

Suggestions Section

Edited by "Spanner"

(324)—Counting Machine (J. R. Williams, Cardiff)

Counting machines can be applied to many useful purposes, and in actual practice their uses are very varied. The model illustrated on this page was designed for counting the number of coins inserted in a slot machine. Each time a coin is inserted an Electric Motor is started up to rotate the Gear 1 through one revolution, and in this manner a record is kept of each coin inserted in the machine, so that it is possible to tell at a glance the total amount inserted.

The model could be used to advantage at a club exhibition, where the insertion of a penny in a slot would set a working model in operation. The counting machine would add interest to the model and would serve also as an encouragement for visitors to increase the club funds.

Fig. 324 shows a rear view of the inverted model with the back and bottom Plates removed. It will be seen that the outer framework is made up of Angle Girders, the sides being filled in with Flat Plates. Four openings are left in the front to expose the figures, and are formed by means of Strips, as shown in the upper illustration. Four 1" Corner Brackets are bolted at the corners of the openings.

In the rear view of the model the figures are not shown, so that the construction can be seen more clearly. The figures are marked on strips of paper that are bolted round the rims of four of the Hub Discs. A separate framework is built up to carry the mechanism, and is supported on three 11½" Screwed Rods arranged longitudinally in the outer framework. Strips are attached to the Screwed Rods by means of nuts and are bolted to Face Plates as shown. At the front of the model the Strips are bolted to Angle Brackets. In arranging the Face Plates in position care should be taken to ensure that the bosses are in proper alignment, and to make quite sure that they are correctly placed it is advisable to insert temporarily an 11½" Axle Rod through the bosses of all the Face Plates, before tightening up the bolts. An additional Face Plate is bolted to the end Plate, and can be seen on the left of the illustration in Fig. 324. This Face Plate carries the Axle Rod on which are journaled the four Hub Discs carrying the figures. A separate Rod carries the Gear 1 and the Hub Disc 2.

The Hub Disc 2 carries a Bush Wheel by which it is secured to the Rod of the Gear 1. A Threaded Pin 3 is carried on the Hub Disc, so that for each revolution of the Disc the Threaded Pin strikes one of the Threaded Pins 4 that are mounted in a "spider" removed from a Swivel Bearing or a Universal Coupling. The spider is carried on a 2" Axle Rod journaled in two 3½" Strips as shown. The other end of the Rod is fitted with a ½" Pinion 5, and three Washers are carried on the Rod between the spider and the Strip. A 1½" Rod is journaled immediately above the 2" Rod and carries a ½" Pinion that engages with the Pinion 5. The second Pinion meshes with the 2½" Gear 6 secured to the Hub Disc that

carries the units figures. At the other side of the Hub Disc a Bush Wheel is fitted.

For each revolution of the Hub Disc 2, the Pinion 5 is moved through a quarter of a turn, and as it is geared through a 5:1 reduction ratio to the second Hub Disc, it follows that the second Disc must rotate through 1/20th of a turn. In arranging the figures on the discs, two complete sets are fixed to each, numbering from 1 to 9, 0, and then 1 to 9 and 0 again. Thus each time the Gear 1 is given a complete turn the units figure is raised or lowered one according to the direction of rotation.

Three of the Hub Discs that carry the figures are each fitted with two Threaded Pins, and these are arranged in such a manner in relation to the figures that as the 9 appears behind the opening at the front of the model one of the Threaded Pins is ready to strike one of the Threaded Pins in the respective spider. In this case the next Hub Disc is rotated through 1/10th of a revolution

in two impulses for a complete revolution of the preceding Hub Disc.

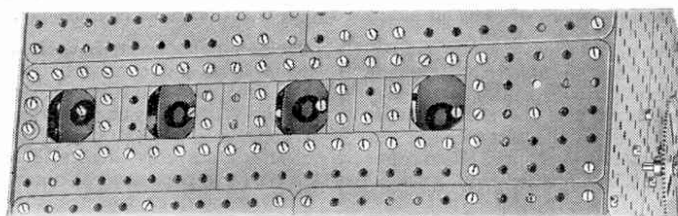


Fig. 324a.

(325)—Automatic Brake for Winding Gear (L. Cowley, Coventry)

The device (not illustrated) is intended for use in model cranes for automatically applying the brake to the hoisting or luffing barrels as soon as they are thrown out of gear with the power unit. The hoisting and luffing barrels are mounted end to end and the Rod of each carries a Gear Wheel. The driving Rod is placed parallel to these two short Rods and carries two Pinions opposite each Gear. One of the Pinions in each pair is not secured to the Rod, and is prevented from rotating by means of a ¾" Bolt screwed into its boss and held in a Strip. The Strip is connected to the lever controlling

the sliding movement of the Rod. The two remaining Pinions are fixed to the Rod and two Washers are placed between the two Pinions in each pair.

For the luffing operation the driving Rod is slid in its bearings until the respective rotating Pinion engages the gear on the luffing barrel, and the fixed Pinion at the other end of the Rod engages the Gear on the hoisting barrel, which is thus prevented from unwinding. To throw the luffing barrel out of gear, the driving Rod is slid in the opposite direction, and thus the luffing barrel is held by its fixed Pinion and the drive is transmitted to the hoisting barrel.

By means of this simple arrangement the hoisting and luffing operations are fully controlled by one lever only, separate

brakes being unnecessary. It will be clear, however, that the lowering of the load or jib must be effected under power and cannot be carried out under the influence of a brake.

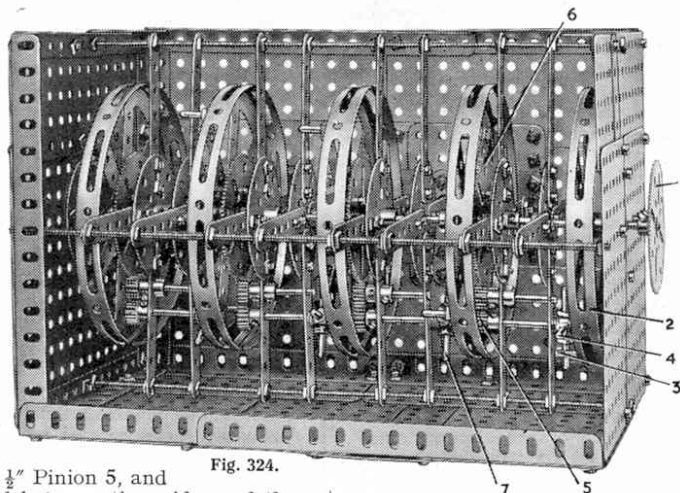


Fig. 324.

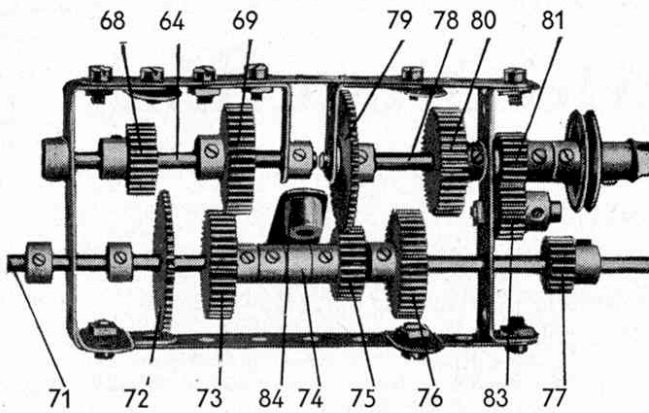


Fig. 5. This gear-box provides three forward speeds and a reverse movement.

forced into contact with the rim of a Boiler End fixed to the gear-box shaft. A free-wheel is incorporated in order to prevent the car from over-running the engine. This consists of two Angle Brackets 4, which are held in contact with a $\frac{1}{2}$ " Pinion on the driven shaft by Spring Cord.

No matter how small a model motor car is, a gear-box of some kind is necessary to make it realistic and interesting. The easiest type to build is one giving a single speed forward and one in reverse. This can be made by fixing a Contrate Wheel on the driving shaft of the Motor, and arranging a sliding Rod fitted with two Pinions so that moving it backward and forward allows either of the Pinions to be meshed with the Contrate Wheel.

Fig. 7 shows a gear-box that provides three speeds forward and one reverse, and is of particular interest on account of its extreme compactness. The end of the Rod 1 is inserted in the bore of the $\frac{1}{2}$ " Pinion 4 carried on a separate Rod 2, from which the final drive is taken. The Rod 2 also carries a $\frac{3}{4}$ " Pinion and Collar. The sliding layshaft is a $4\frac{1}{2}$ " Rod, on which are a $\frac{1}{2}$ " Pinion 5, a $\frac{3}{4}$ " Pinion 6, and a $\frac{1}{2}$ " Pinion 7. A $\frac{1}{2}$ " Pinion 8 is carried on a $\frac{3}{4}$ " Bolt screwed into the transverse bore of a Threaded Boss and locked by means of a grub screw into the opposite end of the bore. The Threaded Boss is rigidly attached to the gear-box frame by a $\frac{1}{2}$ " Bolt 9, but is spaced by a Collar and two Washers.

The movement of the sliding shaft is controlled by a $\frac{3}{8}$ " Bolt 10, the head of which fits between the bosses of the Pinions 6 and 7. The Bolt is fixed in a Collar on the end of a 3" Rod forming the gear change lever, which is pivoted to a 1" Triangular Plate by a further Collar secured in place on the Rod by its grub screw. The latter Collar carries a bolt, the shank of which passes through one of the holes in the Triangular Plate. The Bolt is locked in position by a nut to allow the Rod to pivot freely. The first forward speed is shown in engagement in the illustration, the drive passing through the $\frac{1}{2}$ " Pinion on the driving shaft 1 to the $\frac{3}{4}$ " Pinion 6 on the layshaft. The $\frac{1}{2}$ " Pinion 7 is engaged with the $\frac{3}{4}$ " Pinion on the driven shaft, so that there are two stages of reduction gearing between driving and driven Rods. By sliding the layshaft to the right the Pinion 7 is disengaged, but Pinion 6 remains in engagement with its $\frac{1}{2}$ " Pinion and at the same time is brought into mesh with Pinion 4. This gives a straight through drive.

Further movement of the sliding Rod brings into engagement Pinions 3 and 5 and 6 and 4, thus providing two step-up stages for top gear. Reverse gear is obtained when the rod is slid over to the extreme left, for the drive then goes through Pinions 3 and 8, which are in constant mesh, to Pinion 6, Pinion 7 engaging the $\frac{3}{4}$ " Pinion.

The gear-box shown in Fig. 5 gives the same number of forward speeds as the gear-box just described, but it is more bulky and provides a wider range of gear ratios. It is suitable for incorporation in large models of heavy construction where a wide choice of gear-ratios is an advantage. The operation is exactly the same as the small gear-box shown in Fig. 7.

Gear changing is effected by Crank 84, which is pivotally attached by its slotted hole to Collar 74 and forms the selector arm. Its boss should be fixed on a Rod placed across the chassis of the model in which it is incorporated. A suitable gear lever can then be fixed to the Rod.

The final drive from the gear-box can be transmitted to the rear axle in several ways. A simple arrangement such as a $\frac{1}{2}$ " Pinion driving a Contrate Wheel fixed to the rear axle or any other system of gears producing a right angle drive can be used, and in small models arrangements of this kind are entirely satisfactory. Another useful type of rear axle drive is illustrated in Fig. 1, and is of particular interest because the worm drive gives a fairly large reduction ratio. Its construction is easy to follow from the illustration, and either a $\frac{3}{4}$ " or a $\frac{1}{2}$ " Pinion may be used in conjunction with the Worm.

An alternative construction is to connect two $1\frac{1}{4}$ " Discs by means of $1\frac{1}{2}$ " $\times$ $\frac{1}{2}$ " Double Angle Strips, and to journal the driving shaft, to which the Worm is fixed, in the centre holes of the latter parts. The rear axle is journaled in the $1\frac{1}{4}$ " Discs and is fitted with a $\frac{1}{2}$ " Pinion.

Although devices of this kind are satisfactory for some model-building purposes, in actual practice a solid axle is never used except on certain types of light cars. The reason for this is that when a car is turning in a circle the inner wheel tends to move more slowly than the outer wheel because it travels through a shorter arc. With the two fixed to the axle one of them therefore would drag or skid when turning. In order to allow each of the rear wheels to rotate at different speeds and still transmit the drive when a car is turning corners, it is necessary to introduce a special type of gearing in the rear axle, which is built in two parts. This gearing is the differential. A Meccano differential gear of compact design suitable for inclusion in model cars of all types is shown in Fig. 6. It should be enclosed in a casing consisting of Boiler Ends joined by 2" Strips.

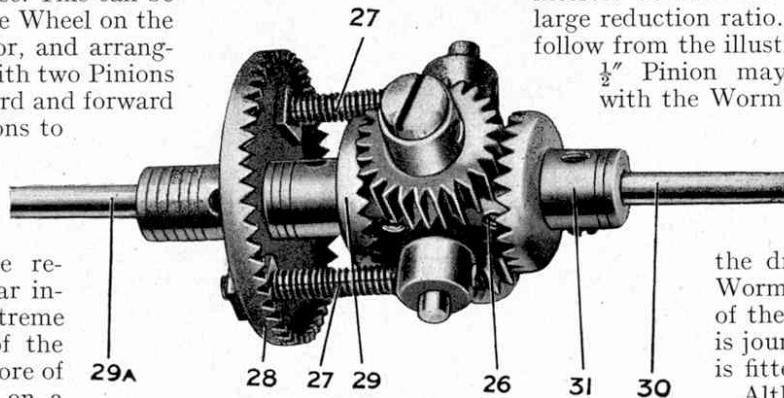


Fig. 6. A compact and efficient Meccano differential gear.

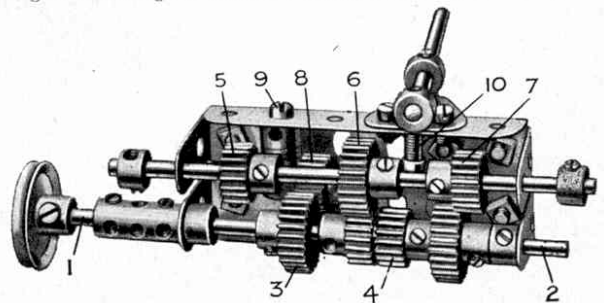


Fig. 7. One of the smallest three-speed and reverse gear-boxes yet constructed from Meccano parts.

