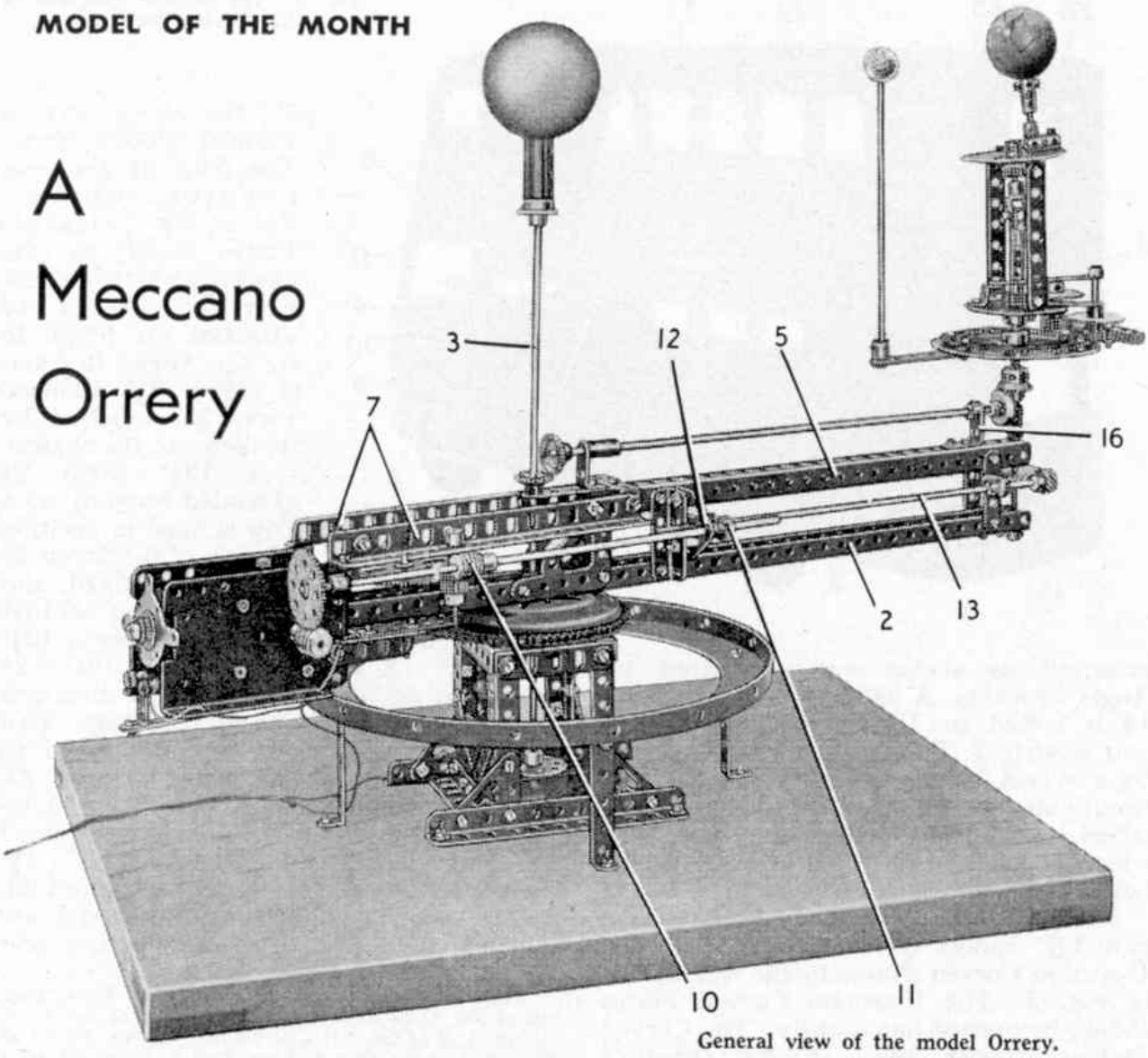
MODEL OF THE MONTH

A Meccano Orrery



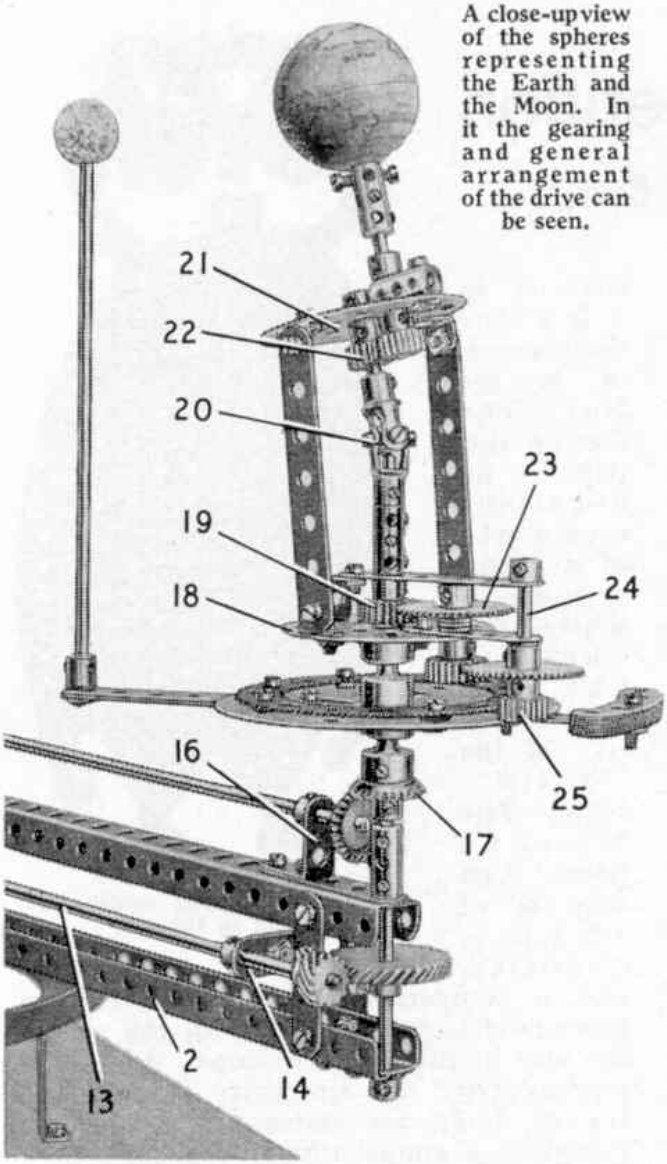
General view of the model Orrery.

AN Orrery is an astronomical instrument of great interest that illustrates the motion of the planets about the Sun, and the operation of the moons of the planets. The earliest instrument of this kind seems to have been made in 1715 for the Earl of Orrery, from whose title its name is derived.

In its usual form an orrery has a number of concentric tubes arranged round a central axis, on which the sphere representing the Sun is mounted. On the upper ends of these tubes, mounted at different levels so as not to interfere with each other, are radial rods of various lengths, on the outer ends of which spheres of various sizes are mounted to represent the planets, and similar arrangements apply to their satellites. The lower end of each of the concentric tubes is driven by means of gearing so as to give the correct movements of the heavenly bodies concerned.

In a Meccano model it is impossible to keep exactly to scale because of the immense range of distances involved. This is easily seen when we realise that if in a model the distance of the Earth from the Sun is represented by a rod 1 ft. in length, that of Pluto, the outermost planet, would be represented by one nearly 40 ft. long, and then the distance from the Sun of the sphere representing Mercury, the innermost planet, would be only 4½ inches. For this reason the present model is restricted to the movements of the Sun, Earth and Moon. To include more would require very complicated gearing.

