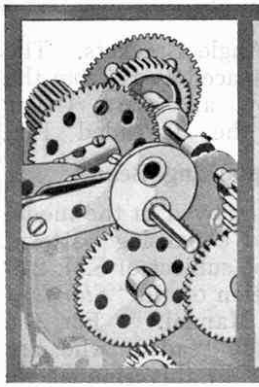
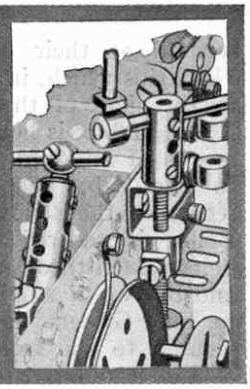


# HOW TO USE Meccano Parts

## VIII.—GEARS, etc. (CLASS O)



*For the purpose o this series of articles we have grouped all the Meccano parts into two main sections, termed the Structural and Mechanical Sections, and these sections have been further divided into a number of separate classes. The complete grouping is as follows. Structural Section: Class A, Strips; Class B, Girders; Class C, Brackets, Trunnions, etc.; Class D, Plates, Boilers, etc.; Class E, Nuts and Bolts, Tools and Literature. Mechanical Section: Class M, Rods, Cranks and Couplings; Class N, Wheels, Pulleys, Bearings, etc.; Class O, Gears and Toothed Parts; Class P, Special Accessories; Class Q, Miscellaneous Mechanical Parts; Class T, Electrical Parts; Class X, Motors, Accumulators, etc.*

THE Meccano parts included in Class O—namely, Gears, Pinions, Sprocket Wheels, Dog Clutches, and other toothed parts—are so important and their adaptations are so varied and numerous that it is impossible to deal with them all, however briefly, in the space available this month. Therefore we refer below to the Gear Wheels, Pinions, Contrates, Bevels, Worms, and Sprocket Gears only, and the remaining toothed parts included in this class will be dealt with next month.

The Meccano range of gear wheels is very comprehensive and enables almost any speed ratio to be obtained. The gears are manufactured from solid brass, with the exception of the 3½″ Gear Wheel and the Sprocket Wheels, which are of specially fine steel. The teeth are cut one at a time, not stamped out, and the precision of the finished parts is such that they are regularly used in the construction of all kinds of scientific apparatus.

The Pinions and Gear Wheels enable ordinary gear trains to be assembled, whilst the Bevel Gears and Contrate Wheels are for transmitting the drive through right angles. The Sprocket Wheels are of course designed for use in connection with chain drive transmission.

The published diameters of the various Meccano Pinions and Gear Wheels do not represent the overall measurements of the Gears, for they are measured from the "pitch line." This is an imaginary line that runs through approximately the centre of the teeth; it indicates the points on the teeth where the actual thrust is imparted from one gear to the other.

### Parts in Class O: Gears and Toothed Parts

| Part No. | | Prices s. | d. |
|---|---|---|---|
| 25 | Pinion Wheels, ¾″ diam., ½″ wide ... each | 0 | 6 |
| 25a | " " ¾″ " ½″ " ... " | 0 | 8 |
| 25b | " " ¾″ " ¾″ " ... " | 0 | 10 |
| 26 | " " ½″ " ½″ " ... " | 0 | 4 |
| 26a | " " ½″ " ½″ " ... " | 0 | 6 |
| 26b | " " ½″ " ¾″ " ... " | 0 | 8 |
| 27b | Gear Wheels 133-teeth (3½″ diam.) ... " | 1 | 3 |
| 27a | " " 57 " (1½″ " ) ... " | 0 | 6 |
| 27 | " " 50 " (1 5/16″ diam.) " | 0 | 6 |
| 31 | " " 38 " (1″ diam.) ... " | 1 | 0 |
| 28 | Contrate Wheels, 1½″ 50-teeth ... ... " | 0 | 9 |
| 29 | " " ¾″ 25 " ... ... " | 0 | 6 |
| 30 | Bevel Gears, ⅞″ 26-teeth ... ... ... " | 0 | 9 |
| 30a | " " ½″ 16 " ... ... ... " | 0 | 6 |
| 30c | " " 1½″ 48 " ... ... ... " | 1 | 6 |
| 32 | Worm, 12 threads per inch ... ... ... " | 0 | 5 |
| 95b | Sprocket Wheels, 3″ 56-teeth ... ... " | 0 | 6 |
| 95 | " " 2″ 36 " ... ... " | 0 | 5 |
| 95a | " " 1½″ 28 " ... ... " | 0 | 4 |
| 96 | " " 1″ 18 " ... ... " | 0 | 3 |
| 96a | " " ¾″ 14 " ... ... " | 0 | 3 |
| 110 | Rack Strips 3½″ ... ... ... ... ... " | 0 | 2 |
| 110a | " " 6½″ ... ... ... ... ... " | 0 | 3 |
| 129 | Rack Segments, 3″ diam. ... ... ... " | 0 | 5 |
| 144 | Dog Clutches ... ... ... ... ... " | 0 | 6 |
| 147 | Pawls, with Pivot Bolts and Nuts ... " | 0 | 3 |
| 147a | Pawls ... ... ... ... ... ... " | 0 | 2 |
| 148 | Ratchet Wheels ... ... ... ... ... " | 0 | 6 |
| 167a | Roller Races, geared, 192 teeth | | |
| 167c | Pinions for Roller Bearings, 16-teeth } see class N. | | |
| 168b | Ball Races, geared, for Sprocket drive | | |