Meccano Suggestions Section

By "Spanner"

(432) Slave Clock (E. Siniscalco, Buenos Aires, Argentine)

Model clock construction is one of the most fascinating branches

of Meccano model-building, whether weight-driven or electric mechanisms are employed. A particularly interesting branch is concerned with master and slave clocks, and a novel clock of the last named type is shown in Figs. 432 and 432a. It is the work of E. Siniscalco, Buenos Aires, Argentine, who was awarded First Prize for it in the "Suggestions" Model-Building Contest. Instead of an ordinary dial and hands, this clock has rotating discs with numbered edges, and these are moved at the end of every minute by an Electric Motor controlled by a master clock.

The mechanism is built up on the side plates of an E6 or E20B Electric Motor. Two $2\frac{1}{2} \times 2\frac{1}{2}$ Flat Plates are fixed by Angle Girders to the Motor in the positions shown, and are connected by a $1\frac{1}{2} \times \frac{1}{2}$ Double Angle Strip. A Worm fixed to the armature shaft of the Motor is in mesh with a $\frac{1}{2}$ Pinion fixed to the 3" Rod 1, which carries at its other end a second $\frac{1}{2}$ Pinion. The latter Pinion in turn is geared to a $2\frac{1}{2}$ Gear Wheel 2, fixed on a $2\frac{1}{2}$ Rod, which carries also a $\frac{1}{2}$ Pinion meshing with 57-teeth Gear 3. A Worm on the same shaft as Gear 3 drives a fourth $\frac{1}{2}$ Pinion that is fixed to the $6\frac{1}{2}$ Rod 4. This Rod carries also a 2" Sprocket Wheel and a metal disc 5 bolted to a Bush Wheel.

The disc has 10 slots cut in its circumference, the slots being of sufficient width to accommodate a Meccano Rod. An Elektron Magnet Coil 6 is clamped between $1\frac{1}{2}$ Strips by 2" Screwed Rods, which in turn are lock-nutted to a support consisting of two Simple Bell Cranks and two $3\frac{1}{2}$ Strips. Next to these Strips is bolted a 2" Slotted Strip, and a $4\frac{1}{2}$ Strip is fixed in a similar position on the other side plate. This Strip carries a Handrail Support, to which is pivoted a Small Fork Piece 7 bearing a $2\frac{1}{2}$ Rod in its boss. Fork Piece 7 is fitted with an Angle Bracket and a Pendulum Connection as shown, the latter forming a brush that makes contact with the insulated Silver Tipped Contact Screw 8. As sparking may occur between Fork Piece 7 and the Rod on which it is pivoted when the device is in operation, it is necessary to connect the brush to the Handrail Support by wire 9. The Magnet Coil Core is gripped in a Swivel Bearing, the spider of which is fixed to the $2\frac{1}{2}$ Rod as shown.

The wiring can now be carried out. The Contact Screw 8 is connected to the right-hand Terminal 17 on the base to which the Motor is bolted, while the left-hand Terminal 17 is connected to one terminal of the Electric Motor. The other Motor terminal is earthed to the frame of the model. The Terminals 17 are connected to the terminals of a suitable Transformer, and the wires 16 through which the controlling impulse passes to the clock, are connected to the Magnet Coil 6.

The frame supporting the numbered hour and minute discs should now be fitted. The Hub Discs are carried on 2" Rods, and the Disc on Rod 11 carries a Threaded Pin 12 that engages with the spider 13 on a $1\frac{1}{2}$ Rod. This Rod is geared through two $\frac{1}{2}$ Pinions and a 57-teeth Gear 14 to the Rod carrying the second Hub Disc. The latter carries two Threaded Pins arranged diametrically

opposite each other, and these operate a similar spider mechanism to that just described. The Pulley 15 and a similar part on the central Disc shaft form the drums of band brakes, which prevent the Discs turning on their own. The Discs should be fitted with numbered strips. The first strip is numbered 1 to 0; the central strip is numbered 0 to 5—0 to 5; and the last strip is numbered 1 to 12.

This mechanism works simply but effectively. When an impulse is sent from the master clock through wires 16 and the Magnet Coil 6, the Magnet Core is pulled upward and raises the $2\frac{1}{2}$ Rod clear of its slot in the disc 5. The brush then makes contact with Screw 8 and sets the Motor in operation, thus causing the disc to rotate. Meanwhile the current is cut off from Coil 6 and the $2\frac{1}{2}$ Rod rests on the circumference of the disc so that it falls when the next slot is brought under it, the circuit to the Motor thus being broken. The mechanism is then ready for the next impulse, which is sent out from the master clock at intervals of one minute. In order to stop the armature of the Motor from rotating after the circuit has been broken the Bell Crank 10, which forms a brake shoe, is arranged to engage with the rim of a $1\frac{1}{2}$ Pulley on the armature shaft.

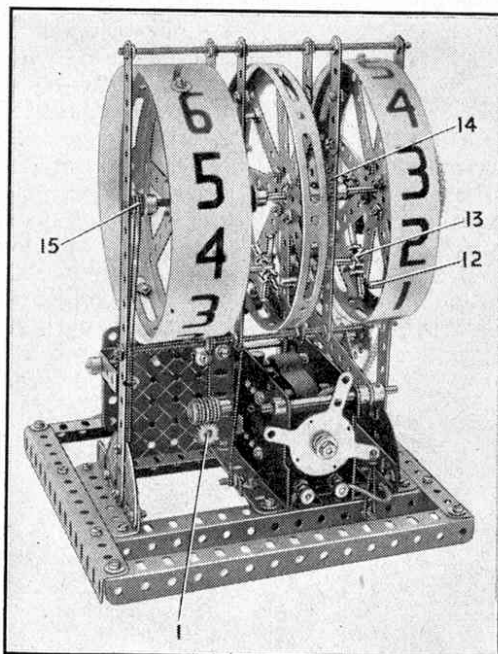


Fig. 432

latter for mobile models. These have proved successful in certain cases, but both have limitations. For example, a momentum drive is only suitable for light models, and a gramophone turntable can be

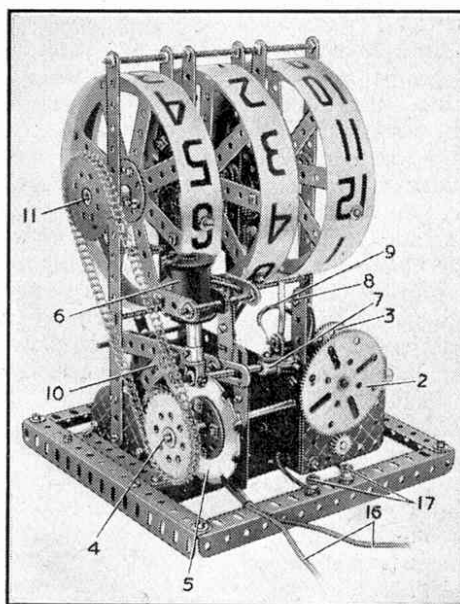


Fig. 432a

(433) Rubber Powered Chassis

(H. Clarke, Chester)

Novel methods of driving Meccano models that have been suggested in the past have included the use of gramophone turntables and momentum drives, the latter for mobile models. These have proved successful in certain cases, but both have limitations. For example, a momentum drive is only suitable for light models, and a gramophone turntable can be used as a source of power only for models of the stationary type. The unusual driving unit illustrated in Fig. 433 will be found useful for operating both small model vehicles and certain types of stationary machines. It is a geared rubber motor suggested by H. Clarke, Chester, and is interesting, although it is limited in application and cannot be regarded as in any way a substitute for a Clockwork or Electric Motor.

The motor is incorporated in a chassis built up of two $12\frac{1}{2}$ Angle Girders connected at their ends by $4\frac{1}{2}$ Angle Girders. A further $4\frac{1}{2}$ Angle Girder bolted near the rear of the chassis supports a $3\frac{1}{2}$ Flat Girder. This Flat Girder and the rear Girder of the chassis provide bearings for the three Rods carrying the Gears. Rod 1 and the Rod in a similar position on the other side of Rod 2 each carry a 50-teeth Gear and a Large Fork Piece. Rod 2 carries a $\frac{1}{2}$ Pinion and a $\frac{1}{2}$ Helical Gear. The latter part in turn meshes with a $1\frac{1}{2}$ Helical Gear fixed to the rear axle of the model.

Each of the twin rubber motors consists of three 20" Driving Bands, and they are anchored to the front of the chassis by Double Brackets and $1\frac{1}{2}$ Rods. The Bands are connected to the Large Fork Pieces by Pivot Bolts. The motors are wound up by means of the hand wheel and the model

travels at surprising speed when it is set on the ground and released. It would be great fun for several model-builders to arrange races between small racing cars powered in this manner, using different numbers of Driving Bands in each motor.

AMONG THE MODEL-BUILDERS

with 'Spanner'

MR Bert Halliday is no stranger to the pages of Meccano Magazine, and his latest contribution concerns the description of two alternative units, usable in conjunction with the Counting Device featured in the April 1978 M.M. These units are of particular value in indicating the number of revolutions of a Meccano-graph designing table.

Counting Device Units

THE Counting Device as originally described in the April 1978 M.M., has one slight drawback in that it has to be re-set after the completion of a specified number of revs. However, there are two alternative methods of obtaining equally-spaced pointers, or 'trips', so that the following one registers the same number of revs. as its predecessor. To those fortunate enough to possess the now obsolete 56T. Gear

Wheel, it is possible to indicate, either, 7; 14; 21; 35; 42 and 49 revs, without re-setting the indicating pointer, or 'trip', each time.

If you should require only, 14; 28 or 42 revs, then to an 8-hole Wheel Disc, bolt two Threaded Bosses by their longitudinal bores, diametrically opposite, and with the transverse bores in line. Into these bores, a Bolt can be screwed as required, to act as a pointer, or 'trip'. Bolt this arrangement to the 56T Gear Wheel; spacing it by Washers for Bolt head clearance, using two more Threaded Bosses as 'nuts', and arranging their transverse bores in line as previously described, and so you have four Threaded Bosses spaced one hole apart, round the Wheel Disc.

You then have four equally-spaced pointers, or 'trips' with the following pointer indicating the same number of revs as its predecessor. One pointer indicates 14 revs., two successive ones, 28 revs., and three, 42 revs. With eight pointers, or 'trips', fitted to the Wheel Disc, each will indicate 7 revs—an arrangement that might be useful to Meccano clock makers, to indicate the passing of a week. The 56T. Gear Wheel will mesh with the Worm at standard spacing, but the 8-hole Wheel Disc must be used for anchoring the pointers, as the Gear Wheel itself

was endowed with only two diametrically opposite holes, in the original designing.

To obtain a continuous indication for 20 revs. bolt three Threaded Bosses one hole apart, to a 6-hole Wheel Disc, and bolt this to a 60T. Gear Wheel, in the manner already described in respect of the 56T. ditto. The 60T. Gear Wheel can be arranged to be driven from the Worm, without any alteration to the setting-up of the original mechanism, by setting this Gear Wheel offset to the centre-line of the Worm, and this will be found to work quite efficiently. To Meccano clock makers, a compact striking mechanism is possible, by fitting four pointers, or 'trips' to the Gear Wheel itself; so providing for the four quarters.

With the appropriate number of pointers, or 'trips', fitted to either a 6-hole Wheel Disc, or the Gear Wheel itself, this unit can be made to indicate, either, 10; 15; 20; 30; 40; 45 and 50 intermediate revs.

Finally, as the 60T. Gear Wheel used in this manner, is offset to the Worm's centre-line, it includes the slightly mind-boggling possibility, of arranging no fewer than four such Gear Wheels, so they are driven from a single Worm! And they could all be on separate shafts, to boot!

MR. Brian W. Smith of Beacon Hill, Surrey, has designed this unusual three speed automatic gearbox, especially suitable for use in Meccano models of Vehicles, various types of small chassis etc. In my experience, gearboxes capable of changing gear automatically are far less common than the standard 'manual' type, as far as Meccano modelling is concerned, and are therefore of potentially greater interest.

MECCANO THREE SPEED 'AUTOMATIC' GEARBOX

THIS gear-box has been designed, (writes Mr. Smith), to work with constant speed electronic motors rather than relying upon centrifugal forces of varying speed input, it is therefore most suitable for use with the currently available 12 volt six gear electric motor.

FRAMEWORK

The simple framework is made up from two Perforated Strips, (or the Chassis of a vehicle construction) at least 9½" long, connected in a parallel manner by four 3½" x ½" Double Angle Strips at the first, tenth, sixteenth and nineteenth holes. On to the first and third holes of one of the Strips, a Double Bent Strip is bolted on the inside of the frame. A Fishplate is sandwiched between the Double Bent Strip and the frame Strip at the third hole to act as a spacer and thus ensure that the Double Bent Strip is kept in parallel alignment with the frame.

INPUT AND TORQUE SENSING SHAFT

A 19t Pinion and a 50t Contrate Gear are fitted at each end of two Socket Couplings taking great care to line the Grub Screw holes up with the recess in the Socket Coupling, this will allow subsequent oiling, necessary because

these assemblies are free to turn on the Axle Rod and carry some significant loads. Two 19t Pinions are connected to a 5" Axle Rod by Pivot Bolts screwed firmly into a Collar, the Pinions being free to rotate on the Pivot Bolts.

The two Socket Coupling assemblies are now placed on the 5" Axle Rod with the Contrates meshing with the foregoing Pinions. Place a Washer at each end of the Rod. Next, fit a Collar on to the forward end of the Rod, placed so that it holds the Socket Coupling assembly Contrate in mesh with the Pinions. The rear Socket Coupling assembly is held in mesh by passing the Axle Rod through the centre hole of crossmember 'B'.

A further Collar is fitted to the front end of the 5" Rod, followed by a Washer and a further 19t Pinion free to turn, another Washer, and the front end of the Rod is inserted through the centre hole of crossmember 'A'.

LAY SHAFT

The lay shaft is a 4" Axle Rod carrying 15t, 19t and 25t Pinions. This is fitted to the third holes from the left of crossmembers 'B' and 'C', the exact positioning of the Pinions is adjusted later. A further 19t Pinion with the bush forward, plus a Washer, are fitted to the Rod forward of crossmember 'B'. The layshaft is retained in position by a Washer and Collar to the rear of crossmember 'C'.

