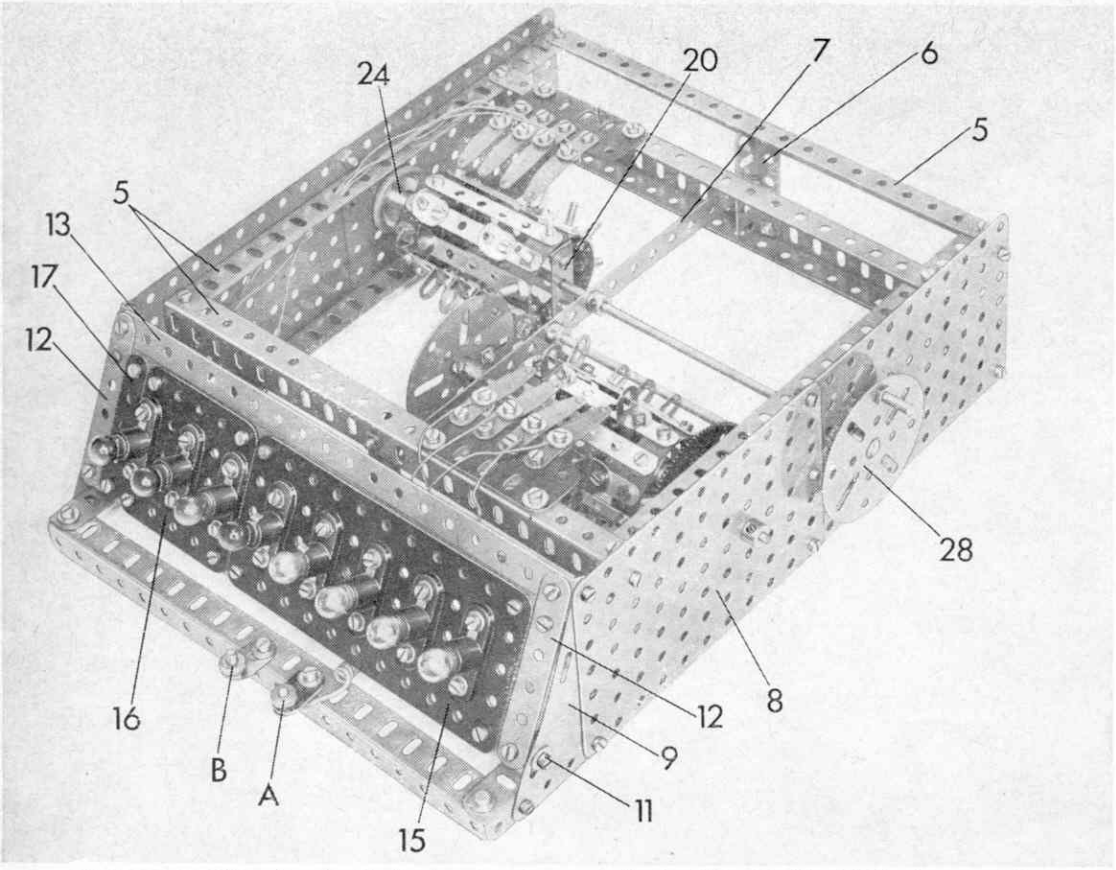
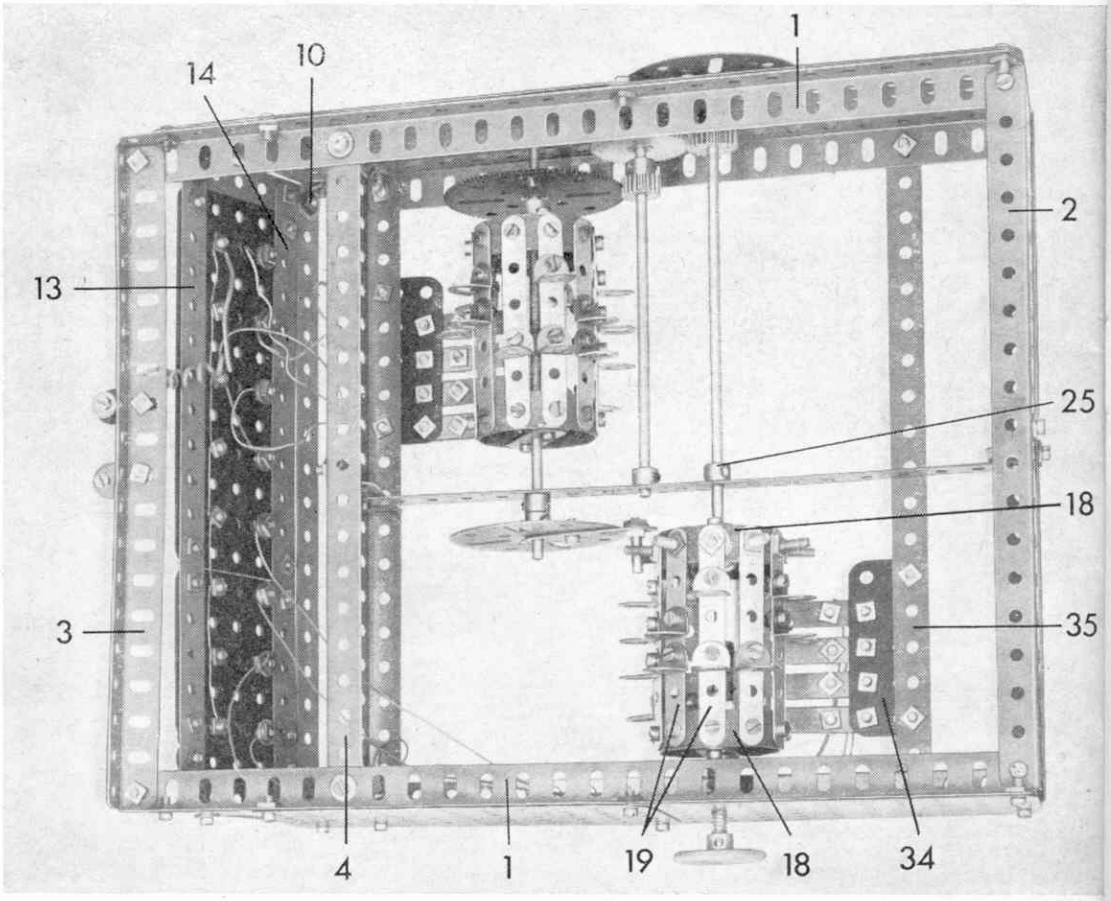


