A couple of simple ones

by Spanner

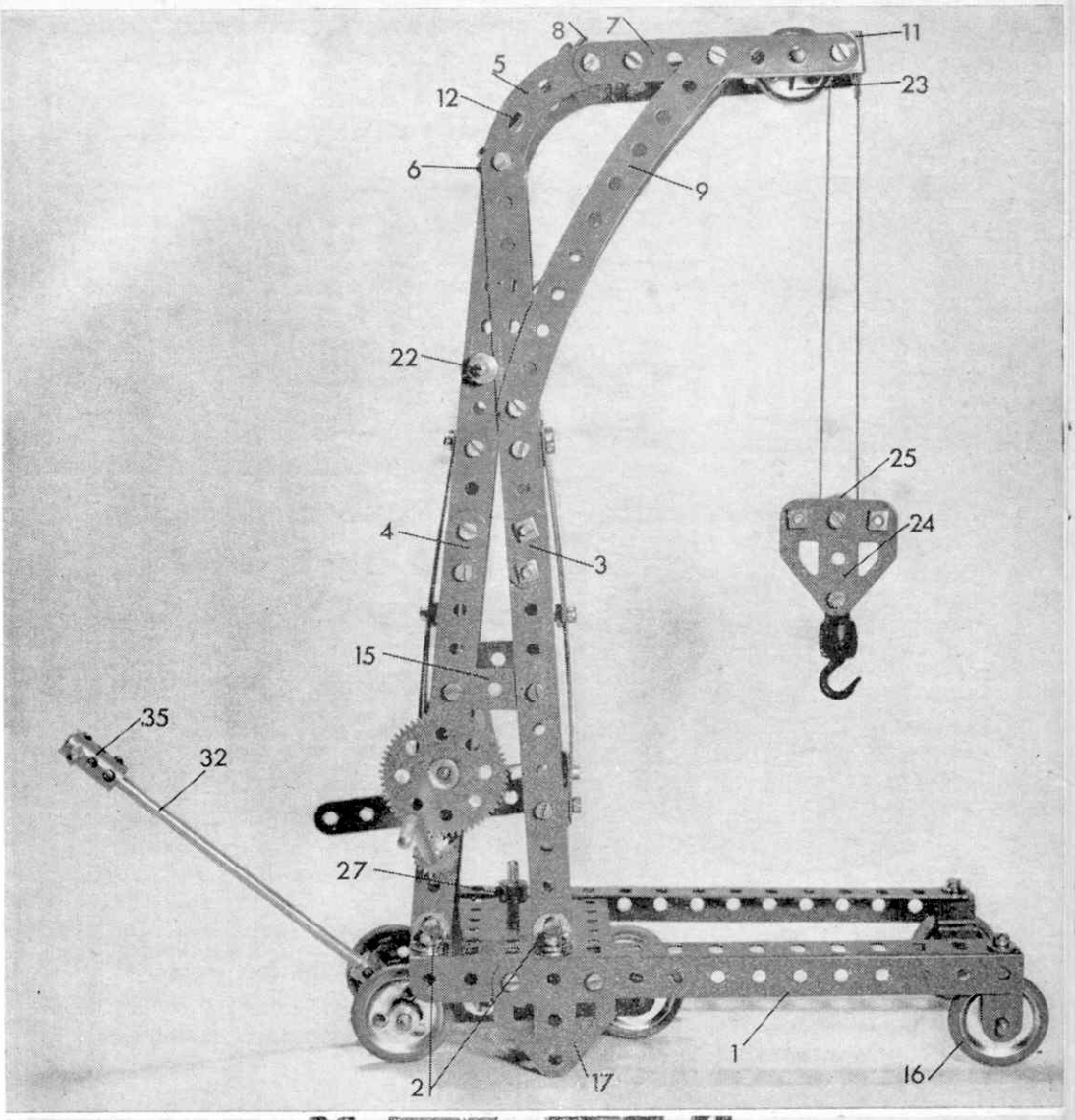
MENTION the word 'Crane' to me and I visualise a slender structure of intricate girder-work, soaring skywards to an immense height and crowned by a long, sweeping jib, cut short at the rear and solidly counterweighted. In other words, I see a huge builder's crane of the type used in the construction of multi-storey buildings, and the reason I do this, no doubt, is because I pass any number of them on the way to the office.

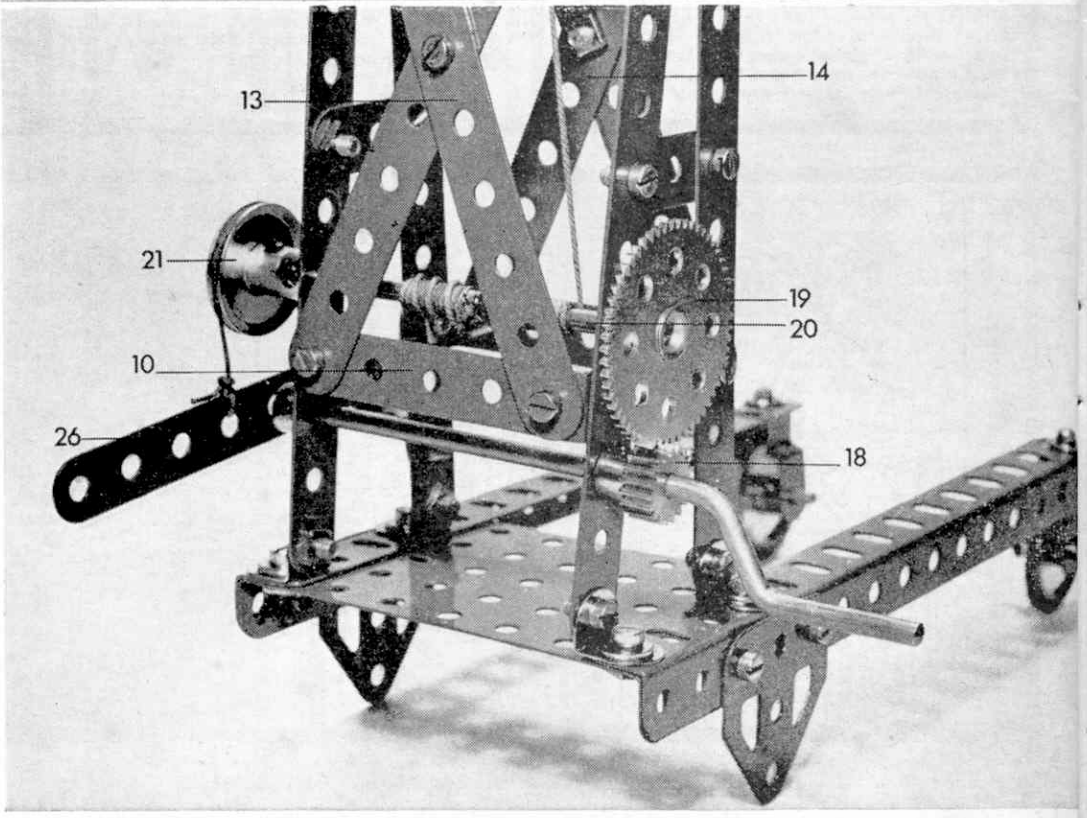
It is perhaps because I think of cranes as giant objects that I was particularly attracted by a little Portable Crane I saw modelled in a very old issue of Meccano Magazine. It seemed to be so much out of the ordinary that I felt it was well worth a second showing, especially as few, if any, of today's readers will have seen it. I therefore built it up, with a few slight modifications, and feature it as the first model in this article.