TORQUE TRANSFER SHAFT

This is a 1½" Axle Rod passed through the frame and Double Bent Strip, to the inside end of which are fitted a Washer, a Crank and a 50t Contrate Gear. The crank is fixed so that it holds the 50t Contrate in mesh with the two 19t Pinions at the forward end of the input and torque sensing shaft.

A 2½" Narrow Strip, pivoted through an end hole by a Bolt lock-nutted to the slot of the Crank, has its other end hole pivoted to an End Bearing, which in turn is fitted to a 2" Axle Rod inserted into the second hole from the right of crossmember 'B'. The other end of the 2" Rod carries a Coupling in transverse position through one of its end holes and this forms the sliding link to the sliding shaft.

SLIDING SHAFT

This is a 5" Axle Rod, fitted in the following sequence; third hole from right of crossmember

'B', fixed-Collar, Washer, other end of sliding link Coupling, Washer, 60t Gear, 57t Gear, 50t Gear, (bush to rear), 3 spacing Washers, third hole from right of crossmember 'C', Washer, Compression Spring, Washer, Compression Spring, Washer, and 19t Pinion. The position of this 19t Pinion provides adjustment for the gear changes by adding to or reducing, the tension of the Springs.

The position of the Gears, together with the Pinions on the lay shaft, is critical. The principle being that normally third gear is engaged, (25t Pinion and 50t Gear), but by sliding the shaft forward, second gear must just engage third gear disengages, and similarly first gear just prior to second disengagement.

OUTPUT SHAFT

This is a 3" Axle Rod journaled through the centre holes of crossmembers 'C' and 'D' and held in position by Washers and Collars fitted inside the crossmembers. This Axle Rod carries a 3/4" face 19t Pinion, positioned so that it remains in mesh with the 19t Pinion at the end of the sliding shaft regardless of the gear ratio selected. At the rear end a suitable power take-off, i.e. a Universal Coupling, is provided.

OPERATION

When power is applied through the input shaft, the transverse 19t Pinions on the Pivot Bolts transfer the energy to both 50t Contrates equally. However, the forward Contrate assembly is not free to rotate, being held in position by the tension of the Compression Springs via the sliding shaft and the torque transfer shaft, thus all the energy is transmitted to the rearward Contrate assembly and from there through the lay shaft, sliding shaft and finally the output shaft.

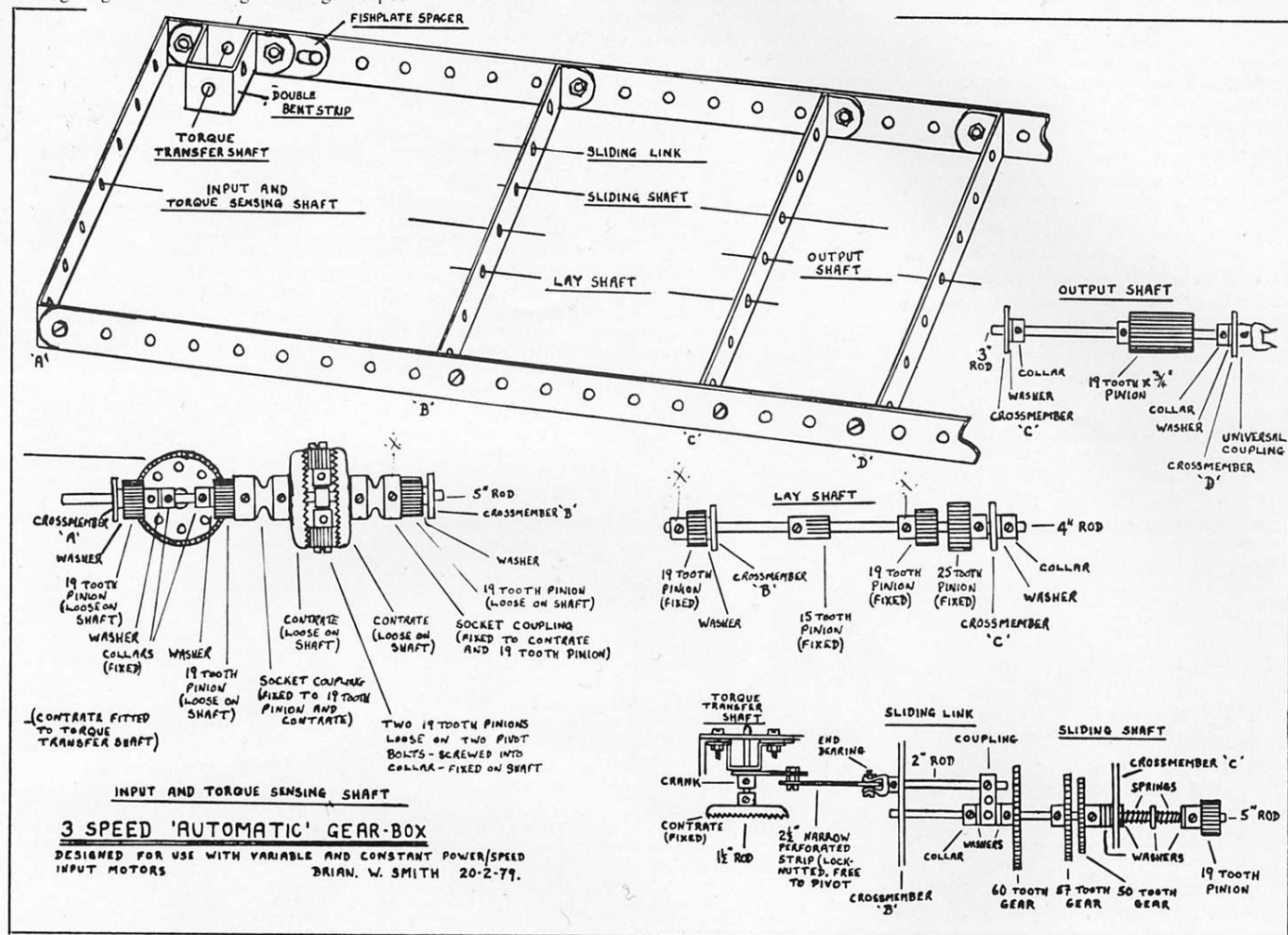
However, if the output shaft experiences any resistance, i.e. the vehicle encounters an upward slope, some of the input shaft energy is diverted to the forward Contrate assembly and thus to the torque transfer shaft which operates by turning and pulling the sliding link forward. This engages the next gear in line, and the next, until the spring tension equals the resistance being experienced by the output shaft. As load on the output shaft decreases the tension of the Compression Springs will return the sliding shaft to a higher gear ratio.

Several adjustments are available apart from

spring tension. These are: the position of the lock-nutted Bolt on the Crank slot, the substitution of the Crank by a Double Arm Crank, this will give earlier gear changes. The two 19t Pinions on the forward end of the input shaft can be replaced by either larger or smaller Pinions, giving later or earlier gear changes respec-

tively. The Compression Springs can be added to, and the power take off can be geared. Any of these modifications or combinations of them will enable the basic design to be satisfactorily installed to suit most models, particularly where power rather than speed is required.

To complete these notes on constructing the gearbox, Mr. Smith points out that all Grub Screws marked 'X' in his diagram need to be flush with their bosses and not protruding. The Meccano 7/64th Grub Screw Part 69c will be found suitable for this purpose.



BENNETT MECHANISM, OR SKEW ISOGRAM

'A mechanism for which no application can be found'. That is the astounding claim made by Steve Tonkin of Bristol, in referring to his model of Bennett's Mechanism. Can an application be found? Construct it for yourself and see! The description below has been supplied by

Mr. Tonkin, with photographs kindly supplied by Alan Partridge.

'When I was a schoolboy, more years ago than I care to remember, we had a lecture one evening on 'three-dimensional mechanisms'. Very intrigued by one item described I afterwards made up what I thought it was from Meccano, and showed it to the lecturer. He pointed out that I had got it all wrong, and mutilated the parts with a pair of pliers, after which it worked very smoothly indeed. The

experience was a little traumatic but the mechanism was imprinted on my memory and I resolved to make use of it in later life if I could.

In thirty years of working on aircraft, missiles & spacecraft I have never seen it used, or been able to use it myself, although a colleague thought he once saw it in the steering gear of a toy steam roller. It looks as though there ought to be a use for it in control runs in aircraft, but aircraft draughtsmen are understandably cautious and difficult to convince.

Construction of the demonstration mechanism, (writes 'Spanner'), is probably the easiest

Fig 1: A general view of the mechanism described by Mr. Tonkin. It was originally published in an article by G.T. Bennett in 'Engineering' magazine for the 4th December 1903.

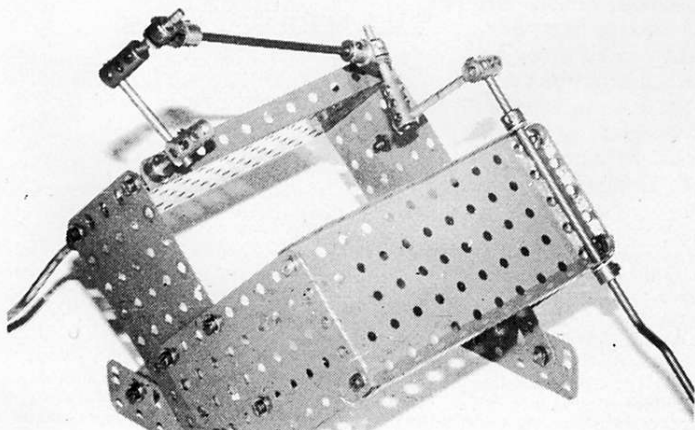
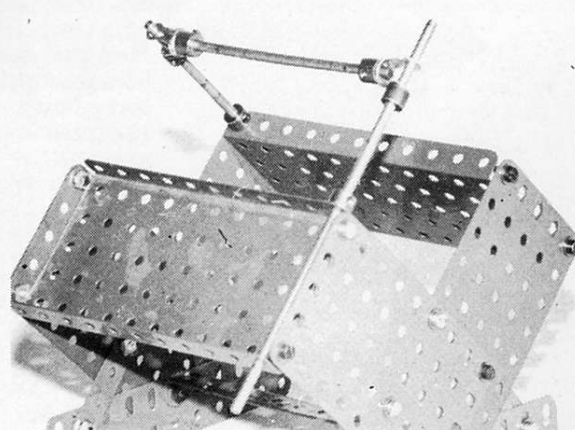


Fig. 2: Recommended method of adjusting the link-rod.

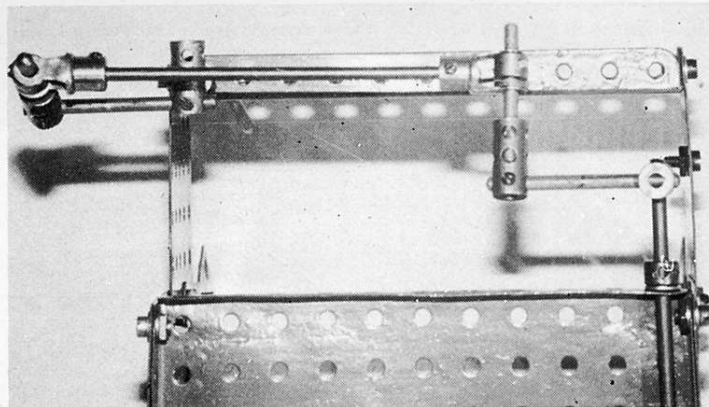


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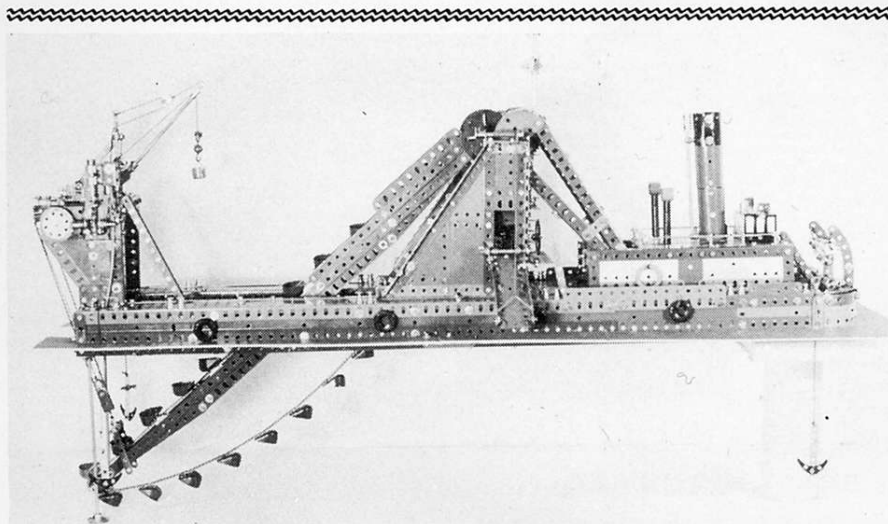


