

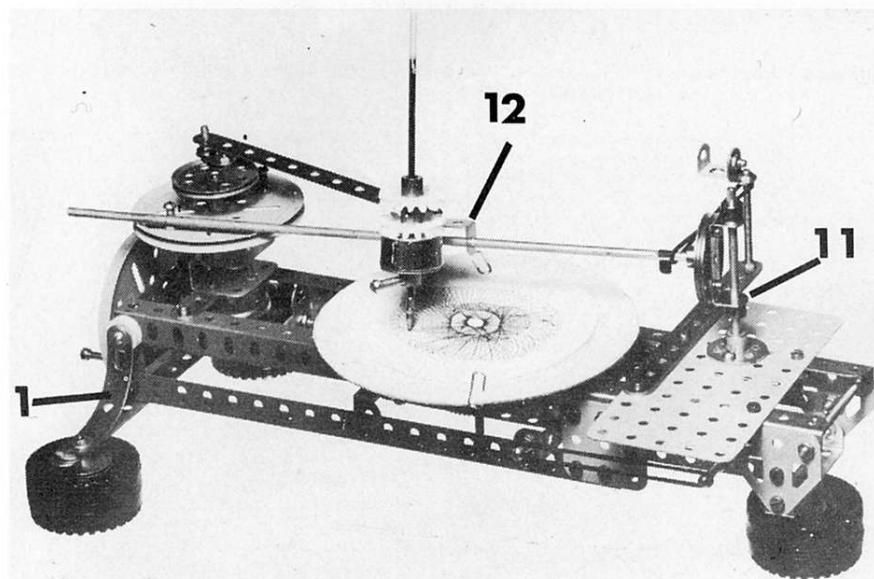
THE underside of the tipping body.



PARTS REQUIRED:

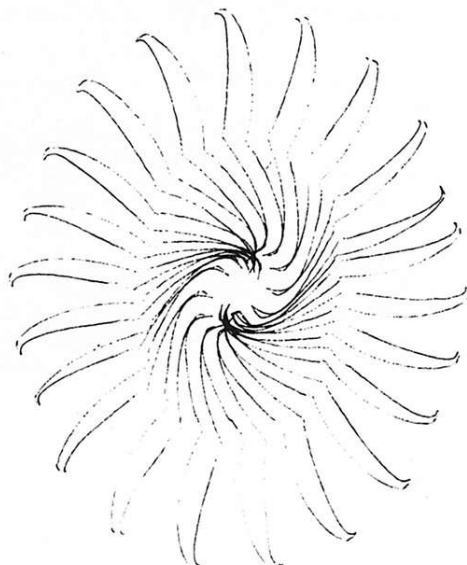
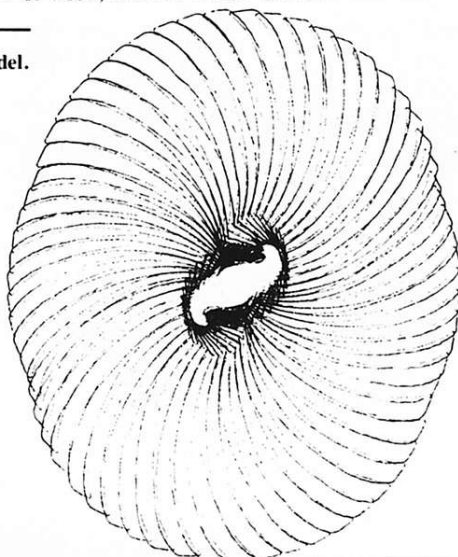
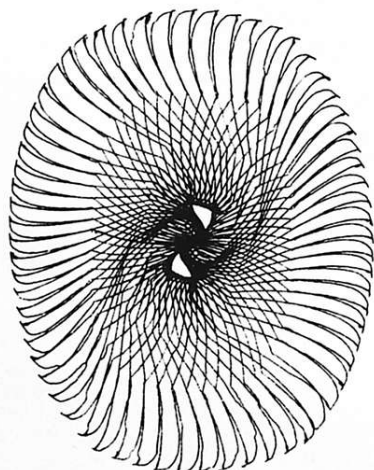
2 of No. 1B	1 of No. 53
4 of No. 2	4 of No. 59
4 of No. 5	1 of No. 70
2 of No. 6	2 of No. 74
4 of No. 8A	1 of No. 80C
1 of No. 9	4 of No. 90A
2 of No. 9F	2 of No. 103F
4 of No. 10	1 of No. 111
1 of No. 11	8 of No. 111A
6 of No. 12	2 of No. 111D
2 of No. 12B	2 of No. 126A
2 of No. 16A	1 of No. 133A
1 of No. 16B	1 of No. 160
1 of No. 18A	1 of No. 186A
1 of No. 19B	2 of No. 189
2 of No. 21	2 of No. 190A
1 of No. 24B	3 of No. 194
1 of No. 26	2 of No. 194A
1 of No. 27A	2 of No. 215
1 of No. 28	4 of No. 235
1 of No. 32	2 of No. 235A
110 of No. 37B	2 of No. 235B
125 of No. 37C	2 of No. 235D
36 of No. 38	4 of No. 611
2 of No. 45	1 of No. 618
1 of No. 48	1 of No. 11053
4 of No. 48A	1 of No. 136 24
2 of No. 48B	2 of No. 187C
1 of No. 51	1 motor and accessories