Portable cranes were, and still are, used extensively in industrial machine shops where, as a rule, there is little room to spare. In such places, a large crane would not only be useless, but would also be very much in the way. A portable crane, however, takes up a minimum amount of space and has the added advantage of being tremendously manoeuvrable. Indeed, it is essential. How else, for example, could a machine tool or casting weighing several hundredweight be brought close up to a specific machine and suspended safely in position until locked in place? It certainly couldn't be lifted by hand!

The Meccano Portable Crane described below is typical of its type and works extremely well. It's by no means difficult to build, although it is a little more complicated than it appears at first glance. Dealing first with the crane, itself, as opposed to the trolley, two 7½ in. Angle Girders 1 are bolted to a 3½ in. by 2½ in. Flanged Plate, at the same time fixing four Angle Brackets 2 in place, two to each Angle Girder. Bolted to each pair of Angle Brackets are two 10 in. compound strips 3 and 4, obtained from 5½ in. Strips overlapped two holes, which are brought together at the top and extended by a 2½ in. Stepped Curved Strip 5, at the same time fixing another Angle Bracket 6 in position. Curved Strip 5 is, itself, extended forward by a 3½ in. Strip 7, the rearmost securing Bolt again fixing an Angle Bracket 8 in place. A 5½ in. Curved Strip 9 is bolted between compound strip 3 and Strip 7 to strengthen the jib.

Compound strips 3 and 4 at each side are now joined by two 2½ in. by ½ in. Double Angle Strips 10,





while 3½ in. Strips 7 are joined by a 1½ in. by ½ in. Double Angle Strip 11. Additional cross-bracing is provided by two 2½ in. Strips 12, bolted between Angle Brackets 6 and 8, and two pairs of 5½ in. Strips 13 and 14. The latter are bolted between Double Angle Strips 10 and Angle Brackets fixed to compound strips 3 and 4, as shown in the accompanying illustration. Note, however, that it may be necessary to bend the Strips slightly to fit. Compound strips 3 and 4 at each side are further braced by a 1½ in. Strip 15.

To the front end of each Angle Girder 1 a Stepped Bent Strip 16 is bolted to provide a bearing for a 1 in. Rod carrying a 1 in. fixed Pulley with Rubber Ring. Flat Trunnions 17 are bolted two holes away from the other ends of the Girders, as can be seen.

Winding Mechanism

Journalled in compound strip 4 is a 3½ in. Crank Handle, held in position by a ½ in. Pinion 18 and a Collar. The Pinion meshes with a 57-teeth Gear Wheel 19 on a 3½ in. Rod 20, also held in place by a Collar, and carrying a 1 in. fixed Pulley 21 on the opposite end to the Gear Wheel. Another 3½ in. Rod 22, on which a ½ in. loose Pulley is held by Spring Clips, is mounted towards the top of compound strips 4, this, again, being secured by Collars, while a further two Collars hold a 2 in. Rod in the end of the jib. Mounted on this last Rod is a 1 in. loose Pulley 23, which is prevented from sliding about by Spring Clips.

A substantial hook is built up from two Flat Trunnions 24, in the apex holes of which a ½ in. Bolt, carrying a Loaded Hook, is held by two Nuts. At the top of the hook, the Flat Trunnions are held sufficiently apart, by three Nuts on two ⅜ in. Bolts, to allow a ½ in. loose Pulley 25 between them. This Pulley is mounted on a ½ in. Bolt, secured by two Nuts. A length of Cord is now attached to a Cord Anchoring Spring on Rod 20, is passed over Pulleys 22 and 23, is taken around Pulley 25 in the hook and is finally tied to Double Angle Strip 11. A brake is supplied by a short length of Cord, passed round Pulley 21 and tied to a 3½ in. Strip 26. This Strip is lock-nutted to a Double Bent Strip bolted to compound strip 3.