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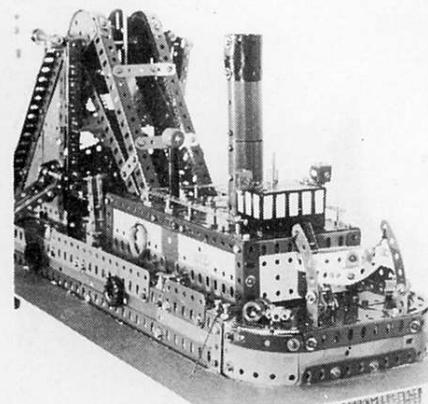
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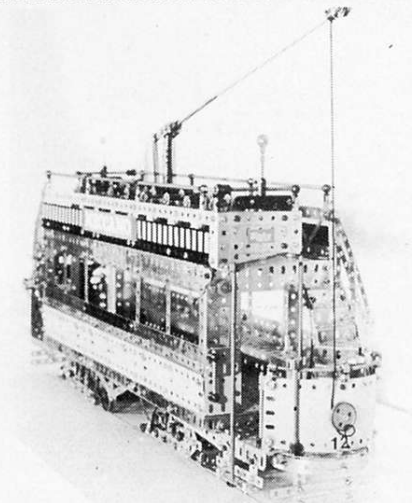
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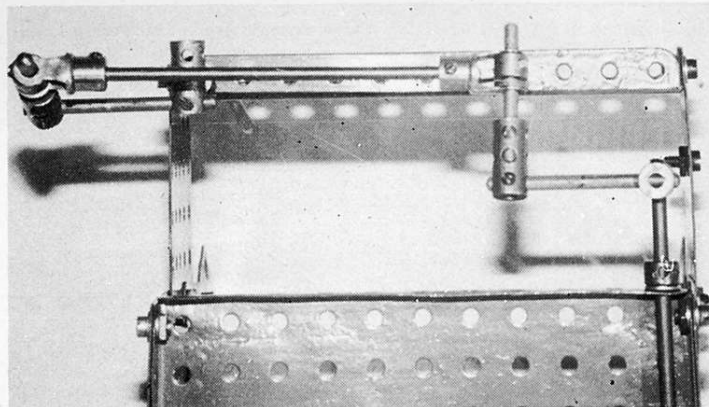
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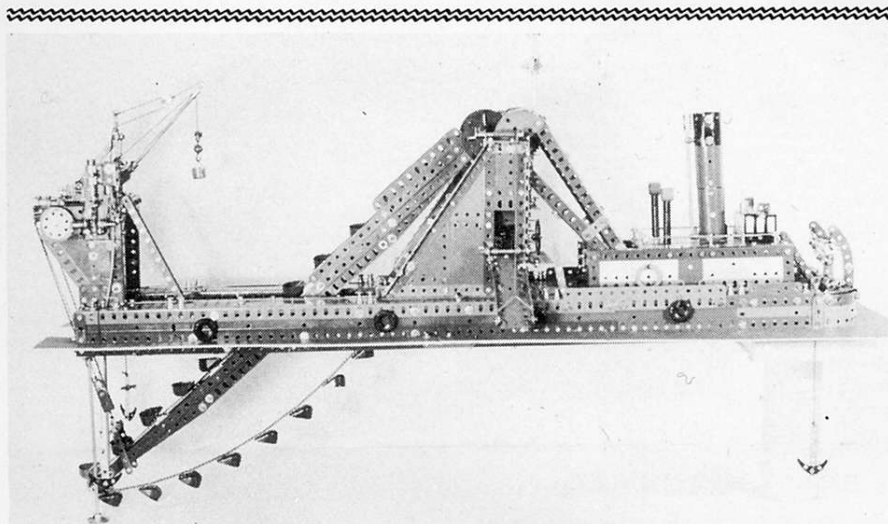


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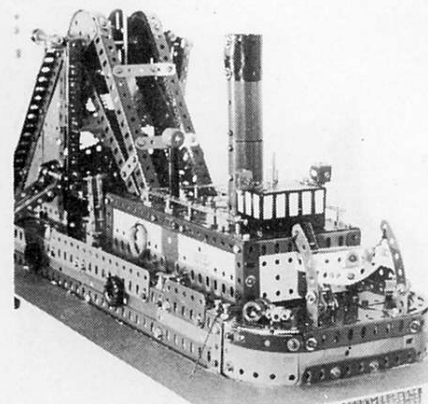
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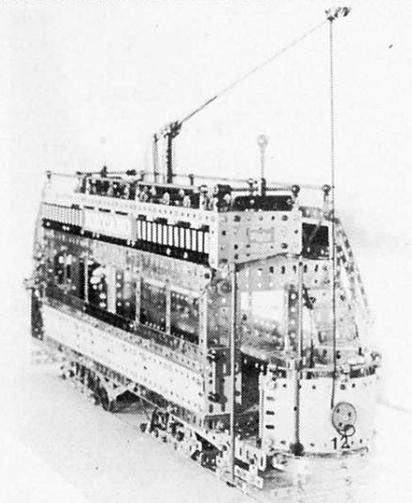
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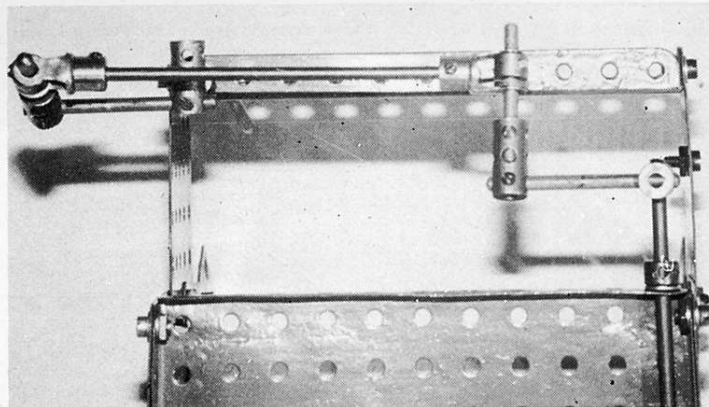
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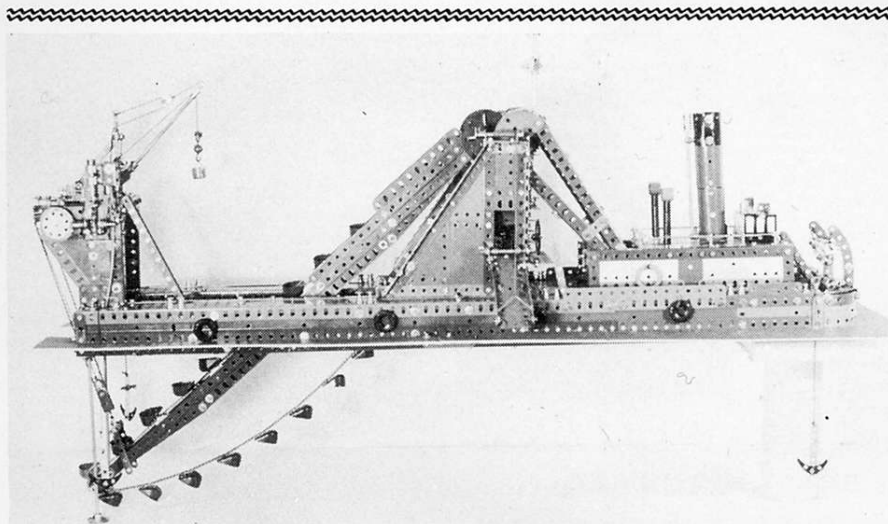


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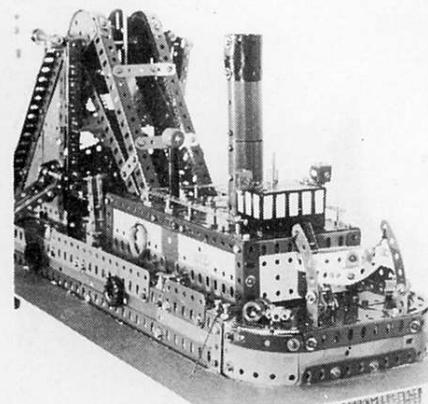
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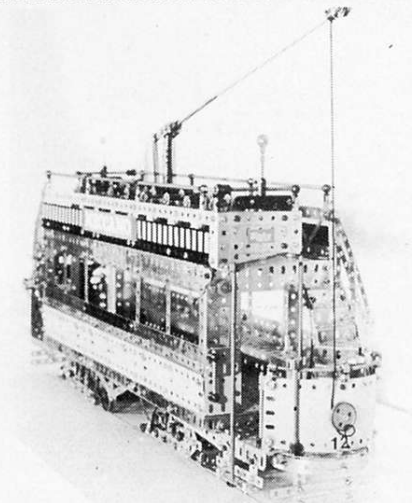
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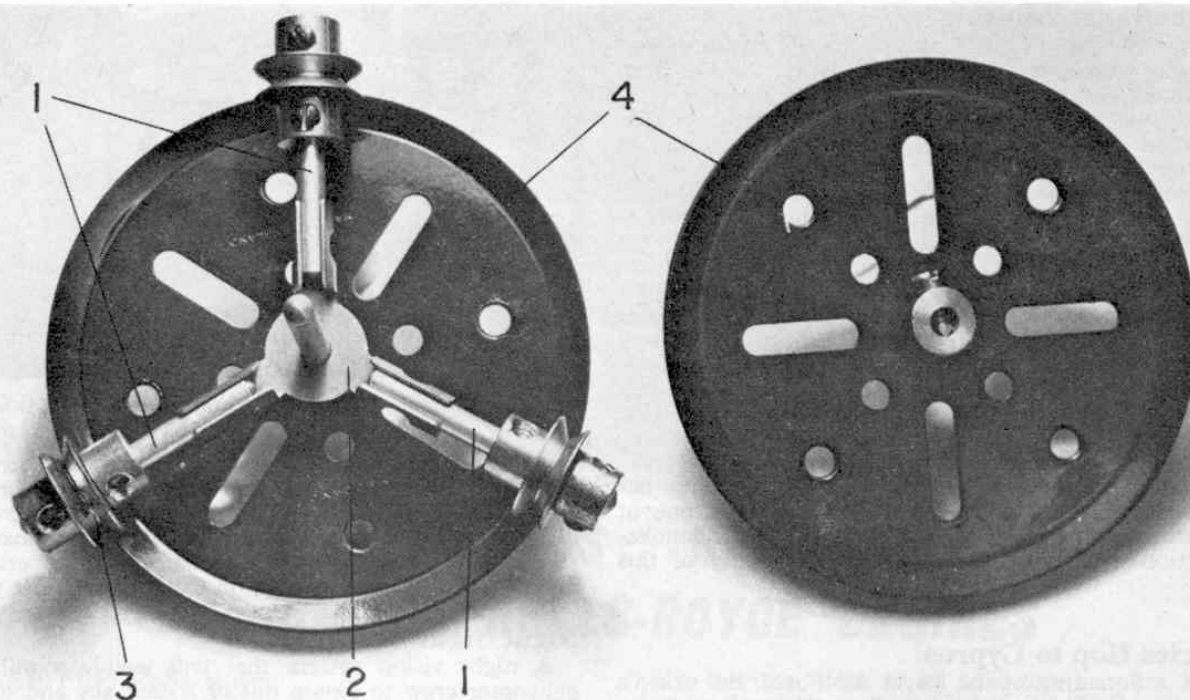


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AMONG THE MODEL BUILDERS with 'Spanner'

COMPACT ROLLER RACE

BECAUSE OF THEIR IMPORTANCE in Meccano modelling, Bert Love devotes this month's Chapter of his Meccano Constructor's Guide to crane turntables, roller races and associated mechanisms. Here, in this article—and at the danger of trying your patience too far!—I have a couple more mechanisms in this line I would like to present. The first, a very simple and compact unit, I feature, not because it is an entirely original idea—it isn't—but because this particular version of a known principle is designed by an 11 year-old enthusiast, C. J. Clotworth of Belfast, Northern Ireland. It just shows you don't need to be growing rather long in the tooth as a modeller before you have enough experience to think of useful ideas!

The Roller Race, itself, is amazingly effective in operation, yet it consists of little more than three $1\frac{1}{2}$ in. Rods 1 inserted one into each arm of a 3-way Rod Connector 2, each Rod being fitted with a free-running $\frac{1}{2}$ in. Pulley 3, held in place by Collars. The whole assembly is mounted between two 3 in. Pulleys 4, Pulleys 3 running on the inside lips of these 3 in. Pulleys. A Rod journalled in the bosses of the Pulleys, and running through the centre of the Rod Connector,

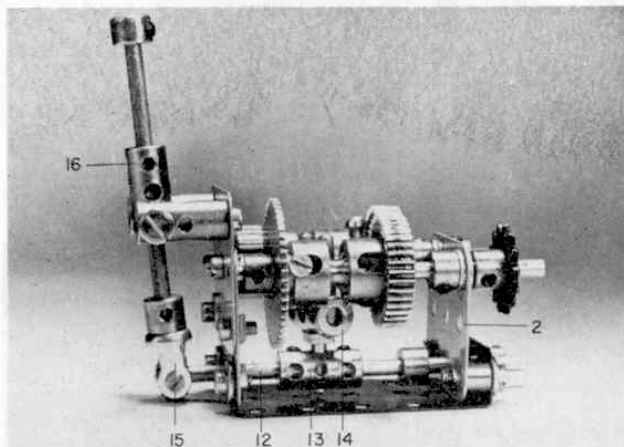
serves to centralise the roller assembly, but remember that at least one of the Pulleys must be completely free on the Rod otherwise the mechanism will not function. That's all there is to it—well done C.J.C.!

ROLLER RACE 2

Our second roller mechanism is really only an extension of the first, with six rollers instead of the original three. As before, each roller is supplied by a free-running $\frac{1}{2}$ in. Pulley without boss 1, mounted on a $1\frac{1}{2}$ in. Rod 2 held in a 3-way Rod and Strip Connector 3, but, in this case, there is no need for the Pulleys to be held in place by Collars as they will be self-locating. Of course, as there are six rollers, two 3-way Rod and Strip Connectors must be used and these must be placed Rod-side to Rod-side so that the Rods interlock on the same level. The resulting "spider" is mounted between two Wheel Flanges 4, the grooves of Pulleys 1 engaging firmly with the flanged parts of the Wheel Flanges and at the same time keeping the Pulleys in place on the Rods.

Although not shown in the accompanying illustration, Bush Wheels or other suitable parts are bolted to the Wheel Flanges to provide centre bosses so that a

centralising Rod may be passed through the Wheel Flanges and Rod and Strip Connectors. Again, remember that at least one of the Wheel Flanges must be left free on this Rod for successful operation.



Left: It may look very simple, but this Roller Race built by 11-year-old G. J. Clotworth of Belfast, is extremely effective in operation. Above: This compact two-speed Gearbox designed by a Lancashire reader, works on the constant mesh principle, as opposed to the mere usual "crash" system.

CONSTANT-MESH GEARBOX

Moving away, now, from roller races, we come to something entirely different: a Two-speed Constant-mesh Gearbox supplied by a Lancashire reader. The joy of this unit is that it does away with the need for a clutch and, because the gears are in constant mesh, completely removes the danger of any gear damage that might result from the "crashing" of the more usual type of gear arrangements.

In operational use the framework for the Gearbox would depend entirely on the parent model, but for the purposes of this article, a mounting is supplied by a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate, to one flange of which a $2 \times 1\frac{1}{2}$ in. compound flat plate 1, built up from two $1\frac{1}{2} \times 1\frac{1}{2}$ in. Flat Plates, is bolted. Fixed to the other flange of the Flanged Plate, but spaced from it by a Collar on the shank of each $\frac{1}{2}$ in. securing Bolt, is a single $1\frac{1}{2} \times 1\frac{1}{2}$ in. Flat Plate 2. Journalled in the upper corner holes of this Plate and in the corresponding holes of plate 1 are two 3 in. Rods 3 and 4, Rod 3 being held in place by two Collars and Rod 4 by a $\frac{3}{4}$ in. Sprocket Wheel 5 and a Collar. Also mounted on Rod 3 are a 1 in. Gear Wheel 6, fixed in place by a standard $7/32$ in. Bolt, and a Socket Coupling 7, in the outside end of which a $\frac{3}{4}$ in. Pinion 8 is secured. Note that the Socket Coupling and Pinion must be free to slide on the Rod.

