MECCANO

GEARS OUTFIT "A"

INSTRUCTIONS

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MECCANO GEARS OUTFIT "A"

This Gears Outfit, used in conjunction with your standard Meccano Outfit, will enable you to build a wide range of interesting mechanisms, and to drive your models through gears just as real engineers do. The gears in the Outfit have been selected as having the widest possible uses. You will find it quite simple to assemble the various mechanisms, steering and reversing gears, etc., that are described and illustrated and to fit them into your Meccano models.

WHAT ARE GEARS AND WHY ARE THEY NECESSARY?

Gearing may be defined simply as the mechanical arrangements used to transmit power from its source to the point where it is applied. For the Meccano model-builder this means the mechanism used to connect his Clockwork or Electric Motor in such a way as to drive the moving part or parts at a suitable speed.

If we wish to transmit a drive from one shaft to another shaft that is parallel to it, we use "Spur" gears. Parts Nos. 25, 26, 27, 27a and 27b are spur gears.

If the shafts to be driven are not parallel but at right angles to each other, we may use "Bevel" gears or "Contrate" gears. Parts Nos. 28 and 29 are contrate gears. These are generally used with Pinions.

Another form of gear used to connect shafts at an angle to each other is the "Worm." Part No. 32 is a worm gear and is used for this purpose in Fig. A.

So far we have considered one shaft driving another without reference to their relative speeds. We come now to another and extremely important function of gearing, namely, to drive a shaft or shafts at a different rate of speed from that of the driving shaft.

Suppose we place a 19-tooth ½" diameter Pinion on one shaft and mesh it to drive a 57-tooth Gear on another as shown in Fig. C. The shaft 2 carrying the 57-tooth Gear will revolve at one-third the speed of the shaft 1 carrying the ½" Pinion. This process is known as "stepping down" the shaft speed.

The great value of a speed reduction of this kind is that a drive of greater power is obtained, the increase in power being directly proportional to the relative number of teeth in the two gears.

In the case mentioned the increase is one to three. The drive from shaft 2 therefore has three times the effective power that can be obtained from the shaft 1 carrying the ½" Pinion.

If instead of a speed reduction we require a speed increase, we carry out a similar process in the opposite direction. For instance, if we place our 57-tooth Gear on

one shaft and mesh it to drive a 19-tooth $\frac{1}{2}$" diameter Pinion on another, the shaft carrying the Pinion will revolve at three times the speed of the shaft carrying the 57-tooth Gear, but the effective power will be reduced to one-third. We have thus "stepped up" our shaft speed, but with a loss of power. This "stepping up" process is seldom used in Meccano model-building, in which the object of gearing is almost always to obtain increased power by "stepping down."
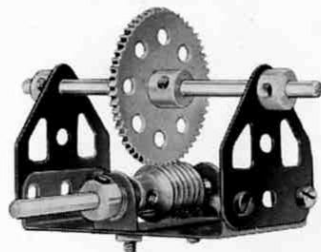
In order to make the best use of the gears in this Outfit it is advisable to know the various ratios that result from using them in any given combination. Fortunately it is easy to find these ratios, and for any two spur, bevel or contrate gears, it is always found in the same way.

Fig. A

The ratio or relative speeds of any two shafts carrying meshing spur, bevel or contrate gears is found by dividing the number of teeth in the smaller gear into the number of teeth in the larger gear. Fig. B shows a simple reduction gear using a $\frac{3}{4}$" Pinion, which has 25 teeth, and a 50-tooth Gear. The ratio resulting from this arrangement is therefore 2 : 1. If the arrangement is reversed, so that the 50-tooth Gear drives the Pinion, the ratio also is reversed, and is therefore 1 : 2.

Worms can be designed to be either reversible or non-reversible. A reversible worm can be used either as the driving or the driven gear, but a non-reversible worm can be used only as the driving member. **The Meccano Worm is of the non-reversing type, and therefore must always be used as the driver when meshed with other gears.**

Whenever a Meccano Worm is meshed with a Pinion, 50-tooth Gear, Contrate or other gear, the resulting ratio is always determined by the number of teeth in the meshing gear, the Worm being rated as 1. For example, a Worm meshed with a $\frac{1}{2}$" Pinion, which has 19 teeth, gives a ratio of 19 : 1. This means that the Worm has to rotate 19 times to drive the Pinion through one complete revolution. A Worm meshed with a 1" Gear, which has 38 teeth, gives a ratio of 38 : 1, and so on.

HOW TO USE GEARING.

The best type of gearing for use in a particular model will depend on the kind of model and the power required to drive it, bearing in mind the type of motor to be used. To operate a slow-moving model demanding great power, such as a traction engine, from a fast running Clockwork or Electric Motor, gearing that will provide a large reduction rate must be used, and a Worm meshed with a 57-tooth Gear in one stage of the gearing is nearly always necessary.

