the wheels, will also be attached to Girders 1, but it is advisable to leave this until after the main bodywork has been completed.

Bodywork and fittings

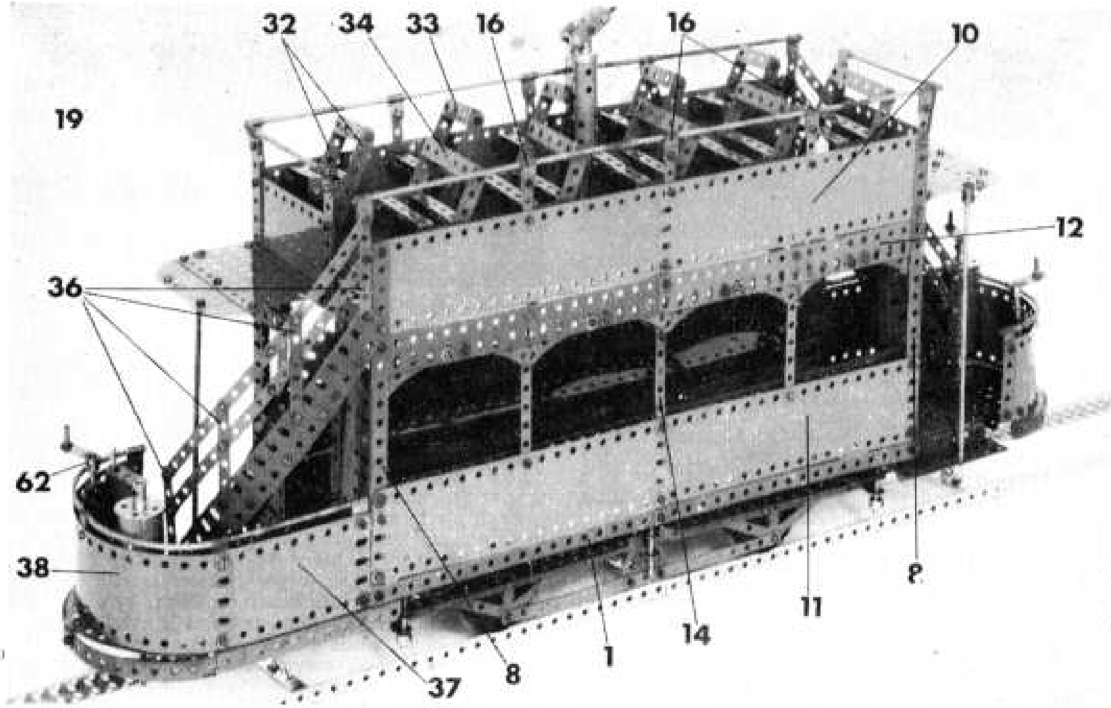
Although enclosing a fairly large area, the body is not at all difficult to build. Two 9½ in. Angle Girders 8 are fixed one to each end of each Girder 1, then Girders 8 are joined as shown by an 18½ in. Angle Girder 9 and two 10½ × 2½ in. compound strip plates 10 and 11, each obtained from two 9½ × 2½ in. Strip Plates overlapped one hole. Girder 9 coincides with the lower edge of plate 10.

Also bolted between Girders 8, immediately below plate 10, is an 18½ in. compound flat girder 12, built up from two 9½ in. Flat Girders. This compound flat girder is joined to compound strip plate 11 by two 4½ in. Narrow Strips 13 and a 10½ in. compound narrow strip 14 all equally spaced apart. Strip 14 is obtained from two 5½ in. Narrow Strips, overlapped one hole, and it can be seen that it extends from Angle Girder 1 upwards to project a distance of two holes above compound plate 10. Three 2½ in. Narrow Strips 15 are fixed to the plate, these also projecting a distance of two holes above the plate, and a right-angled Rod and Strip Connector 16 is added to the top of each one. Lower down, a curved top is given to each side window by two 2½ in. Curved Strips 17.

Girders 9 are now joined at each end by a 6½ in. compound angle girder 18, obtained from one 5½ in. and one 4½ in. Angle Girder. Attached to the outside of this compound girder are a 4½ in. Flexible Plate, edged by two 3½ in. Strips 19, and a 4½ in. Angle Girder to which a 4½ × 2½ in. Flat Plate 20 is bolted to serve as a canopy. Plate 20 is extended by two Semi-circular Plates and a 2½ × 1½ in. Flexible Plate.

At each end of the lower saloon, an entrance-way is left open, but to either side of this a vertical panel is built up. Both panels, however, are different, that beneath Plate 20 consisting of a 7½ in. Strip bolted to Angle Girder 18 and joined to nearby Girder 9 by two 2 in. Strips 21 and 22. The area above Strip 21 is enclosed by a 1½ × 1½ in. Flat Plate, while the area below Strip 22 is covered by a 2½ × 1½ in. Flexible Plate. The space between the Strips is left blank to represent a window.

The other panel at the opposite side of the entrance-way consists simply of a 5½ × 1½ in. Flexible Plate extended by a 2½ × 1½ in. Flexible Plate, both edged by a 7½ in. Strip 23. At the bottom, the two panels are connected by a 6½ in. compound Strip 24, obtained from two 4½ in. Strips and bolted between Angle Girders 8.

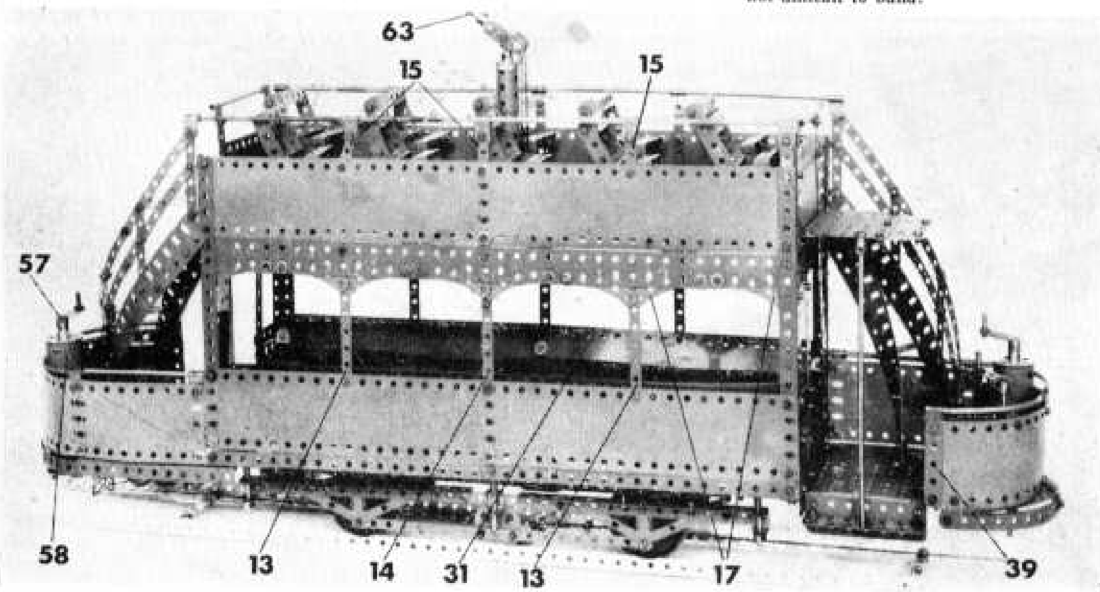


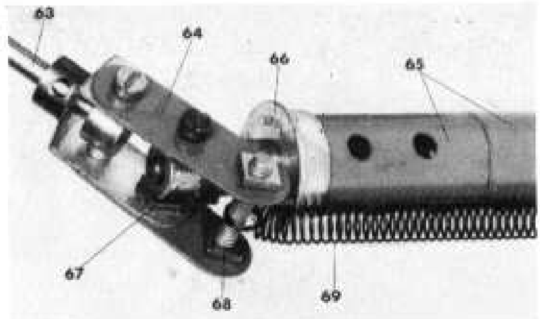
Inside the lower saloon two long bench seats running the full length are provided and these, together with the floor, can be built as a separate unit and fitted complete. Two 18½ in. Angle Girders 25, placed 2½ in. apart are joined at each end by a 3½ in. Angle Girder 26, the intervening space being enclosed by a 12½ × 2½ in. Strip Plate and a 5½ × 2½ in. Flat Plate 27, both bolted to the lower flanges of Girders 25.

Fixed to the vertical flange of each Girder 25 is an 18½ × 1½ in. compound flexible plate 28, built up from four 5½ × 1½ in. Flexible Plates, to the upper edge of which another 18½ in. Angle Girder 29 is bolted. This

Above, this superb Meccano-built model, is based on a 1903 tram of the type used by Bradford city tramways early this century. It is driven by a Power Drive Unit.