In the case of Rod 4, this also carries a Socket Coupling 9, this one fitted with a 1 in. Gear Wheel 10, both parts being free to slide on the Rod as one unit. Fixed on the Rod—again by a standard $7/32$ in. Bolt—is a 50-teeth Gear 11. It will be noticed, by the way, that fixed Gears 6 and 11 are situated towards opposite ends of the Gearbox and mesh with the appropriate sliding Gear. These sliding Gears should never disengage the fixed Gears, therefore their travel should be limited to a distance slightly less than the width of Pinion 8.

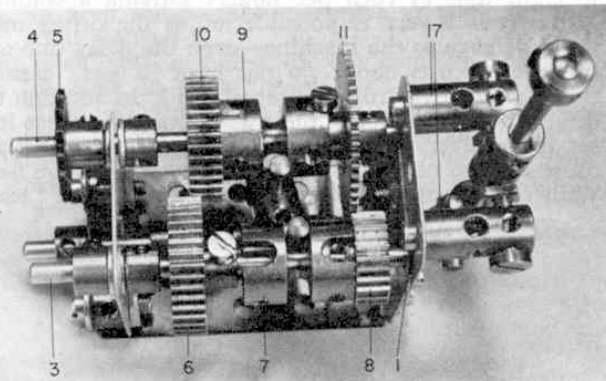
Travel limitation in the model illustrated is easily achieved by the gear-change mechanism, built up from a compound $3\frac{1}{2}$ in. rod 12 mounted in the centre holes of the flanges of the Flanged Plate and prevented from sliding too far by two Collars. The compound rod,

itself, is made up from a 2 in. Rod and a $1\frac{1}{2}$ in. Rod joined together by a Coupling 13, in the centre transverse bore of which a Threaded Pin is held. The threaded shank of this Pin is tightly screwed into the centre tapped bore of another Coupling 14, in the end smooth bores of which two 1 in. Rods are held. These Rods engage in the waists of Socket Couplings 7 and 9.

Fixed on one end of rod 12 is a Swivel Bearing 15, in the boss of which a 3 in. Rod is held to serve as the gear-change lever. Loose on the Rod is a Coupling 16, in the lower end transverse tapped bores of which two Pivot Bolts are held by Nuts, the Pivot Bolts, themselves, being carried in the end transverse bores of two Threaded Couplings 17 fixed to the upper corners of compound flat plate 1. A Collar is mounted on the upper end of the gear-change lever to act as a knob.

Regarding operation of the Gearbox, as all the gears are in constant mesh, actual gear-change is effected by engaging the slot in the free end of one or the other Socket Coupling with the $7/32$ in. Bolt in the boss of the respective fixed Gear on Rod 3 or 4. Thus, when the gear-change lever is pulled back away from the gearbox, the two Socket Couplings are pushed forward away from the lever, engaging Socket Coupling 7 with the Bolt in Gear 6 and, at the same time, moving Socket Coupling 9 away from Gear 11. Socket Coupling 9 and Gear 10, of course, are free to turn on Rod 4 (the output shaft) and can therefore be temporarily discounted as they do not impart any movement to the Rod. However, because Gear 6 is fixed on Rod 3 (the input shaft), its rotary movement when the shaft is turned is transferred through Socket Coupling 7 to Pinion 8. This Pinion meshes with fixed Gear 11 on Rod 4, therefore a ratio of 2 : 1 results.

When the gear-change lever is pushed forward, Socket Coupling 9 engages with the Bolt in the boss of Gear 11, while Socket Coupling 7 disengages with the Bolts in Gear 6. Socket Coupling 7 and Pinion 8, are now free on the Rod and so can, in their turn, be temporarily forgotten. However, fixed Gear 6 meshes with similar Gear 10 and, as the latter Gear is connected by Socket Coupling 9 to fixed Gear 11, drive is transmitted to the output shaft at a ratio of 1 : 1. Neutral occurs where both Socket Couplings are disengaged from their respective fixed Gears. It sounds complicated on paper, but it's easier to follow with the completed Gearbox in front of you!



A top view of the Gearbox showing the layout of the input and output shafts.

PARTS REQUIRED			
3—16b	1—27	1—51	1—96a
1—17	2—31	9—59	1—115
1—18a	9—37a	3—63	2—147b
2—18b	11—37b	2—63c	1—165
1—25	10—38	3—74	2—171

A New Meccano Gears Outfit

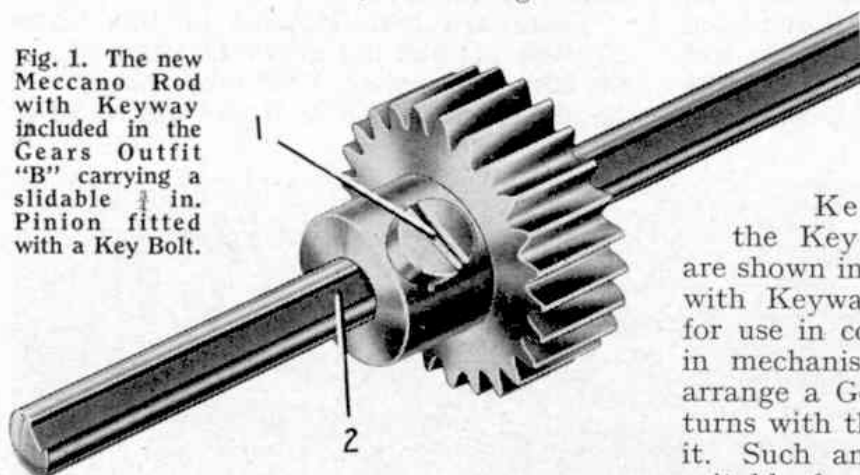
Exciting Possibilities for Model-Building

ONE of the most important additions to the range of Meccano Outfits in recent years was the Meccano Gears Outfit "A." Its appearance gave owners of smaller Meccano Outfits, containing either

assemble with their aid many other types of gear mechanisms, such as gear-boxes, differentials, twin-drive, steering and reversing gears. Examples of all of these

are fully described and illustrated in the very attractive Book of Instructions included in the Outfit.

Fig. 1. The new Meccano Rod with Keyway included in the Gears Outfit "B" carrying a slidable $\frac{1}{2}$ in. Pinion fitted with a Key Bolt.



Now I want to refer specially to the new Rod with Keyway (Part No. 230) and the Key Bolt (Part No. 231), which are shown in Fig. 1 on this page. The Rod with Keyway is 4" long and is intended for use in conjunction with the Key Bolt in mechanisms where it is necessary to arrange a Gear or Pinion so that while it turns with the Rod it is free to slide along it. Such an arrangement is particularly suitable for use in gear-boxes. The Key Bolt is marked 1 in Fig. 1, and the Rod with Keyway is marked 2.

To use the Key Bolt it is screwed into one of the threaded holes in the Gear or Pinion, so that the spigot at the end of

no gears or only a few, the chance to build up more exciting drives for their models.

In the Meccano world we are always striving for improvement and now we have designed a new Gears Outfit, known as Gears Outfit "B," that will be even more valuable to model-builders. It contains a carefully selected assortment of standard Meccano gears and other parts designed to allow these to be used with the greatest effect. In addition, it includes two entirely new Meccano parts, known as the Rod with Keyway and the Key Bolt respectively, while a Compression Spring and four Collars also have been added. Every model-builder indeed should get the two new parts, for they will open up new fields for exciting experiments in the construction of mechanisms.

When a Clockwork or Electric Motor is used to drive a model, even a small and simple one, the best results are obtained when suitable speed reduction gearing is arranged in the drive. All the gears required to assemble such reduction gearing are provided in this Outfit, and in addition it is easy to

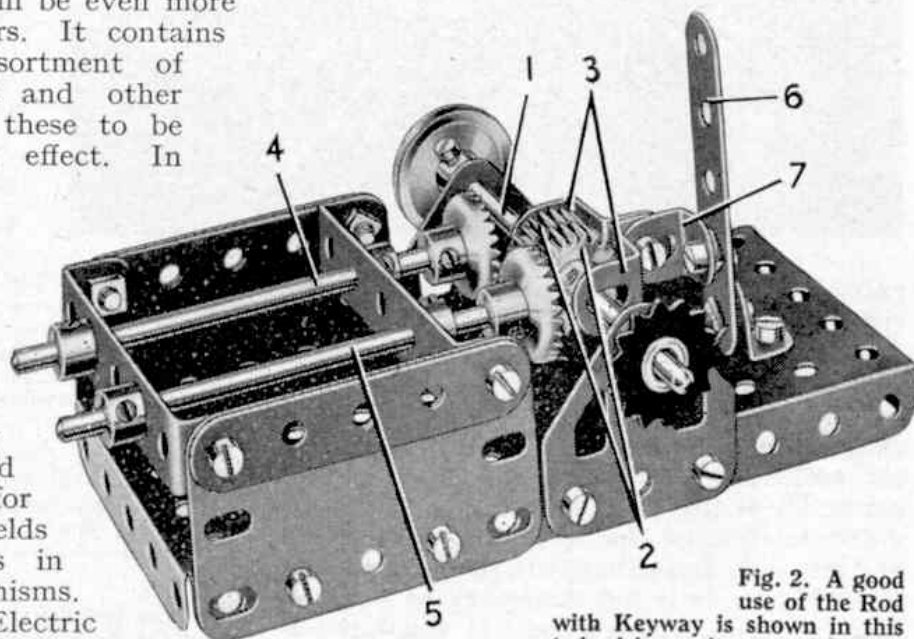


Fig. 2. A good use of the Rod with Keyway is shown in this twin-drive unit.

the Key Bolt enters the Keyway in the Rod with Keyway. The spigot does not grip the Rod, even when it is screwed down tight, but the fact that it projects into the Keyway or groove ensures that

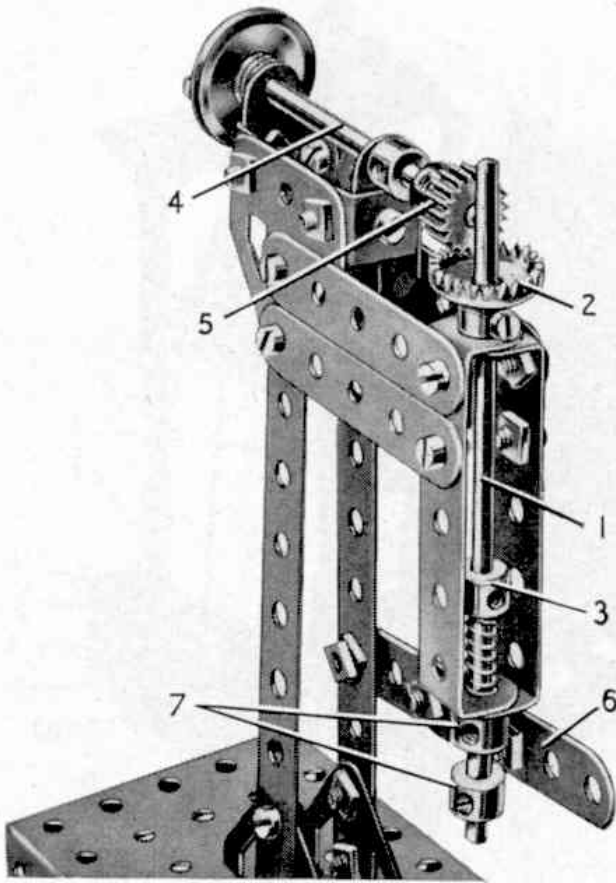


Fig. 3. An application of the Rod with Keyway to form the drill spindle of a model drilling machine. By its use the spindle is free to rise and fall without interruption to the drive.

the Gear or Pinion turns with the Rod. Several applications of the Rod with Keyway are shown in the Gears Outfit "B" Instructions Book and three examples are shown in Figs. 2, 3 and 4 on these pages.

Fig. 2, from the Instructions Book, illustrates how to build with the gears in the Outfit a Twin Drive Unit that will be found useful in many models such as cranes, in which it is necessary to drive two separate movements from a single Motor. With this mechanism a drive can be transmitted to two shafts, either independently or together; and one of these shafts can be used to operate the hoisting movement of a crane, while the other controls raising and lowering of the jib.

The second mechanism, also taken from the

Instructions Book, shows how a drive can be transmitted to a Rod that must be free to slide in its bearings. This particular example is a drive to the shaft of a model drill, and shows how the Rod with Keyway and the Key Bolt enable the shaft to be raised or lowered without affecting the drive.

The gear-box for model vehicles shown in Fig. 4 has been designed as a further example of the way in which the new Rod with Keyway can be used with standard Meccano gears in the assembly of compact mechanisms of various kinds. This gear-box provides three forward speeds and a reverse drive, and it requires a few gears in addition to those contained in the Gears Outfit "B." It serves to illustrate how easily the new parts can be used not only with the parts in the Gears Outfit but with other parts in the Meccano System.

Referring to Fig. 4 the gear-box input shaft is a Rod 1 that carries a $\frac{1}{2}$ " Pinion in constant mesh with a 57-tooth Gear on a Rod with Keyway 2. The other gears on the Rod with Keyway are free to slide but they are made to turn with the Rod by Key Bolts screwed into their bosses. The sliding gears are grouped in pairs, and each pair is linked by connecting arms to a selector shaft. The sliding gears can be moved into mesh with corresponding gears on the output shaft 3. The movement of the selector shafts is controlled by the gear lever 4, which is universally mounted.