Sometimes the amount of reduction required may be greater than it is possible to get in a single stage using

only two gears. This difficulty is overcome by the use of four or six gears suitably meshed together in pairs to form one, two or three stages of reduction. Such an arrangement is known as a compound gear train.
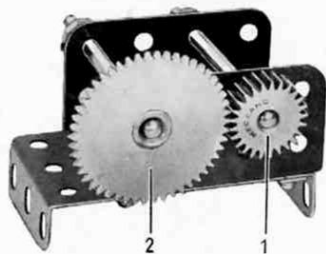

Fig. B

A good example of a two-stage compound reduction gear of this kind is shown in Fig. 2. It will be seen that this makes use of four gears, a Worm, a 57-tooth Gear, a $\frac{3}{4}$" Pinion and a 50-tooth Gear. The Worm is fixed on the shaft of the Motor and meshed with the 57-tooth Gear 1 on a shaft 4 suitably mounted. This forms the first stage of the reduction, and the ratio it provides is 57 : 1. The second stage is formed by a $\frac{3}{4}$" Pinion 2 also fixed on shaft 4, meshed with a 50-tooth Gear on shaft 3. As the $\frac{3}{4}$" Pinion has 25 teeth, the ratio provided by the second stage is 2 : 1. The total resulting ratio of the train is found by multiplying together the ratio given by each stage, that is 57 : 1 multiplied by 2 : 1, giving a total ratio of 114 : 1.

Now let us see exactly what happens when the combined gears are set in motion. Let us assume that the speed of the motor shaft carrying the Worm is 570 revolutions per minute. Shaft 4, carrying the 57-tooth Gear, will rotate at a speed of 570 divided by 57, that is at 10 revolutions per minute. The Pinion on shaft 4 therefore rotates at 10 revolutions per minute and as the ratio between this Pinion and the 50-tooth Gear on shaft 3 is 2 : 1, the 50-tooth Gear revolves at 10 divided by 2 revolutions, that is 5 revolutions per minute.

The speed of the Motor drive has therefore been reduced from 570 to 5 revolutions per minute, a total reduction ratio of 114 : 1. **The result is that the power that can be exerted by shaft 3 is 114 times greater than is obtainable direct from the Motor shaft.**

A 3 : 1 ratio of reduction is very suitable for use with a Clockwork Motor such as the Meccano No. 1 type, and will give a sufficiently powerful drive for most light models. It is easily arranged as shown in Fig. D. In the illustration $\frac{1}{2}$" Pinion 1 is fixed to the Motor driving shaft and meshed with a 57-tooth Gear 2 fixed on a short Rod 3 mounted in holes in the Motor sideplates. The drive to the model then is taken from Rod 3.

This form of reduction gear is one of the most useful in model-building and is nearly always used when a simple reduction is required.
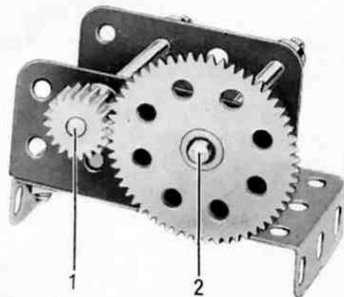

Fig. C

HOW TO USE MECCANO SPROCKET AND CHAIN.

Sometimes it is necessary for one shaft to drive another placed in some other part of a model, and the distance between the rods makes it impracticable to use gears for the purpose. In such cases the best method of drive is the Meccano Sprocket and Chain system, an example of which is seen in Fig. E. In this illustration a $\frac{3}{4}''$ diameter Sprocket is shown driving a 2″ diameter Sprocket.
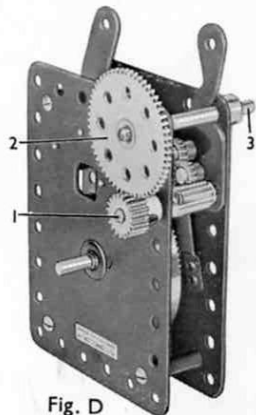
An advantage of this type of drive over ordinary pulley-and-belt drive is that the Chain drive is positive in action; that is there is no slip between the Chain and the Sprockets as may occur between a Cord belt and a pulley. This positive drive therefore makes it possible for one Sprocket to drive another at a definite rate, just as with meshing gears. The step-up or reduction ratio between any two Sprockets linked by Chain is found in exactly the same way as with the meshed gearing already explained.

Meccano Sprocket Chain is supplied in lengths of 40″, and comprises six links to the inch. It can easily be

Fig. D

separated and joined again when the requisite length has been measured off. To separate, the ends of one of the links are gently prised up with the blade of a screwdriver so that the adjacent link can be slipped out. After rejoining, the ends are bent back again carefully so that they do not grip the next link too tightly. The Chain should be passed round the wheels so that the turned-over ends of the links face outward or away from the wheel, as this will result in smoother running. The chain will also be less likely to jump the Sprocket Wheels.

Once the basic principles of gears and gear trains are understood, it is easy to assemble many interesting and useful mechanisms. In the following pages we illustrate and describe a selection of such mechanisms that will be found to meet most of the requirements of Meccano model-builders.
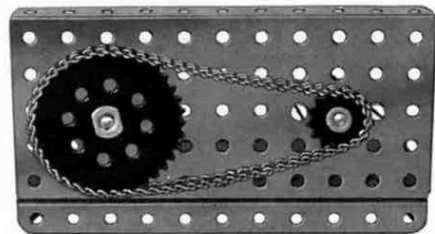
Fig. E

A.1 WORM REDUCTION GEARING.

