

Fig. 445

### (445) Electric Beam Engine

(N. Craig, Glasgow)

Solenoid engines possess a fascination for young Meccano model-builders, who find them both instructive and practical. These novel power units can be built in a variety of forms, and in Fig. 445 is illustrated a model beam engine operated on this system. When connected to a Meccano T6, T6A or T6M Transformer it will work efficiently at a good speed.

The model is built up on a base consisting of  $9\frac{1}{2}$ " Angle Girders joined by  $4\frac{1}{2}$ " Angle Girders and four  $4\frac{1}{2}$ "  $\times$   $2\frac{1}{2}$ " Flat Plates. The twin beams are supported by two Large Shafting Standards bolted in the positions shown. Each beam is made from a  $7\frac{1}{2}$ " Strip, one  $5\frac{1}{2}$ ", one 2" and one  $1\frac{1}{2}$ " Strip, all of which are bolted together in the manner shown. The beams are pivoted on a 3" Rod and are spaced apart by a Coupling. Bearings for the crankshaft are made by bolting two Flat Trunnions between two  $1\frac{1}{2}$ " Angle Girders, which are then bolted to the base.

The crankshaft can now be assembled. The centre webs 1 are Cranks, and the outer webs are Double Arm Cranks. In order to ensure correct alignment a Rod is pushed through their centre holes while they are being assembled. The crank-pins are 1" Screwed Rods, shown at 2 in our illustration. Each is first passed through two Cranks 1 and is fixed in place by nuts, and a Collar is then pushed on it and the Screwed Rod is secured to one of the Double Arm Cranks by lock-nuts. A  $1\frac{1}{2}$ " Rod is fixed in the boss of one of the Double Arm Cranks, while the other carries a  $2\frac{1}{2}$ " Rod. Washers prevent the crankshaft from moving endways when mounted in its bearings.

The connecting rods 3 are 3" Screwed Rods, screwed into the Collars on the crank-pins and held in place by lock-nuts. They are gripped at their upper ends in the bosses of End Bearings, which are pivotally attached to the beams by lock-nutted bolts. At this point it is as well to look over the various joints to make sure that they run freely.

The twin "cylinders" of the engine are Elektron Magnet Coils 4 and 5, and they are clamped between two  $2\frac{1}{2}$ " Flat Girders by means of six 1" Screwed Rods. The lower Screwed Rods each hold an Angle Bracket by which the unit is bolted to the base, and each Angle Bracket is spaced from the base

by two washers. The "pistons" are Magnet Cores, each of which is fitted with a Collar as shown. Small Fork Pieces are pivoted to the Collars by bolts, and connecting rods formed by 2" Rods link the cores to the Collars on the beams.

A commutator consisting of a Collar 6 fitted with a bolt is now fitted to the crankshaft. As the crankshaft rotates the bolt makes contact with two brushes made from Pendulum Connections, which are held by insulated 6 B.A. Bolts on Reversed Angle Brackets.

The electrical connections are as follows Brush 7 is connected to one terminal of Coil 5, and brush 8 is connected to a terminal of Coil 4. The remaining terminals of the Magnet Coils are connected by a short wire, and a lead is taken from them to Terminal 9, which is insulated from the base. Terminal 10 is in electrical contact with the base.

A Meccano Flywheel is fitted to the crankshaft, and the brushes are adjusted by bending them so that the bolt in Collar 6 makes and breaks contact at the beginning and end of each downward stroke of the Magnet Cores. The latter should be given a coat of thin oil to allow them to move easily in and out of the Coils. In order to secure good running the Cores should be arranged so that they project as far as possible into the bores of the Coils when they are at the bottom of their stroke.