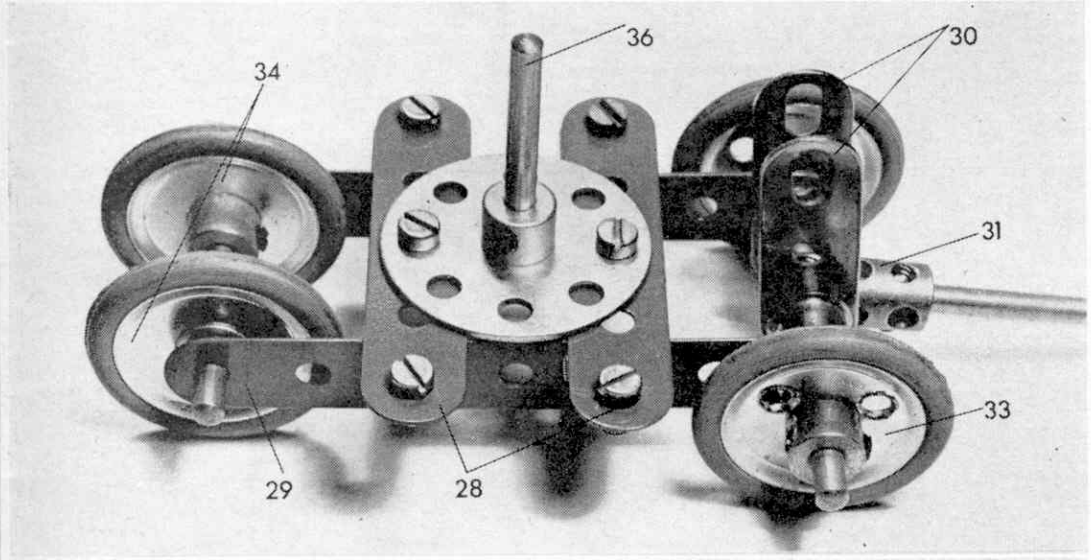
Trolley

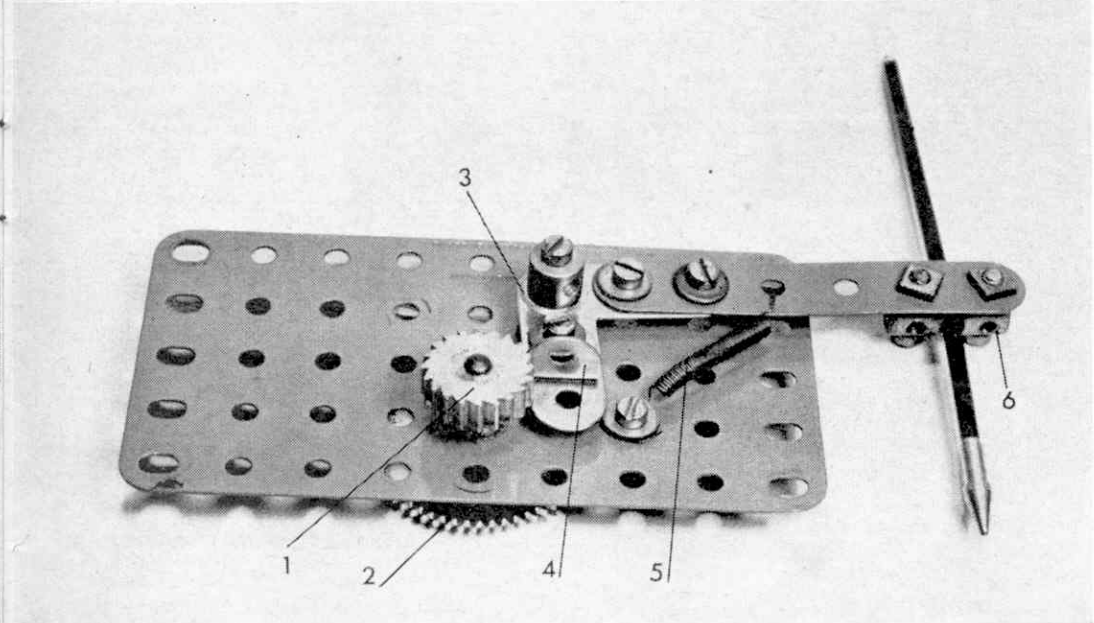
At this stage the crane proper has been completed, leaving only the trolley to be built and this is very simple. Two 2½ in. Strips 28 are attached by Angle Brackets to two 3½ in. Strips 29. Securely mounted between the latter, on a 2½ in. Rod, are two Cranks 30 and a Coupling 31, the Coupling being between the Cranks with the Rod passing through one of its end transverse smooth bores. A 5 in. Rod 32 is fixed in its longitudinal bore. Mounted on each end of the 2½ in. Rod, outside the Strips, are two 1 in. Pulleys without boss 33, each loosely held by two Collars. Journalled in the other end of Strips 29 is a 2 in. Rod, held in place by two 1 in. fixed Pulleys 34. Rubber Rings are mounted both on these Pulleys and on Pulleys 33. A Coupling 35, carrying a transversely-mounted 1½ in. Rod, is fixed on the end of Rod 32. Finally, an 8-hole Bush Wheel with a 1½ in. Rod 36 fixed in its boss, is bolted to Strips 28.

The principles involved in the trolley are really quite straightforward. Rod 36 protrudes through the centre hole in the 3½ in. by 2½ in. Flanged Plate and the weight of the crane presses down on the arms of Cranks 30, thus raising the handle formed by Rods 32 and 35. When this handle is depressed, the Cranks lift the crane—and consequently Flat Trunnion 17—off the ground so that the whole model can be towed away. A Collar 27 should be fixed on Rod 36, above the Flanged Plate, to prevent the Plate being raised so high that the arms of the Cranks slip out from underneath it.

Parts Required:

12 of No. 2	5 of No. 22	1 of No. 48
5 of No. 3	3 of No. 22a	2 of No. 48a
4 of No. 5	2 of No. 23	1 of No. 53
2 of No. 6a	1 of No. 24	1 of No. 57c
2 of No. 8b	1 of No. 26	11 of No. 59
16 of No. 12	1 of No. 27a	2 of No. 62
1 of No. 15	4 of No. 35	2 of No. 63
2 of No. 16	84 of No. 37a	2 of No. 89
1 of No. 16b	73 of No. 37b	2 of No. 90a
2 of No. 17	9 of No. 38	2 of No. 111a
2 of No. 18a	1 of No. 40	2 of No. 111c
2 of No. 18b	2 of No. 44	4 of No. 126a
1 of No. 19s	1 of No. 45	6 of No. 155





Dot Machine

Have you ever had to prepare a manuscript or poster which incorporated a load of dotted lines? If you have, you will know that drawing these lines by hand can be a bit of a nuisance, so you should be particularly interested in the other little model featured here. It's what could be described as a 'mechanical dot drawer'.

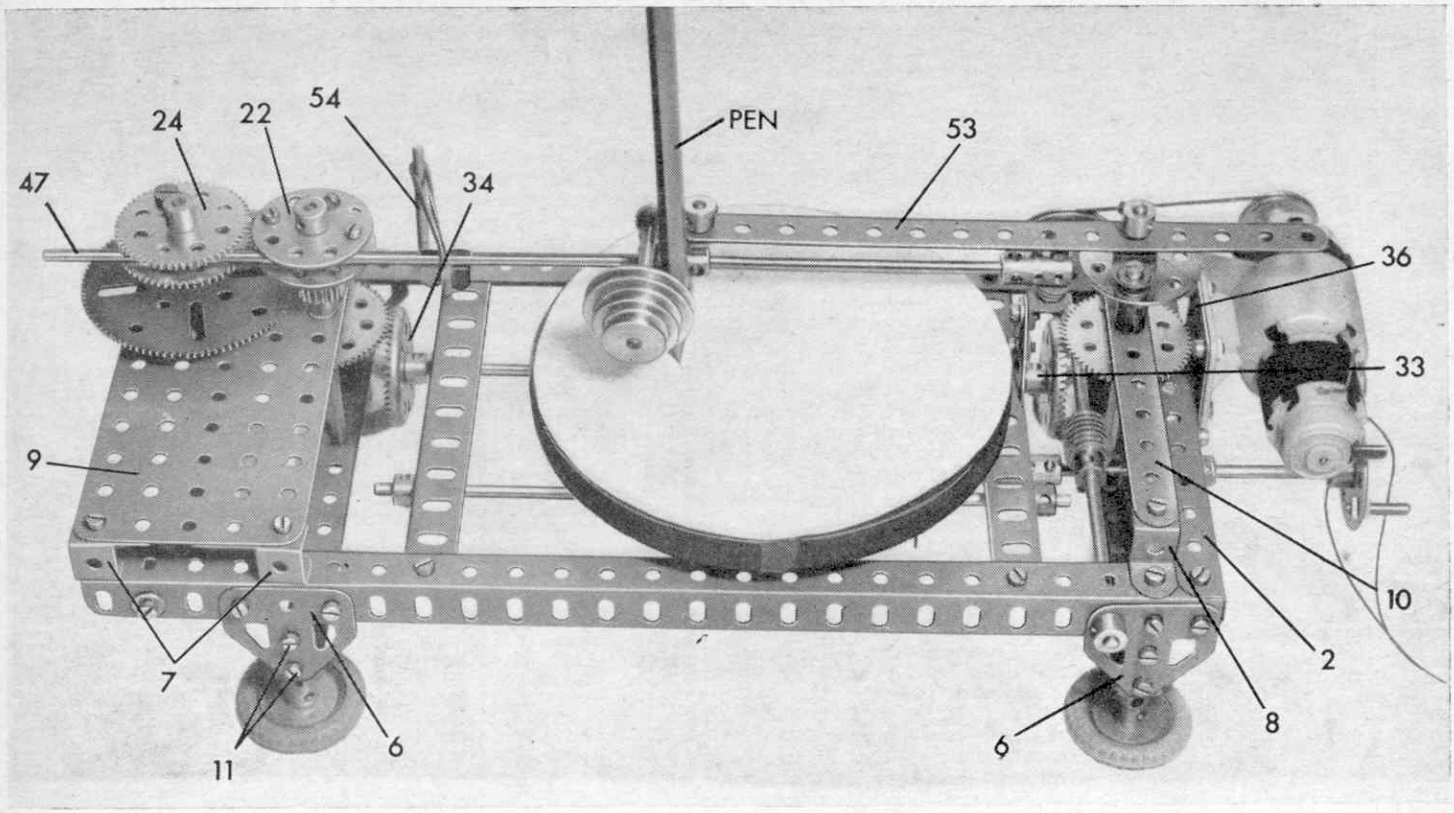
The model is really very simple in design, consisting of a 4½ in. by 2½ in. Flat Plate, in the centre of the second row of holes of which a 1 in. Rod is held by a Ratchet Wheel 1 and a 50-teeth Gear Wheel 2. Pivotally attached to the Plate in the position shown is a Bell Crank 3, one arm of which is extended by a 3 in. Strip, while an Angle Bracket 4 is bolted to the other arm in such a position that it engages with the teeth of the Ratchet Wheel. It is important to remember that the Bell Crank is loose on the shank of a ¾ in. Bolt, held by two Nuts in the Plate, with three Washers spacing the Bell Crank from the inside Nut.