Below, if you are a tramway enthusiast, you will agree that this model has all the fascinating lines of a typical old-time tram. Despite its size—more than 24 in. long and 12 in. tall—it is not difficult to build.





Above, a close up view of the swivel connection between the trolley pole and its mounting, seen here lying on its side. Note the use made of the tapped bores in the Collars. Below, a close up view of the truck showing its suspension and wheel arrangement.

in turn has fixed to its free flange an 18½ × 1½ in. compound flexible plate 30 obtained from four 5½ × 1½ in. Flexible Plates, then each seat is completed by a back provided by an 18½ × 2½ in. compound strip plate 31, attached to plate 30 by Obtuse Angle Brackets. Note that plate 31, which is built up from two 9½ × 2½ in. Strip Plates, projects a distance of only two holes above plate 30. When finished, the seat is fixed in position by bolting Angle Girder 26 to compound strip 24.

In the case of the upper deck two 18½ in. compound strips, each obtained from two 9½ in. Strips, are bolted between compound girders 18 to provide anchoring points for five 5½ × 3½ in. Flat Plates forming the floor. To prevent the floor sagging in the middle, strengtheners are provided by one 5½ in. and one 4½ in. Angle Girder bolted in suitable positions to each compound girder 9 and projecting at right-angles under the floor. Each Angle Girder attached to one girder 9 coincides with its opposite number attached to the other girder 9, *but they are not bolted together*.

Two rows each of five seats are next added, one row consisting of single seats and the other of double seats. Both types are similarly built up from two 3½ in Strips 32, fixed to the floor by Angle Brackets. A 1½ in. Strip is bolted to each of the 3½ in. Strips, then the two sides are joined by three Double Angle Strips, 1½ × 1½ in. 33 in one case and 2½ × ½ in. 34 in the other.

Stairways

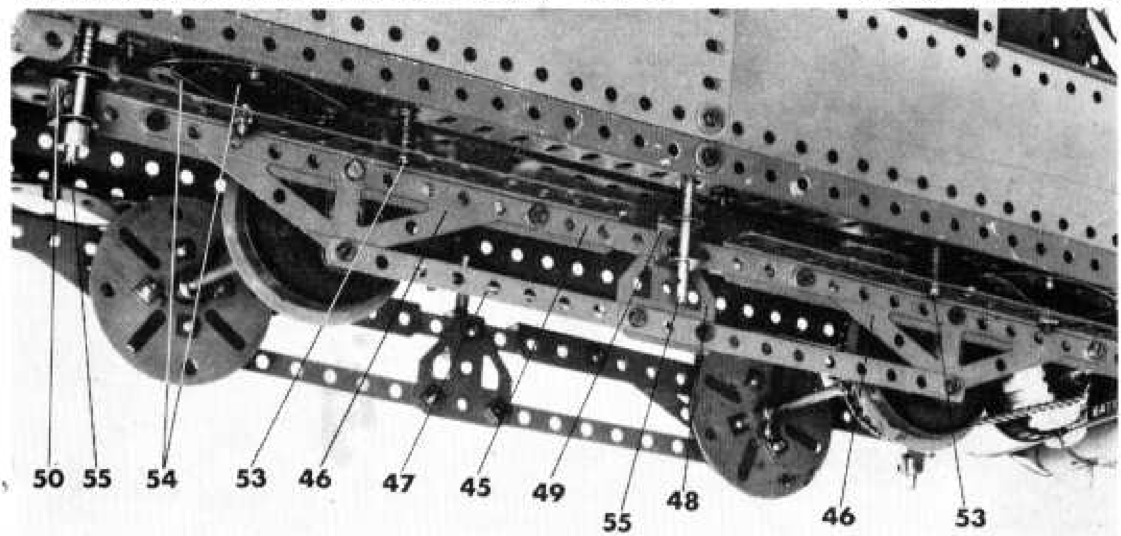
Like the full-size tram, our model has two curved external stairways, one at each end, running from the driving platform to the top deck. Both are similarly built from one 7½ in. and one 9½ in. Flat Girder, curved to shape and joined by six 1½ × ½ in. Double Angle Strips 35. At its lower end, the 7½ in. Girder is attached to the platform by an Angle Bracket, while the upper end of the 9½ in. Girder is bolted direct to Angle Girder 8.

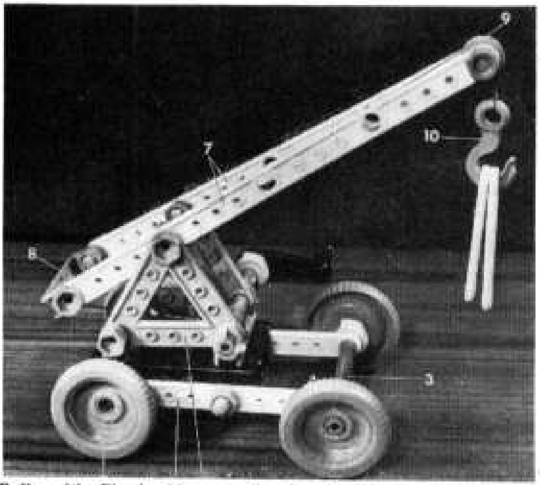
A handrail is provided by four 3 in. Narrow Strips 36 joined by two 9½ in. compound narrow strips, each obtained from one 4½ in. and one 5½ in. Narrow Strip. Fitted to the top of the upper Strip 36 is a right-angled Rod and Strip Connector which is connected to similar parts 16 by suitable Axle Rods joined by Rod Connectors. Right-angled Rod and Strip Connectors joined by a 4½ in. Rod are also bolted to the tops of Strips 19.

Each platform is enclosed by a 4½ × 2½ in. Flexible Plate 37 attached to one Angle Girder 8 by Fishplates and extended by a curved 9½ × 2½ in. Strip Plate 38. The latter is attached to the platform at its ends by 1 × ½ in. Angle Brackets and in the centre by a ½ × ½ in. Angle Bracket. In addition, one end is overlayed by a 2½ in. Strip 39, while a hand-rail is again supplied by suitable Rods, some curved, attached by right-angled Rod and Strip Connectors.

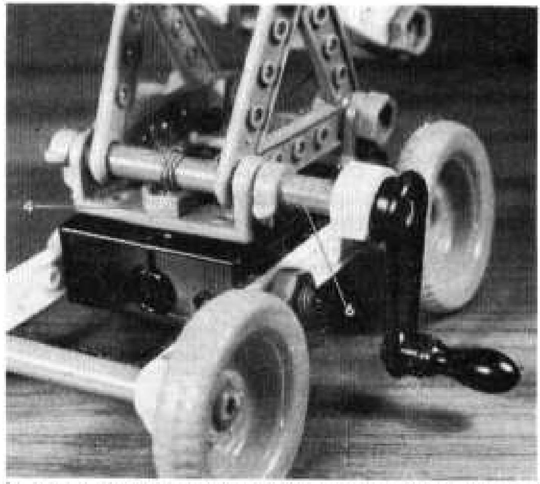
A fender is next obtained from a curved 9½ in Strip 40 wedged, at one end, behind Angle Girder 3 and attached, at the other end, to Plate 39 by a Fishplate. In the centre, it is attached to Flexible Plate 6 by a 1 × ½ in. Angle Bracket to the top of which two 4 in. Stepped Curved Strips 41 are bolted. To provide a step, a 3½ in. Flat Girder 42 is attached by Angle Brackets to another 3½ in. Flat Girder which is in turn fixed by Angle Brackets to the underside of the platform. A vertical rail runs from the step to the canopy, being held in a Rod Socket 43 fixed to Flat Plate 20.

Continued next month.





Built with Plastic Meccano Set B, this simple little Mobile Crane works extremely well and can be used to lift quite heavy weights.



A close-up view of the Crane winding mechanism. Note that the winding shaft is used as one of the anchoring points for the superstructure.

LIFT AND CARRY by Spanner

An easy to build Mobile Crane produced from Plastic Meccano Set B

AMONG THE most popular of all subjects for Meccano model-builders are cranes, be they new or old; large, small or in-between. I say this with authority, because our many years of experience with the standard system have proved it beyond doubt. We have not, on the other hand, had many years of experience with the comparatively new Plastic Meccano system, but I see no reason for thinking that the tastes of modellers in Plastic Meccano should be very much different from those of their more advanced relations. In fact, I am inclined to think that, if anything, the young owner of a Plastic Meccano Set is likely to be more interested in a crane model simply because it can usually be made to "work" and working models are particularly fascinating to young minds.