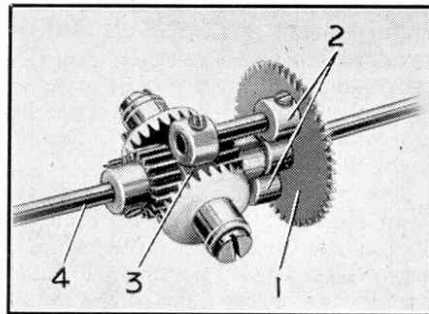


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The unit illustrated is the work of D. Perkins, Hull. It is constructed by fixing two Collars 2 to a 50-teeth Gear 1. A  $7/32$ " Grub Screw is screwed through the tapped hole of each Collar into the tapped hole of the 50-teeth Gear, an operation for which a screwdriver with a thin shaft is necessary, and two more Collars are fixed in a similar manner to a "spider" 3. Two 1" Rods

connect the sets of Collars and are held in place by Grub Screws. A Rod is pushed through the boss of the 50-teeth Gear and is fitted at its inner end with a  $\frac{1}{2}$ " Pinion. The Rod projects only  $\frac{1}{4}$  in. into the bore of the Pinion.

The  $\frac{3}{4}$ " Contrate Wheels are now fitted. They rotate on Pivot Bolts, which are screwed into the remaining tapped holes of the "spider" and are held in place by lock-nuts. The sides of the nuts should be parallel to the end of the "spider," so that the corners do not catch in the teeth of the Pinions.

The Rod 4 also is fitted with a  $\frac{1}{2}$ " Pinion and passes through the "spider" into the bore of the first  $\frac{1}{2}$ " Pinion.

Another differential gear, the outstanding feature of which is simplicity, is illustrated in Fig. 446a. It was submitted by W. McSimon, Liverpool, and is intended for use with a Sprocket Chain drive.

The gearing is contained in a framework that consists essentially of two  $1\frac{1}{2}$ "  $\times$   $\frac{1}{2}$ " Double Angle Strips 3, which are bolted at one end to a 2" Sprocket Wheel 4, and at the other end to two  $1\frac{1}{2}$ " Discs. Rod 2 is passed through the boss of the 2" Sprocket Wheel and is locked in the boss of a  $\frac{3}{4}$ " Pinion. Rod 2 projects only halfway through the boss of this Pinion. Rod 1 passes through the  $1\frac{1}{2}$ " Discs and carries a Collar, a washer and a  $\frac{3}{4}$ " Pinion, the Collar being placed between the two  $\frac{3}{4}$ " Pinions. Rod 1 projects into the bore of the first-mentioned  $\frac{3}{4}$ " Pinion. Two  $\frac{3}{4}$ " Contrate Wheels held in the frame by Pivot Bolts mesh with the  $\frac{3}{4}$ " Pinions.

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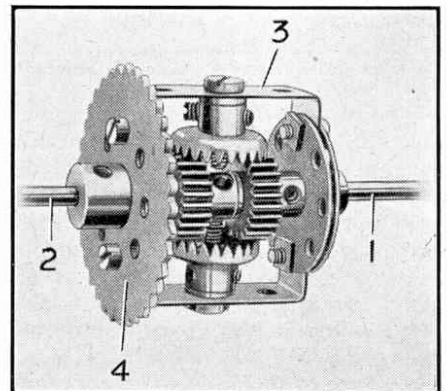


Fig. 446a

mechanism need not be a complete model, but perhaps part of a large model in which it serves some definite function. Novel uses for Meccano for purposes other than model-building also will be considered for publication.