MECCANOGRAPH



A GENERAL view of Dr. Cameron's Meccanograph, built from the current series No. 4 outfit, plus a 5" diameter design table made of thick card or wood, and two rubber bands.

SOME of the fine designs produced on this model.

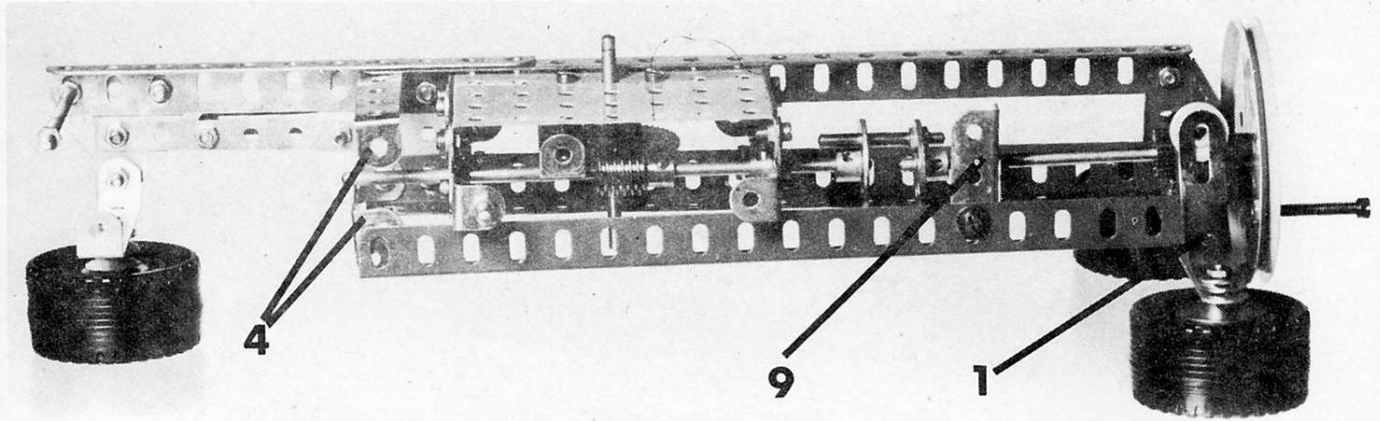


THIS machine produces a wide range of designs mostly resembling flowers. It requires a designing table which is easily made from 1/4" plywood, although thick card was substituted for photographic expediency in the illustrations. Two rubber bands and ball-point pen refills are also necessary.

THE FRAME

This is composed of four 9 1/2" Angle Girders bolted at one end to a 2 1/2" x 1 1/2" Flanged Plate. All four Girders are secured to the flanges by their elongated holes, using a Washer in between for spacing purposes. The upper two Girders are held by 1/2" Bolts that first pass through a Washer, then the end slot of a 3" Formed Slotted Strip 1, and a 1/2" Pulley, remembering the Washer for spacing purposes between the 9 1/2" Angle Girder and the 2 1/2" x 1 1/2" Flanged Plate.