Anyway, believing this to be true, I am featuring here a simple but most effective model of a little Mobile Crane that can be built with Set B. And when I say simple, I *mean* simple! The chassis consists of nothing more than a Base to each side of which a 3-hole Strip 1 is fixed. Attention must be given to the fixing Bolts, however, as the Bolt that passes through the centre hole of each Strip carries a Nut in the normal way, while the Bolt passed through the rear end hole carries a Road Wheel 2 held by a Collet Nut. Note that the Road Wheel must be fixed on the Bolt in such a position that it allows the Bolt to revolve. Journalled in the other end holes of the Strips is a 4½ in. Axle 3 on each end of which further Road Wheels are mounted, as shown.

Bolted to the top of the Base are two Double Angle Strips 4, to which two 2-hole Triangular Girders 5 are fixed, by Nuts and Bolts in the case of the rear Double Angle Strip, and by a 4½ in. Axle 6 held in place by Axle Clips in the case of the front Double Angle Strip. A Handle is mounted on one end of this Rod.

Two 5-hole Strips 7 are next attached one to the apex of each Triangular Girder, the securing Bolts passing through the second hole from the end of each Strip. The Strips themselves are connected at one end by a Double Angle Strip 8 and, at the other end, by a Bolt on which a Pulley Wheel 9 is mounted. Lastly, a length of Cord is taken from Axle 6, is passed through the centre hole in Double Angle Strip 8, is passed over Pulley Wheel 9 and is finally tied to a Hook 10.

PARTS REQUIRED

2—3-hole Strips	1—Pulley Wheel
2—5-hole Strips	2—Axle Clips
1—Base	1—Hook
13—Bolts	2—4½ in. Axles
11—Nuts	2—2-hole Triangular Girders
3—Double Angle Strips	1—Handle
4—Road Wheels	

Captain Cook on Stamps—*continued*

ately promoted to captain. His third and last voyage had the aim of finding the fabled North-West Passage. In June 1776 he set sail for the Pacific and after visiting New Zealand and Tasmania, discovered a number of islands in the Cook Archipelago before exploring Alaska and Hawaii, where he was killed by natives in February 1779. During his second voyage he had landed at Opahi in the island of Niue (depicted on the 1d. stamp of 1950) and charted the Hervey Islands in the North of the archipelago (shown on the 1d. stamp in the Cook Islands set of 1949). During his third voyage he visited Aitutaki and Mangaia and mapped other islands in this group. The landing of Cook's expedition was depicted on the ½d. stamps issued by Rarotonga, Aitutaki, Niue and Penrhyn in 1920, while Cook's portrait appeared on the 1½d. stamp of the same series. Another, though less accurate, version of the landing was shown on the ½d. stamp of the 1932 series of the Cook Islands, showing the *Resolution* anchored under full sail! Captain Cook, wearing a naval officer's hat, appeared on the 1d. stamp. The only other stamp to portray Captain Cook is the 1s. in the Cook Islands set of 1949 which depicts his statue erected in 1914 near Admiralty Arch in London.

SIMPLE MECHANISMS

Simplicity is the keynote of these model building hints supplied by Meccano Magazine readers for other followers of the hobby

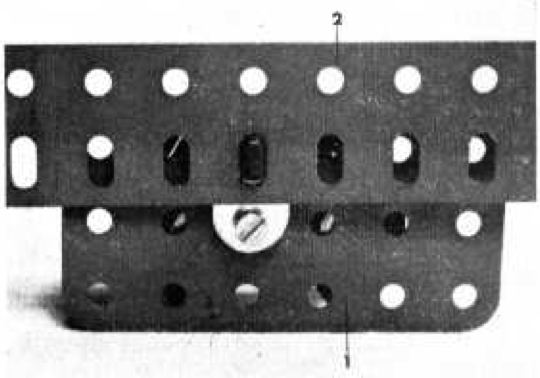
EVERY HOBBY has its pitfalls and Meccano is certainly no exception. I fear, though, that the fault in this case usually lies not with the system but with the user or, more particularly, with the enthusiasm of the user. By this I mean that many of us often get carried away with ourselves when building models. We fall into the trap of trying to introduce too much complexity and this, as you know, can be as much a bad habit as producing inadequate models.

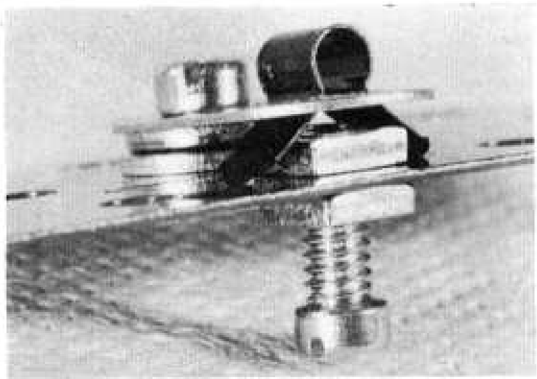
Don't think that I am decrying complicated models —far from it. What I am against is making overly complicated mechanisms just for the sake of complexity. When building models that have working movements, for example, the mechanisms controlling the movements should be made as simple as possible for the job on hand. This, you may think, is common sense, but it is surprising how many people come up with a fantastic unit bristling with Gears, Pinions, Rods and Worms when something quite simple would do the job just as well and probably more efficiently. In this article, therefore, I am featuring some ideas supplied by readers for items that are extremely useful and yet decidedly uncomplicated.

Doorcatch

First out of the bag is a little doorcatch (see Fig. 1) suggested by Mr. R. R. Hauton of Lincoln. From the accompanying illustration you will see that it consists of nothing more than a Spring Clip pressed through the elongated hole of a Fishplate. In operation, the Fishplate is attached to the door of the model being built, the doorframe of which must be so designed that another elongated hole in its outside edge coincides with the Spring Clip. When the door is shut, the "bulge" of the Spring Clip should also press into the latter elongated hole making, as Mr. Hauton says, "a good, firm catch."

Another view of the doorcatch as it would appear from the inside of a model. The Flat Plate 1 represents the door and the Flat Girder 2, the door frame.

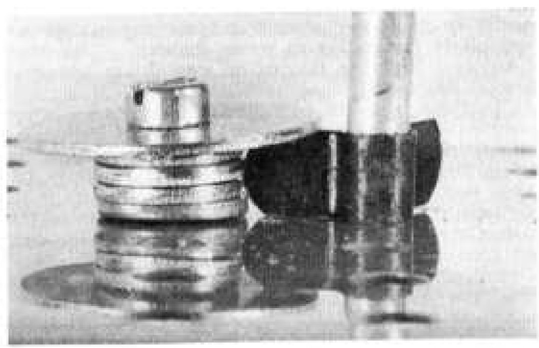




A very simple doorcatch for models designed by Mr. R. R. Hauton of Lincoln.

Control rod damper

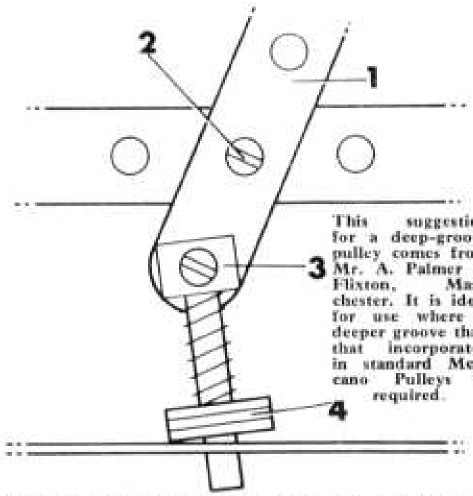
Another out-of-the-ordinary use for a Spring Clip has been suggested by Mr. L. R. Atkinson of Putney Heath in London, who produced a most effective damper (Fig. 2) for the control rod of a gearbox or, indeed, of any other mechanism actuated by the sliding movement of a Rod. You will know that when a gear arrangement or drive motion is controlled by a free-sliding Rod a certain amount of trouble can be caused by the Rod moving about on its own causing the drive to engage or disengage prematurely, as the case may be. Mr. Atkinson has overcome the problem in suitable cases by mounting a Spring Clip on the control Rod against the sideplate of the gearbox or model. An arm of the Spring Clip is trapped behind a $\frac{3}{4}$ in. Washer fixed to the sideplate, but spaced from it by three Washers on the shank of the securing Bolt. The grip of the Spring Clip prevents the Rod from sliding on its own, while allowing it to be moved by hand. It's a very simple idea, yet perfectly adequate.



In this mechanism, designed by Mr. L. R. Atkinson of Putney Heath, London, a Spring Clip is used as a damper to prevent the control rod of a gearbox or similar item from sliding of its own accord.