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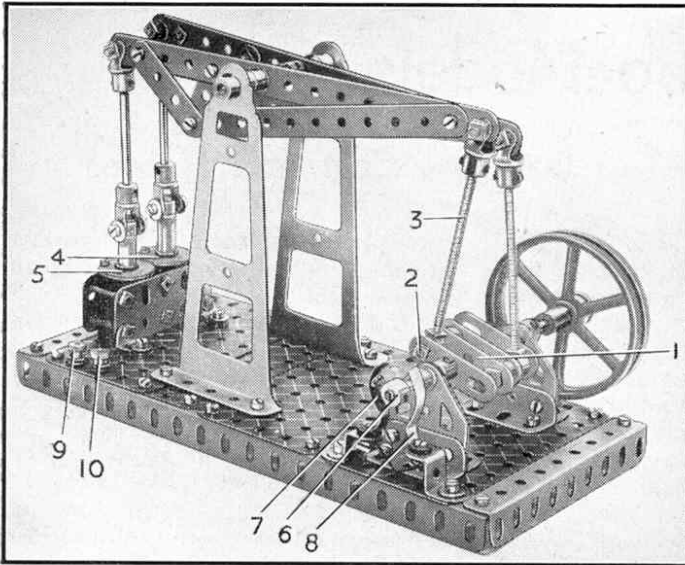


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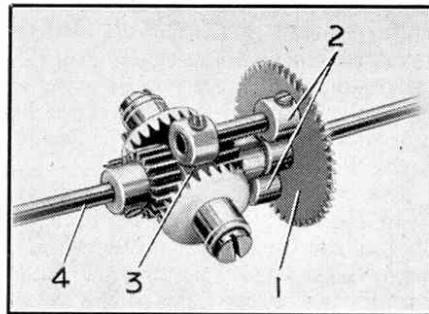


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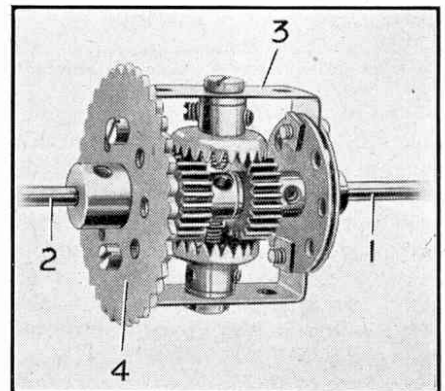


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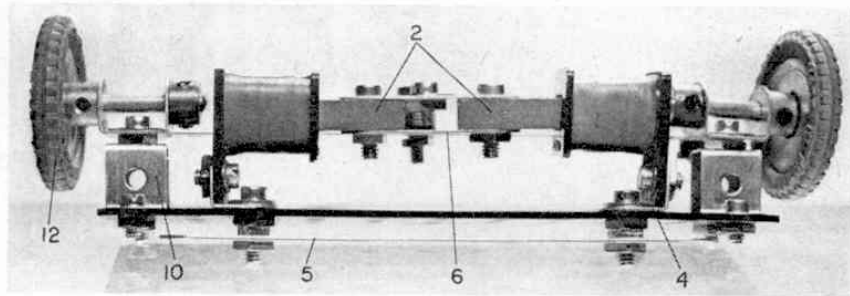


Our heading photo shows a small Differential utilising Universal Coupling "Spiders."

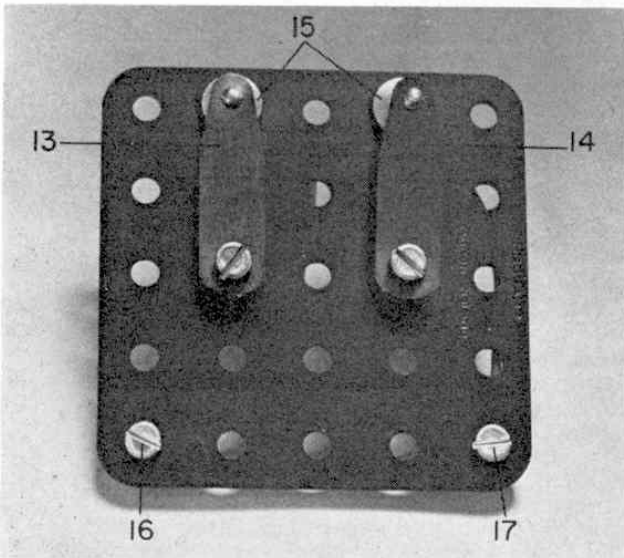
Below left: An interesting remote-controlled steering unit. Right: A front view of the inverted Steering Unit.