Thus the Orrery we have chosen as the subject for the June "Model of the Month" demonstrates the annual journeys of the Earth round the Sun and of its satellite the Moon round the Earth, and also illustrates their rotations. It is based



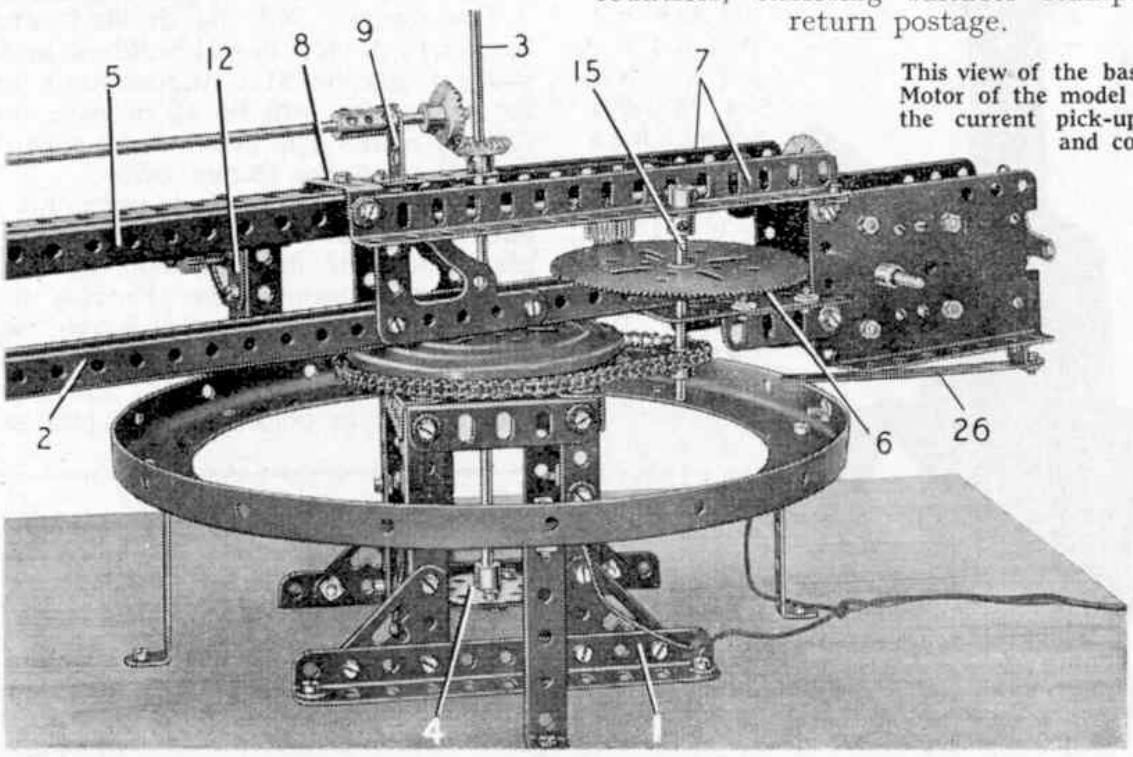
A close-up view of the spheres representing the Earth and the Moon. In it the gearing and general arrangement of the drive can be seen.

on a model entered by Mr. de Beer, Leader of the Cape Peninsula Meccano Club, in a recent model-building Competition. The gearing ensures that the Earth rotates round the Sun in the same time that it takes to rotate upon its own axis 365 times, while the Moon makes 13 revolutions round the Earth in the same period. The Moon always presents the same face to the Earth, and the axis of the latter body is so inclined that there is an angle of 23½ degrees between the plane of its equator and that in which it rotates round the Sun.

Suitable spheres or balls to represent the Sun, Earth and Moon may be obtained quite easily, and no trouble should be met in securing them to their respective shafts. The appearance of the model will be enhanced if the globes representing the Earth and Moon are painted to show or suggest the markings on the surfaces. That representing the Sun also could be painted bright yellow.

The model is driven by a Meccano Motor mounted on the end of the main revolving arm, current being collected by a shoe in contact with a pick-up ring.

