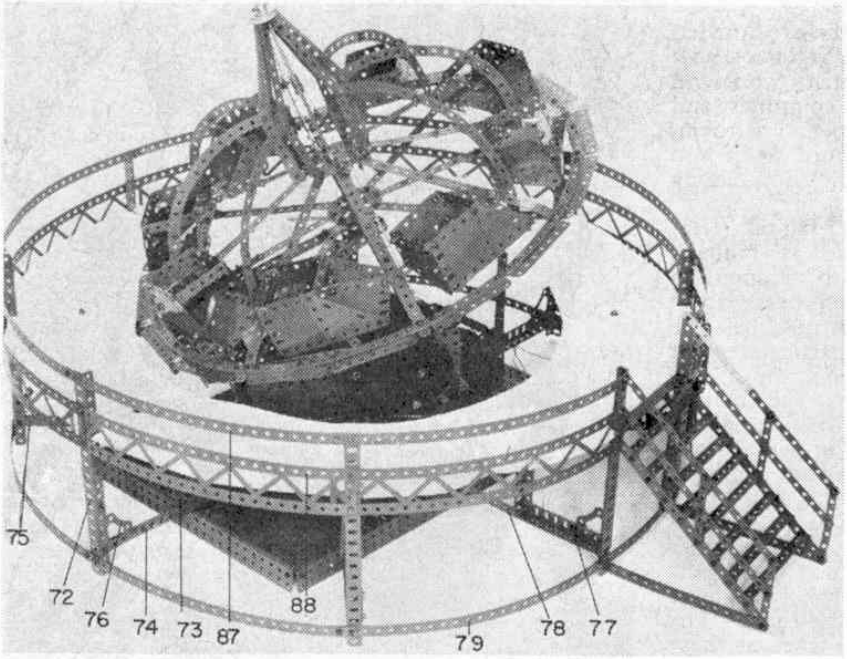


MECCANO SATELLITE

by Spanner

HAVE YOU older readers re-visited a permanently-sited fairground recently after a break of several years ? If so, I'll guarantee you were surprised by the numerous new machines that have been invented of late to thrill—or upset—those brave heroes who have the courage to try them !

Up to a few years ago a fair was a good one if, besides the usual sideshows, it had dodgems, several roundabouts, a big-dipper and, of course, a Waltzer. Nowadays, these things, while still necessary amusements, are a bit old-hat. All sorts of better, more terrifying machines have appeared: raceways, flying jets whose height can be controlled by the " pilot " and a whole variety of twisting and twirling machines that make me—at least—feel as if I'm about to die !

One example of the last type has provided the inspiration for the new Meccano model featured here. The original was found at New Brighton fair where it is known as " The Satellite " but I expect that different fairgrounds have different names for it. It basically consists of a number of " cars " mounted on a revolving disc which is in turn mounted on a cranked arm fixed to a roller bearing. The arm also revolves with the roller bearing so that, when the model is in operation the combination of the two speeds results in the upper disc travelling particularly fast in relation to the ground. As the revolving motions take place, however, the cranked arm extends causing the upper revolving disc to tilt and, as the arm itself is revolving, the position of the disc is constantly changing so that somebody sitting in a car doesn't know where he is !