A 7 1/2" Perforated Strip 2, is then fixed to the end round holes of the lower two 9 1/2" Angle Girders, extending five holes either side. Two 'feet' for the Meccanograph are formed, each in the following manner. A 1 1/8" Bolt is passed up in succession through a Road Wheel Centre, a hard Plastic Tyre, a 1" Pulley, the next to the



PARTIALLY dismantled view showing arrangement of table drive.

end hole of the $7\frac{1}{2}$ " Strip, the end slotted hole of the 3" Formed Slotted Strip, a Washer, and finally a Nut.

Note that the 1" Bush Wheel in each case is not employed here, it's use being reserved for a later constructional stage. The upper pair of $9\frac{1}{2}$ " Angle Girders are extended by a pair of $5\frac{1}{2}$ " Angle Girders 3, overlapping by four holes. The joins are secured by a $1\frac{1}{2}$ " x $1\frac{1}{2}$ " Flat Plate on each side, this Plate also holds the lower $9\frac{1}{2}$ " Angle Girder on each side, overlapping by two holes. Upper and lower Bolts on one Plate only, also hold two $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips 4, arranged as shown. Do not finalise the framework assembly at this point because the table assembly has yet to be constructed, and then inserted between the $9\frac{1}{2}$ " Angle Girders.

THE TABLE ASSEMBLY

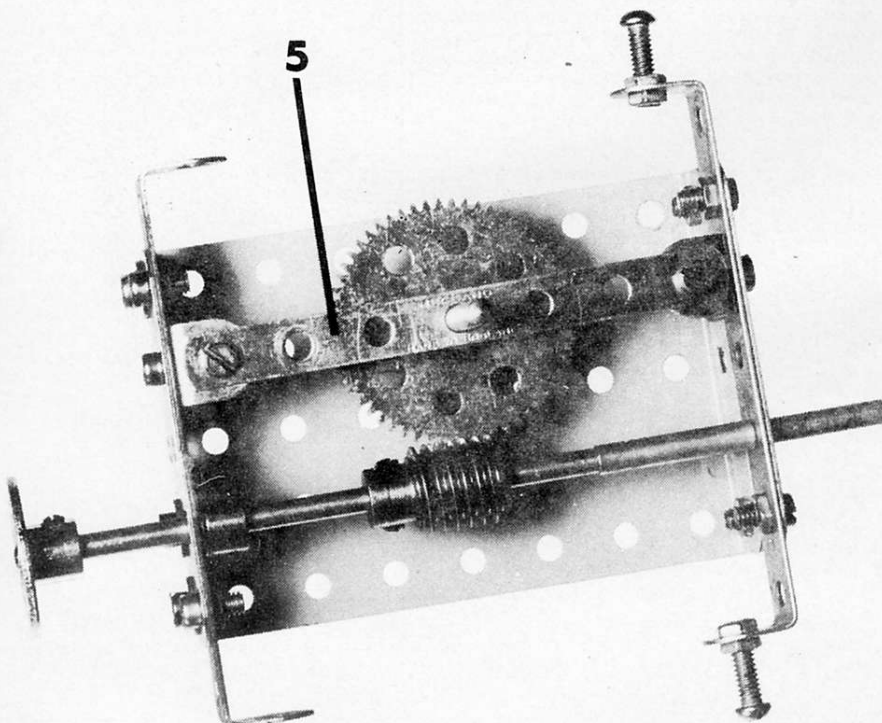
Two $2\frac{1}{2}$ " Flat Girders are secured via their slotted holes to either flange of a $3\frac{1}{2}$ " x $2\frac{1}{2}$ " Flanged Plate. $3\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips are then secured to the round holes of the Flat Girders, and two 1" x $\frac{1}{2}$ " Angle Brackets hold a $3\frac{1}{2}$ " Narrow Strip 5. A Double Bent Strip is bolted to the inside of the assembly, it's centre

hole vertically in line with the centre hole of the $3\frac{1}{2}$ " Narrow Strip, through these holes is passed a $2\frac{1}{2}$ " Axle Rod, carrying a 57t Gear and a Washer. To assist easy sliding of this unit later on, the $3\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips are arranged so that they butt against the flanges of the $3\frac{1}{2}$ " x $\frac{1}{2}$ " Flanged Plate, adjusting the $2\frac{1}{2}$ " Flat Girders accordingly. After this adjustment, the top edges of the $2\frac{1}{2}$ " Flat Girders should project slightly above the top surface of the Flanged Plate.