Fig. 1

The gear arrangement shown in Fig. 1 is specially suitable for use as a rear axle unit for small vehicles in which it is not necessar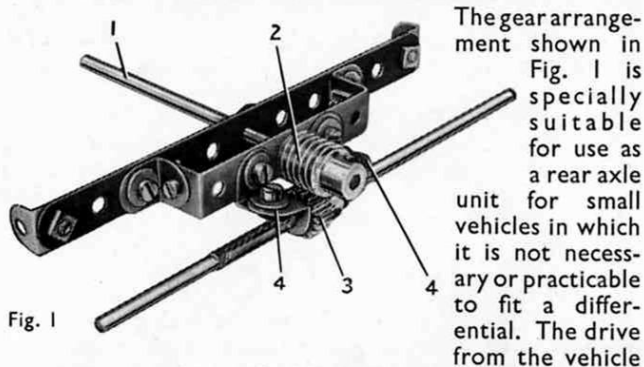y or practicable to fit a differential. The drive from the vehicle power unit is taken to Rod 1, if possible through a flexible drive to allow for changes in the angle of the drive caused by movement of the axle under the action of its springs. Rod 1 is mounted in a Strip as shown, and in a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip attached to Angle Brackets bolted to the Strip. The Rod is fitted with a Worm 2 that meshes with a $\frac{1}{2}"$ Pinion 3 on the rear axle. The axle is carried in built-up corner angle brackets 4 fixed to the $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip. Each corner angle bracket is assembled from two $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets arranged as shown.

The mechanism is shown fitted with a $5\frac{1}{2}"$ Strip and an axle formed by short Rods joined by a Rod Connector, and of course the length of both the Strip and axle can be varied to suit any particular model.

A.2 REDUCTION GEARING FOR E020 MOTOR.

The assembly of gears shown in Fig. 2 provides a reduction ratio of 114 : 1, and is designed specially for use with an E020 Electric Motor. The Motor is supported on a raised platform consisting of two $1\frac{1}{2}"$ Angle Girders attached to $1\frac{1}{2}"$ Flat Girders bolted to the base. The Motor is spaced from the Angle Girders by a nut on each of the bolts, so that a Worm fixed on its armature shaft meshes accurately with a 57-tooth Gear 1 locked on a

Fig. 2

$3\frac{1}{2}"$ Rod. The Rod is mounted in Girder Brackets bolted to the base, and it carries also a $\frac{3}{4}" \times \frac{1}{4}"$ Pinion 2. The Pinion meshes with a 50-tooth Gear fixed on a Rod 3 also mounted in the Girder Brackets.
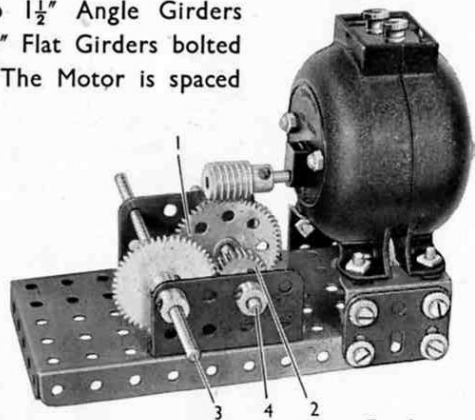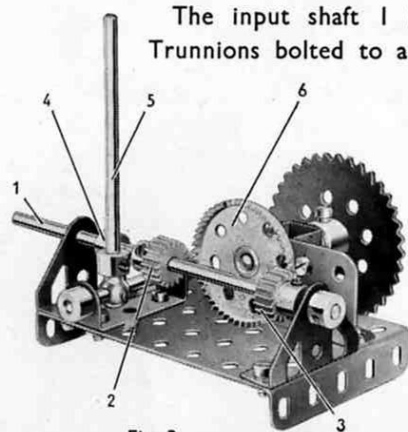
A.3 REVERSING GEAR.

The input shaft 1 is mounted in two Trunnions bolted to a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. The shaft is fitted with two $\frac{1}{2}'' \times \frac{1}{4}''$ Pinions 2 and 3, and a Collar 4, and is free to slide within limits in its bearings. Its movement is controlled by a lever 5, mounted as shown, which engages between the Pinion 2 and the Collar 4. The Pinions are spaced apart a distance slightly greater than the diameter of the Contrate 6. When the lever 5 is moved to the left, Pinion 3 engages with the Contrate 6, thus transmitting the drive from the input to the output shaft. Movement of the lever to the right disengages Pinion 3 and brings Pinion 2 into mesh with the Contrate, reversing the direction of rotation of the output shaft.

Fig. 3

A.4 REVERSING AND REDUCTION GEAR.