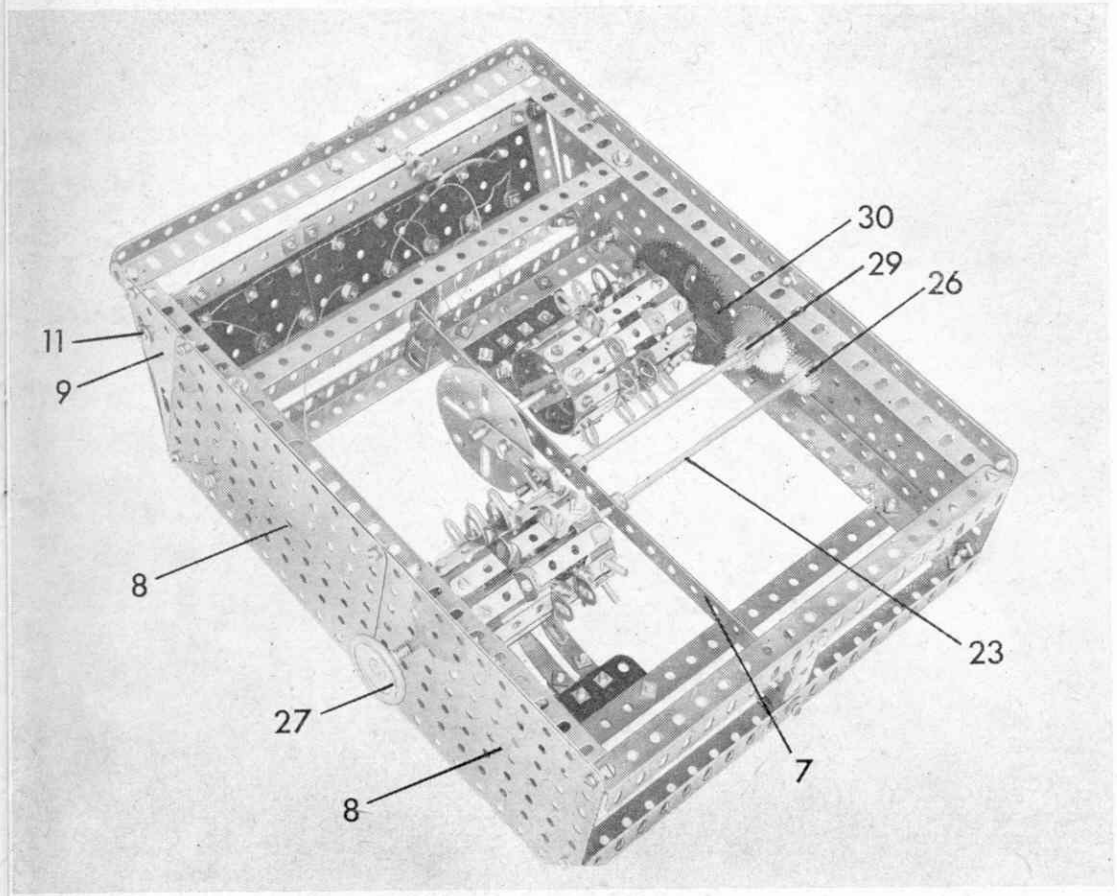
A Meccano-built Binary Counting Machine based on plans supplied by Mr. William Hawkin, of Helsby, Lancs., and his son David