A 4" Axle Rod carrying (from left to right in the illustration), a 1" Bush Wheel, a Washer, a Collar and a Worm Gear, is extended by a $1\frac{1}{2}$ " Axle Rod held in a Rod Connector, and journalled through the $2\frac{1}{2}$ " Flat Girders and $3\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips as shown. The Worm Gear engages with the 57t Gear. The entire table assembly is now placed inside the frame already constructed, the $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips 4, now being bolted to the opposite Angle Girders to 'box-in' the table assembly.

The Bolts securing the Girders must be adjusted to allow easy sliding of the table assembly, adding extra Washers if necessary. However, best results will come if the movement of the assembly is not too loose.

UNDERSIDE view of table assembly. This is constructed as a separate unit and inserted into the main framework of the Meccanograph.



THE FRAME COMPLETED

The remainder of the frame consists of a pair of Flat Trunnions, a 3" Screwed Rod and another 'foot', made in a similar manner to the others except for the use of two $\frac{1}{2}$ " Pulleys and a $\frac{3}{4}$ " Washer instead of a 1" Pulley. 3" Narrow Strips are added between the Flat Trunnions and the $1\frac{1}{2}$ " x $1\frac{1}{2}$ " Flat Plates. A $5\frac{1}{2}$ " x $2\frac{1}{2}$ " Flat Plate 6 is fixed to the upper $9\frac{1}{2}$ " Angle Girders as shown, with a stacked pair of $5\frac{1}{2}$ " Perforated Strips extending it's right-hand edge by three holes. A 2" Screwed Rod is lock-nutted to the end hole of this doubled Strip, this is turn supports a pen holder consisting of an Angle Bracket and a Double Bracket.

MECHANISM

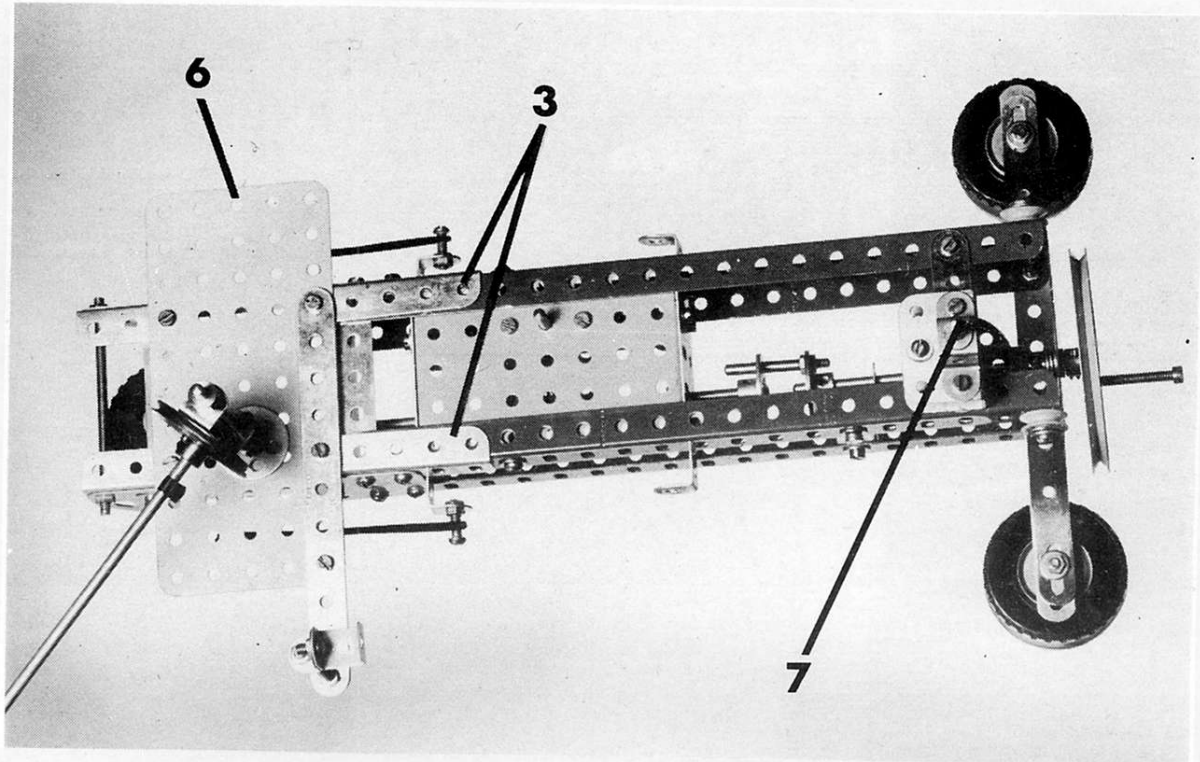
A $2\frac{1}{2}$ " Axle Rod 7 is journalled through a Channel Bearing, with a Double Bent Strip fixed to it's top surface, fixed to the two upper $9\frac{1}{2}$ " Angle Girders by two stacked $2\frac{1}{2}$ " Perforated Strips. A $\frac{3}{4}$ " Bolt is lock-nutted to the outer centre holes of the Channel Bearing, to increase rigidity. The $2\frac{1}{2}$ " Rod 7 carries two Washers and a Contrate Gear below the $2\frac{1}{2}$ " Strips, a Washer, a 3" Pulley, (boss upward), and a $1\frac{1}{2}$ " Pulley, (boss down) above the Double Bent Strip. A 1" Corner Bracket 8 is bolted to a $1\frac{1}{2}$ " Angle Girder 9, fixed to the slotted holes in two of the $9\frac{1}{2}$ " Angle Girders.