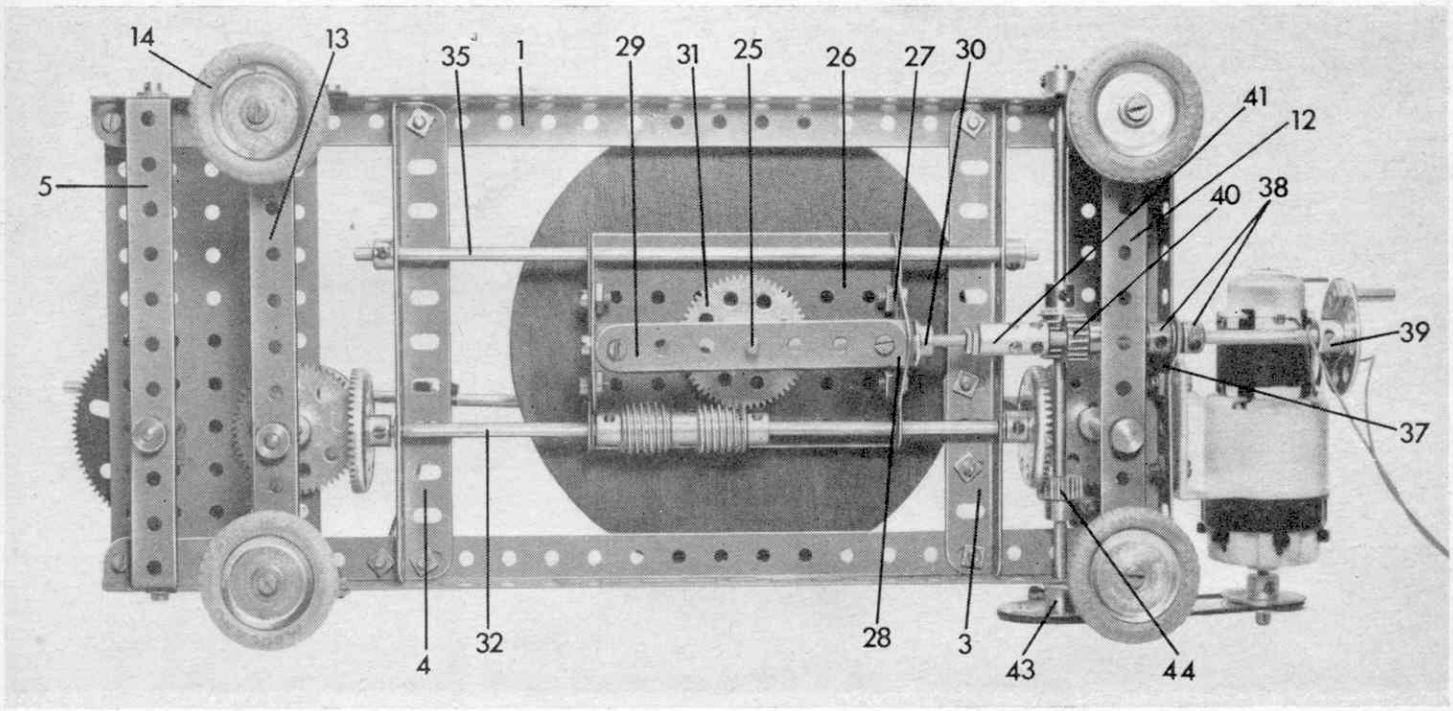
Angle Bracket 4 is held in constant contact with Ratchet Wheel 1 by a short length of Spring Cord attached to the 3 in. Strip and bolted to the Flat Plate. A penholder of some sort is attached to the end of the 3 in. Strip and a suitable pen is fixed in this. For the purpose of illustration we used a Coupling 6 as the penholder and a ball-point pen refill as the marking instrument, but the best results are obtained from a felt tipped pen. In this event, however, the pen holder would need to be something such as a Small Fork Piece.

To use the model successfully a wooden rule is required. The rule is placed on the paper to be marked and the dot machine is positioned so that the Flat Plate slides along the edge of the rule while Gear Wheel 2 runs along the top of the rule when the machine is pushed along.

Parts Required:

1 of No. 4	3 of No. 37b	1 of No. 111
1 of No. 12	7 of No. 38	2 of No. 111a
1 of No. 18b	1 of No. 53a	1 of No. 128
1 of No. 27	1 of No. 58	1 of No. 148
7 of No. 37a	1 of No. 63	





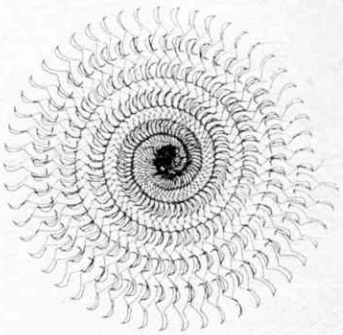
to be followed by two 57-teeth Gear Wheels 24 spaced by a second ½ in. Pulley without boss. Here, again, the holes in the faces of these Gear Wheels must be in line with each other. Gear Wheel 23 meshes with Pinion 20.