The FIRST MECCANO BINARY COUNTER

We are living in the age of the Computer. Every day these fantastic electronic "Brains" take a greater part in the running of our lives. The Binary Counting system forms an important part of even the most complicated computers, and this month Spanner describes a working Binary Machine built entirely from Meccano parts.

The Binary viewed from beneath, showing the layout of the primary and secondary cylinders





In this view the construction of the main framework is clearly shown

NEVER, to the best of my knowledge, has a Binary Counting Machine ever been built from Meccano parts. If one has, I certainly have never heard about it, and I still would not have done so were it not for Mr. William Hawkin, of Helsby, Lancs., and his son David, who sent me details of an excellent model that they have designed and built. The model described in this article is based on Mr. Hawkin's plans and I must say it works extremely well.

The Binary counting system is used extensively in electronic computers, the counting progressing in single units. In the version illustrated, each revolution of Face Plate 28 adds one unit to the total which is indicated by the eight Lamps fixed to the front of the model. These flash 'on' and 'off' in a pre-arranged sequence and the Lamps illuminated at any one time show the number of times Face Plate 28 has been turned. Ninety-nine different light-combinations are available, therefore, the model will 'count' up to 99.

For descriptive purposes, I have divided the model into easily-identified sections as follows:

Framework

A rectangular construction is built up from two 12½ in. Angle Girders 1, connected by two 9½ in. Angle Girders 2 and 3, with a further 9½ in. Angle Girder 4 being added, as shown. A square construction is then produced using four 9½ in. Angle Girders 5, and this is joined to Girders 2 and 4 by two 2½ in. Angle Girders 6, fixed in the centre holes of the respective 9½ in. Girders. Girders 6 are, in turn, connected by a 9½ in. Strip 7.

Bolted to Girders 1 and 5 at each side are two 5½ in. by 3½ in. Flat Plates 8 and a 3½ in. by 2 in. Triangular Flexible Plate. 9. At the top, Plate 8 is joined to Plate 9, the fixing Bolt also securing an Angle Bracket 10 in place. Another Angle Bracket is fixed in place by Bolt 11, then the two Angle Brackets are connected by a 3 in. Strip 12 at the same time bolting 9½ in. Strips 13 in position between the sides. Another 9½ in. Strip 14 is bolted between Strips 12. Secured to this Strip and to lower Strip 13 are a 5½ in. by 2½ in. Insulating Flat Plate 15, a 2½ in. by 2½ in. Insulating Flat Plate 16 and a 2½ in. Insulating Strip 17.

Revolving Cylinders

Two basically similar cylinders, referred to as primary and secondary, are each built up from two 5½ in. Strips 18, bent to form a circle and connected together by ten 3 in. Narrow Strips 19. Fixed diametrically across one end of the cylinder is a 1½ in. Strip 20, attached to Strip 18 by Angle Brackets 21, while a Double Arm Crank is similarly attached to the other end of the cylinder. Note that in the secondary cylinder, Narrow Strips 19 are secured to Strip 18 at one end by ½ in. Bolts 22, the shanks of which point outwards.

Once the basic cylinder has been built, Angle Brackets are bolted to nine of the ten 3 in. Narrow Strips 19, the tenth Strip being left blank. The quantity and position of the Angle Brackets on the Strips will determine the sequence of the lights, so great care must be taken to see that no two Strips are identical.