The free hole of the 1" Corner Bracket, and the end $2\frac{1}{2}$ " x $1\frac{1}{2}$ " Flanged Plate, support a 4" Axle Rod which carries a 1" Bush Wheel at it's inside end, a $\frac{1}{2}$ " Pinion just inside the Flanged-Plate, spaced by three Washers, a 3" Pulley on the outside, separated by one Washer and holding a $1\frac{1}{8}$ " lock-nutted Bolt serving as a handle.

The $\frac{1}{2}$ " Pinion meshes with the Contrate Wheel, and a Long Threaded Pin is lock-nutted to the face of the 1" Bush Wheel. The shank of this Threaded Pin should slide freely through a hole in the table assembly 1" Bush Wheel, enabling the assembly to move to & fro whilst still being driven. The table itself can now be fitted, for photographic purposes this was represented by a circle of thick card, but $\frac{1}{4}$ " plywood is far better if the model is to be in use for some time.

Whatever material you choose, the table is secured to a Bush Wheel, fixed to the $2\frac{1}{2}$ " table assembly vertical Axle Rod. A $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip, (lugs up), is fixed between the upper $9\frac{1}{2}$ " Angle Girders at point 9a. Two Bolts 10 are fitted in diametrically opposite holes of the 57t Gear, and these engage the edge of this $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip, providing a to & fro movement of the table.

A pair of rubber bands are looped around $\frac{3}{4}$ " Bolts lock-nutted to the 3" Narrow Strips, and around $\frac{1}{2}$ " Bolts lock-nutted to the lugs of one of the table assembly $3\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips. Make certain that the assembly slides freely against the Bolts in the 57t Gear under the tension of the rubber bands.



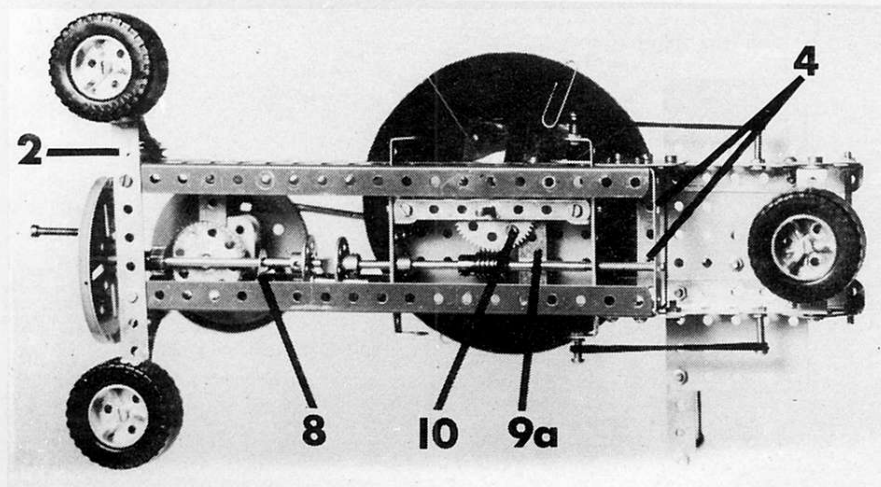
VIEW from above with designing table removed and pen arm swung away.