MOVING WORK TABLE

The actual work table itself is a circular piece of hard wood approximately 5½ in. diameter, and perhaps ½ in. thick, to the underside of which an 8-hole Bush Wheel is screwed. Fixed in the boss of this Bush Wheel, which must lie in the exact centre of the work table, is a 2 in. Rod 25. An arrangement is now built up from a 3½ in. by 2½ in. Flanged Plate 26 to each flange of which a 2½ in. Strip and a Flat Trunnion 27 is fixed. Two Angle Brackets 28, joined by a 3½ in. Strip 29, are bolted through the apex holes of the Flat Trunnions, at the same time securing a Threaded Crank 30 in place at one end. The completed arrangement is then mounted on Rod 25, being held in place by a 57-teeth Gear 31. This Gear engages with two Worms fixed on an 8 in. Rod 32, mounted in Angle Girders 3 and 4 and in the end holes in the flanges of Flanged Plate 26. A Collar is added to the Rod to act as a 'stop', while two 1½ in. Contrate Wheels 33 and 34 are mounted one on each end of the Rod, Washers being used as spacers. Another 8 in. Rod 35, held by Collars in Angle Girders 3 and 4, passes through the other end holes in the flanges of Flanged Plate 26. Contrate Wheels 33 engage with Gear Wheel 15 and Contrate Wheel 34 engages with Gear Wheel 19.

MOTOR AND DRIVE

A Power Drive Unit is bolted, along with a 1½ in. by 1½ in. Flat



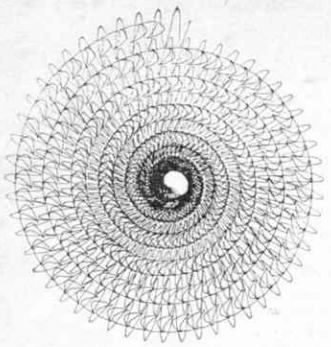


Plate 36, two 1½ in. Strips and a 1 in. Corner Bracket 37, to the vertical flange of Angle Girder 2. Held by Collars 38 in the Corner Bracket is a 4 in. Rod, carrying an 8-hole Bush Wheel 39, a ½ in. Pinion 40 and a Threaded Coupling 41. Fixed by Nuts in the threaded portion of Coupling 41 is a 3 in. Screwed Rod which is screwed into the boss of Threaded Crank 30. A Threaded Pin is fixed to the face of Bush Wheel 39.

Pinion 40 engages with a Worm 42 on a 6½ in. Rod X journalled in Angle Girders 1 and held in place by a Collar and a 1½ in. Pulley 43. Also fixed on this Rod is a ½ in. Pinion 44 that engages with Contrate Wheel 33. Pulley 43 on the other hand, is connected by a 6 in. Driving Band to a 1 in. Pulley on the output shaft of the Power Drive Unit.

PEN ARM

A 1 in. by ½ in. Angle Bracket is bolted to a Trunnion 45 which, in turn, is bolted to the horizontal flange of Angle Girder 3. A ¾ in. Bolt is passed through one end transverse smooth bore of a Coupling 46 and is fixed by two Nuts to the short lug of the Angle Bracket with three Washers spacing the Coupling from the upper Nut. The Coupling must move perfectly freely on the Bolt. Fixed in the longitudinal bore of the Coupling is an 11½ in. Rod 47, the other end of which lies between Bush Wheels 21 and 22 and between Gear Wheels 24.

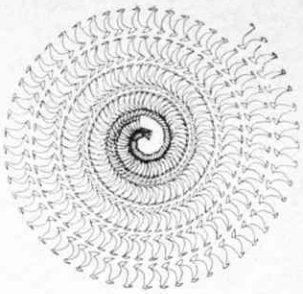
Loose on Rod 47 is another Coupling 48 to the centre of which a Small Fork Piece 49 is secured by a ⅜ in. Bolt. Mounted in the end transversed tapped bores of the Coupling are a Handrail Support 50, in which a 2 in. Rod is fixed, and a Threaded Pin 51. A Cone Pulley 52 is mounted on the end of the 2 in. Rod to provide a weight for the pen which is held between the arms of small Fork Pieces 49 by a long B.A. bolt and nut. An ordinary ball-point pen is quite suitable for use in the model. Two Washers are placed on each Threaded Pin 18 and 51, then the Threaded Pins are connected by a 7½ in. Strip 53, loosely held on the Pins by Collars. Rod 47, incidentally, is held between Bush Wheels 21 and 22 and Gear Wheels 24 by a Driving Band, slipped over the Rod and caught on a 2 in. Screwed Rod 54 held by Nuts in one Angle Girder 1. Spring Clips prevent the Band from sliding on the Rod.

OPERATION

The working theory of the spiralograph is not really difficult to follow. As Rod X revolves, Pinion 44 drives Contrate Wheel 33 and consequently Contrate Wheel 34 also. Contrate Wheel 33, in turn, drives Gear Wheel 15 which causes Bush Wheel 17 to revolve. Threaded Pin 18, attached to this Bush Wheel, acts as a cam which activates Strip 53, and causes the pen holder to move backwards and forwards on Rod 47. At the same time Contrate Wheel 34 drives Gear Wheel 19, Causing Bush Wheels 21 and 22 and Pinion 20 to revolve. Pinion 20 meshes with Gear Wheel 23, therefore, Gear Wheels 24 will also revolve. If Pivot Bolts or ½ in. Bolts are inserted in the holes in the faces of Gear Wheels 24 and/or Bush Wheels 21 and 22, they will cause Rod 47 to oscillate sideways, which movement, of couse, is transmitted to the pen holder.

Assuming that there is a pen in the pen holder, we have seen, so far, how it is moved forward, back and sideways in a regular rhythm. While all this is going on, however, Worm 42 drives Pinion 40 which, in turn, causes the 3 in. Screwed Rod in Threaded Coupling 41 to revolve. As it revolves in Threaded Crank 30 the work table is moved slowly along Rods 32 and 35. The Worms on Rod 32, however, engage with Gear Wheel 31, thus causing the work table itself to revolve. Because of these additional movements the pattern being drawn by the pen slowly spirals inwards to the centre of the paper.

Different patterns can be obtained by altering the positions of the Bolts in Gear Wheels 24 and/or Bush Wheels 21 and 22, or by altering the distance of Threaded Pin 18 from the centre of Bush Wheel 17. In addition, the working length of Strip 53 can be changed or the Strip can even be removed altogether. The quantity of Bolts inserted into Gear Wheel 24 and Bush Wheels 21 and 22 will also affect the pattern as, indeed, will any combination of the foregoing methods. In short, there's plenty of choice.