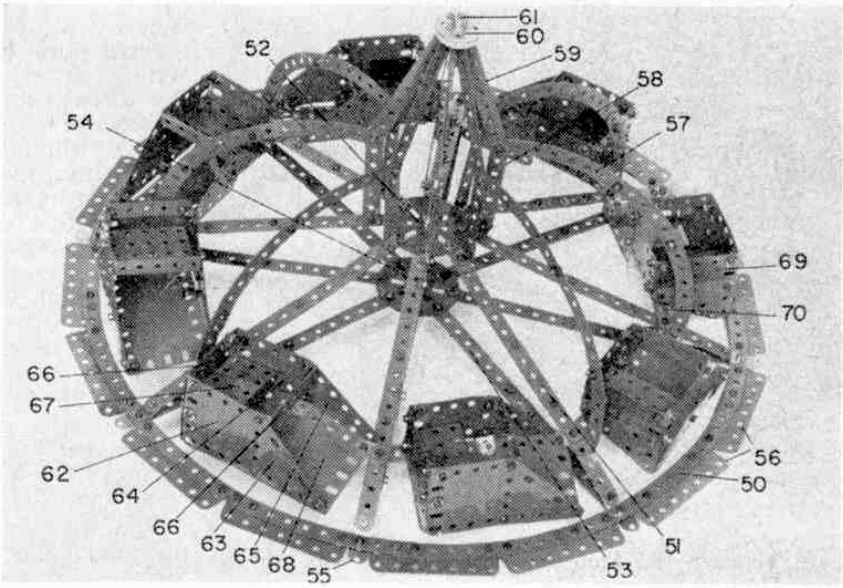
By using two Power Drive Units, it has been possible to make the model reproduce all the movements of the original, yet, despite the apparently complicated operation, construction is reasonably straightforward. Beginning with the central arm section, a base for the roller race is built up from two 18½ in. Angle Girders 1 joined by two 12½ in. Angle Girders 2 and two 12½ in. Strips 3. The vertical flanges of both sets of Girders are extended by suitable Flat Girders, as shown. A further two 18½ in. Angle Girders 4 are bolted between Girders 2, then two similar Flat Plate arrangements are fixed to Girders 1, each arrangement consisting of two 5½ × 3½ in. Flat Plates 5 connected by a 4½ × 2½ in. Flat Plate 6 to result in a 12½ in. long compound flat plate. A 9⅞ in. Flanged Ring 7 is fixed to the centres of Strips 3 and Angle Girders 4, the securing bolts also fixing two 9½ in. Strips 8, at right-angles to each other, to the Flanged Ring.

At this stage, the drive for the central rotating arm should be produced. Two 2½ × 2½ in. Flat Plates 9 are attached to one of the earlier-mentioned Flat Plate arrangements by 2½ in. Angle Girders, further 2½ in. Angle Girders being bolted to the tops of the Plates. The latter Girders are joined by two 2½ in. Angle Girders 10, the flanges containing the circular holes being vertical. Passed through the centre circular hole in outside Girder 10 is a 1 in. Rod 11 on which two Compression Springs and a Short Coupling are mounted. Journalled in the inside transverse bore of this Short Coupling and in Flat Plate 6 is a 4 in. Rod 12 carrying, in order, a 2 in. Pulley with Motor Tyre 13, a Coupling, a 1½ in. Contrate Wheel and a Collar, the last holding the Rod in place. Note that the Rod passes through one end transverse bore of the Coupling which, incidentally, should be loose on the Rod. Inserted loose into the longitudinal bore of the Coupling is a 2½ in. Rod held in place by a Collar and carrying a ½ in. Pinion in mesh with the 1½ in. Contrate Wheel and a 1½ in. Sprocket Wheel 14. This Sprocket is connected by Chain to a ¾ in. Sprocket on the output shaft of a Power Drive Unit bolted to one Plate 5.

Bolted to the other Flat Plate arrangement are a 2½ in. × ½ in. Double Angle Strip 15 and two 1½ × ½ in. Double Angle Strips 16, the latter joined by a 2½ in. Strip. Each Double Angle Strip 16 is attached to the adjacent lug of Double Angle Strip 15 by a 2 in. Perforated Slotted Strip. Journalled in the 2½ in. Strip and in Flat Plate 6 is a 3 in. Rod carrying a 1½ in. Pulley with Motor Tyre 17 and held in place by a Collar. The Pulley with Motor Tyre will later serve as a steadying roller for the upper section of the roller race which is another 9⅞ in. Flanged Ring 18.