Below: This simple control panel controls the Steering Unit very successfully.

Bottom right: A detailed working model of a Mobile Rotary Drilling Rig.



distance of about  $\frac{1}{16}$  in. through the spider. One Rod 3 is journalled, free, in the boss of an 8-hole Wheel Disc 4, while the other Rod is similarly journalled in the boss of a  $1\frac{1}{2}$  in. Contrate Wheel 5, a spacing Washer being mounted between the Contrate and spider. Note that the special shouldered bolts supplied with each spider must be screwed tight into all four of its tapped bores. The protruding ends of Rods 3 are then inserted into the transverse smooth bores of a Handrail Support 6, the shank of which carries a Nut. Screwed tight into the tapped bores of the Handrail Coupling



are a  $\frac{1}{2}$  in. and a  $\frac{3}{8}$  in. Bolt, each carrying another Universal Coupling spider 7, complete with shouldered bolts. These spiders must turn absolutely freely on their Bolts, the head of the shouldered Bolts engaging between the heads of the shouldered bolts in spiders 1 and 2 as they do so. Bush Wheels 4 is connected to Contrate Wheel 5 by three or more  $1\frac{1}{2}$  in. Bolts 8, the Nut on the shank of Handrail Support 6 locating between two of them (in adjacent holes) to hold the Support in position. The following Parts List applies to the unit as illustrated.

#### PARTS REQUIRED

2-16	10-37a	1-111c	4-140y
1-24	1-38	3-111d	
1-28	1-111a	1-136	

#### South African Model

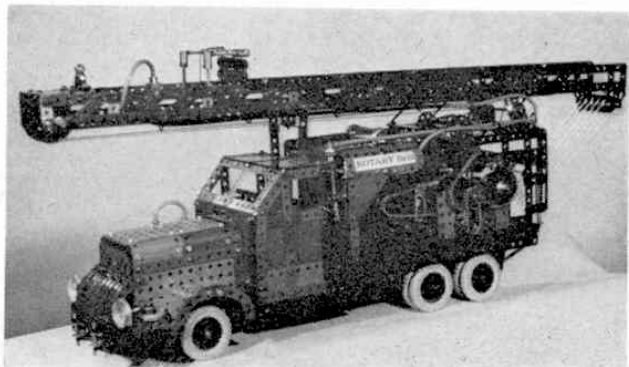
I would like to finish this month by drawing attention to the splendid Mobile Drilling Rig model, illustrated here, which is the work of Mr. Les Thompson of Uitenhage, Eastern Cape, South Africa. In a recent letter to me Les says, "After much persuasion by my

friends to build a working model for our town's annual Hobbies Exhibition, I got started on this Rotary Drilling Machine and, after more than fifty hours spare time I finally managed to complete it.

"It performs most of the operations of its lifesize original, the only pieces of machinery that do not operate being the water pump and compressor unit. A 220-volt electric motor drives a four movement gearbox mounted behind the cab, the four movements consisting of, raising and lowering of the tower, raising and lowering of the workmen's platform on the tower, block and tackle system for raising and lowering drilling rods out of the ground and finally the turning of the rotary drill. A further three-speed gearbox is incorporated to control the rotary drill, the three speeds on the lifesize machine being used for drilling through different rock formations. Also mounted on the truck is an imitation compressor unit and water pump, and I have fitted a few lights to the model. It looks very realistic at night.

"The drilling rods are 27 in. in length and reach up to the platform where they are connected to the 'Kelly,' swivel and travelling block and then up to the crown block. In the actual machine the drilling rods are screwed into each other but my rods are connected by couplings. I have also laid a few pieces of plastic piping for show purposes as they look quite realistic. The model stands 35 in. high with the tower erected and when ready for travelling it is 34 in. long and 12 in. high (almost to scale). The truck itself is of rigid construction but there is no steering, differential and gearbox as I had to use nearly all my gears on the drilling machinery. Altogether 42 gears were used which include the Sprocket Wheels. To lift the tower a massive block and tackle system which consisted of 13 pulleys was used. It takes 31 seconds to raise to full height."