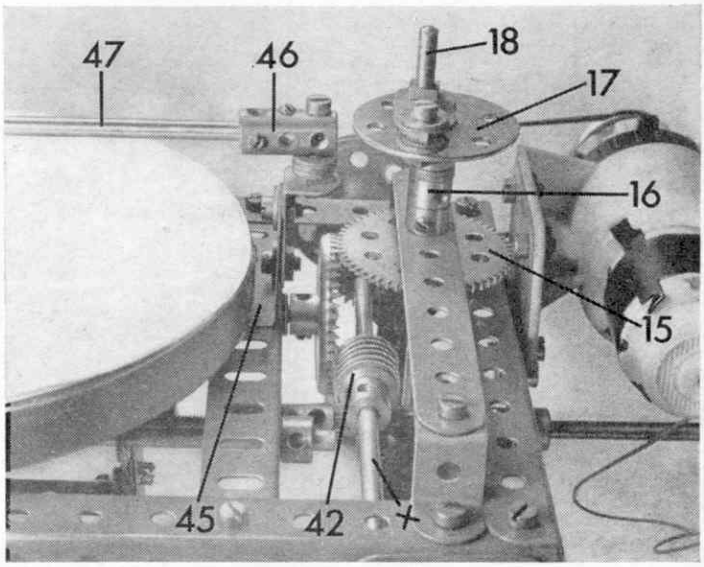


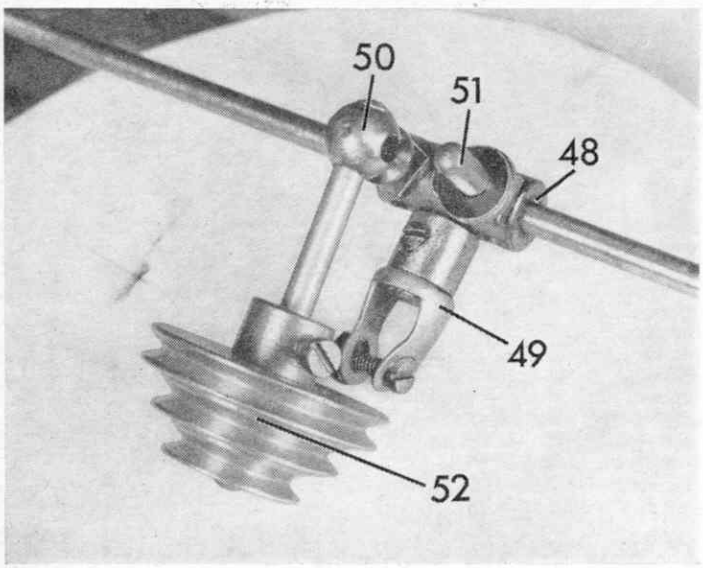
PARTS LIST

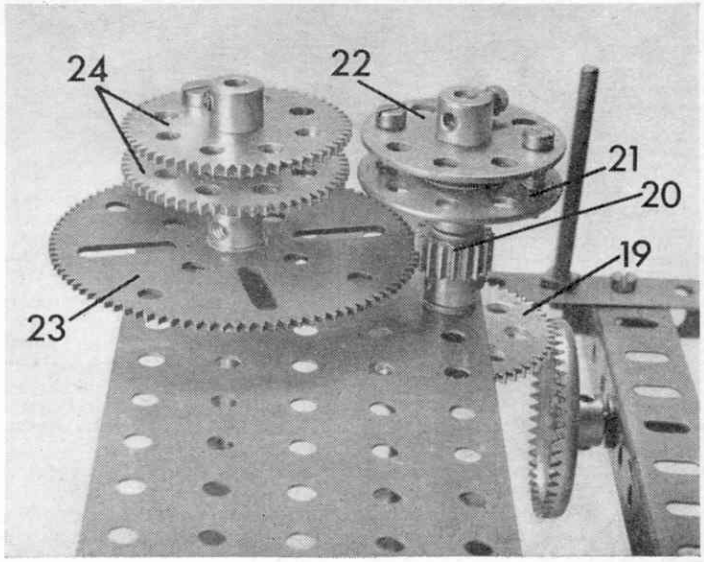
1 of No. 1a	4 of No. 24	1 of No. 74
1 of No. 3	1 of No. 24b	1 of No. 80c
2 of No. 5	3 of No. 26	1 of No. 81
3 of No. 8	5 of No. 27a	8 of No. 111
1 of No. 10	1 of No. 27c	1 of No. 111c
4 of No. 11	2 of No. 28	3 of No. 115
2 of No. 12	3 of No. 32	1 of No. 116a
5 of No. 12b	2 of No. 35	1 of No. 123
1 of No. 13	72 of No. 37a	3 of No. 125
2 of No. 13a	64 of No. 37b	6 of No. 126a
1 of No. 14	14 of No. 58	1 of No. 133a
1 of No. 15b	1 of No. 48d	1 of No. 136
2 of No. 16a	1 of No. 53	3 of No. 147a
1 of No. 16b	18 of No. 59	1 of No. 186
1 of No. 17	1 of No. 62a	1 of No. 186a
1 of No. 21	2 of No. 63	4 of No. 142c
5 of No. 22	1 of No. 63c	1 Power Drive
2 of No. 23	1 of No. 70	Unit

IMPORTANT

The patterns produced by this model should be drawn on 5½ in. diameter discs of plain paper. Meccano Magazine is able to offer specially cut discs to readers at 1s. 3d. for twenty including postage. Write to 'Spiralograph Discs', Meccano Magazine, Thomas Skinner and Co. (Publishers) Ltd., St. Alphage House, Fore St., London, E.C.2.







Among the model builders

WHEN motorising a hand-operated Meccano Crane, experience shows that it is not sufficient simply to couple a power unit to the winding shaft of the crane. This would work, of course, but would be most unsatisfactory as the direction of travel of the load could only be altered by reversing the Motor, and the speed of operation would be constant unless the speed of the Motor itself could be controlled.

What is required, in fact, is a special gearbox, and Mr. Kenneth Burnett of Hove, Sussex, has designed just such a gearbox, a slightly modified version of which you will see illustrated on this page. It gives three forward and three reverse speeds and has a neutral position that allows the motor to continue running although the Crane is not actually in operation. In other words, once the Motor has been switched on, operation of the model can be controlled entirely from the gearbox.