The input shaft 1 is mounted in a $2\frac{1}{2}'' \times 1''$ Double Angle Strip, and carries a $\frac{3}{4}''$ Contrate 2. The position of the Contrate is adjusted so that it can be meshed with either of the $\frac{1}{2}''$ Pinions 3 and 4, which are fixed on a Rod free to slide in Girder Brackets bolted to the base. A 57-tooth Gear 5 is fixed on a Rod also mounted in the Girder Brackets, and the Gear meshes with the Pinion 3. The drive can be transmitted to either of the Pinions 3 and 4 by sliding the Rod on which they are fixed, but Pinion 3 remains in constant mesh with the Gear 5. The sliding movement of the Rod is controlled by a lever 6, consisting of a Rod fixed in an End Bearing lock-nutted to an Angle Bracket. The lever engages between Collars on the sliding Rod.
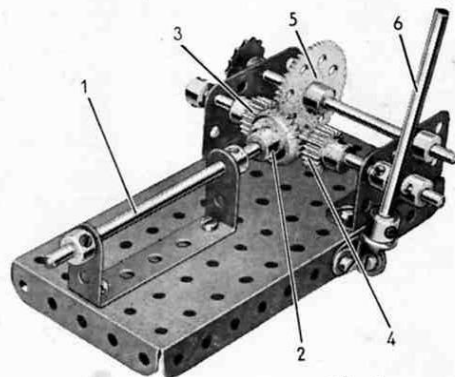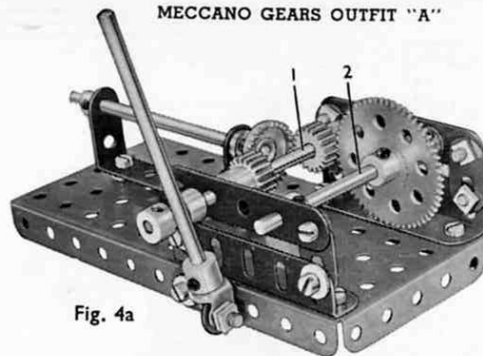
Fig. 4

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Fig. 4a

Fig. 4a shows this reversing mechanism adapted for use with an E020 Electric Motor. Owing to the position of the armature shaft of this Motor it is not possible to mount the Rods and Gears in standard holes, and the method illustrated makes use of the slotted holes in Fishplates and Angle Girders in order to adjust the height of the drive. Rods 1 and 2 are mounted in 2½″ Strips fitted at each end with Fishplates. The Fishplates are attached to the slotted holes of 2½″ Angle Girders bolted to the base.

A.5 AUTOMATIC REVERSING MECHANISM.

The mechanism (Fig. 5) is built on a 5½″ × 2½″ Flanged Plate, fitted with a Flat Trunnion 1 and a Trunnion 2. The input shaft is a Rod 3 mounted in a 2½″ × ½″ Double Angle Strip attached to the base by ½″ Bolts. These Bolts are passed through holes in the Double Angle Strip and are fixed in place by nuts. A second nut is then screwed

on each Bolt and their shanks are passed through the Flanged Plate and locked by further nuts. The height of the Double Angle Strip above the Flanged Plate is adjusted so that a ½″ Pinion 4 on Rod 3 meshes accurately with a 1½″ Contrate 5. Contrate 5 is free to turn on a Pivot Bolt fixed by two nuts to the base. The output shaft is a 5″ Rod 6 free to slide in Flat Trunnion 1 and Trunnion 2. It is fitted with ¾″ Pinions 7 and 8, positioned so that either can be moved into mesh with Contrate 5 by sliding Rod 6.

The reversing device is operated by a ½″ Pinion 9 fixed on a Rod 13 mounted in the Flanged Plate and in a Double
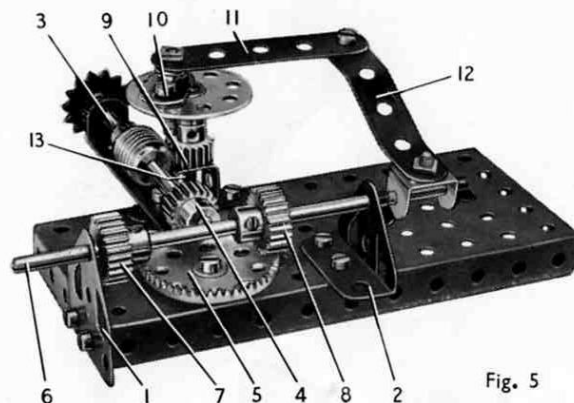

Fig. 5

8

Bent Strip bolted to it. The Pinion is in constant mesh with a Worm on Rod 3. Rod 13 carries also a Bush Wheel fitted with a Fishplate 10, and a 2½" Strip 11 is linked to the Fishplate by a lock-nutted bolt. The free end of Strip 11 is then attached by another lock-nutted bolt to a 2½" Strip 12 that is fixed tightly to a Double Bracket. The Double Bracket is clamped between Spring Clips on Rod 6.
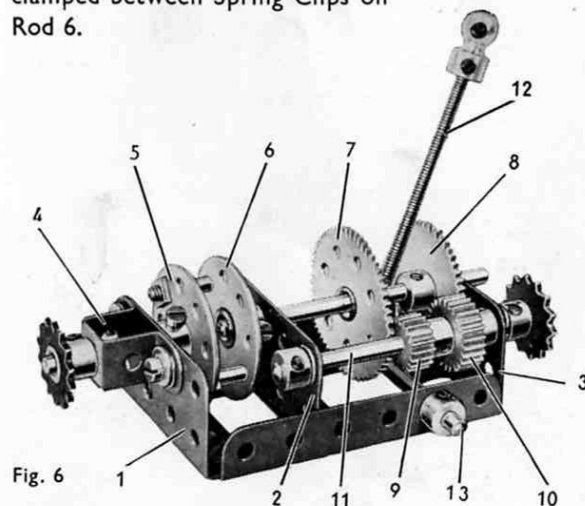

Fig. 6

A.6 TWO-SPEED GEAR BOX.