Les finishes by saying that he got most of his ideas from a drilling machine which was working a few miles outside his home town. This is interesting because it proves just how important it is for a "freelance" modeller to keep his eyes open if he hopes to discover new subjects to work on. Ideas can be all around us if we only take the trouble to see them.



# AMONG THE MODEL BUILDERS

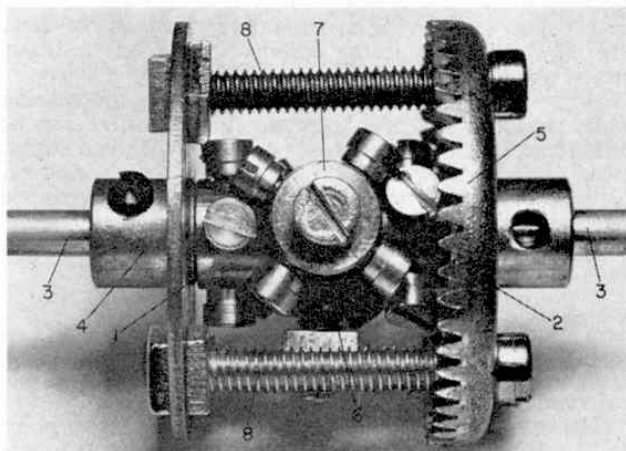
## with Spanner

EVERY DAY of the week, without fail, a considerable amount of Meccano correspondence from modellers appears on my desk. All of it is carefully read and much of it contains some very useful ideas, but it is particularly interesting to find over a period of time that we have a hard-core of "regulars": M.M. readers who write fairly frequently and often with more than the usual amount of suggestions to offer. Naturally enough, these modellers are mentioned regularly in the magazine—not because of favouritism, but simply because of their ideas—and we begin this month with a suggested mechanism from one of the regulars, Mr. Timothy Ward of Bristol.

In his last letter to me Mr. Ward writes, "I have noticed in the Meccano Magazine from time to time articles dealing with remote-controlled models, but these have all used a motor of some sort for steering. As I cannot afford to use motors for small jobs like this (if I did, I would need six or seven motors!), I have worked out a simple method using Elektrikit Coils, which I incorporated in a small remote-controlled car."

Mr. Ward supplied plans of the car's complete chassis with his letter, but, as it is only the steering mechanism which is of particular importance to us here, I have taken the liberty of extracting this mechanism and modifying it somewhat to suit general models rather than Mr. Ward's specific construction. Two Rectangular Coils 1, with Cores 2, are each attached to a  $5\frac{1}{2} \times 2\frac{1}{2}$  in. Insulating Flat Plate 3 by an Angle Bracket 4, a  $\frac{1}{2}$  in. Bolt being used to secure the Angle Bracket to the Plate. Fixed by Nuts on the protruding shanks of these Bolts, above the Plate, is a  $4\frac{1}{2}$  in. Strip 5, then Cores 2 are joined, with a distance of one hole separating them, by a  $1\frac{1}{2}$  in. Strip 6 and a Flat Trunnion extended by a 2 in. Slotted Strip 7.

Next, two Double Brackets 8, each with a  $1\frac{1}{2}$  in. Strip 9 secured between its lugs, are lock-nutted to two Double Bent Strips 10 which are in turn bolted to Insulating Plate 3. Lock-nutted between the ends of Strips 9 is a  $5\frac{1}{2}$  in. Strip 11, then Slotted Strip 7 is



pivotaly attached to the centre of this Strip by a Pivot Bolt, a Collar on the shank of the Bolt spacing the two Strips apart. Lastly, two 1 in. Rods, each carrying a 1 in. Pulley with Motor Tyre 12, are held by Collars in Double Brackets 8.