Full instructions and a list of the parts required to build the Meccano Orrery can be obtained by writing to the Editor, enclosing a 2d. stamp for postage. Readers in Canada, Australia, New Zealand, South Africa, United States of America and Ceylon can obtain instructions for the *current* "Model of the Month" by writing to the main Meccano Agents for those countries, enclosing suitable stamps for return postage.



This view of the base and Motor of the model shows the current pick-up ring and collector shoe.

MODEL OF THE MONTH

MECCANO ORRERY

Illustrated in the June 1957 issue of the "Meccano Magazine."

Construction of the Base

Two vertical 3½" Angle Girders are bolted to a 5½" Angle Girder 1 to form each side of the base. The 3½" Angle Girders are braced by 1½" Corner Brackets, and they are connected at their upper ends by a 2½" Angle Girder. The sides of the base are connected by four 3½" Angle Girders and the structure is braced by 2½" Strips. A Toothed Disc from a Ball Thrust Race is fixed to the top of the base. The complete assembly is bolted to a suitable baseboard.

Assembly of the Rotating Arm

Two 18½" Angle Girders are bolted together to form a channel girder 2, and this is fixed to the Flanged Disc of a Ball Thrust Race. The Flanged Disc and the Toothed Disc fixed to the base are then arranged with the Ball Cage between them, and an 11½" Rod 3 is passed through the assembly. The lower end of this Rod is fixed in a Bush Wheel 4 bolted to two 2½" x ½" Double Angle Strips attached to the base. A Collar is fixed on the Rod 3 to hold together the sections of the Ball Thrust Race.

Two 12½" Angle Girders are connected to form a channel girder 5, and this is supported by two 2" Strips and two Corner Gussets bolted to the girder 2. A 2½" x 2½" Flat Plate 6 is fixed to one end of girder 2, and two 2" Angle Girders are bolted to the edges of the Flat Plate. An E20R(S) Electric Motor is fixed to the projecting ends of the 2" Angle Girders. A 7½" Angle Girder 7 is connected to each side-plate of the Motor by an Angle Bracket, and is bolted to a 1½" x ½" Double Angle Strip 8 fixed to the girder 5. The bolt securing the Double Angle Strip supports also a 1" x 1" Angle Bracket 9, and a 2½" Strip passed over the Rod 3.

The Rod 3 is used to support the ball representing the sun.

Arrangement of the Main Drive

A Worm on the Motor armature shaft engages a 57-tooth Gear on an 11½" Rod that carries also a Worm 10 and a ½" Pinion 11. The 11½" Rod is supported in a 1" x 1" Angle Bracket bolted to the Motor side-plate and connected to the Girder 7 on the same side by a Fishplate, and in a Flat Trunnion 12 bolted to a 2" Angle Girder. An 11½" Rod 13 supported in the Flat Trunnion and in a Fishplate bolted to a 1" x ½" Angle Bracket 14, carries a ½" Pinion that meshes with the Pinion 11.

The Worm 10 drives a ¾" Pinion on a Rod mounted in the Flat Plate 6 and one of the Girders 7. A ½" Pinion on the same Rod meshes with a 3½" Gear on a Rod 15, which carries a ⅝" Sprocket. The Sprocket is connected by Chain to the Toothed Disc of the Ball Thrust Race.

The Drive to the Earth

A ½" Helical Gear on the end of Rod 13 drives a 1½" Helical Gear

on a 6½" Rod, which is mounted in a 1½" and a 2½" Strip bolted to the girders 2 and 5. The bolts fixing the 2½" Strip secure also a 1" x 1" Angle Bracket 16.

The 6½" Rod is fitted with a Coupling and a Collar, then an assembly formed by a ⅞" Bevel Gear 17 fixed in a Socket Coupling, another Socket Coupling connected to the first by a Short Coupling, and a Face Plate 18 held in the upper Socket Coupling. Before the upper Socket Coupling is fixed on the Short Coupling, a 4" Circular Plate is passed over the Short Coupling so that the Circular Plate is able to rotate freely. The complete assembly of the Socket Couplings, the Bevel Gear and the Face Plate must be free to rotate on the 6½" Rod. A ¾" Pinion 19 and a Coupling can now be fixed on the 6½" Rod, and a Universal Coupling 20 is connected to the Coupling by a 1" Rod.