Tightly fixed to this Flanged Ring are a 9½ in. Strip 19, positioned diametrically, and two 4½ in. Angle Girders 20. Note that the latter are mounted with their horizontal flanges uppermost and are actually fixed on ¾ in. Bolts passed through the horizontal flanges of the Girders and held by Nuts in the Flanged Ring. A 1½ in. Insulating Flat Girder (Elektrikit Part No. 508)

At left: One of the latest " amusements " for giving thrills at fairgrounds is the " Satellite ". This large Meccano model reproduces all the nerve-shattering movements of the original.



At right: A close-up view of the complete upper rotating disc with its cars. Although it may look complicated, this part of the model is, in fact, quite easy to build.

Below: In this view of the model, the framework and superstructure have been removed to show the main base and elevating arm sections with their separate drive arrangements.

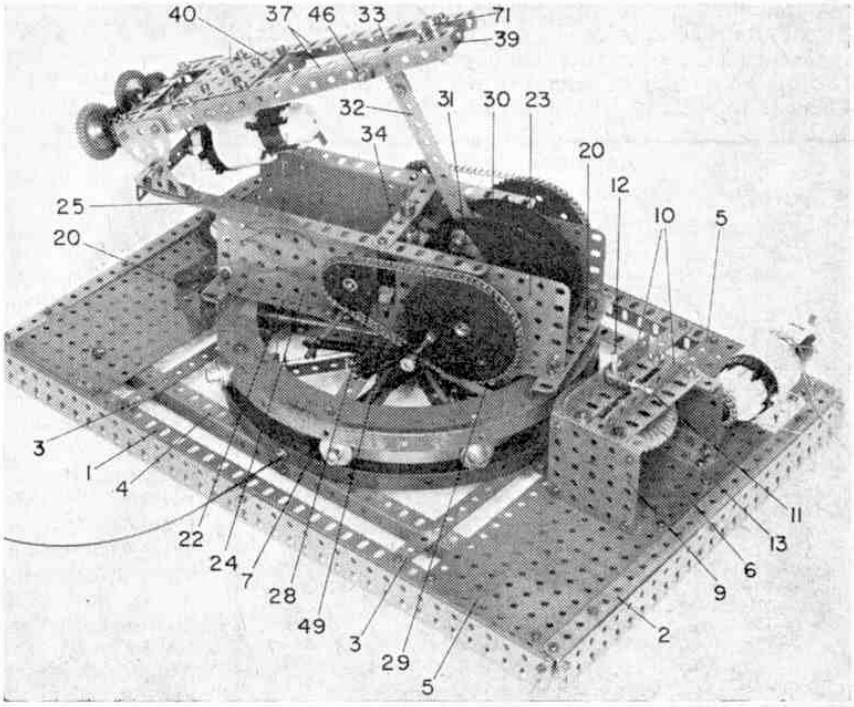
is bolted to this Strip, the securing Bolts passing through the seventh and eighth holes of the Strip and a 1 in. Wiper Arm 21 is secured to the Insulating Girder.

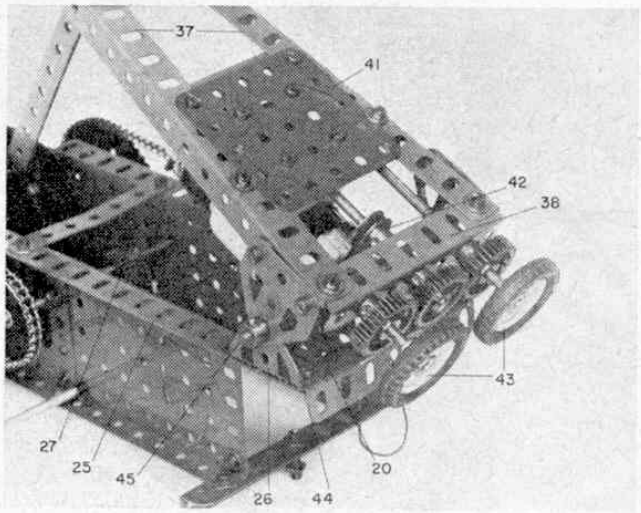
Bolted between Angle Girders 20 are two 9½ in. Angle Girders 22 to each of which two 4½ × 2½ in. Flat Plates 23 and 24 are secured, a distance of one hole separating the Plates. (A distance of five clear holes separates the Girders.) A further two 9½ in. Angle Girders 25 are bolted to the upper edges of Plates 23 and 24 in such a position that they project four holes beyond Plate 24, after which the projecting ends are connected by a 3½ in. Angle Girder, the securing Bolts also helping to fix two Trunnions 26 to Girders 25.