For descriptive purposes, we will assume that we are looking at the secondary cylinder with Bolts 22 at the right-hand side. One Angle Bracket is bolted to the first Strip through the first free hole from the right. In the case of the second Strip (above the first), one Angle Bracket is bolted through the second hole. Two Angle Brackets are fixed to the third Strip, one through the first hole and one through the second. The fourth Strip again carries one Angle Bracket, fixed through the third free hole from the right, while the fifth Strip carries two Brackets, one through the first and one through the third hole. The sixth Strip also carries two Brackets, one through the second hole and the other through the third, whereas three Brackets are fixed to the seventh Strip, one through each of the first three holes. The eighth Strip carries one Bracket through the fourth hole and the ninth Strip has two, one in the first hole and one in the fourth. The tenth Strip is blank.

The Primary cylinder is similarly prepared except that the direction is reversed. The same quantities of Angle Brackets are fixed in identical positions on the Narrow Strips only, this time, the second Strip is that below the first Strip, and so on in the reverse direction. This must be done as the same light-sequence is required while the two cylinders rotate in opposite directions.

When both cylinders are finished, they can be mounted in the framework. The secondary cylinder is placed, with the Bolts innermost, on a compound 10½ in. Rod 23 obtained from an 8 in. and a 2½ in. Rod joined by a Coupling. This Coupling is secured to the 2½ in. Rod, but the 8 in. Rod must be free to turn in its other half. A 1 in. fixed Pulley with Rubber Ring 24, a Collar 25 and a ¾ in. Pinion 26 are also mounted on the rod, which is then journalled in Flat Plates 8 and 9½ in. Strip 7, parts 24, 25 and 26 holding it in position. The cylinder is now fixed tightly to the 2½ in. Rod by a Grub Screw in the boss of the Double Arm Crank. A Compression Spring, followed by another 1 in. fixed Pulley with Rubber Ring 27 is secured on one end of Rod 23, outside Flat Plate 8, while a Face Plate 28 in which a Threaded Pin is secured, is mounted on the other end, a Washer being used as a spacer. Pinion 26 is meshed with a 50-teeth Gear Wheel fixed, together with a ½ in. Pinion 29, on a 5½ in. Rod journalled in 9½ in. Strip 7 and Flat Plates 8 at one side.

The primary cylinder is now mounted on a 6½ in. Rod, also journalled in Strip 7 and Plates 8, that in addition carries a 2½ in. Gear Wheel 30. Collars hold the Rod in place, but a sufficient length must remain at the inside end to carry a Face Plate 31. A 2 in. Slotted Strip, in the elongated hole of which a Threaded Pin 32 is fixed, is slipped over the end of the Rod and is bolted to the Face Plate. Gear Wheel 30 meshes with Pinion 29.

With each revolution of Face Plate 31, Threaded Pin 32 engages with one of the ½ in. Bolts 22, thus causing the cylinder to make one-tenth of a revolution. Consequently the secondary cylinder revolves once for every ten revolutions of the primary cylinder. Ten revolutions of Face Plate 28 will, in turn, result in one revolution of the primary cylinder, but it is essential that Threaded Pin 32 does not engage with the Bolt 22, to move the secondary cylinder, until the tenth revolution of Face Plate 28.

Electrical System

Eight Elektrikit Lamp Holders carrying Lamps are bolted to Insulating Flat Plates 15 and 16. Two 2½ in. Insulating Flat Girders 33 and 34 and then fixed, one to front Angle Girder 5 and the other to a 9½ in. Strip 35, bolted between side Angle Girders 5. Four 1½ in. radius Wiper Arms (Elektrikit part No. 532) are secured to each of the Flat Girders, as shown.