A simple control panel for the mechanism can be built up from an Insulating Plate, to which two Wiper Arms 13 and 14 are bolted. When each Wiper is depressed it should make contact with a Contact Stud 15, or ordinary bolthead, this Stud being wired direct to its opposite number. Each Wiper should be connected to one or other of the free terminals of Coils 1, while another lead is taken from Strip 5 to a terminal 16 on the control panel. A second terminal 17 is added to the control panel, this being wired to one Contact Stud 15. The power source required to operate the mechanism is 15-volt A.C. and it should be connected to terminals 16 and 17.

### PARTS REQUIRED

#### BASIC MECHANISM

1—5  
1—2a  
5—62  
2—11  
2—12  
2—18a  
2—22  
23—37a  
13—37b  
1—45  
3—59  
4—111a  
2—142c  
1—147b  
1—510  
2—520  
2—526  
1—534

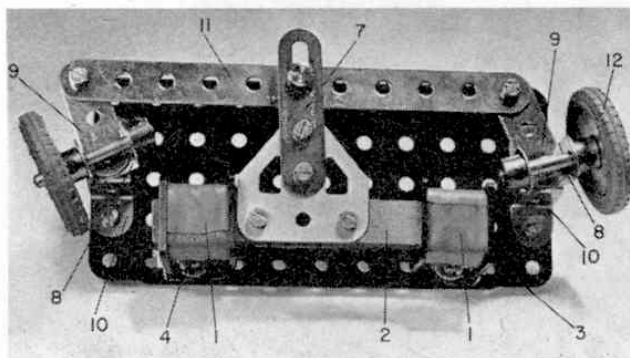
#### CONTROL PANEL

18—37a  
2—38  
2—111a  
2—111c  
1—511  
2—231

### Small differential

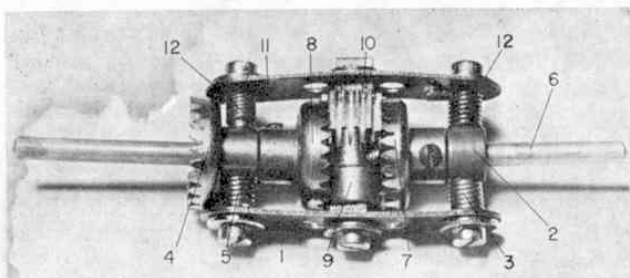
Moving away from Mr. Ward's remote steering gear, we have a small and very compact differential mechanism suggested by Mr. Bob Hauton of Lincoln—another enthusiast whose ideas have been featured in these pages before now. Differentials, of course, are anything but new to Meccano, yet this particular example is completely different to the normal type of unit in that it uses Universal Coupling "spiders" (Part No. 140y) in place of the usual gearing. This, I know, sounds most unorthodox, but, says Mr. Hauton, "Surprisingly enough, it works very smoothly". I must add, though, that the example illustrated, which I built up from Mr. Hauton's original sketches, tended to catch slightly, but it was assembled rather hurriedly for photography and so I am sure that, with a little careful adjustment, and lubrication, it can be made to work quite satisfactorily.

Construction is much easier than the usual type of Meccano differential. Two Universal Coupling spiders 1 and 2 are fixed one on the end of each Rod 3 serving as the respective half shaft, the Rod projecting a