Self-locking lever

Equally simple is another idea from Mr. Atkinson—this time for a self-locking lever (Fig. 3) that makes an ideal gear shift. A Strip 1 serving as the actual lever is pivotally connected to a suitable mounting by a Bolt 2 lock-nutted through its second hole. Pivotally attached to the lower end of the Strip is a Collar 3 in which a short Rod is fixed. Mounted on the Rod is



This suggestion for a deep-groove pulley comes from Mr. A. Palmer of Flixton, Manchester. It is ideal for use where a deeper groove than that incorporated in standard Meccano Pulleys is required.

a Compression Spring followed by three Washers 4, after which the Rod is inserted into a hole in a Strip or other suitable part that is fixed in relation to the above-mentioned mounting.

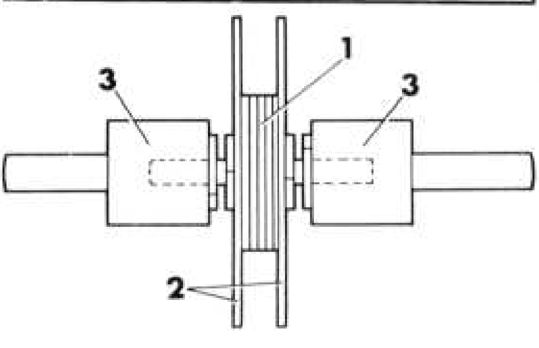
Using the method described the lever has only two steady positions—one way or the other—but the sprung action of the Rod certainly holds the lever firmly in the chosen position. Incidentally, Mr. Atkinson explains in a footnote that " This arrangement gives movement of about 1 in. at the second hole above the pivot point (of Strip 1)—enough for most gear changes ! It follows, of course, that the linkage actuating the gear-change would be coupled to this hole.

Deep-groove pulley

We come now to an item supplied by Mr. A. Palmer of Flixton, Manchester. Regular builders, especially of advanced models, will have found that there are occasions when standard Meccano Pulleys are inadequate, because the depth of the groove is not sufficient for the job on hand. Mr. Palmer has devised a built-up deep-groove pulley, illustrated in Fig. 4, to overcome the problem. Depending on the width required, five or more $\frac{3}{4}$ in. Washers 1 are trapped between two 6 or 8-hole Wheel Discs 2 held by Nuts in the centre of a 1 in. Screwed Rod. An Adaptor for Screwed Rod 3 (Part No. 173a) is mounted on each end of the Rod, being locked in positions by a Nut—that's all !

PARTS REQUIRED

2—24a	5—38d	2—173a
4—37a	1—82	



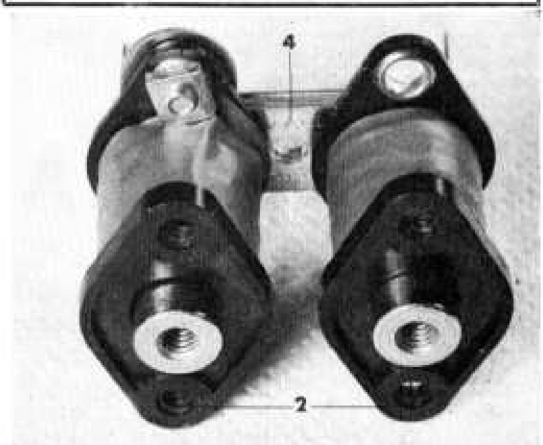
Electromagnetic grab

Turning from mechanics to electrics, we have a compact electromagnetic grab (Fig. 5) designed by Timothy Ward of Horfield, Bristol. It is intended, he tells me, " for use with smaller cranes where a pulley block is either unnecessary or too difficult to fit in." Mr. Ward is quite correct as far as he goes, but I would like to go even further and say that the grab would make a first-class and perhaps more interesting substitute for a hook even in cranes where hooks would normally be fitted.

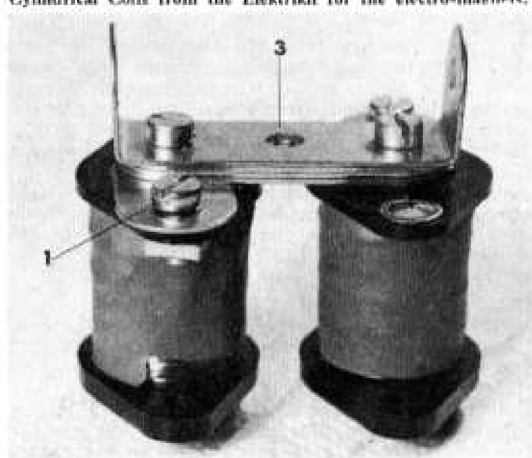
To build the grab, two Fishplates 1 are bolted one each to the S terminals of two Cylindrical Coils 2. Fixed to the top of the Fishplates by $\frac{3}{8}$ in. Bolts are a $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 3 and three $1\frac{1}{2}$ in. Strips 4, while the same Bolts fix three Washers and a 1 in. Core below each Fishplate. The hoist Cord of the model is tied to the lugs of Double Angle Strip 3 while the leads from the power-source are connected to the terminals of the Coils. The grab can be operated from a power source of anywhere between $4\frac{1}{2}$ and 15 volts A.C. or D.C.

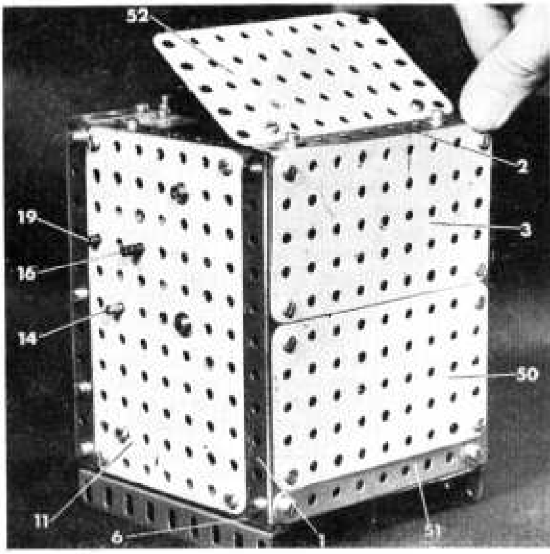
PARTS REQUIRED

3—6a	2—37b	2—111
2—10	6—38	2—522
2—37a	1—48	[illegible]—528

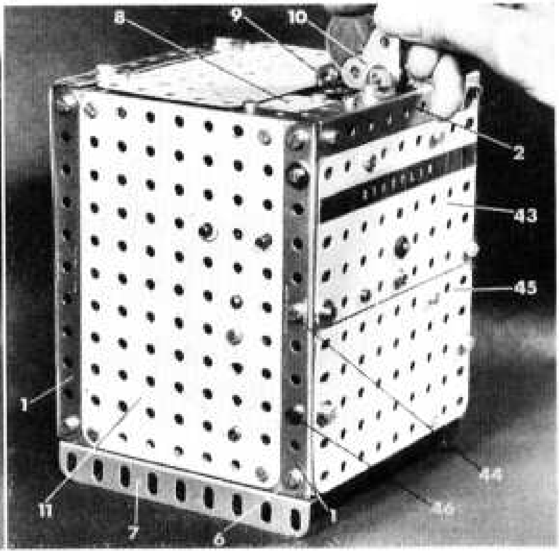


A simple electromagnetic grab designed by Timothy Ward of Horfield, Bristol for use with small crane models. It uses two Cylindrical Coils from the Elektrikit for the electro-magnets.





A rear view of the completed model showing construction of the basic " box."



The Meccano " Diabolik "—a mechanical money-box designed and built by Mr. Guiseppe Servetti of Piacenza, Italy.

MONEY GRABBER by Spanner

No problems in saving with this mechanical money-box. Put a coin in the slot and the mechanical hand grabs it tightly

FASCINATING GADGETS a-plenty have been built with Meccano, but few I have seen can match the particular example featured here. For reasons we shall see later it has been christened " Diabolik " by its Italian builder, Mr. Guiseppe Servetti of Piacenza, Italy. It is, in effect, a battery-powered, mechanical money-box, driven by a Junior Power Drive Motor and it's almost impossible to resist feeding it with coins ! Drop a coin in the slot provided and wait. Mysterious grinding noises and metallic rattles emanate from the dark interior of the box then, in due course, a lid in its top slowly opens and a " hand " appears. Almost gently it grasps the coin, pauses hesitantly then, without warning, suddenly whips the coin away to disappear inside the box with a bang—quite startling !