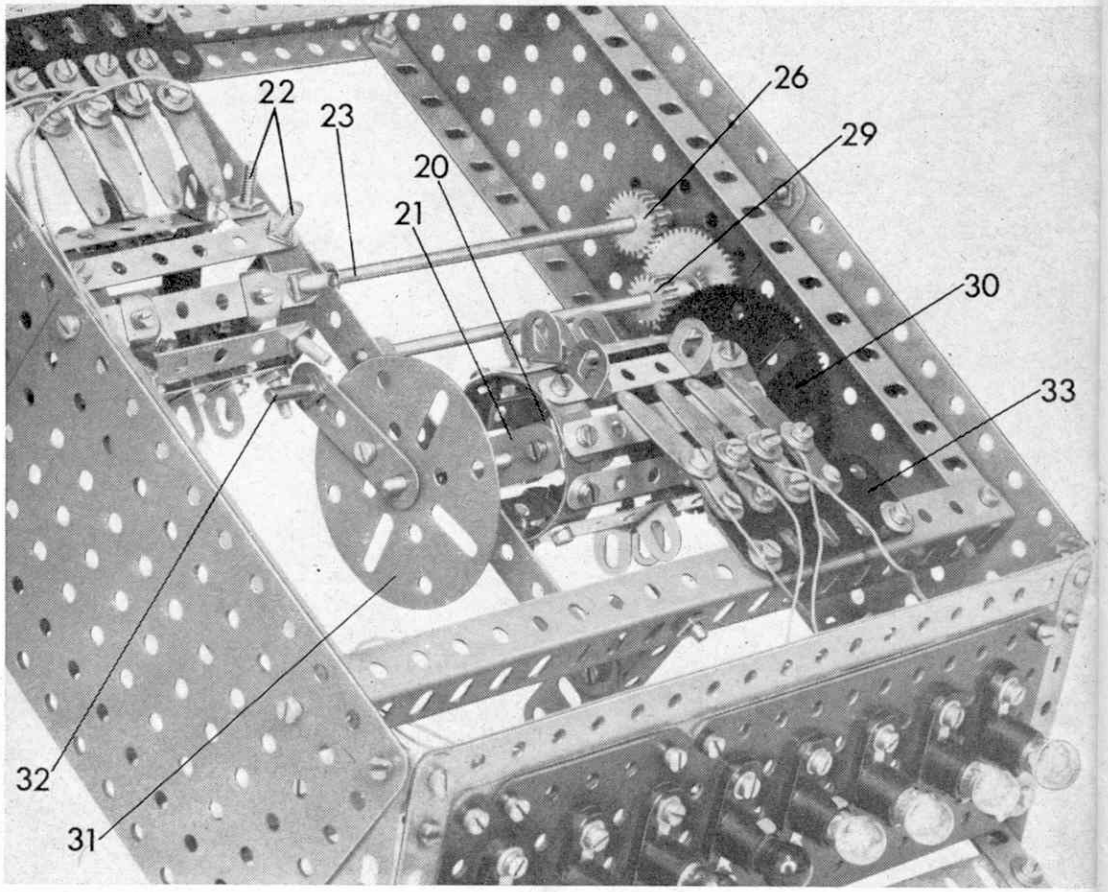
As this model operates on the 'live chassis' principle, great care must be taken with the wiring to see that none of the insulated wires make an electrical contact with any metal part of the framework, as this will cause a short circuit. To begin with, the lower Terminals of all the Lamp Holders are connected together by a length of wire which must not make contact with any metal part of the model. Lengths of insulated wire are then taken in order from the four Wiper Arms attached to Insulating Flat Girder

33 to the top terminals of the first four Lamp Holders to the right of the model, while further lengths of insulated wire are taken from the remaining four Wiper Arms to the upper terminals of the left-hand Lamp Holders.

Two terminals, to receive current from the power source, are built up and are attached to Angle Girder 3. One terminal A is obtained by fixing a $\frac{3}{8}$ in. Bolt in an Insulating Fishplate with a Nut, and by adding a Terminal Nut to hold the power source lead in place. The other terminal B is built up in a similar manner, except that an ordinary, metal Fishplate is used. This Fishplate must make an electrical contact with Girder 3, which can be done by scraping off a little of the enamel on the Girder. Terminal A is connected to the lower terminal of any one of the Lamp Holders, using insulated wire.

The Wiper Arms must be positioned as to lie directly over the vertical lugs of the Angle Brackets fixed to Narrow Strips 19. As the cylinders are turned different Wiper Arms make contact with different Angle Brackets or combinations of Angle Brackets, thus causing the Lamps to light in sequence. Before starting to count, the cylinders must be arranged so that the Wiper Arms are above the blank Narrow Strips, to give zero.

To discover the 'code', Face Plate 28 is turned once and a note made of the Lamp which lights up. The Face Plate is turned again, causing another Lamp to light up which is noted. The operation is repeated until the blank Narrow Strip is again uppermost. You will find that Face Plate 28 has been turned ten times, the first nine revolutions causing the four right-hand Lamps to light in sequence. With the tenth revolution, Threaded Pin 32 will have caused the secondary cylinder to revolve one-tenth of a turn, causing one of the four left-hand Lamps to light up. If you continue to turn Face Plate 28, this Lamp will remain lit, while the four right-hand Lamps again light up in the sequence already noted. After another ten revolutions of Face Plate 28 a second Lamp in the left-hand 'block' will light up, and so on until the secondary cylinder has made one complete revolution, when the machine is again at zero. At this stage Face Plate 28 will have been turned one hundred times. To sum up, the right-hand block of Lamps counts the units while the left-hand block counts the tens.