# AMONG THE MODEL BUILDERS

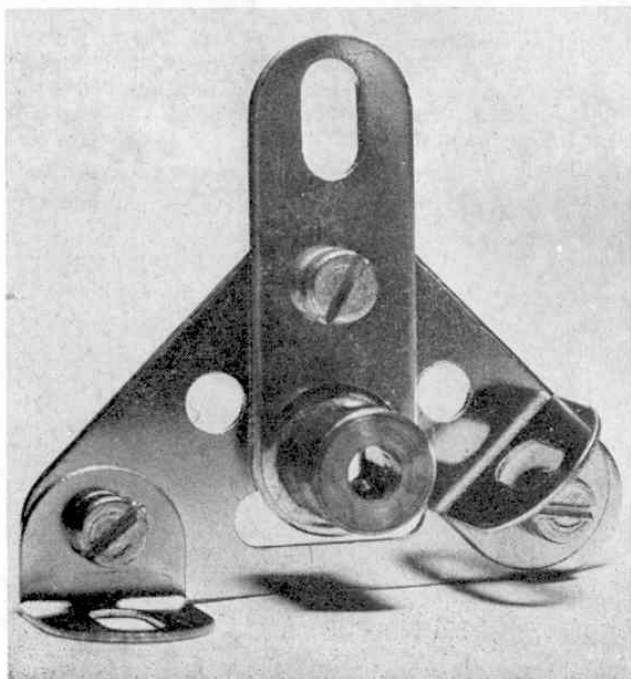
## with 'Spanner'



Another in the series of working mechanisms for small motor vehicles is this "baby" Differential designed by Mr. James Grady of Dundee, Scotland.

### "BABY" DIFFERENTIAL

James Grady of Dundee (the man, you may remember, who specialises in useful mechanisms for smaller motor vehicles using 1 in. Pulleys with Motor Tyres as wheels) has been designing again—and with his usual success. This time he has come up with the very neat, yet fully-working "baby" Differential illustrated in the accompanying photograph.



In his covering letter to me, Mr. Grady writes, "In designing this mechanism, I deliberately refrained from using any expensive parts such as Couplings, etc., as my aim was to make it as cheaply as possible to catch the youngsters. Why should the boys with the big Sets get all the fun?!" Why, indeed, Mr. Grady!

Construction of the mechanism has been made possible by the new-design 2 in. Strips with the additional hole in the centre. Secured by a Nut in the centre hole of one of these new 2 in. Strips 1 is a  $1\frac{1}{8}$  in. Bolt, a Washer between the head of the Bolt and the Strip. One end of the Strip is then secured to a Collar 2 by a  $\frac{3}{8}$  in. Bolt, but is spaced from it by a Cord Anchoring Spring 3 on the shank of the Bolt, a Washer also being carried between the bolthead and the Strip. At its other end, the Strip is secured to the boss of a  $\frac{3}{4}$  in. Contrate Wheel 4, again being spaced from it by a Cord Anchoring Spring 5 and carrying a Washer under the bolthead.

Now journalled, free, in the Collar is a  $1\frac{1}{2}$  in. Rod 6, on the inside end of which a second  $\frac{3}{8}$  in. Contrate Wheel 7 is fixed. Another  $\frac{3}{8}$  in. Contrate Wheel 8, is in turn, fixed on the inside end of a 2 in. Rod journalled, free, in the boss of Contrate 4. Mounted, free, on the  $1\frac{1}{8}$  in. Bolt between Contrates 7 and 8 is a Collar 9 and a  $\frac{1}{16}$  in. Pinion 10, after which a second 2 in. Strip 11 is lock-nutted on the lower end of the Bolt. The Pinion, of course, meshes with the Contrates.

To finish the Unit off, the ends of Strip 11, like Strip 1, are secured to Collar 2 and the boss of Contrate Wheel 4 by  $\frac{3}{8}$  in. Bolts, Cord Anchoring Springs 12 again being used as spacers, and Washers again being carried, one under the head of each Bolt. A certain amount of careful adjustment may be required before the mechanism will operate freely, and it will be necessary to curve the 2 in. Strips slightly, but I can assure readers that Mr. Grady's sample unit illustrated worked extremely well, indeed.

### PARTS REQUIRED

2—6	1—26c	3—37a	1—59
1—17	3—29	8—38	4—111c
1—18a			1—111d

### For the Mathematically-minded

In lighter vein, Mr. Bob Hauton of Lincoln—another well-known member of Meccano modelling circles—has supplied me with an idea for a Meccano