Framework

A rectangular box framework is constructed from four vertical 5½ in. Angle Girders 1 joined at the top by four 4½ in. Angle Girders 2, the securing Bolts holding the rear Girder also fixing a 4½ × 2½ in. Flat Plate 3 in position. The side Girders 1 are joined at their lower ends by a special built-up base consisting of a 4½ × 2½ in. Flat Plate and two 4½ in. Flat Girders 4 and 5. Each end of these parts is sandwiched between the horizontal flanges of two 4½ in. Angle Girders 6, placed one inside the other with their vertical flanges pointing upwards, while the securing Bolts fix a third 4½ in. Angle Girder 7 in position with its vertical flange pointing downwards. Note that Flat Girder 5 is not bolted in position but must be left free to slide in the groove supplied by the horizontal flanges of the two above-mentioned Angle Girders. The Flat Girder will later serve as the access hatch for the battery.

Bolted in the top front corners of the framework are two 1½ × 1½ in. Flat Plates 8 connected by a 2½ in. Insulating Flat Girder to the centre of which a Collar 9 is fixed by a Bolt screwed up into one of its tapped bores. This Bolt also fixes a 1 × ½ in. Angle Bracket by its long lug to the underside of the Insulating Girder with its short lug towards the front and pointing downwards. A guide slot is then provided by two 1 in. Corner Brackets 10, separated by two Washers and mounted with further Washers on a ½ in. Bolt fixed in two Angle Brackets bolted to front Girder 2. The Corner Brackets must not touch Collar 9. Each side of the framework is enclosed by a 5½ × 3½ in. Flat Plate 11.

Drive mechanism

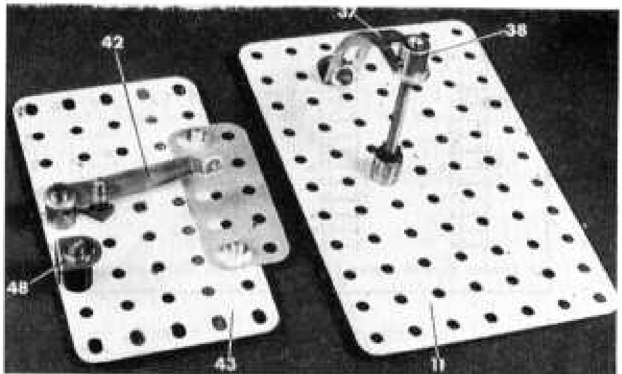
A Junior Power Drive Motor carrying a Worm on its output shaft is bolted to the base of the unit as shown. Engaging with the Worm is a 57-teeth Gear 12 fixed, together with a ¾ in. Pinion 13, on a 5 in. Rod 14 held by a Collar in Plates 11. In mesh with Pinion 13 is a second 57-teeth Gear 15 *loose* on an off-set 5 in. Rod 16, but with its boss fixed in one end of a Socket Coupling also loose on the Rod. Fixed in the other end of the Socket Coupling and loose on the Rod is another ¾ in. Pinion 17, the whole assembly being held in place by a Collar 18.

Mounted on a third 5 in. Rod 19 are two 8-hole Bush Wheels 20 and 21, a Collar 22, a Threaded Coupling 23, a 50-teeth Gear 24, in mesh with Pinion 17, and a second Collar which is spaced from Plate 11 by suitable small-diameter non-Meccano washers to prevent it catching on Gear Wheel 15. These washers are readily obtainable from most hardware stores and electrical-spares dealers. Held by Nuts in adjacent holes in the face of Bush Wheel 20 are a ⅜ in. Bolt 25 and a Rod Socket, while a ½ in. Pinion 26 is mounted loose on a ¾ in. Bolt held in the face of Bush Wheel 21. An ordinary Bolt is screwed into one tapped bore of Collar 22.

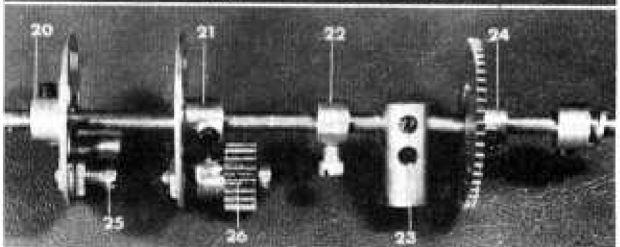
Hand and counterweight

Because it is equipped with four "fingers" and a "thumb," I feel I should call the actual coin-grabbing mechanism a "hand," although I must confess it looks more like the death-dealing claw of some diabolical monster. (Hence Mr. Servetti's title!) All the fingers are supplied by Pawls without boss 27, the middle, third and little fingers being mounted on a ½ in. Bolt fixed to an Angle Bracket. A washer separates the middle finger from the lug of the Bracket while two Washers separate the third finger from the middle and the little from the third. Note, incidentally, that the securing Bolt passes through the second hole in the "little finger" Pawl, but the first hole in the other two Pawls. The "index finger" Pawl is fixed on a Bolt held by a Nut in the second hole of the middle finger.

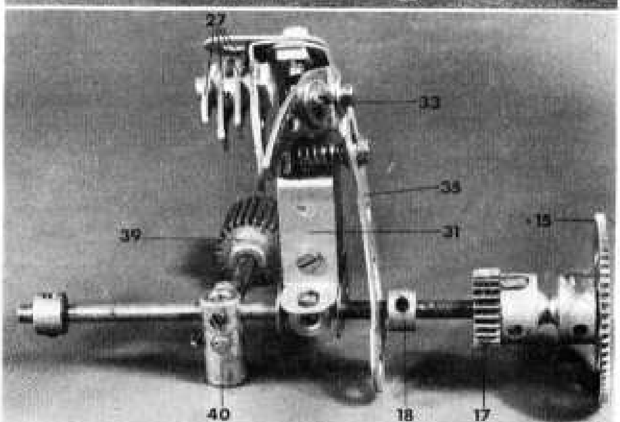
The Angle Bracket is bolted to a 1 in. Corner Bracket which is in turn bolted to one end of a bent 3½ in. Strip 28 forming the "arm." At its opposite end, this Strip is bolted, along with a 1 × ½ in. Double Bracket 29, to a Threaded Coupling 30, the securing Bolt being screwed into its threaded longitudinal bore. (When the mechanism is finished, Rod 16 will be fixed in the opposite end transverse smooth bore of this Coupling.)

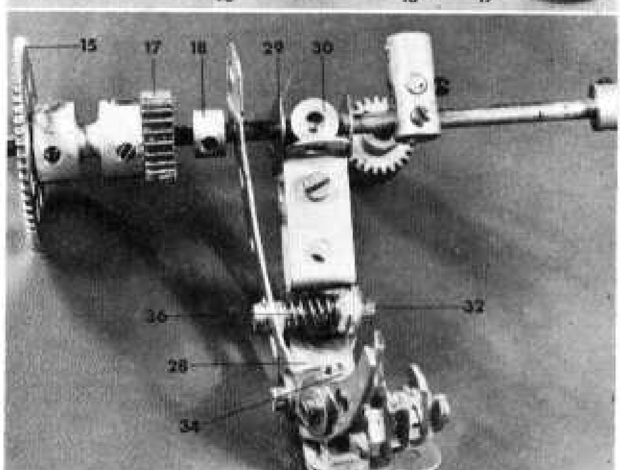


Top right; plates 11 and 43 removed from the model to show construction of "thumb" controlling guide and battery contact points.



Next; The movement operating rod or camshaft, removed from the model.





Lastly; Two views of the "arm" and "hand" with the mounting rod removed from the model. Note that, when the unit is in place, the Gear/Socket Coupling/Pinion arrangement is in contact with Collar 18.

PARTS REQUIRED

2—2a	2—25	3—63c	1—115
1—3	1—25b	1—63d	1—120b
4—9	1—26	13—64	1—124
10—9a	1—27	1—72	3—133d
1—9c	1—27a	2—74	5—147c
1—9d	1—27d	1—81	1—171
1—10	1—32	2—89a	1—212a
1—11a	60—37a	2—103c	1—215
6—12	54—37b	1—103f	1—507
1—12b	25—38	2—111	1—533
3—15	2—52a	2—111a	1—564
1—17	6—53a	1—111c	
2—24	6—59	2—114	

1 Junior Power Drive Motor. 1 2½ in. Strip adhesive tape.

Fixed to Strip 28, but spaced from it, as shown, by a Short Coupling, is a 1 × ½ in. Reversed Angle Bracket 31. This is not bolted to any other part, but it serves as a strengthener, being wedged between Threaded Coupling 30 and an Angle Bracket bolted to Strip 28. A Bolt 32 carrying a Washer and a Nut is fixed to the free lug of this Angle Bracket.