The inside edge of each Plate 24 is overlayed by a 2½ in. Strip to help provide extended bearings for a 5 in. Rod carrying a ½ in. Pinion 27 at its centre and a 1½ in. Sprocket Wheel 28 at each end. These Sprockets are connected by Chain to two 3 in. Sprockets 29, each mounted on a 2 in. Rod journalled in Flat Plate 23 and in a Double Bent Strip bolted to the Flat Plate. Fixed on the inside end of each Rod is an 8-hole Bush Wheel to which a 4 in. Circular Plate 30 is bolted, one of the securing Bolts helping to secure two Cranks 31, one to each side of the Plate as shown. Washers are mounted on the remainder of the securing Bolts to ensure an even lie. Held in the bosses of both sets of Cranks 31 is a 1½ in. Rod, in the centre of which two 5½ in. Strips 32, one on top of the other, are fixed. Another Crank 33 is secured to the upper end of these Strips.

A 3½ in. Strip 34 is now bolted between the sixth holes of Angle Girders 25. Journalled in this Strip and in Strip 19 is a 6 in. compound rod carrying a Worm and held in place by Collars, one above Strip 34 and the other below Strip 25. The Worm engages with Pinion 27. Fixed on the rod immediately beneath the lower Collar is a Commutator 35 (Elektrikit Part No. 551) which makes permanent contact with Wiper Arm 21. The compound rod, by the way, consists of one 2 in. Rod and one 4 in. Keyway Rod 36 joined by a Coupling.

Incorporated in the elevating section of the central arm is the drive unit for the upper rotating disc. Before it can be fitted, however, the arm section is built up from two converging 9½ in. Angle Girders 37 joined at one end by a 3½ in. Angle Girder 38 and towards the other end by a 1½ in. Angle Girder 39, this Girder being secured through the second holes of Girders 37. Girders 37 are further joined through their twelfth holes by a 2½ in. Angle Girder 40, the securing Bolts also fixing a 2½ in. × 2½ in. Flat Plate 41 in position. The Plate is additionally secured by the trapping action of Washers mounted on Bolts fixed in Girders 37, then a Power Drive Unit is attached to the underside of the Plate by Threaded Bosses so as to leave a





space between the Plate and the base of the Power Drive Unit.

This space allows three 5½ in. Rods to be journalled in Girders 38 and 40, each Rod carrying a 1 in. Gear and held in place by a Collar. A ½ in. Pulley 42 is fixed on the centre Rod beneath Plate 41 and is connected by a 2½ in. Driving Band to a ½ in. Pulley on the output shaft of the Power Drive Unit. A 1 in. Pulley with Motor Tyre 43 is fixed on the outside end of the two remaining Rods, as shown. A Flat Trunnion 44 is now bolted to each Girder 37 but is spaced from it by two Washers *on the inner securing Bolt only*. This makes the Trunnions parallel and enables the complete construction to be pivotally connected to the previously-described section of the arm by a 4½ in. Rod 45, held by Collars in the apex holes of Flat Trunnions 44 and Trunnions 26. Crank 33 is mounted on a 3 in. Rod 46, held by Collars in the fifth holes of Girders 37.