PEN CARRYING ARM

This is an 1 1/2" Axle Rod held in the boss of a 1 1/2" Pulley, bolted to a 1 1/2" x 1/2" Double Angle Strip 11, swivelling between Collars on a 3" Axle Rod. This Rod is secured to the 5 1/2" x 2 1/2" Flat Plate 6 via a 1" Bush Wheel. The 1 1 1/2" Rod must line up with the upper surface of the 3" Pulley cam-wheel but must not drag on it.

It carries a sliding pen-holder consisting of a 1 1/2" x 1/2" Double Angle Strip 12 to which a 1" Bush Wheel is fixed by a 1/2" Reversed Angle Bracket, the Bracket being held by an upwards projecting 1/2" Bolt. A 3/4" Bolt held in the tapped transverse bore of the 1" Bush Wheel is used for convenient securing of a ball-point pen refill. 1/2" Bolts are arranged as required on the 3" Pulley cam-wheel, and the 1 1 1/2" Rod maintains contact with these by the tension of a 6" Driving Band looped around the Rod and the 2" Screwed Rod serving as support for the pen holder.

UNDERSIDE view of completed model. Meccano parts of varying colours have been used to assist in parts differentiation.



The 1 1/2" Pulley at the top of Rod 7 is made into an eccentric of considerably variable range by bolting a Fishplate to a hole in it's face, using two nuts. The angle of the Fishplate can be varied by loosening the top nut, adjusting the Fishplate, then re-tightening. The outer slotted hole of the Fishplate holds a 1/2" Bolt. A 5 1/2" Perforated Strip connects this 1/2" Bolt shank, and the upwards projecting 1/2" Bolt on the pen-holder, by it's end holes.

OPERATION

Light oil should be applied sparingly to all moving parts including the sliding table drive and particularly the Bolts of the cam-wheel 3" Pulley. Light card, (unlined filing card stock is suitable), is cut into circles and held on the table by suitable clips etc. A weight must be used to increase the pressure of the pen on the card, for this the remaining Road Wheel Centre will be found suitable if augmented by two Multipurpose Gearwheels.

Many options for varying the designs are available, such as altering the position of the 1" Bush Wheel bolted to the Flat Plate 6, varying the number and layout of the 1/2" Bolts secured to the cam-wheel 3" Pulley etc. Greater versatility can be obtained by lengthening the 5 1/2" Perforated Strip connecting arm by bolting a 2" Perforated Strip to one end, the centre hole of this giving additional 1/2" spacing possibilities. Further experiments are possible with 7 1/2", plus 7 1/2" plus 2" Perforated Strip combinations.

PARTS REQUIRED:

2 of No. 1B	4 of No. 48A
3 of No. 2	2 of No. 48B
2 of No. 5	1 of No. 51
2 of No. 6	1 of No. 53
4 of No. 8A	3 of No. 59
2 of No. 9	1 of No. 70
1 of No. 9F	2 of No. 74
1 of No. 10	1 of No. 80C
1 of No. 11	1 of No. 81
1 of No. 12	2 of No. 103F
2 of No. 12B	3 of No. 111
1 of No. 13	7 of No. 111A
2 of No. 15B	4 of No. 11D
2 of No. 16A	1 of No. 115A
1 of No. 16B	1 of No. 125
1 of No. 18A	2 of No. 126A
2 of No. 19B	1 of No. 133A
2 of No. 21	1 of No. 160
2 of No. 22	1 of No. 186A
4 of No. 23	1 of No. 213
1 of No. 24B	2 of No. 215
1 of No. 26	2 of No. 235A
1 of No. 27A	1 of No. 235B
2 of No. 27F	3 of No. 187C
1 of No. 28	(all parts)
1 of No. 32	1 of No. 187E
1 of No. 35	
64 of No. 37B	
94 of No. 37C	
40 of No. 38	Circle of 1/4" plywood
1 of No. 38D	Four small woodscrews
2 of No. 45	Two rubber bands
2 of No. 48	Card stock