Turning to the thumb, this also is represented by a Pawl 33, but first a Threaded Boss 34 is mounted loose on the shank of the second Bolt securing the Corner Bracket to Strip 28, the Bolt passing into one transverse tapped bore of the Threaded Boss. The "thumb" Pawl is then bolted to a bent Fishplate which is in turn bolted, along with a 3 in. Stepped Curved Strip 35, to the end of the Threaded Boss. A Bolt is held by a Nut in the nearby elongated hole of Curved Strip 35, this Bolt lying opposite Bolt 32. A Compression Spring 36 is slipped onto the shanks of both these Bolts and the resulting pressure on Strip 35 causes the thumb to close against the index finger. With the mechanism in position, Rod 16 passes through the free elongated hole in Strip 35.

A curved guide controlling the sideways movement of Stepped Strip 35 as the "arm" is raised, is provided by a Formed Slotted Strip 37, one end of which is fixed by an Angle Bracket to appropriate Flat Plate 11. Its other end is held by a Threaded Boss 38 and a Nut on a 2 in. Screwed Rod locked by a Nut in a second Threaded Boss bolted to Plate 11.

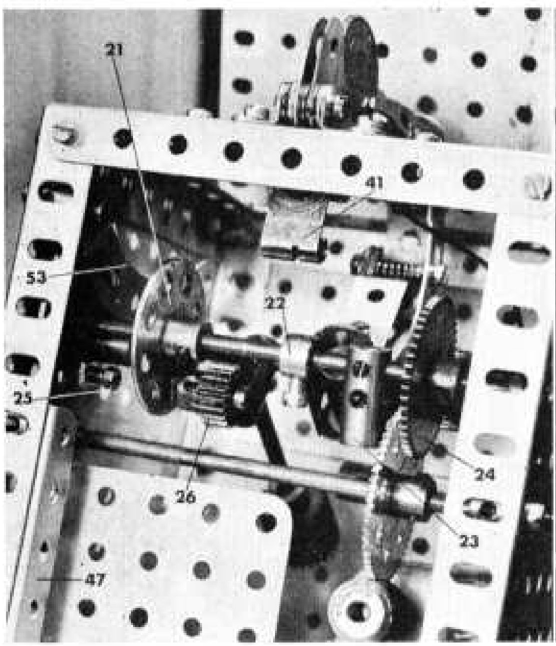
The counterweight for the hand consists of a ¾ in. Pinion 39, with a ¾ in. face, which is mounted on the end of a 2½ in. Rod, fixed in the central transverse smooth bore of a Threaded Coupling 40. This Coupling is mounted as shown on Rod 16.

Electrical system

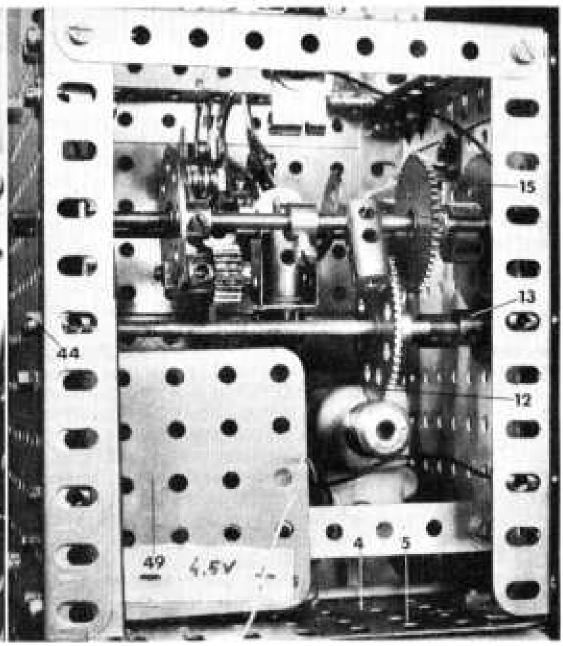
Before going any further with the Diabolik, it is best to complete the electrical system. A right-angled Rod and Strip Connector 41 is bolted to the short lug of the 1 × ½ in. Angle Bracket fixed to the underside of the earlier-mentioned Insulating Flat Girder. In contact with the front face of this is a 2 in. Wiper Arm 42 (Elektrikit Part No. 533) bolted to a Threaded Boss which is in turn fixed to a 4½ × 2½ in. Flat Plate 43. This Plate is removable and is held in position by Bolts screwed into the transverse bores of two Threaded Bosses fixed one to each front Girder 1 by Bolts 44. Another 4½ × 2½ in. Flat Plate 45 is similarly held in position, Bolts 46 securing the Threaded Bosses to Girders 1. Note that, with Plates 43 and 45 in position, the securing Bolts at one side fix a 3 in. Angle Girder 47 to one Angle Girder 1. This serves as a guide for the battery, another guide being provided by a second 3 in. Angle Girder bolted to the inside of Plate 45.

Secured to Plate 43, in addition to the Wiper Arm, is a 2½ in. Flat Girder, which slots behind front Girder 2, and an Insulating Spacer (Elektrikit Part No. 564) to which an Angle Bracket 48 is bolted. Wiper Arm

A close-up view of the movement controlling rod showing the positions of the parts when the arm is fully raised.



In this view of the model the front Plates have been removed to show the layout of the drive mechanism operated by a Junior Power Drive Motor.



42 is prevented from turning on its Threaded Boss by a Threaded Pin projecting through the second hole in the Wiper. This Threaded Boss and Angle Bracket 48 form the contacts for the Motor's power source which in this case is a 4½ volt Ever Ready 1289 or equivalent "flat" torch battery. A backing plate for the battery is provided by a 2½ × 2½ in. Flat Plate 49 attached to a 4½ in. Strip which is in turn attached to Plates 11 by Threaded Bosses.

When fitting the battery, the positive (short) terminal must make contact with the Threaded Boss, while the negative (long) terminal makes contact with Angle Bracket 48. Actually, the Angle Bracket and Threaded Boss do not lie above the centre of the battery, therefore you will probably find it necessary to bend the battery terminals to the appropriate side so as to make good contact. The wiring of the model itself is simple. One Motor lead is connected to Angle Bracket 48, while the other lead is taken from the Motor and connected to the 1 × ½ in. Angle Bracket to which Rod and Strip Connector 41 is bolted. The battery is held in position by Flat Girder 6.

To complete the model, the back is enclosed by a 4½ × 2½ in. Flat Plate 50 and a 4½ in. Strip 51. Another 4½ × 2½ in. Flat Plate 52, attached to nearby Girder 2 by Hinges, acts as a lid for the box. It is controlled by a 3 in. Stepped Curved Strip 53 loosely attached to a Threaded Boss fixed to front, left-hand Girder 1. The forward movement of the hand also helps to open the lid, therefore it is very important that a strip of Sellotape be fixed to the underside of Plate 52 to provide a "slipway" for the hand.

Operation

When a coin is placed in the slot it makes contact with Collar 9 and Corner Brackets 10 thus completing the circuit to the Motor which begins to operate. The drive is transferred through the relevant Gears and Pinions to Rod 19 which rotates clockwise when viewed from the right. As Bush Wheel 20 revolves Bolt 25 acts against Curved Stepped Strip 53 which pushes open the lid. As this is taking place, Bush Wheel 21 is revolving so that Pinion 26 presses down on Threaded Coupling 40 causing the "arm" to rise As it does so, Threaded Coupling 23 acts against the side of Stepped Curved 35 keeping the "thumb" and "index finger" apart until, at the very top of the hand's movement when the thumb and finger are one each side of the coin, the Coupling disengages the Strip. Immediately, the action of Compression Spring 36 causes the thumb to close on the coin and, as the cycle continues, the arm pulls the coin from the slot.

While all this has been going on Collar 22 has been rotating. At the beginning of the operation, the Bolt in the Collar should have been holding Wiper Arm 42 away from Rod and Strip Connector 41 so that the coin was essential to complete the electrical circuit. However, as the Collar revolves, the Bolt eventually moves away from the Wiper Arm thus allowing it to make contact with Rod and Strip Connector 41 which in turn completes the circuit and enables the Motor to continue running. The arm begins to withdraw with the coin until, when Pinion 26 leaves Threaded Coupling 40 the counterweight comes free and drops causing the arm to shoot into the box. As it does so, guide 37 presses against the side of Strip 35 and opens the "thumb" to release the coin. Almost immediately the Bolt in Collar 22 contacts Wiper Arm 42 lifting it clear of Rod and Strip Connector 41 to break the circuit, and complete the cycle of operations.