The frame for the gear box (Fig. 6) is formed by two 3" Angle Girders joined across by the Girder Brackets 1, 2 and 3. A Double Bent Strip 4 is bolted to the Girder Bracket 1, to provide a bearing for a 1½" Rod that carries a Bush Wheel 5 fitted with two Threaded Pins. The Threaded Pins engage in holes in a second Bush Wheel 6 fixed on a 3" Rod free to slide in the Girder Brackets 2 and 3.

The 3" Rod carries a 57-tooth Gear 7 and a 50-tooth Gear 8, spaced so that they can be moved into mesh with the ½" × ¼" Pinion 9 and the ¾" × ¼" Pinion 10. Pinions 9 and 10 are fixed on the input shaft 11. The lever 12 is a 3½" Screwed Rod fixed in the tapped hole of a Collar on Rod 13, and it engages between the bosses of Gears 7 and 8. When the lever is moved to the right, Gear 7 meshes with Pinion 9, providing a 3 : 1 reduction ratio between Rod 11 and the Rod carrying the Bush Wheel 5. If the lever is moved to the left, Gear 8 meshes with Pinion 10, providing a 2 : 1 ratio between the Rods.

A.7 STEERING MECHANISM FOR MODEL CARS.

The construction of vehicles of one kind or another forms a large part of the average model-builder's activities, and in almost all of these some kind of steering system is required.

The contents of this Gear Outfit, in conjunction with a Meccano Outfit, permit many different steering arrangements to be built up, and one of the most useful of these is shown in Fig. 7. This mechanism is suitable for all kinds of motor cars and lorries.

The front axle is formed by two 7½" Strips, and it is attached to leaf springs consisting of Strips of various
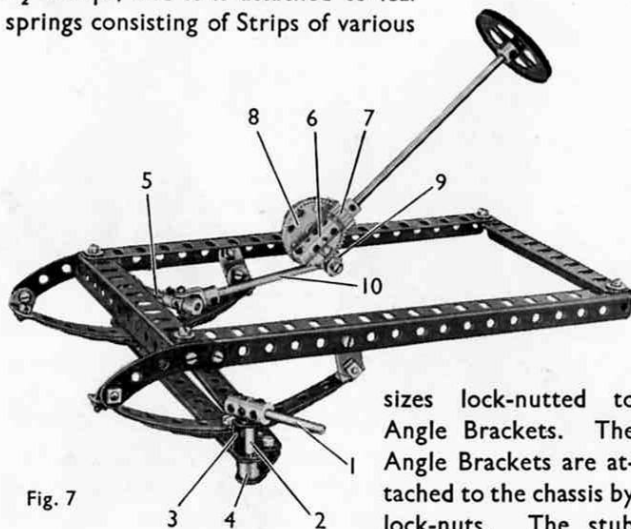

Fig. 7

sizes lock-nutted to Angle Brackets. The Angle Brackets are attached to the chassis by lock-nuts. The stub axles 1 are fixed in

Couplings mounted on vertical 1" Rods 2. The Rods 2 are carried in the ends of the axle beam and in ½" Reversed Angle Brackets 3, and are fitted at their lower ends with Cranks 4. The Cranks are linked together by a Strip held by lock-nutted bolts. The Coupling supporting the off-side stub axle is fitted with a 2" Rod 5.

The steering column is a 6½" Rod free to turn in the longitudinal bore of a Coupling 6. The Rod is held in position by a Collar and by a ½" × ¼" Pinion 7. A 1⅛" Bolt is passed through a Double Bracket bolted to the chassis, and is held tightly to the Double Bracket by nuts. A 1½" Contrate 8 is free to turn on the Bolt, which is then screwed into the centre tapped bore of the Coupling 6. A nut screwed up against the Coupling holds the steering column at any desired angle.

A Fishplate 9 bolted to the Contrate 8 is connected to a Rod 10 by a Collar.

A.8 STEERING SYSTEM FOR HEAVY TRACTION ENGINES AND TRACTORS.

Another very useful and simple steering device is shown in Fig. 8. This is specially designed for large traction engines and similar models. The steering wheel is secured to the upper end of the Rod 1, which is mounted freely in Double Brackets fixed to the side of

the model. At its lower end it carries a Worm 2 and this drives a $\frac{3}{4}''$ Pinion 3 fixed on a Rod mounted freely in a Double Angle Strip 4 or other suitable part
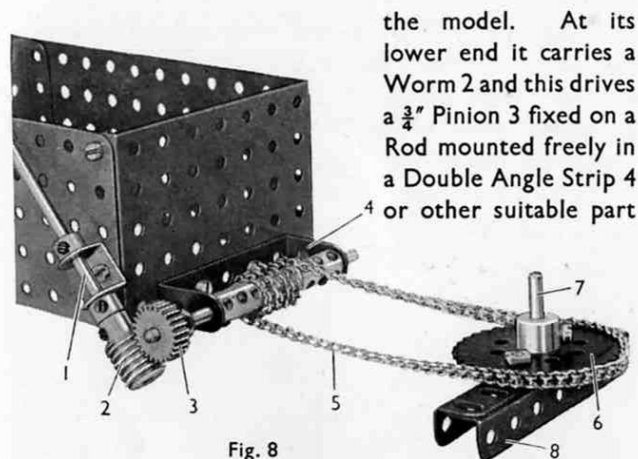

Fig. 8

bolted to the framework of the model. On this Rod are several Couplings, the purpose of which is to provide a grip for the endless length of Sprocket Chain 5, which is wound a few turns round them before its ends are joined up.