Having completed the elevating arm, it can now, if required, be fitted to its base. A "spider" for the roller race is easily built up from a Face Plate 47, to which eight radiating 2½ × ½ in. Double Angle Strips 48 are bolted. Journalled in the lugs of each of these Double Angle Strips is a 5 in. Rod held in place by a Collar and a Spring Clip and on the end of which a ¾ in. Flanged Wheel is mounted. The Flanged Wheels run on the flange of Flanged Ring 7. The central arm section is lowered until Flanged Ring 18 lies on the Flanged Wheels, at which time Keyway Rod 36 should pass free through the boss of Face Plate 47 to be fixed in the boss of a Double Arm Crank bolted to the centre of one Strip 8. Pulleys with Motor Tyres 12 and 17 should engage with the flange of Flanged Ring 18, the former being pressed hard against the Ring by the action of the Compression Springs on Rod 11.

You will, of course, have realised that Pulley with Tyre 13 drives the revolving arm, using the friction drive method. It is therefore a good idea to glue strips of sticking plaster or emery paper, etc., to the flange of Flanged Ring 18 to increase adhesion.

The weight of the elevating arm is counteracted by six Tension Springs 49 in two sets of three, each set held by a Collar on a Long Threaded Pin fixed in the face of Sprocket Wheel 29. The other ends of two of the Springs are tied to Strip 19, while the third is mounted on an 8 in. Rod held by Spring Clips in Flat Plates 24.

Now we come to the actual revolving disc carrying the cars. A ring is built up from fourteen 5½ in. Curved Strips 50 suitably overlapped to result in the ring having 120 holes. Two sets of spokes are then produced, one from eight 8½ in. compound strips 51, attached to a Face Plate 52 by Obtuse Angle Brackets, and the other from eight 9½ in. compound strips 53 bolted direct through their end two holes to another Face Plate 54. All the compound strips each consist of two overlapping 5½ in. Strips. Spokes 51 are attached to the ring by Obtuse Angle Brackets while spokes 53 are fixed direct to the ring, a single Bolt being used to secure the Obtuse Angle Bracket and the lower spoke in each case and, at the same time, extending the lower spoke with a Fishplate 55. Sixteen 3½ in. Flat Girders 56 are bolted around the ring to provide a flat surface to which the separate friction drive for this part of the model will be applied.

Eight 10 in. compound curved strips 57 are next each produced from three 4 in. Stepped Curved Strips, suitably overlapped. One end of each compound strip is attached by an Angle Bracket to appropriate spoke 53, the other end being bolted to the joint between a 3½ in. Strip 58 and a 4½ in. Strip 59. Strip 58 is attached by an Angle Bracket to corresponding spoke 51 while Strip 59 is wedged inside a 1½ in. Flanged Wheel 60 mounted on a 12 in. compound rod 61, obtained from one 4 in. and one 8 in. Rod joined by a Coupling. Compound rod 61 is also held in the bosses of Face Plates 52 and 54.

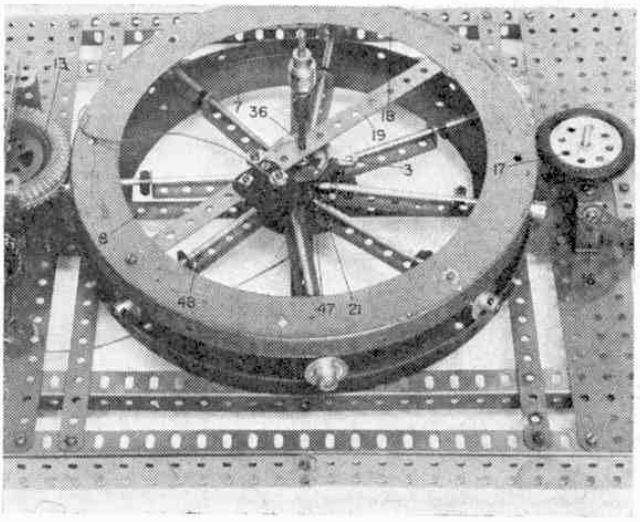
Turning to the cars, each of these is similarly built, one side consisting of a 2½ × 2½ in. Flexible Plate 62 extended by a 2½ × 2½ in. Triangular Flexible Plate 63, and the other side being a 2½ × 1½ in. Flexible Plate 64 extended by a 2½ × 2 in. Triangular Flexible Plate 65. The sides are joined by two 2½ × ½ in. Double Angle Strips 66 and a 2½ × 1½ in. Flanged Plate 67. An angled floor is provided to correspond with the angle of the revolving disc and is obtained from a 4½ × 2½ in. Flexible Plate 68 attached to the smaller side by Obtuse Angle Brackets and to the larger side by Angle Brackets bent to an acute angle. A 2½ × 1½ in. Flexible Plate 69 extended by a 2½ × 1½ in. Triangular Flexible Plate completes the back of the car which is then fixed to spokes 51 by a 1½ in. Strip 70 at the rear and by a Fishplate at the front.