GREAT ENGINEERS No. 5

RICHARD TREVITHICK

(1771—1833)

THIS MECHANICAL inventor, almost unknown outside the engineering field, was a man with a consuming desire to achieve his objects, but a person with little ambition or ability as a business man. At school his teachers classed him as slow, obstinate or disobedient. Yet he developed an insatiable urge to achieve whatever he set out to do, and was a "veritable volcano" of inventions, some of his ideas predating engineering progress by years. He was born during early stages of the Industrial Revolution when steam was making its impact on the affairs of the country. This was due mostly to James Watt, as he improved the steam engine so much its power gave it a major "part" in the Industrial Revolution.

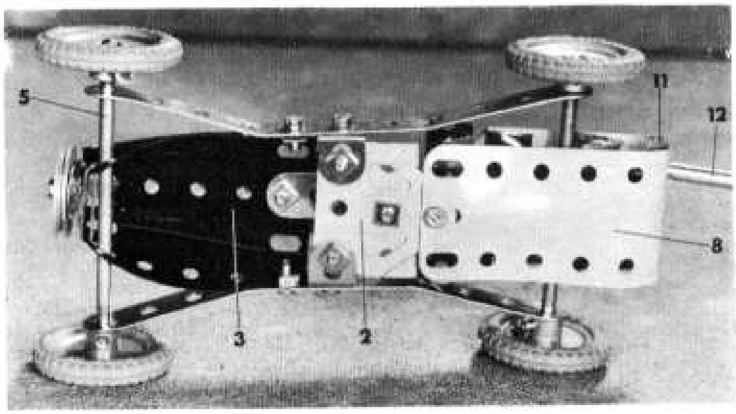
Watt's first engines were atmospheric engines, but later he employed low pressure steam. Trevithick's engines used high-pressure steam and they proved far more economical. Known as "puffers," they were applied to many duties, including passenger cage winding in mines.

William Murdock, one of Watt's mechanics and another great inventor, constructed a small steam-driven carriage in 1786, but for some reason this was not developed and his experiments were forgotten. Trevithick took up this subject and was trying out a steam carriage in late 1801, with some success, since he and his cousin, Andrew Vivian, took out a patent in 1802 for "Improvements in the Construction of Steam Engines." John Vivian,

JUNIOR RACER IN MECCANO

by Spanner

Designed especially for young modellers, this little Racing Car can be built with an Outfit No. 1



ACCORDING TO the "Dismal Johnnies" of our society, British sport has "had it." We cannot, say the pessimists, get anywhere in international events—as big-time sportsmen we're useless! There can be little doubt that some people actually believe this nonsense. True, there are some branches of sport in which we do not exactly shine, but this applies to all countries. We, on the other hand, are holders of the World Cup for football—a mighty sport—and on top of that we are the undisputed leaders of the whole world in motor racing—one of the fastest, most dangerous sports in existence today.

Motor racing, in fact, has provided the inspiration for our outfit model this month, it being a little Racing Car built with the No. 1 Set. A glance at the accompanying pictures will show you that it is not a scale model based on a particular prototype, but I find it a very attractive offering and unmistakable in its general lines.

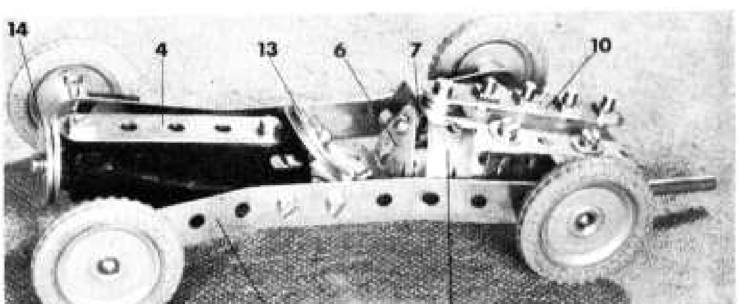
Construction is not difficult. Two $5\frac{1}{2}$ in. Strips 1 are shaped as shown and are attached by Angle Brackets to a Flat Trunnion 2, the Angle Brackets lying in the centres of the Strips. A $2\frac{1}{2} \times 2\frac{1}{2}$ in. compound plastic plate 3, obtained from two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Plastic Plates, is overlaid by a $2\frac{1}{2}$ in. Strip 4 and is secured to Strips 1 by its rear corners. Its front edge is then curved round as shown, to be held in position by a length of Cord tied between the corners. Passed through the elongated holes in these corners of the plate is a $3\frac{1}{2}$ in. Axle 5, journalled in the end holes of Strips 1 and held in place by 1 in. Pulleys fitted with Motor Tyres.

Bolted to Flat Trunnion 2 is a Trunnion 6, to the apex of which a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 7 is fixed by one lug. Secured to this Double Angle Strip by a $\frac{3}{8}$ in. Bolt is a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 8 overlaid by a shaped $2\frac{1}{2}$ in. Strip 9 and a straight $2\frac{1}{2}$ in. Strip 10, these two Strips separated by two Washers. Four Bolts are held by Nuts in Strip 10 to represent the cylinder head.

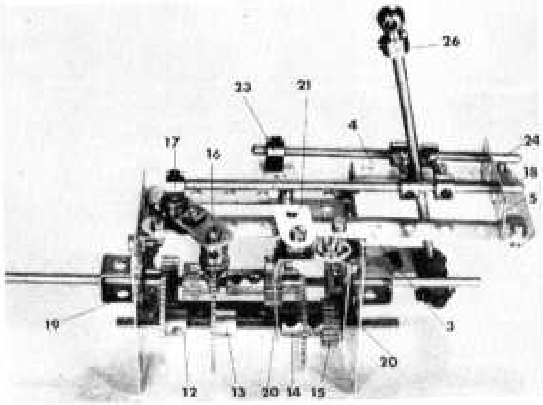
Flexible Plate 8 is now bent down and under in a deep "U" to be bolted to the apex of Flat Trunnion 2. Four Angle Brackets are attached beneath the upper section of the Plate, while a 1 in. Rod is held by a Spring Clip 11 and a Rod Connector 12 in the curve of the "U" to act as the exhaust pipe. Another $3\frac{1}{2}$ in. Rod carrying 1 in. Pulleys with Motor Tyres is journalled in the free ends of Strips 1, then the model is completed with a steering wheel 13 and a front grille 14, both supplied by 1 in. Pulleys without boss and both attached to compound plate 3, Pulley 13 by a Fishplate and Pulley 14 by an Angle Bracket. Note that the Fishplate fixing the steering wheel is bent to an obtuse angle.

PARTS REQUIRED

2—2	2—22a	1—126
3—5	1—35	1—126a
1—10	22—37a	4—142c
7—12	21—37b	1—189
2—16	6—38	2—194
1—18b	1—48a	1—213
4—22	1—111c	



Above and at right, built with a Meccano Outfit No. 1, this little Racing Car is not based on any particular prototype, but it is easily recognisable as a racer.



A 4-speed Gearbox with a gate change built by—we don't know who! Owing to internal reorganisation, all correspondence relating to the mechanism has been lost so, if you built it, please write to Spanner.

AMONG THE MODEL-BUILDERS

with Spanner

PICTURED HERE is an extremely useful gate-change four-speed gearbox that I am hoping somebody will recognise as his own. A rather strange statement, you may think, and one that needs a little explanation. Early last year, during an enforced absence because of illness, the gearbox arrived on my unattended desk. After my return to work, the earlier *Meccano Magazine* ceased publication (no connection, I assure you!) and in the resulting reorganisation all correspondence relating to the mechanism was lost.

Luckily the actual box remained safe and I have wanted to feature it ever since the M.M. returned at the beginning of the year. Without any details of the builder, however, I was a bit loath to do so, not being able to give the necessary credit, but it struck me that, unless I did feature it, I may never find the builder at all. Did you, therefore, build the gearbox illustrated? If you did, or you know who did, please write to me at *Meccano Magazine* Northern Office, Binns Road, Liverpool 13.

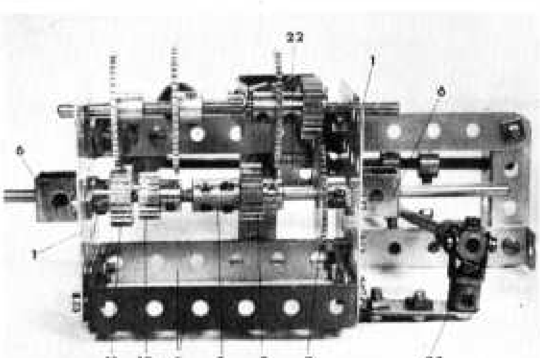
The gearbox itself presents no great problem from a constructional point of view, particularly as all the four ratios operate in one direction, no reverse gear being included. A framework is built up from two $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates 1, joined together, at one side, by two $3 \times 1\frac{1}{2}$ in. Double Angle Strips 2 and, at the other, by a $5\frac{1}{2}$ in. Strip 3 attached by Angle Brackets. Strip 3 projects a distance of five holes past one Plate 1 and is connected to a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 4, bolted to the Plate, by a 2 in. Angle Girder 5.