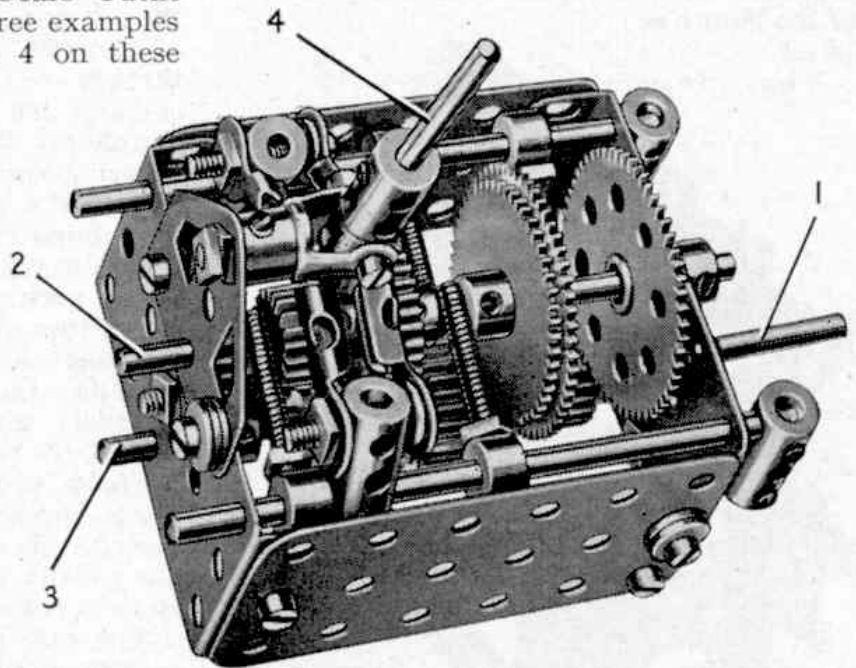


Fig. 4. One of the most useful applications of the Rod with Keyway is to be found in gear-boxes. It is used in this three-speed and reverse example, and helps in keeping it compact.

Among the Model-Builders

By "Spanner"

A Pre-Selector Gear-Box

Some time ago I had a visit from C. Horsford, Liverpool, a keen model-builder who delights in the construction of intricate mechanisms. He brought along to show me his latest effort, a pre-selector gear-box, which he had constructed on a large scale for the purpose of demonstrating the principles and action of such a mechanism. This month I am able to illustrate this mechanism in Figs. 1 and 2 and I hope that the few details of its main features that follow will be of interest to other readers and will spur them on to experiment with similar attractive and fascinating constructions.

The gear-box provides four forward speeds and a reverse drive, each ratio having its own planetary gear train. The gear trains for the forward speeds are similar in general arrangement, and it is proposed to describe only one of them in

of a Face Plate 2 freely mounted on the input shaft 1. A Gear Ring is connected to a Strip by long Bolts, and a Bush Wheel bolted centrally to the Strip serves as

a bearing to support the Gear Ring on Rod 1. The Gear Ring assembly must be free to rotate on the Rod. In the gear train under consideration two 1" Gears 3 are fixed on 1" Rods mounted in outer, opposite holes in the Face Plate 2. The 1" Rods are held in place by $\frac{1}{2}$ " Pinions 4, which engage the Gear Ring, and the Gears 3 mesh with another 1" Gear fixed on the Rod 1. The three other forward speeds can be obtained by using $\frac{1}{2}$ "

Pinions and a 57-tooth Gear, $\frac{3}{4}$ " Pinions and a 50-tooth Gear, and a $\frac{7}{16}$ " Pinion and a 60-tooth Gear instead of the 1" Gears mentioned in the gear train described above.

The reverse gear train 6 consists of a Face Plate 7 and a Gear Ring mounted as described previously. Four $\frac{1}{2}$ " Pinions are fixed on 1" Rods mounted in a line across the Face Plate. The inner pair of Pinions mesh with a $\frac{1}{2}$ " Pinion on the Rod 1 and the outer pair engage the Gear Ring.

The Face Plates of the four forward gear trains are coupled together in pairs, each pair having a 2" Sprocket attached to them. These Sprockets are connected by Chain to Sprockets on the output shaft 10. The reverse Face Plate 7 also is attached to a 2" Sprocket that is connected by Chain to the output shaft.

The gear ratio required is engaged by preventing the appropriate Gear Ring from turning. A selector lever 12 is arranged to slide two Couplings 11 on a



Claude Giasson, St. Hyacinth, Canada, who has won prizes in Meccano Competitions.

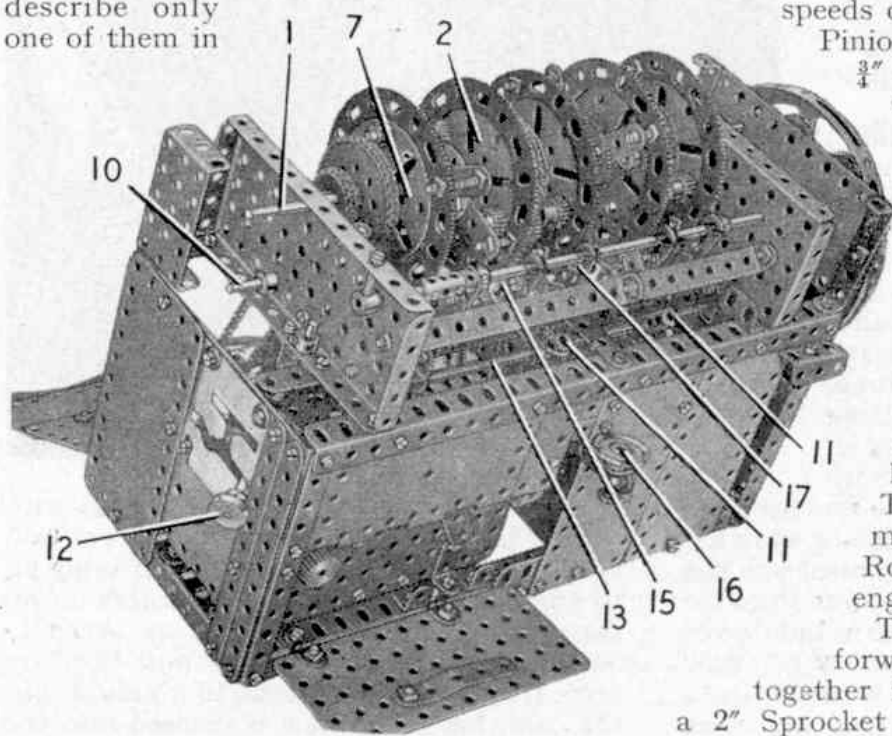


Fig. 1. The pre-selector gear-box built for demonstration purposes by C. Horsford, Liverpool.

detail. The other three can be made in practically the same way but by altering the sizes of the gears different speed ratios can be obtained.

Each of the forward gear trains consists

Rod 13, so that one of these Couplings is brought in line with the appropriate Gear Ring. When the control pedal 16 is depressed, this Coupling raises one of five $3\frac{1}{2}$ " Strips pivoted on Rod 14, which

then turned in the same way as a Screwdriver to tighten the bolt.

Pincer Grab for Cranes

In actual practice cranes used for handling loads of particular kinds are often fitted with special equipment designed to speed up the loading and unloading operations. Among these special fittings are grabs for handling loose material in bulk, such as coal, gravel, etc., and pincer grabs to hoist loads such as blocks of stone. A simple pincer grab made with Meccano is shown in Fig. 4. The construction is easy but it will readily lift imitation stone blocks made from wood or other suitable material, and will add to the interest of a model crane designed for loads of this kind.

The two arms of the grab are each made from a $3\frac{1}{2}$ " Strip and a $2\frac{1}{2}$ " Curved Strip. End Bearings bolted to the Curved Strips carry Centre

Forks that form the jaws of the grab. The arms are freely connected by a lock-nutted bolt 1. A $2\frac{1}{2}$ " Strip 2 is lock-nutted to the upper end of each arm, and the upper ends of these Strips are connected by a lock-nutted bolt that supports also a Fishplate 3. This Fishplate is used to attach the grab to the crane hook.

Models of grabs used for handling bulk materials such as coal, iron ore, etc., can be made quite easily with even a fairly small Outfit, and some interesting operating schemes can be devised for grab cranes. This type of grab should be made in two sections hinged together at their upper ends. The main suspension Cord should be attached

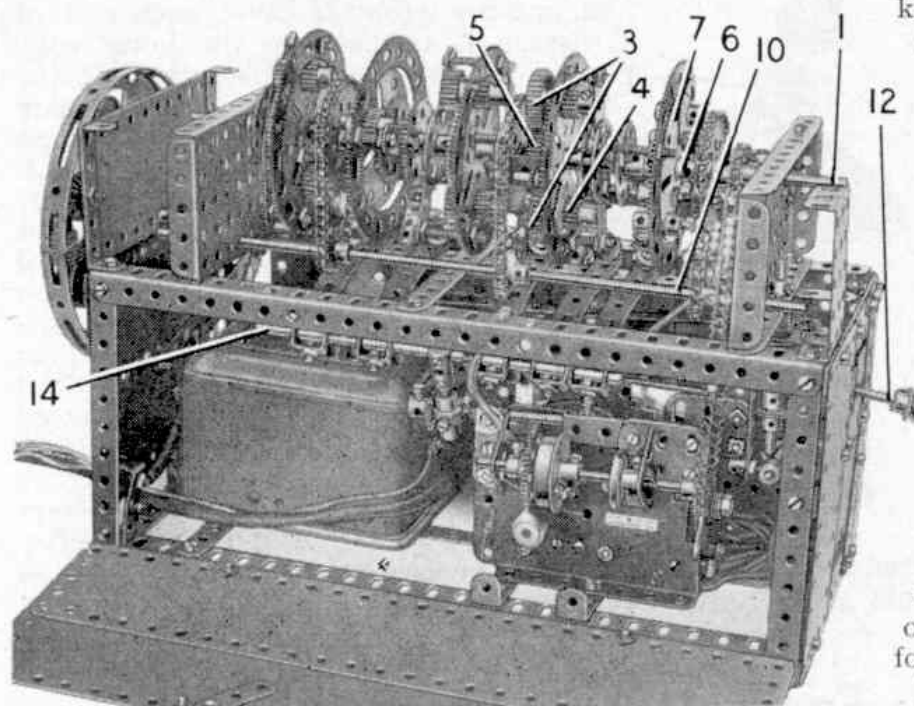


Fig. 2. The pre-selector gear-box seen from the other side, with part of the casing removed.

brings an Angle Bracket 15 into engagement with the Gear Ring and prevents it from turning. The Angle Bracket is bolted to a $1\frac{1}{2}$ " Strip 17.

A Useful Accessory

From time to time I have given details of hints on placing nuts and bolts in inaccessible positions in models. The most useful tool for dealing with nuts in awkward places is the Box Spanner, Part No. 34b, with which most model-builders will be familiar. Very often however, it is necessary to tighten a bolt placed in such a position that it is difficult to insert and turn the standard Screwdriver. The simple tool shown in Fig. 3 should prove very useful in these circumstances.

A Coupling 1 is fixed at one end of a long Rod, and a Rod 2 is passed through one end of the Coupling and is held in place by a Collar and a Gear. The lower end of the Rod 2 should be filed to the same shape as the blade of a screwdriver. The tool is used by holding the long Rod in one hand and inserting the filed end of the Rod 2 in the slot of the bolt to be tightened. The Gear is

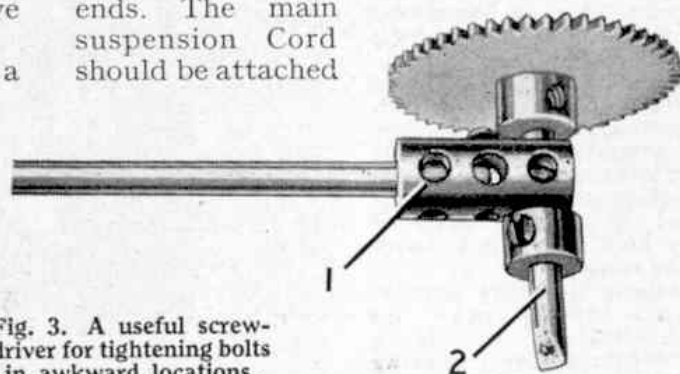


Fig. 3. A useful screwdriver for tightening bolts in awkward locations.

Among the Model-Builders

By "Spanner"

A COMPACT EPICYCLIC GEAR-BOX

In the February, 1956, issue I included pictures and brief details of an interesting four-speed and reverse pre-selector gear-box constructed recently by C. Horsford Liverpool. The gear-box was of the

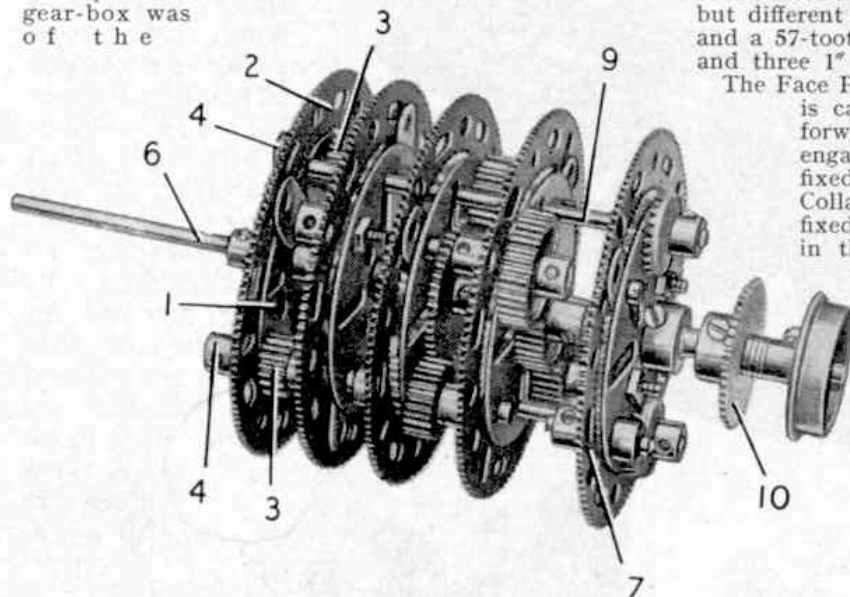


Fig. 1. A four-speed and reverse pre-selector gear-box designed and constructed by C. Horsford, Liverpool.

epicyclic type and was arranged in a special housing so that it could be used for demonstration purposes. The gear-box itself however was unsuitable for use in a model vehicle owing to its size. Since the original mechanism appeared I have had another visit from Horsford, who brought along an improved version of the gear-box with the important advantage that the overall size had been greatly reduced. Although still large compared with the more usual type of gear-box, the size has been reduced to proportions that permit the mechanism to be fitted to large models of vehicles such as tankers, where the arrangement of the body provides sufficient room. The improved epicyclic gear-box is shown in Figs. 1 and 2.