In Fig. 2 a ¾″ Pinion is engaged with a 50-teeth Gear Wheel. Let us assume that the Rod upon which the Pinion is fixed is rotated at a speed of 60 revolutions per minute. The ¾″ Pinion has 25 teeth, and for every complete revolution that it makes it will cause the 50-teeth Gear Wheel to turn a distance occupied by 25 of its teeth, which is exactly one half of its circumference. Thus the 50-teeth Gear will turn only 30 revolutions per minute. The difference in speed obtained in this combination of Pinion and Gear is therefore as 2 to 1, and is written "ratio 2 : 1."

A ½″ Pinion having 19 teeth is shown in Fig. 3 in mesh with a 57-teeth Gear Wheel. As the latter has three times as many teeth as the Pinion (and its pitch line diameter is three times as great), three revolutions of the Pinion are required for every complete revolution of the Gear Wheel. The ratio of this combination is therefore 3 : 1.

There are of course numerous other gear ratios obtainable, and the more usual ones are shown below, together with the alternative methods by which they may be produced. Meccano boys may find the list useful for reference purposes :—

Ratio 1 : 1 — two ½″ Pinions (axles ½″ between centres); two 1″ Gear Wheels (axles 1″ between centres); two 57-teeth Gear Wheels (axles 1½″ between centres); two ⅞″ Bevel Gears (see Fig. 4); ¾″ Pinion and ¾″ Contrate Wheel. Ratio 1.24 : 1 — ½″ Pinion and ¾″ Contrate Wheel (Fig. 1).

Ratio 2 : 1 — ¾″ Pinion and 50-teeth Gear Wheel (axles 1″ between centres); ¾″ Pinion and 1½″ Contrate Wheel. 3 : 1 — ½″ Pinion and 57-teeth Gear Wheel (axles 1″ between centres); ½″ Bevel and 1½″ Bevel.

7 : 1 — ½″ Pinion and 3½″ Gear Wheel (axles 2″ between centres). 19 : 1 — ½″ Pinion and Worm. 57 : 1 — 57-teeth Gear and Worm (see Fig. 7).

A variety of gear ratios may of course be obtained by connecting two Sprocket Wheels of varying diameter with a length of Sprocket Chain.

It will be observed from the accompanying price list that the ½″ and ¾″ diam. Pinions are each made in three widths, ¼″, ½″ and ¾″. The ¼″ width Pinion is for ordinary gearing, whilst the wider Pinions are specially designed for use in cases where the shaft on which a Pinion is secured is required to move longitudinally without disengaging the Pinion from its Gear Wheel. This movement is frequently required in Meccano gear boxes.

Fig. 10 shows how three different speeds may easily be obtained from a driving shaft with the aid of one intermediate shaft and a ½″ diam. ½″ width Pinion. Rod 1 is the driving shaft and carries the special Pinion. Rod 2 is the intermediate shaft, and Rod 3 is the driven shaft. Rod 2 may be moved longitudinally in its bearings by means of the sliding hand lever 4, which is connected to Rod 2 by means of the Couplings 5 and 6, the latter being free on the Rod 2. The movement of Rod 2 is so adjusted by Collars 7 that the 57-teeth Gear Wheel 8 remains always in mesh with the ½″ width Pinion 9. On sliding the lever 4, the

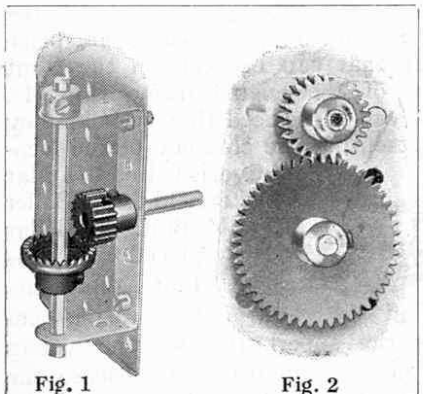


Fig. 1 Fig. 2

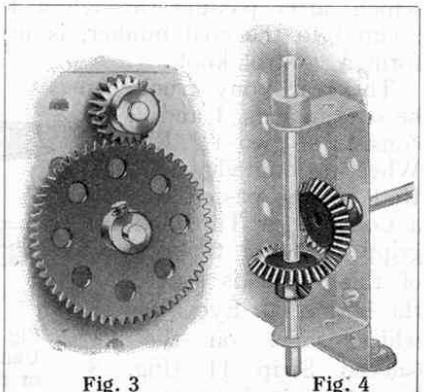


Fig. 3 Fig. 4