Bolted to the outside of each Plate 1, in the centre, is a Double Bent Strip 6. Journalled in one Flate Plate and its Double Bent Strip is a $3\frac{1}{2}$ in. Rod carrying a 50-teeth Gear Wheel 7, a $\frac{3}{4}$ in. Pinion 8 and a Short Coupling 9, the Rod being inserted only half-way into the Short Coupling, where it is fixed in place. Loose in the other half of the Coupling is another $3\frac{1}{2}$ in. Rod, journalled in the remaining Flat Plate and Double Bent Strip. Mounted on this Rod are a $\frac{1}{2}$ in. Pinion 10 and a $\frac{3}{4}$ in. Pinion 11.

A sliding layshaft is next provided by a 4 in. Keyway Rod, journalled in Plates 1 and carrying a 50-teeth Gear 12, a 57-teeth Gear 13, another 50-teeth Gear 14 and a $\frac{3}{4}$ in. Pinion 15. Gears 12 and 13 are fixed on the Rod, but Gear 14 and Pinion 15 are free to slide, being held by Key Bolts. This arrangement, in fact, results in a sort of two-in-one layshaft and for this reason requires a double control system, one operating the fixed gears and the other the sliding gears.

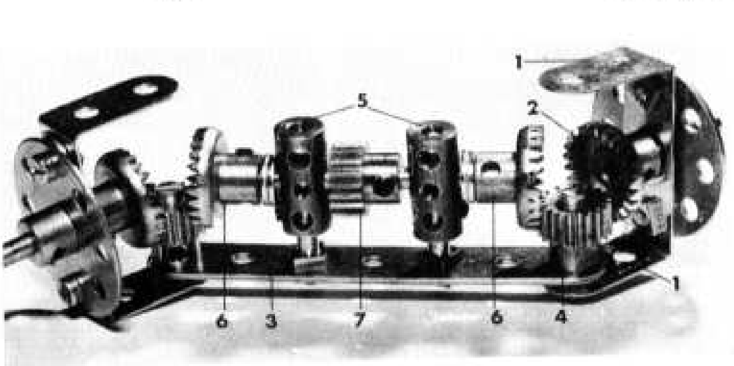
In the former case, a $1\frac{1}{2}$ in. Strip 16 is lock-nutted to Strip 3 through its second hole. A Collar 17 is pivotally attached to one end of this $1\frac{1}{2}$ in. Strip, but is spaced from it by two Washers on the shank of the securing Bolt. Held in the Collar is a 5 in. Rod 18, on which a further two Collars are mounted, approximately $\frac{3}{4}$ in. apart, with a Bolt screwed into one tapped bore, as shown. Pivotally attached to the other end of Strip 16 is an End Bearing 19, the arms of which are located over Gear Wheel 13. Note that they must not grip the Gear.

Pinion 14 and Gear 15 are moved by two $1\frac{1}{2}$ in. Strips 20, placed one each side of the parts and joined at the top by an ordinary Angle Bracket and a $1 \times \frac{1}{2}$ in. Angle Bracket. To the latter, a $2\frac{1}{2}$ in. Strip 21 is pivotally connected, but is spaced from it by two Washers and a Nut on the shank of the Bolt. The same Strip is also similarly connected to a second $1 \times \frac{1}{2}$ in. Angle Bracket 22, bolted to nearby Flat Plate 1, while a Collar 23 is itself pivotally connected to the free end of the Strip. Fixed in this Collar, as shown, is a 4 in. Rod 24 carrying two Collars fitted with Bolts, situated opposite the Collars on Rod 18.



An underside view of the Gearbox showing the input and output shafts as well as the layshaft.

Suggested by Mr. R. A. Dobson of Pudsey, Yorkshire, this interesting Front-Wheel Drive Unit is ideal for heavy-duty and commercial vehicles.



A gear-change lever is provided by a 4 in. Rod secured in one end of a Universal Coupling 25, pivotally connected to a 1½ in. Strip fixed to Plate 1 by a 1 × 1 in. Angle Bracket. The gear lever, carrying a Handrail Coupling 26 at its upper end, is located between the Bolts in the Collars on Rods 18 and 24.

Although equipped with gate-change, this gearbox is unlike the type found in real cars in that the movement of the gear level in the gate is different to that found in a car. In a typical car, movement of the gear lever usually follows an "H" pattern, the gears being changed by moving the gear lever direct from one position to the next. It is never necessary to move the lever from one position to the next and then to a third position just to change one gear, but it can be necessary in the Meccano gearbox. This is because there are two positions for each control shaft 18 and 24, therefore, to obtain four gears, both shafts must sometimes be moved. Nonetheless it is still an extremely useful gearbox. The following parts list, incidentally, applies to the mechanism exactly as illustrated.

PARTS REQUIRED:

1—2	1—15	1—27a	6—59
1—5	1—15a	30—37a	1—63d
4—6a	1—15b	33—37b	2—72
1—9e	2—16	12—38	2—111c
3—12	3—25	2—45	1—136a
1—12a	1—26	2—47a	1—140
2—12b	3—27	1—48a	1—230

Front-wheel drive

Staying with mechanisms, but moving away from gearboxes, we come to a Front-wheel Drive system suggested by Mr. R. A. Dobson of Pudsey, Yorkshire. Front-wheel drive, of course, has frequently proved invaluable, particularly when fitted to heavy-haulage tractors and "cross-country" vehicles such as Land-Rovers, etc. It does, however, result in the added difficulty of having to incorporate a variable direction drive —necessary because the front wheels of most vehicles provide the steering and are, therefore, constantly changing direction. This difficulty is especially present in Meccano models because of the understandable limitations of a miniature system compared to the real thing, but Mr. Dobson has overcome the problem extremely well. All the same, he does stress that his method, rather than being for general use, is more suited to "commercial and other heavy-duty vehicles, where haulage power is more important than speed."

PARTS REQUIRED:
(For Unit as illustrated)

1—3	2—18b	4—29	8—38
4—12a	2—24	8—37a	2—63
1—17	3—26	4—37b	2—111
	2—115		

Construction of the mechanism is fairly obvious from the accompanying illustration which, by the way, shows it in partly dismantled form. Each stub axle consists of two 1 × 1 in. Angle Brackets 1 bolted to an 8-hole Bush Wheel mounted, along with a ¾ in. Contrate Wheel 2, on a short Axle Rod. The road wheel would also be mounted on this Rod. Lock-nutted between the free lugs of each lower Angle Bracket are two 3½ in. Strips 3, one on top of the other, the securing ¾ in. Bolt in each case also holding a ½ in. Pinion 4.

Next, two Threaded Pins are fixed in Strips 3 and on them are mounted two Couplings 5. Journalled in the centre transverse smooth bores of these Couplings is a 2½ in. Rod carrying a ¾ in. Contrate Wheel 6 at each end and a ½ in. Pinion 7 in the centre. Contrates 6 engage with Pinions 4, while the drive from the Motor is taken to Pinion 7.

When fitted to a model, the free lugs of upper Angle Brackets 1 would be joined and the whole assembly would be fixed to the chassis in some way. A steering linkage would also be provided, probably by Strips bolted to one of the Angle Brackets and, finally, the drive would be taken to Pinion 7 either by a Worm or a Gear Wheel.

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***AIR NEWS** continued from page 336*

ment of eight machine-guns, represented the first of a whole new generation of modern, heavily-armed monoplane fighters.

When Sir Robert Watson-Watt discovered the possibilities of radar, the R.A.F. was quick to put it to use and this, as much as anything, ensured victory in the Battle of Britain in 1940. When peace returned, the radar aids employed by Bomber Command to improve its navigation and bombing accuracy during the great night offensive against Germany, became available to make airline flying safer and more reliable than ever before.

It cannot be claimed that the Air Ministry showed much enthusiasm when one of its young officers, named Frank Whittle, said that he believed he could design and build a practical jet-engine in the 'thirties and asked for official support. But it was not alone in its scepticism, and when Whittle proved his claim the Air Ministry was so quick off the mark in ordering jet fighters that the Meteor became the first jet to be used in action, in July 1944.

As we know, the jet-engine went on to revolutionise airline flying. It will be surprising if, one day, the airlines do not benefit just as greatly from the vertical take-off capability that the R.A.F. is pioneering, with the Harrier, at the beginning of its second 50 years.