As in the case of the previous mechanism a separate epicyclic assembly is used for each ratio. The assemblies for each of the four forward speeds are similar in general design and differ only in the sizes of the Gears and Pinions used. It is necessary therefore to describe only one forward gear train and the reverse gear assembly in detail.

Each of the forward speed gear trains consists of a Face Plate 1 located inside a Gear Ring 2 by two pairs of Fishplates bolted to the Face Plate. The Fishplates in each pair are spaced apart by two Washers on the bolt and are arranged so that they are located one on each side of the Gear Ring. Two $\frac{1}{2}$ " Pinions 3 are fixed on 1" Rods mounted in holes in

the Face Plate, and these Rods carry also two $\frac{7}{16}$ " diameter Pinions 4. The Pinions 3 mesh with the inner teeth of the Gear Ring and the Pinions 4 engage a 60-tooth Gear 5 fixed on the input shaft 6. This assembly provides the top gear train of the mechanism.

The three remaining forward gear trains are constructed in the same way as the top gear assembly, but different ratios are obtained by using $\frac{1}{2}$ " Pinions and a 57-tooth Gear, $\frac{3}{4}$ " Pinions and a 50-tooth Gear and three 1" Gears.

The Face Plate assembly of the reverse gear train 7 is carried out in the same way as for the forward gears, but two $\frac{1}{2}$ " Pinions 8 that engage the inner teeth of the Gear Ring are fixed on 1" Rods held in the Face Plate by Collars. The Pinions 8 engage similar Pinions fixed on Threaded Pins passed through holes in the Face Plate, and the latter Pinions mesh with another $\frac{1}{2}$ " Pinion fixed on the input shaft 6. When all the gear trains are mounted on shaft 6, the five Face Plates are coupled together by two 4" Rods 9 held in the reverse gear Face Plate by a Collar and a $\frac{3}{4}$ " Contrate each. The drive from the gear-box is taken from a Gear 10 coupled to the reverse gear Face Plate by a Socket Coupling.

The gear required is engaged by preventing the appropriate Gear Ring from turning by

means of a suitable selector mechanism.

A NOVEL TOY FOR YOUNG MODEL-BUILDERS

Fig. 3 illustrates a simple but effective model of a ticket issuing machine of the kind used by many public transport companies. This attractive little model is the result of a combined effort by Mr. J. H. Hammond, Slough, and his son. The main details of the machine will be clear from the picture, but the following notes may be helpful to model-builders who wish to make the machine for themselves or for younger brothers and sisters.

A roll of paper is carried on a $3\frac{1}{2}$ " Rod that is

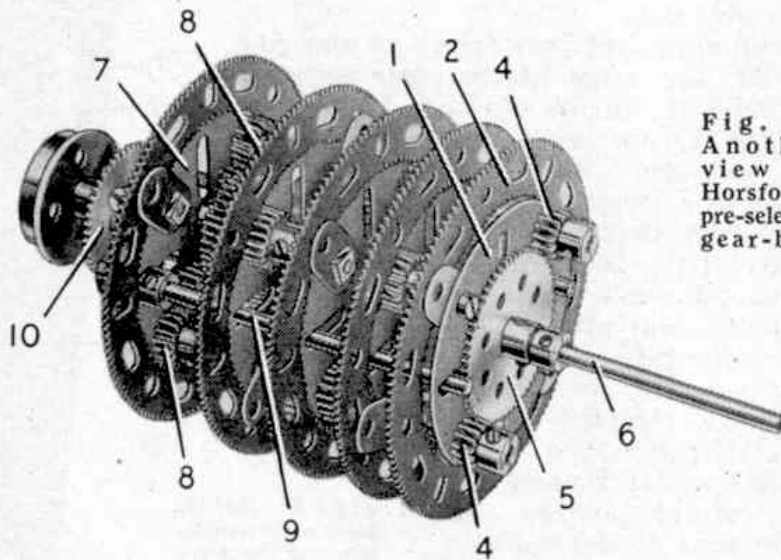


Fig. 2. Another view of Horsford's pre-selector gear-box.



These two smiling Mexican boys won prizes in a recent Meccano Competition. They are (left) Jose Lopez de Lara and (right) Jaime Lopez de Lara, and they live in Guadalajara.

supported in $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates bolted to a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. The free end of the roll is passed round three 1" Pulleys, each fitted with a Rubber Ring and fixed on a Crank Handle. The paper is pressed lightly against the Rubber Rings by a Flat Trunnion bolted to a $2\frac{1}{2}''$ Strip, which is supported by a Double Angle Strip. The roll of paper is located between two $5\frac{1}{2}''$ Strips passed over the $3\frac{1}{2}''$ Rod and the Crank Handle and held in place by Spring Clips. A stop to control the length of ticket issued is provided by a 2" Rod that slides in Angle Brackets and engages the set screw in a Bush Wheel fixed on the Crank Handle.

This simple model will provide a lot of fun for the younger members of the family, and it can be built entirely with parts in a No. 1 Outfit.

A FRICTION DRIVE MECHANISM FOR USE WITH A MAGIC CLOCKWORK MOTOR

Some time ago I received a letter from an overseas reader of the *M.M.*, Mr. J. H. Dodwell, San Fernando, Trinidad, whose son is a keen Meccano model-builder. Mr. Dodwell obtained a *Magic Clockwork Motor* to drive the models his son builds, but as this Motor is non-reversing
s o m e

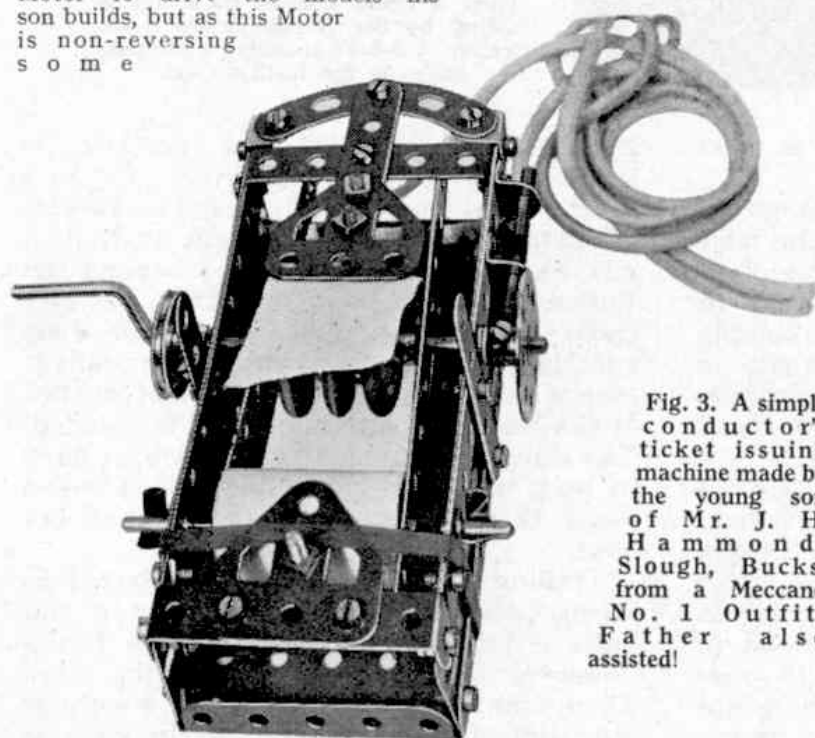


Fig. 3. A simple conductor's ticket issuing machine made by the young son of Mr. J. H. Hammond, Slough, Bucks, from a Meccano No. 1 Outfit. Father also assisted!

difficulty was experienced in using it in cranes, in which it is necessary to raise and lower a load. Mr. Dodwell set to work to solve the problem, and sent me details of the ingenious mechanism he devised specially for cranes operated by a *Magic Clockwork Motor*. With this arrangement the Motor is used to raise the load and a simple device is included to disconnect the drive to the winding shaft to allow the load to be lowered under its own weight.

The mechanism is shown in Fig. 4, and it will be seen that the Motor is bolted to a baseplate and is connected by a Driving Band to a $\frac{1}{2}''$ fixed Pulley 1 on a $3\frac{1}{2}''$ Rod. This Rod is supported in two Flexible Plates strengthened by $2\frac{1}{2}''$ Strips, and Spring Clips are used to hold the Rod in place. The winding shaft is a $3\frac{1}{2}''$ Rod that carries a 1" Pulley fitted with a Motor Tyre 3. At one end this Rod is mounted in a $2\frac{1}{2}''$ Strip that covers the slotted hole in one of the Flexible Plates, but at the other end the Rod is

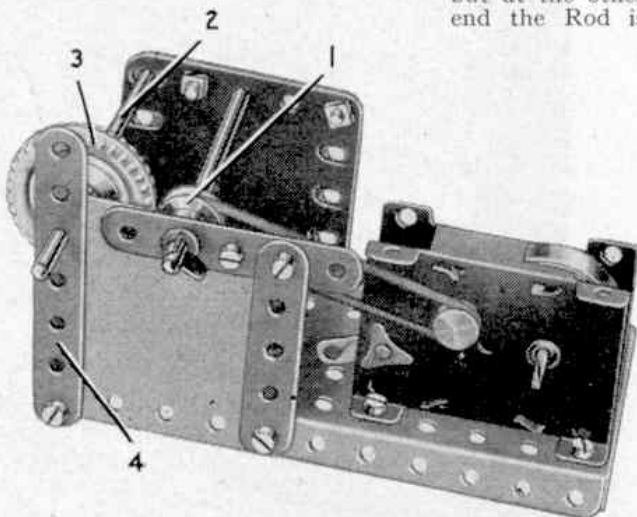


Fig. 4. A friction drive mechanism that gives some advantages of a reversing motor to the non-reversing *Magic Motor*.

mounted in the slotted hole in the Plate. The Rod 2 is therefore free to slide slightly in the slotted hole, and the Tyre 3 can be moved into contact with the Pulley 1 to complete a friction drive arrangement. When the Tyre is moved away from Pulley 1 the drive is disconnected and Rod 2 is free to turn in its bearings.

The sliding movement of Rod 2 can be controlled by a lever 4 consisting of a $3\frac{1}{2}''$ Strip. This Strip is passed over Rod 2 as shown and it is pivoted on a bolt attached to the base by two nuts.

In addition to its use in model cranes, this simple mechanism has other applications in model-building. For example it can be used with a *Magic Clockwork Motor* for operating the striker in a pile driver or the lifts in a model elevator. It should therefore appeal to all owners of *Magic Motors* in view of the wider scope that it provides for the use of this handy power unit.

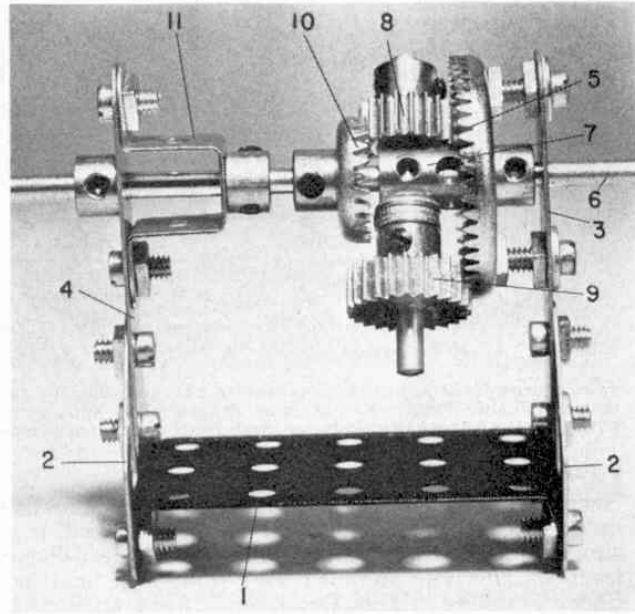
to rotate and, with it, $\frac{1}{2}$ in. Pinion 8. This Pinion, as it rotates, runs around Contrate 10 causing the output shaft to turn as it does so. The input and output shafts, by the way, are shown in the following parts list as $3\frac{1}{2}$ in. Rods, but, in a model their length would of course be dictated by requirements.

Gearbox from Hungary

For our final offering this month we again draw on the ideas of Hungarian modeller Andreas Konkoly of Budapest—a gentleman very well known in Meccano circles for his magnificent "Meccanograph" designing machines. The mechanism featured here, however, has nothing to do with this subject, but is, in fact, a gearbox which Mr. Konkoly tells me is "especially suitable to be built into Meccano motor car models". With six forward and three reverse ratios it might well be used for inclusion in heavy vehicles, although it is a little out of the ordinary in that it includes two gear-change levers.

As far as construction is concerned, a framework is produced from two $7\frac{1}{2}$ in. Strips, attached by Angle Brackets at one end to two $1\frac{1}{2}$ in. Flat Girders 1 and, at the other end, also by Angle Brackets, to another $1\frac{1}{2}$ in. Flat Girder 2 extended upwards by a Flat Trunnion 3. Two $1\frac{1}{2}$ in. Angle Girders 4 are bolted one each to Flat Girder 2 and Lower Flat Girder 1, while two 1×1 in. Angle Brackets 5 and 6 are bolted to one of the $7\frac{1}{2}$ in. Strips, the end securing Bolt in the case of Bracket 5 also helping to fix between the Strips a $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 7. The other Bolt holding this Double Angle Strip also fixes a left-hand Corner Angle Bracket 8 to the outside of the other $7\frac{1}{2}$ in. Strip, while a $1\frac{1}{2}$ in. Flat Girder 9 is bolted to the back of the Double Angle Strip. Bolted between the centres of the $7\frac{1}{2}$ in. Strips are two Double Brackets, the lugs of which are joined by a $1\frac{1}{2}$ in. Strip 10 and a Flat Trunnion 11, then a right-hand Corner Angle Bracket is secured to the appropriate $7\frac{1}{2}$ in. Strip to complete the framework.

Now mounted in Flat Girder 2 and Angle Bracket 6 is a 3 in. Rod serving as the input shaft and carrying in the positions shown a 1 in. Gear 12, a $\frac{3}{4}$ in. Pinion 13 and a $\frac{1}{2}$ in. Pinion 14. This latter Pinion, together with a Collar 15, holds the Rod in place. The Rod is next inserted, free, part way into the bore of a $\frac{1}{2} \times \frac{3}{4}$ in. Pinion 16 fixed on one end of a 4 in. Rod 17 journalled in Flat Trunnion 11, Strip 10 and Double Angle Strip 7. Fixed on this Rod are a $\frac{3}{4}$ in. Pinion 18 and a $\frac{1}{2}$ in. Pinion 19, positioned as shown, the Rod then being inserted, free, part way into the bore of another $\frac{1}{2}$ in. Pinion 20, fixed on the end of the output shaft. This output shaft, supplied by a 2 in. Rod journalled in Flat Girders 1 and Angle Bracket 5, also carries a $\frac{3}{4}$ in. Pinion 21 and is held in place by a Collar outside the framework.