Once the revolving disc has been completed, it is mounted on the elevating arm by inserting compound rod 61 in the boss of a Double Arm Crank 71 bolted to Angle Girder 39, a Collar spacing the boss of Face Plate 54 from the boss of the Crank. A Compression

PARTS REQUIRED

17—1	1—16	8—48c	2—111
7—1a	1—16a	8—48d	6—111c
4—1b	1—16b	8—51	2—115
36—2	3—17	4—52a	2—115a
8—2a	1—18a	30—53a	1—120b
12—3	1—18b	26—54	2—126
2—5	1—20	22—59	2—126a
8—6a	1—20a	5—62	4—133
2—7a	8—20b	2—63	1—142a
2—8	1—21	2—63d	2—142c
14—8a	2—22	2—64	1—142d
6—8b	2—23a	4—70	2—146a
8—9	2—24	1—72	2—167b
4—9a	2—26	14—89	16—188
4—9b	1—28	24—89b	8—190
5—9d	3—31	1—94	8—191
1—9f	1—32	2—95a	8—221
16—10	1,000—37a	2—95b	8—222
40—12	1,000—37b	7—99	8—223
32—12c	500—38	1—100	1—230
1—13a	6—43	4—103a	4—235b
4—14a	2—45	2—103b	8—235f
9—15	2—48	16—103d	1—507
1—15a	26—48a	4—108	1—508
2—15b	24—35	3—109	1—511
			1—532
			2—551

The built-up roller bearing fitted to the model. Note that the Flanged Rings 18 and 19 should run on the flanges of the Flanged Wheels incorporated in the "spider" of the bearing.



Spring is mounted on the rod, beneath the Girder to provide tension and is held in place by a further Collar. With the disc in position, Pulleys with Motor Tyres 43 should coincide with Flat Girders 56.

This leaves us with the circular superstructure to be built which presents no great problems. Six supports are each produced from a 9½ in. Angle Girder 72 attached to a 5½ in. Angle Girder 73 by a 7½ in. Angle Girder 74, the last projecting a distance of six holes past Girder 73. In four of the supports the connection between Girders 72 and 74 is strengthened by a 1½ in. Corner Bracket 75, while a Corner Gusset 76 is used in the remaining two supports, then the top of Girder 73 in each case is connected to Girder 72 by a 4½ × ½ in. Double Angle Strip. Another two supports are next built up; identical to the first six except that 7½ in. Girder 74 is replaced by a 4½ in. Angle Girder 77, then all the supports are attached to the roller race base, the first six by bolting Girders 74 direct to the base and the last two by extending Girders 77 with 9½ in. Strips 78. Notice that the two slightly different supports are placed diametrically opposite each other.

Girders 72 are now connected by a complete ring made up of eight 12½ in. Strips 79 bolted through the second holes of the Girders. A set of steps are added, one of the uprights being supplied by one 9½ in. Girder 72 and the other by a further 9½ in. Angle Girder 80. The uprights are joined by a 5½ in. Strip 81, attached by Angle Brackets, the securing bolts also fixing two 9½ in. Strips 82 in place. The other ends of these Strips are connected to the lower ends of the uprights by 7½ in. Strips 83 then the steps are provided by eight 5½ × ½ in. Double Angle Strips 84 bolted between Strips 82. A handrail at each side is supplied by two 9½ in. compound narrow strips 85 attached by two 3½ in. Narrow Strips 86, as shown.