The Chain passes round a Sprocket Wheel 6, which is fixed on a Rod 7. This Rod when mounted in the model is free to pivot. A road roller, or the axle for the front wheels of a tractor, is carried in a suitable framework 8 bolted to the Sprocket 6.

A.9 CASTOR STEERING.

A different type of steering mechanism is shown in Fig. 9. This is known as castor steering, and is intended for use in steering the driving wheels of a small vehicle such as a mobile crane or a delivery van, so as to give the maximum manœuvring ability. It is easy to assemble and it operates very smoothly. The steering wheel of the vehicle is connected in any suitable manner, according to the type of model under construction, to a Rod 1, which carries a Worm 2. This Worm engages and actuates a 57-tooth Gear 3. The framework 4 supporting the road wheels is attached to the 57-tooth Gear, and the entire unit pivots on a Rod 5.
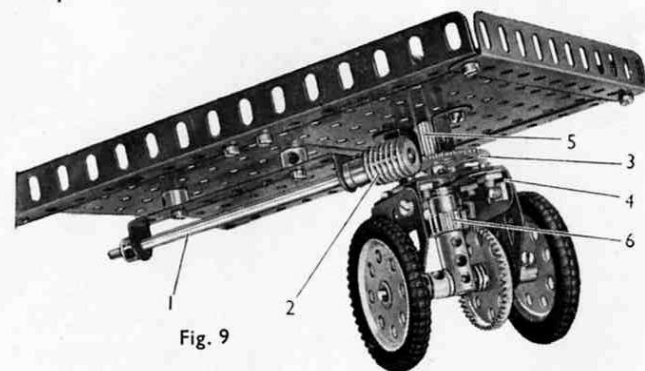

Fig. 9

This Rod 5 is connected at its upper end through gearing to the motor used to drive the vehicle, and at its lower end it carries a $\frac{1}{2}$" Pinion 6 that engages a $1\frac{1}{2}$" Contrate mounted on the axle of the road wheels.

When the Rod 5 is set in motion by the driving motor, it actuates the road wheels through the Pinion 6 and Contrate, and this drive is not interrupted when the steering wheel is moved. All that happens is that the Worm 2 then causes the 57-tooth Gear 3 and the frame carrying the road wheels to rotate about the Rod 5.

A.10 SIMPLE DIFFERENTIAL GEARS FOR MODEL CARS.

When a car turns a corner the inner wheels travel only a short distance compared with the outer wheels which have to describe a much greater arc. This means that the inner wheels have to mark time, or turn more slowly, while the outer wheels cover the larger sweep. For the driving wheels, therefore, means must be provided to drive the inner wheel more slowly than the outer

Fig. 10

wheel, the moment the car begins to turn. The mechanism used for this purpose is known as a differential, and it is a very interesting one to construct. Many different kinds of differential can be made from Meccano Gears, and two forms that can be built from the Gears in this Outfit are shown in Figs. 10 and 11.

The device shown in Fig. 10 is a very simple form of differential and is compact enough to be built into a small model. It is designed for use with a Sprocket Chain drive instead of the more usual shaft drive. A 2" Sprocket Wheel 1 is fixed to a Bush Wheel 2 by means of two $1\frac{1}{2}$" × $\frac{1}{2}$" Double Angle Strips 3, each of the four bolts holding the parts carrying a Washer for spacing purposes. A Rod to carry one of the road wheels is now passed through the boss of the Sprocket Wheel and fitted with a $\frac{3}{4}$" Contrate 4. Sufficient of the Rod is left projecting to allow it to pass into the longitudinal bore of a Coupling 5. A second Rod 6 passing through the Bush Wheel carries the other road wheel, and is fitted with a Contrate and treated in the same way as the first.
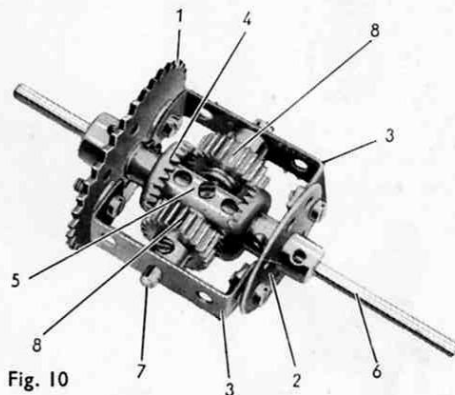
The transverse bore of the Coupling is fitted with a 2″ Rod 7 secured in place by a grub-screw. This Rod forms a bearing for two ¾″ Pinions 8 that are each spaced away from the Coupling by two Washers, so that they fit snugly against the Double Angle Strips forming the frame of the mechanism. When the mechanism is fitted in a model car the drive from the motor is taken by Sprocket Chain to the Sprocket 1.
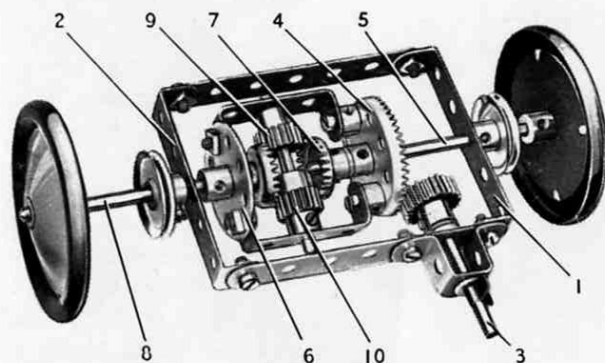

Fig. 11

A.11 DIFFERENTIAL GEAR.