A Face Plate 21 is connected by Angle Brackets to 3½" Strips, which are attached to Angle Brackets bolted to the Face Plate 18. A 1½" Rod is passed through the boss of the Face Plate 21, is fitted with a ½" Pinion 22, and is fixed in the Universal Coupling 20. Pinion 22 engages a ½" Pinion on a 1½" Rod mounted in a Coupling attached to Face Plate 21 by a ½" Bolt. The upper end of the 1½" Rod carries a Coupling used to support the globe representing the earth.

An 11½" Rod is extended by a 1½" Rod connected by a Coupling, and these Rods are mounted in the Angle Brackets 9 and 16. A ⅞" Bevel Gear is fixed on the 1½" Rod and meshes with a similar Bevel Gear fixed on the Rod 3. A ⅞" Bevel Gear fixed on the end of the 11½" Rod engages the Bevel Gear 17.

The Drive to the Moon

A Gear Ring is attached to the 4" Circular Plate but is spaced from it by a nut on each bolt. The arm supporting the Rod carrying the ball representing the moon is formed by three 3½" Strips. These are bolted to the Circular Plate and they carry a Rod Socket. The arm is counter-balanced by eight 2½" Curved Strips attached to a 2" Strip, which is bolted to the Circular Plate directly opposite to the arm.

A 2" Strip is bolted to the Face Plate 18, and a 3" Strip is placed on the 6½" Rod between Pinion 19 and the Coupling above it. The 3" Strip is connected to the Face Plate 18 by a ½" Reversed Angle Bracket. Pinion 19 drives a 50-tooth Gear 23 on a 1" Rod, which carries also a ¾" Pinion arranged below the Face Plate 18. This Pinion drives a 50-tooth Gear on a Rod 24, mounted in the 2" and the 3" Strips, and a ½" Pinion 25 on the same Rod engages the Gear Ring.

Details of the Current Supply

A length of wire is attached to one terminal of the E20R(S) Electric Motor, and is connected to one of the Girders 7 by a bolt, so that the terminal is "earthed" to the frame of the model.

Four 2½" x ½" Double Angle Strips are bolted to a Flanged Ring, and these are attached to the baseboard as shown. The Flanged Ring must be arranged so that the Rod 3 is located at the exact centre. A 1" x ½" Angle Bracket is fixed on the second terminal of the Motor, and a 4½" Strip 26 bolted to the Angle Bracket presses against the Flanged Ring. The enamel should be removed from the end of the Strip and from the edge of the Flanged Ring to ensure good electrical contact. One wire from the source of current-supply is connected to the Flanged Ring and the other is bolted to the base that supports the rotating arm.

PARTS REQUIRED

1 of No. 2A	2 of No. 18a	1 of No. 94
5 " " 3	2 " " 18b	1 " " 96a
1 " " 4	1 " " 20b	2 " " 108
6 " " 5	1 " " 24	2 " " 109
4 " " 6	3 " " 25	1 " " 111a
1 " " 6a	6 " " 26	12 " " 111c
2 " " 7a	2 " " 27	1 " " 125
2 " " 8	1 " " 27a	1 " " 126a
2 " " 8b	1 " " 27b	4 " " 133
2 " " 9	4 " " 30	1 " " 140
8 " " 9b	2 " " 32	1 " " 146a
2 " " 9d	110 " " 37a	1 " " 163
3 " " 9e	90 " " 37b	1 " " 167b
2 " " 10	34 " " 38	1 " " 168
6 " " 12	1 " " 48	2 " " 171
3 " " 12a	6 " " 48a	1 " " 179
2 " " 12b	10 " " 59	1 " " 180
4 " " 13	5 " " 63	1 " " 211a
2 " " 14	1 " " 63d	1 " " 211b
1 " " 16b	1 " " 72	1 E20R(S) Electric Motor.
3 " " 17	8 " " 90	