Enclosing the whole superstructure, except the entrance-way, is a "fence" obtained from seven 12½ in. Strips 87 extended by one 5½ in. Strip, and seven 12½ in. Braced Girders 88 extended by one 5½ in. Braced Girder.

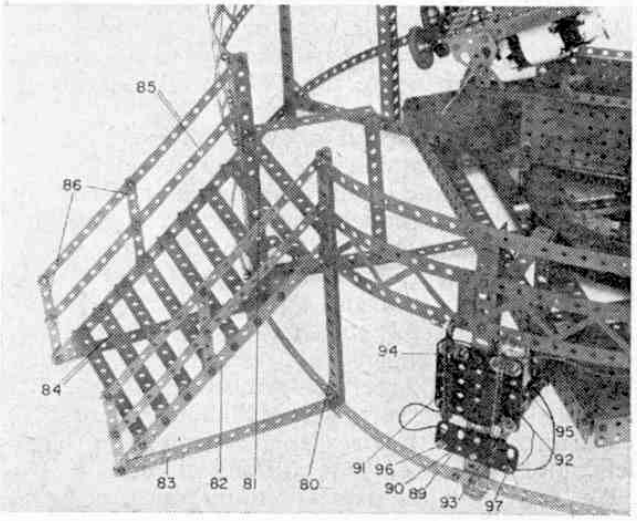
Finally, as far as construction goes, a floor is provided by hardboard or cardboard segments bolted to the Double Angle Strips joining Girders 72 and 73. This, at least, is the cheapest way of doing it, but, if you had sufficient parts, you would almost certainly be able to use Plates of various sorts.

All that now remains to be seen to are the electrical circuits. First, however, a switch assembly is produced from a 2½ × 2½ in. Insulating Flat Plate 89 bolted to one Girder 72, a 2½ in. Insulating Flat Girder 90 being fixed lower down the same Girder. Two 3½ in. Strips 91 and 92, each carrying a Threaded Pin to act as a handle, are lock-nutted to Angle Brackets 93 bolted to Plate 89, then a further two pairs of Angle Brackets 94 and 95, arranged "back-to-back" as shown, are fixed to the upper corners of the Plate. The free lugs of these latter Brackets should be bent apart slightly to allow Strips 91 and 92 to fit tightly between them. The enamel should be scraped from the Strips where they are lock-nutted to Brackets 93 and where they make contact with Brackets 94 and 95 to ensure that good electrical connections will be made. Two terminals 96 and 97, supplied by Bolts are fixed to Insulating Flat Girder 90.

Coming finally to the wiring of the model, Angle Brackets 93 are connected together by a short length of insulated wire, then terminal 96 is connected to one of the Angle Brackets. Terminal 97, on the other hand, is earthed by connecting it to some part of the model (we used Flanged Ring 7), making sure that the connection is not insulated by the enamel of the part to which it is connected. In the case of the Power Drive Unit fixed to the roller bearing base, one of its motor leads is simply connected to terminal 97, the other being connected to Angle Brackets 95.

The Power Drive Unit fixed to the elevating arm is just as simple. In this case, one of its motor leads is connected to Commutator 35, while the other is earthed. (We connected it to Flanged Ring 18). The last job, however, is a little more complicated. A length of very thin insulated wire is connected to Wiper Arm 21 and is then threaded down the slot in Keyway Rod 36 to be finally connected to Angle Brackets 94. The leads from the power source are taken to terminals 96 and 97.

Note it is essential that all earthed connections make good electrical contact, therefore it is advisable to remove the enamel from around the points where the connections are to be made. Remember also that, for the upper motor to work, earthed current must pass through the roller bearing. To ensure that this happens, the enamel should be removed from the ends of the flanges of Flanged Rings 7 and 18.



In this view of the Meccano Satellite, the steps of the model as well as the electrical switch gear controlling the two Power Drive Units are clearly shown.