The housing for the mechanism is formed by two 3½″ Strips bolted to 2½″ × ½″ Double Angle Strips 1 and 2.

The 2″ Rod 3 is rotated by the motor, and a ¾″ × ¼″ Pinion fixed on the Rod meshes with a 1½″ Contrate 4, which is free to turn on a Rod 5. Two 1½″ × ½″ Double Angle Strips are attached to the Contrate by ⅜″ Bolts, and a Collar on each Bolt is used for spacing purposes. The 1½″ × ½″ Double Angle Strips are connected at their free ends by a Bush Wheel 6.

A ¾″ Contrate 7 is fixed at the inner end of Rod 5, and a similar Contrate is fixed on a Rod 8, which is mounted in Double Angle Strip 2 and the Bush Wheel 6. Two ½″ Pinions 9 and 10 are carried on a 2″ Rod mounted in the 1½″ × ½″ Double Angle Strips, so that the Pinions mesh with the ¾″ Contrates. Pinion 9 is fixed on the Rod, and Pinion 10 is free to turn but is held in position by a Collar.

A.12 TWIN DRIVE UNIT.

The input shaft 1 (Fig. 12) is mounted in two Trunnions bolted to a 5½″ × 2½″ Flanged Plate used for the base. The Rod carries ½″ Pinions 2 and 3 positioned as shown. The Rod is free to slide in its bearings, but its movement is controlled by a lever 4 consisting of a 3½″ Strip. The Strip is lock-nutted to an Angle Bracket bolted to the base, and a ⅜″ Bolt fixed in the Strip by a nut engages between Pinions 2 and 3.
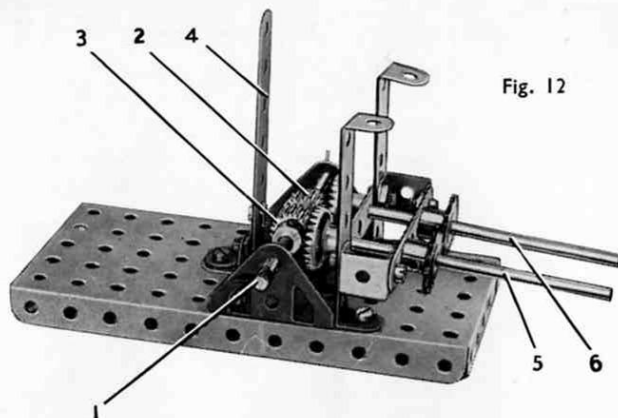
Fig. 12

The output shafts 5 and 6 are fitted with $\frac{3}{4}''$ Contrates that can be meshed with either of the Pinions 2 and 3. Rods 5 and 6 are mounted in two $2\frac{1}{2}''$ Strips, which are connected by Double Brackets and bolted to $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips fixed to the base.

The drive can be transmitted to either of Rods 5 and 6 by moving the lever 4 so that the appropriate Pinion is slid into mesh with its Contrate, or alternatively both Rods can be driven when one of the Pinions is engaged with each Contrate.

A mechanism of this type is useful for operating the hoisting and luffing movements of a model crane.

A.13 SIMPLE EPICYCLIC GEAR MECHANISM.

In an ordinary train of gear wheels such as that shown in Fig. 6, the motion is obtained by all the gears of the train being rotated about their axes. This form of gearing is quite suitable for the majority of cases in which gearing is required by the model-builder, but there are occasions when another and very fascinating form of gearing, known as "epicyclic," can be used. In an epicyclic gear train the motion is obtained by rotating a bar or arm carrying at least one of the wheels around the axis of another wheel of the train. The result of this is that the driven wheels receive a compound rotation, which
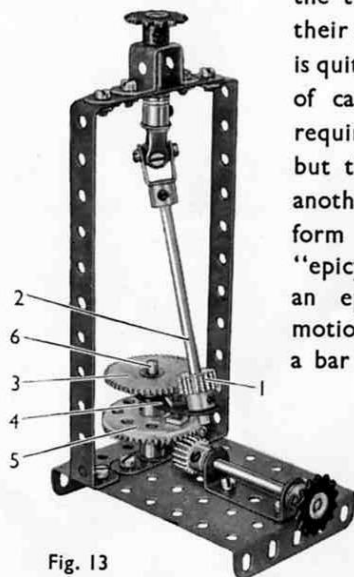
Fig. 13

is very useful when it is required to obtain high rates of reduction or increase in gear speeds in a small space.