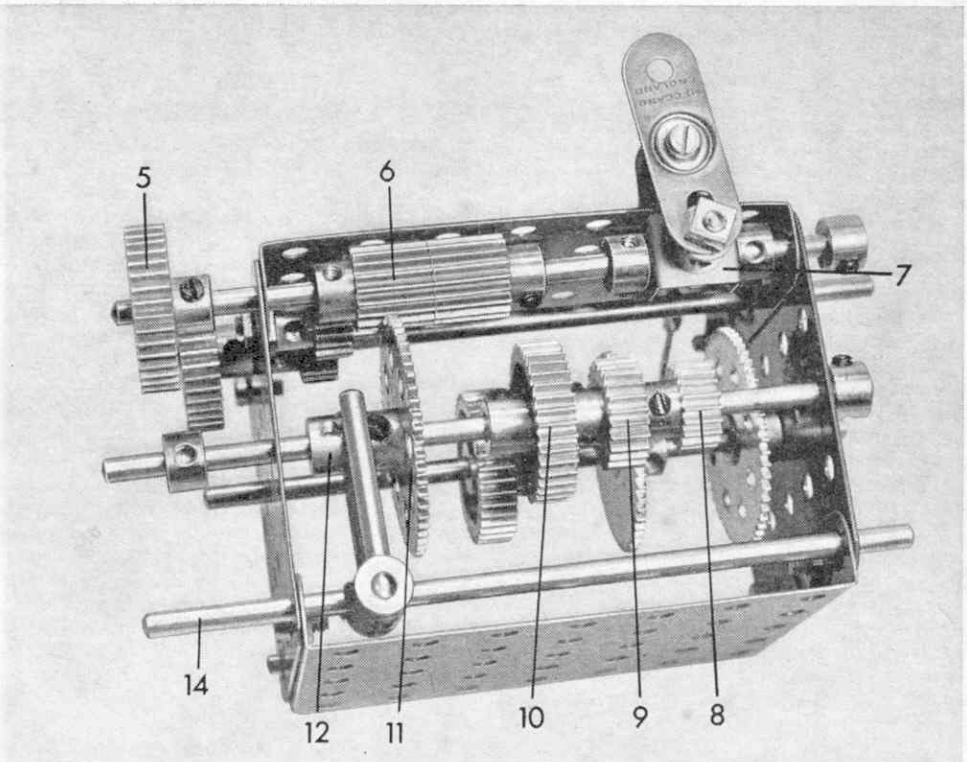
The framework of the unit consists of two 3½ in. by 2½ in. Flanged Plates joined by two 2½ in. by 2½ in. Flat Plates. All the Rods used in the mechanism are journalled in these Flat Plates. The input shaft is a 5½ in. Rod 1 carrying a 1 in. Gear Wheel 2 and a ½ in. Pinion 3, the Gear Wheel and Pinion being mounted one each side of the Flat Plate. Pinion 3 is in mesh with another ½ in. Pinion 4, loose on a ¾ in. Bolt held by Nuts in the Flat Plate.

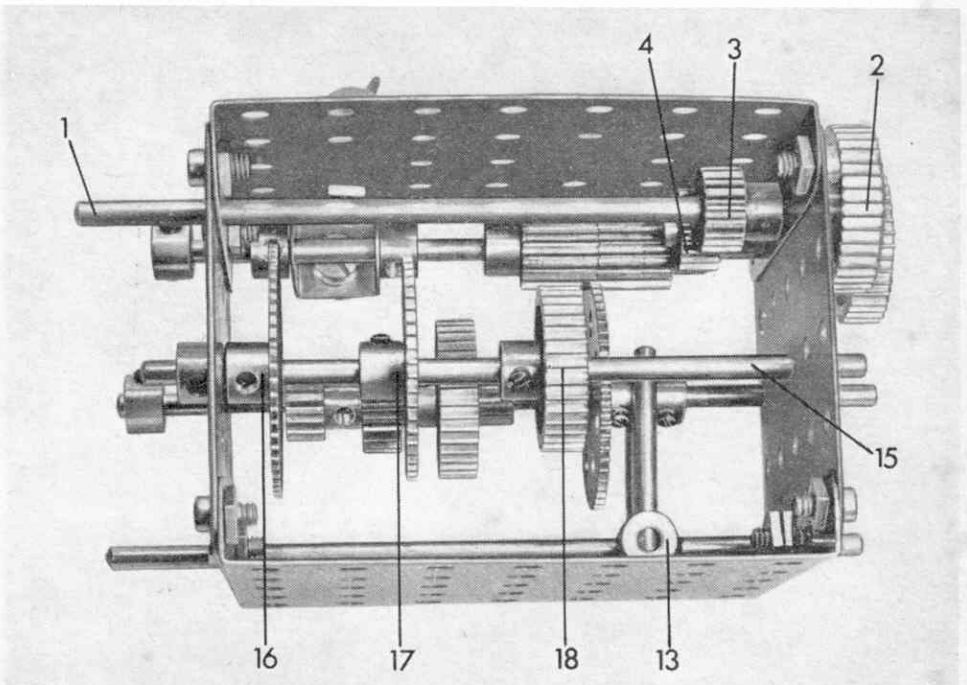
Journalled vertically above Rod 1 is a second 5 in. Rod also carrying a 1 in. Gear 5, in addition to a compound ½ in. by 1 in. Pinion 6 obtained from two ½ in. by ½ in. Pinions. This Rod must be free to slide in its bearings being controlled by a large Fork Piece 7 held on the Rod by Collars. The Fork Piece is lock-nutted to a Double Arm Crank which is, in turn, lock-nutted to a 1 in. by ½ in. Angle Bracket bolted to the Flanged Plate. Gear Wheels 2 and 5 mesh together as also do Pinion 4 and Compound Pinion 6, but the latter two must not be in mesh at the same time as the two former. The Compound Pinion, in fact, should be placed on the Rod so that it meshes with Pinion 4 a fraction after Gear Wheels 2 and 5 come out of mesh. In other words there must be a neutral period. A 'stop' is provided by a Collar mounted on the opposite end of the Rod to Gear 5. Note that the standard Grub Screw in the boss of the inside Pinion included in Compound Pinion 6 must be replaced with a $\frac{7}{64}$ in. Grub Screw, part No. 69c.

The main layshaft consists of a 5 in. Rod that carries a ½ in. Pinion 8, a ¾ in. Pinion 9, a 1 in. Gear Wheel 10, a 57-teeth Gear 11 and a Collar 12. Movement of this layshaft is controlled by two 1½ in. Rods, located between the boss of Gear Wheel 11 and Collar 12, and fixed in the end transverse bores of a Coupling 13 which is mounted on another 5 in. Rod 14. A 4½ in. Rod 15 serves as the output shaft and carries a 57-teeth Gear 16, a 50-teeth Gear 17 and another 1 in. Gear 18. As the main layshaft is moved, Gears 8, 9 and 10 mesh with Gears 16, 17 and 18 respectively, but more than two Gears must never be in mesh at the same time. Again, there must be a short neutral position between each Gear, and it is important to note that a 57-teeth Gear 11 must be in constant mesh with Compound Pinion 6. Collars are mounted on the ends of the main layshaft to prevent it moving more than necessary.