A close-up view showing the primary cylinder and gearing

Parts required

5 of No. 1a	2 of No. 22	2 of No. 109	8 of No. 539
4 of No. 2	1 of No. 25	10 of No. 111a	8 of No. 540
2 of No. 4	1 of No. 26	18 of No. 111c	(any colour)
2 of No. 6a	1 of No. 27	2 of No. 115	2 of No. 542
2 of No. 8	1 of No. 27c	2 of No. 155	1 of No. 558
7 of No. 8a	178 of No. 37a	2 of No. 225	
2 of No. 9d	142 of No. 37b	20 of No. 235a	
1 of No. 10	33 of No. 38	1 of No. 502	
42 of No. 12	4 of No. 52a	2 of No. 507	
1 of No. 13a	1 of No. 55a	1 of No. 510	
1 of No. 14	4 of No. 59	1 of No. 511	
1 of No. 14a	2 of No. 62b	1 of No. 513	
1 of No. 16a	1 of No. 63	8 of No. 532	

Meccano loom from page 35

the Shuttle may foul the Warp threads when entering the shed.

Provided all the above instructions have been carefully followed, the Loom should now run under power without trouble. If the woven fabric buckles between the Reed and the take-up roller, however, the Weft thread is too thick and should be replaced by thinner thread. If the fabric has little loops at the edges, the Weft thread is too slack and requires the cotton wool in the Shuttle pushing further into the Collar. Great care must be taken, however, because, if the tension is too great, it will prevent the Shuttle from reaching the Threaded Bosses or will cause the Shuttle to spring back into the Warp threads. Should the Rack Strip catch the bottom threads of the shed, the Heald frames need lowering by moving the Collars at the ends of $4\frac{1}{2}$ in. Strips 60.

PARTS REQUIRED

6 of No. 1a	2 of No. 2	1 of No. 3
2 of No. 1b	13 of No. 2a	23 of No. 4
6 of No. 5	1 of No. 26c	24 of No. 69a
3 of No. 6a	5 of No. 27a	1 of No. 70
4 of No. 7a	1 of No. 27b	2 of No. 73
4 of No. 8	1 of No. 27c	2 of No. 77
10 of No. 8a	1 of No. 27d	2 of No. 80a
2 of No. 8b	4 of No. 30	2 of No. 81
9 of No. 9	1 of No. 32	6′ 6″ of No. 94
2 of No. 9a	2 of No. 35	6 of No. 95
2 of No. 9d	236 of No. 37a	4 of No. 96
8 of No. 12	196 of No. 37b	52 of No. 101
2 of No. 12a	134 of No. 38	4 of No. 103
2 of No. 13	4 of No. 43	16 of No. 103d
10 of No. 13a	1 of No. 46	4 of No. 103f
8 of No. 14	4 of No. 48	2 of No. 106
1 of No. 16	2 of No. 48d	4 of No. 109
3 of No. 16a	6 of No. 52a	1 of No. 110
4 of No. 16b	2 of No. 55a	10 of No. 111
10 of No. 17	5 of No. 57c	6 of No. 111c
1 of No. 18a	52 of No. 59	6 of No. 115
2 of No. 20a	6 of No. 62	2 of No. 120b
2 of No. 23	2 of No. 62b	8 of No. 133
2 of No. 23a	12 of No. 63	1 of No. 136a
2 of No. 24	1 of No. 63d	2 of No. 146a
3 of No. 26	2 of No. 64	5 of No. 173a
3 of No. 26a	24 of No. 69	1 of No. 186a
		1 E15R Electric Motor

Made in Hong Kong from page 37

other American cars of today an automatic transmission system is fitted as standard, while optional extras include power steering, compass and translucent floor mats!

In the case of the Buick Riviera, only one version is available, this being described by the manufacturers as a 'two-door hard-top coupé'. The power plant comes in the form of a 6,965 c.c. capacity V-8 engine, developing 360 b.h.p. It gives the car a maximum speed of something like 120 m.p.h. and allows it to cruise over long distances at little under the 100 m.p.h. mark. Again, automatic transmission is fitted as standard.

Before finishing, I should just like to say that I expect a few collectors to dislike the new models, simply because they are made in Hong Kong. I, personally, think that they are perfectly good Dinky Toys, especially for the price, and I am sure you will agree with me that they should be judged on their merits —not on their country of manufacture.