A simple type of epicyclic gear is shown in Fig. 13. A Pinion 1 on Rod 2 engages with a 50-tooth Gear 3. Rod 2 is journalled in a 1½" Strip 4 bolted to a Contrate 5, which rotates freely on the vertical Rod 6. This Rod may be secured in position, so preventing the Gear Wheel 3 from turning; or it may be rotated at a different speed from and in an opposite direction to the Contrate Wheel. The number of revolutions described by the Pinion 1 always exceeds that of the Contrate 5, but the speed ratio varies according to the sizes of the Pinion and Gear Wheel 3, and to the movement, if any, of the latter.

A.14 INTERMITTENT MOTION MECHANISM.

By means of the mechanism shown in Fig. 14, intermittent motion can be imparted to a rotating Rod, of almost any duration and in a variety of sequences. A 57-tooth Gear 1 fitted with four ¾" Bolts is mounted on a Rod and driven by a Worm 2 that is in constant engagement with the Gear. The Worm is fixed on a Rod 3 that is driven from the motor through suitable gearing.

The end of the Rod protruding from the Worm carries one half of a Dog Clutch 5, the other portion of which is

fixed to the inner end of a sliding output Rod 6. A Compression Spring 7 on this Rod maintains contact between the two sections of the Dog Clutch when the drive is being transmitted. As the Rod 3 driven by the Bevel Gears rotates, however, the Bolts in the 57-tooth Gear come into engagement with a tappet rod 8. The movement from this is transmitted through a sliding Rod 9 and Crank 10 to the Rod carrying the Compression Spring, and in this way the members of the Dog Clutch are drawn apart.

The duration and sequence of the drive to the output Rod 6 can be varied by altering the number and position of the ¾" Bolts in the 57-tooth Gear.

Fig. 14

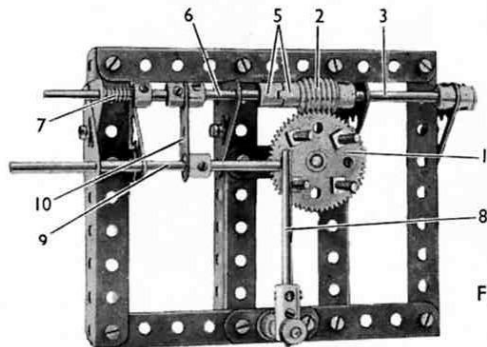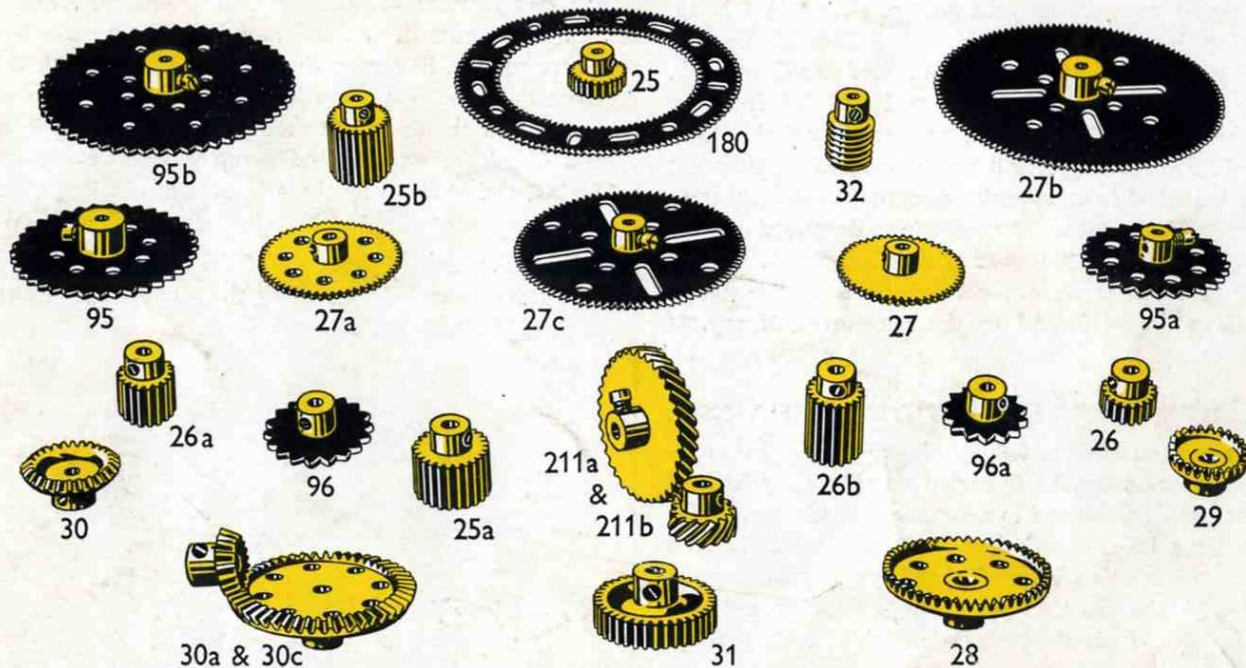THE ILLUSTRATIONS BELOW SHOW A RANGE OF GEARS IN THE MECCANO SYSTEM

95b

25b

25

180

32

27b

95

27a

27c

27

95a

26a

96

25a

211a & 211b

26b

96a

26

30

29

30a & 30c

31

28

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