Parts required

1 of No. 12b	2 of No. 27a	1 of No. 63
4 of No. 15	4 of No. 31	1 of No. 69c
1 of No. 15a	13 of No. 37a	1 of No. 111
2 of No. 18a	9 of No. 37b	1 of No. 111a
1 of No. 25	1 of No. 38	1 of No. 116
3 of No. 26	2 of No. 53	1 of No. 147b
2 of No. 26a	7 of No. 59	
1 of No. 27	1 of No. 62b	



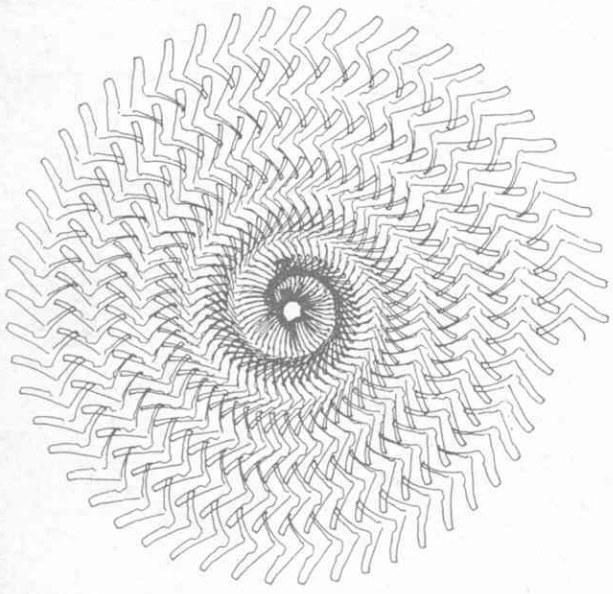


South Midlands Meccano Society

News reached me recently of the third biennial meeting of an excellent organisation known as the South Midlands Meccano Society. It was held at the Society's base at Cheltenham, and was attended by a dozen members from as far apart as Bath, Abingdon and Stratford-upon-Avon, who spent something like six hours studying other members' models, explaining the workings of their own models, exchanging information and generally enjoying the company of fellow enthusiasts.

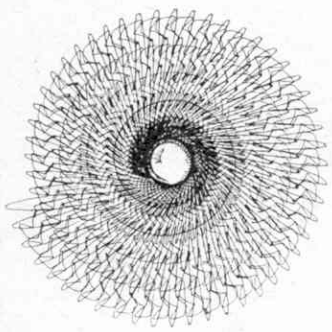
The South Midlands M.S. originated some three years ago when the organiser, Mr. Esmond H. L. Roden, of Cheltenham, noticed a prize-winning model in an old edition of M.M. that had been built by another Cheltenham resident, Mr. Stanley Rouse. He contacted Mr. Rouse, and the resulting friendship proved so successful from a Meccano point of view that the pair decided to seek out other adults with an interest in the hobby. Cheltenham, however, seemed devoid of further enthusiasts at the time and so they extended their search to within 45 miles of the town, scouring old M.M.'s for names. This was successful and the Society was born, holding its first official meeting in September 1965. It is still very much alive, but there is plenty of room for growth. Anybody interested should contact Mr. Roden, at 25 Cleevelands Avenue, Cheltenham. He will be delighted to hear from you.

More than a Meccanograph



Fascinating to build, and even more fascinating to operate, the Meccano Spiralograph produces complex spiral patterns to order. You can set the machine to produce a variety of different designs.

FEW Meccano models are more fascinating than those amazing mechanical pattern - producing machines which, for many years, we have identified by the name 'Meccanograph'. I suppose most enthusiasts with enough parts at their disposal have, at some time or another, had a shot at building one of these captivating gadgets, but few designers have managed to produce anything quite so successful and yet so compact as the machines invented by Mr. Andreas Konkoly of Budapest, Hungary. Mr. Konkoly is now a past master of the Meccanograph, having built examples of many shapes and sizes.



He has been written about in Hungarian magazines and has even appeared with his creations on Hungarian television.

Not least, he has provided the M.M. with some very useful material. In August 1965, for example, we published an article entitled 'A Magnificent Meccanograph'. As you will have guessed, the model featured was designed by Mr. Konkoly. Now he has sent us details of another model—this time of a machine he aptly describes as a 'Spiralograph'. Generally speaking, it's very similar to a Meccanograph except that, instead of drawing a regular pattern which ends at its starting point, it draws a pattern that gradually spirals into the centre.

This is a complete departure from the normal run of things and results in some very interesting and unusual designs. Any number of different patterns can be produced, in fact, although it takes a bit of practice to obtain the best combinations. Once we had mastered the operation of the model, we were so impressed with it that we decided to show it —working—on the Meccano Magazine stand at the Daily Mail Boys and Girls Exhibition which will be held at Olympia from December 27, 1966 to January 10, 1967 inclusive. If you pop along we'll be delighted to see you.

Construction of the model is not difficult, but great care must be taken to see that the framework is quite rigid and that all gears and other moving parts run perfectly freely. To begin with a strong framework is built up from two 12½ in. Angle Girders 1 connected through their first, fifth and eighteenth holes by three 5½ in. Angle Girders 2, 3 and 4, and through their twenty-fourth holes by a 5½ in. by ½ in. Double Angle Strip 5.

Bolted to the vertical flange of each Angle Girder 1 are two Flat Trunnions 6, while bolted to each horizontal flange are two Double Brackets 7 and a ½ in. by ½ in. Reversed Angle Bracket 8. Fixed to Double Brackets 7 is a 5½ in. by 2½ in. Flat Plate 9, whereas a 5½ in. Strip 10 is fixed to Reversed Angle Brackets 8. A 1 in. by ½ in. Angle Bracket 11 is secured by Bolts 11 through its long lug to the inside of each Flat Trunnion 6, then two 5½ in. Strips 12 and 13 are fixed one to the short lugs of each pair of these Angle Brackets by a ¾ in. Bolt that also carries a 1 in. fixed Pulley with Motor Tyre 14 and a Collar.

GEARING

Held by Collars in Strips 10 and 12 is a 4 in. Rod carrying a 57-teeth Gear Wheel 15 positioned so that it lies between Strip 10 and Angle Girder 2. A loose Collar 16 and two Washers are placed on the top of the Rod to be followed by a 6-hole Bush Wheel 17, but note that the Rod must not protrude through the boss of this Bush wheel. Fixed by a Nut in the face of the Bush Wheel is a ⅜ in. Bolt carrying above the Bush Wheel, in order, a Washer, a Fishplate, a Nut and two more Washers. A Threaded Pin 18 is mounted in the other end of the Fishplate.

Another 4 in. Rod, carrying a second 57-teeth Gear Wheel 19 is journalled in Flat Plate 9 and Strip 13, being held by a Collar beneath the Strip and a ½ in. Pinion 20 above the Plate. Note, however, that the Pinion is spaced from the Plate by a Collar, while another Collar is used to space the Pinion from an 8-hole Bush Wheel 21, fixed above it on the Rod. A ½ in. Pulley without boss is then slipped into the Rod and is held in place by a second 8-hole Bush Wheel 22. The holes in the face of this Bush Wheel must lie vertically above the holes in the face of Bush Wheel 21.

Journalled in Double Angle Strip 5 and Flat Plate 9 is a 3 in. Rod held in place by a Collar and a 2½ in. Gear Wheel 23, the latter spaced from Plate 9 by a Washer. A loose Collar is added to the Rod