At this stage the sliding layshafts can be added, but, first, an "idler" $\frac{1}{2}$ in. Pinion 22 for the reverse gears is mounted loose on a $\frac{3}{4}$ in. Bolt held by two Nuts in Flat Trunnion 3, the Pinion meshing with Pinion 14 on the input shaft. With this done, the associated layshaft, supplied by a $4\frac{1}{2}$ in. Rod 23, is mounted in Flat Trunnions 3 and 11. Fixed on this Rod are a $\frac{1}{2}$ in. Pinion 24, a 50-teeth Gear Wheel 25, a 1 in. Gear 26, a Socket Coupling 27 and a 57-teeth Gear 28, Gears 26 and 28 being fixed in opposite ends of the Socket Coupling as well as to the Rod. A Collar 29 outside Flat Trunnion 3 prevents the Rod from sliding too far during gear change.

For the other sliding layshaft a 4 in. Rod 30 is used, this being journalled in upper Flat Girder 1 and Flat Girder 9. Mounted on the Rod between the Girders are a $\frac{3}{4}$ in. Pinion 31 and a $\frac{1}{2}$ in. Pinion 32, a second $\frac{1}{2}$ in. Pinion 33 being mounted on the Rod outside the Girders. Clamped against this Pinion by a Collar is a Crank 34 between two Washers, the Rod passing through the centre hole in the arm of the Crank. Note that the Pinions on this layshaft must, in due sequence, mesh with the Pinions on the Rods beneath them and for this reason full use must be made of the elongated holes in the Flat Girders to ensure that there is sufficient room for the Pinions to mesh.

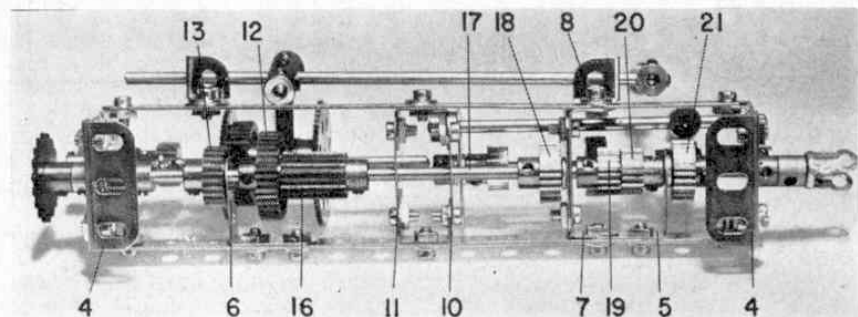
Fixed in the boss of Crank 34 is a 4 in. Rod 35, sliding in the end holes of Flat Girders 1 and 9. Secured on this Rod is a Short Coupling, in the longitudinal bore of which a 3 in. Rod 36, forming one gear-

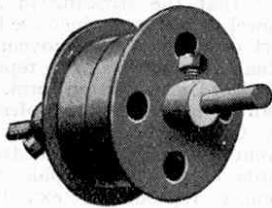
Above right:

W. Dixon of Ash Vale, nr Aldershot, Hampshire, takes full credit for this interesting Epicyclic Reversing Mechanism. The advantage of this type is that it does not employ a system of gears on a parallel shaft as is often the case when in-line drive is required.

Right:

An underside view of Mr. Konkoly's Gearbox showing the composite input/intermediate/output shafts.





Meccano Belt Pulley, constructed from two Flanged Wheels

Suggestions Section

Edited by "Spanner"

(75)—Epicyclic Gear Clutch

(C. Potter, Streatham, S.W.16)

AN efficient clutch movement that will permit the driving power to be applied gradually to the load, or resistance that is to be overcome, should form a valuable addition to a large number of Meccano models.

During the past few months we have received very many suggestions for frictional clutches with which this result may be obtained, and we intend to deal with one or two in a special article in the near future. The majority of the suggestions depend for their action, however, upon the friction created between two revolving surfaces, one of which may be pressed against the other with varying force, and in order to secure the best possible results from such a device one of the frictional surfaces should be of some special material, such as rubber or leather, as in actual practice. On the other hand there is another form of clutch that employs spur gearing with which to obtain the required results. This is known as an epicyclic or "planetary" gear clutch, and C. Potter's model, which is here illustrated shows that it can be reproduced perfectly with standard Meccano parts.

As a rule, ordinary straight-toothed gear wheels are used in actual practice. This means that the Contrate Wheel 3 of the Meccano model would be replaced by a gear wheel and the axles of the Pinions 4 would be parallel to the shafts 1 and 2 instead of at right-angles to them. But this would necessitate the use of an internally-toothed gear wheel of sufficient diameter to completely encircle the gear wheel 3 and its pinions, the outer teeth of which it would engage. It is to obviate the necessity of such a part that the second Contrate Wheel 8 has been introduced. Incidentally, this explanation should make the description "planetary" more obvious, for the movement of the pinions round the gear wheel is similar to the "Sun and Planet Motion" described in the May (1926) Suggestions Section.

Construction of the Model

Two Rods 1 and 2 are mounted in direct line with one another in any suitable bearings. The Rod 1 is the primary, or driving shaft and Rod 2 is the secondary, or driven shaft. The former is gripped by the set-screw of a $1\frac{1}{2}$ " Contrate Wheel 3, the teeth of which engage with $\frac{1}{2}$ " Pinions 4 mounted on 1" Axle Rods secured in the ends of a Coupling 5. The grub screws having been removed, the Pinions are free to revolve on their axles, but they are held in place by the Collars 6.

The Rod 2 passes through the bosses of a $1\frac{1}{2}$ " Pulley Wheel 7 and the second $1\frac{1}{2}$ " Contrate Wheel 8, and its inner end is secured in the centre transverse hole of the Coupling 5. The set-screws

of the Pulley 7 and Contrate Wheel 8 are removed so that both wheels are free to turn independently of the Rod 2. They are secured together, however, by means of two $\frac{1}{2}$ " Bolts, each of which is equipped with three nuts, one immediately behind the Pulley 7 and one on each side of the Contrate Wheel 8.

The unit 7 and 8 is so placed upon the Rod that the teeth of the Contrate Wheel 8 are in constant engagement with the $\frac{1}{2}$ " Pinions 4. The movement of the Wheel 7 is controlled by a friction

brake consisting of a length of cord, one end of which is tied to an Angle Bracket 9 in the base of the model and the other end to a Threaded Boss 10 mounted on a Threaded Rod journaled in a convenient position near the wheel 7. This Rod carries a hand wheel 11 and is prevented from moving longitudinally in its bearings by a pair of Collars with set-screws. It will be seen that this brake resembles Standard Mechanism No. 86 (Strap and Screw Brake).

If the brake is in the "off" position, that is with cord slack, the unit 7 and 8 is quite free to revolve about the Rod 2. Hence if power is applied to the

Contrate Wheel 3 the Pinions 4 commence to turn upon their axles, driving the Contrate Wheel 8 in an opposite direction, and no movement is imparted to the Rod 2.

Suppose that the hand wheel 11 is rotated in a clockwise direction, so gradually applying a braking effect on the Pulley 7. The Contrate Wheel 8 now becomes increasingly difficult to turn, and the Pinions 4 commence to climb round its teeth, thereby rotating the Coupling 5 and the Rod 2.

It will be seen from the above that by means of this clutch the power can be applied to the load very smoothly and without shock, for the Rod 2 commences to rotate immediately the resistance on the Pulley 7 becomes greater than the load (that is the resistance on Rod 2). The speed of the latter Rod increases in proportion to the increase in the resistance on Pulley 7 and the maximum speed is reached when the movement of the Pulley ceases altogether. It should be noted that the arrangement of the gearing is similar to that described under Suggestion No. 70 (Epicyclic Transmission Gear) and a ratio of one in two is obtained when the unit 7 and 8 is immovable—that is, the Rod 2 rotates only once in every two revolutions of Rod 1.

The type of brake used may vary, of course, according to the requirements of the particular model in which the device is incorporated, but the screw-operated brake is the best in nearly all cases, for it permits of the gradual application of the retarding effect.

When the clutch is "out"

(Continued on next page, column 3)

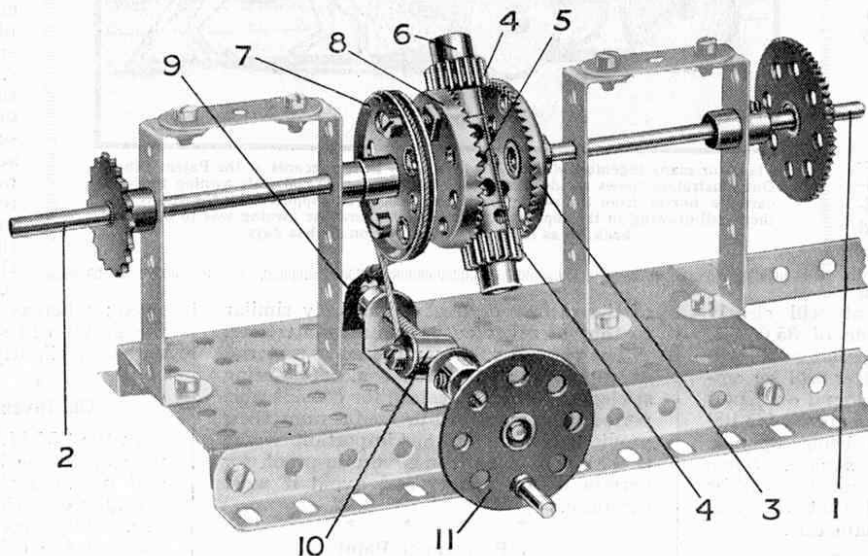


Fig. 75

(76)—Meccano Bicycle Brake

(L. P. Storey, Clifton, Bristol)

We continue to receive from time to time examples of the numerous practical purposes to which Meccano may be adapted. One of the latest to be brought to our notice consists of an ingenious foot brake fitted by L. P. Storey to his Raleigh bicycle.

The designer describes this as "a gradual brake, to be used in coasting down long hills, when the continued pressure of the hand brakes tires the hands." We hope it is not necessary to warn any reader who decides to fit a similar device to his bicycle that very great care should be taken in securing the various parts, and all nuts and bolts must be screwed very rigidly in position.

The lever 1 (Fig. 76) is in duplicate and in order to obtain increased rigidity is made up of six $5\frac{1}{2}$ " Strips, three Strips being placed together on each side of the bicycle frame bar and pivoted by bolt and lock-nuts (see Standard Mechanism No. 262) to a $5\frac{1}{2}$ " Strip 2 clamped round the bar. A $2\frac{1}{2}$ " x $2\frac{1}{2}$ " Flat Plate 3 is bolted to a $1\frac{1}{2}$ " Double Angle Strip and is kept in place by two $1\frac{1}{2}$ " Strips 4. This serves as the operating pedal and a $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip 5 bolted to the plate forms the heel-rest. $2\frac{1}{2}$ " Strips 6 are bolted to each set of $5\frac{1}{2}$ " Strips 1, and are kept in place by two $1\frac{1}{2}$ " Strips.

A fourfold $2\frac{1}{2}$ " Strip 7 (i.e., four $2\frac{1}{2}$ " Strips placed together) is bolted to the Raleigh brake clip 8 on each side of the bicycle frame, and is connected to Strips

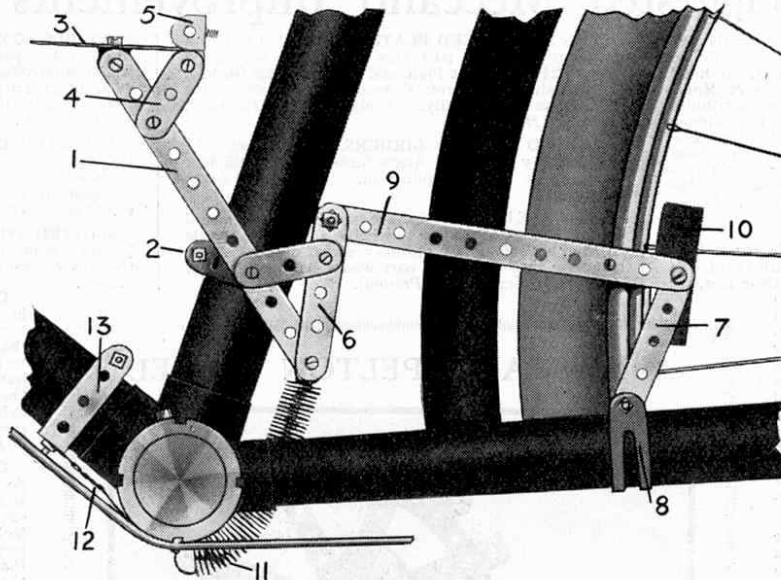


Fig. 76

any cycle or hardware dealer. The brake blocks may be purchased for a few pence each. If it is required at any time to strengthen the spring 11, the position of the clamp 13 on the bar may be raised.

Parts required:

14 of No. 2	1 of No. 48A
10 " " 5	1 " " 72
4 " " 6A	2 Brake Blocks
25 " " 37	1 Strong Spring
5 " " 37A	Small piece of
3 " " 48	Copper Wire

(77)—Friction Grip Tongs

(P. Harrad, Prestwich, Manchester)

In the July 1926 "M.M." we described a Meccano friction grip, or lever grip tongs, of the type used in block-setting cranes. We have now received a suggestion for a similar device that is both simple in design and efficient in operation. The apparatus is illustrated on this page and it will be seen that it may easily be attached to any Meccano crane.

Each arm of the "tongs" consists of a $3\frac{1}{2}$ " Strip and a $2\frac{1}{2}$ " Curved Strip (large radius) overlapped two holes and bolted together. Each "jaw" consists of a 1" Triangular Plate 1 bolted to a pair of Angle Brackets secured one on each side of the Curved Strip. All the bolts 2 are secured by lock-nuts to allow for free movement of the various parts of the tongs.

Miniature stone blocks, weighted boxes, etc., may be lifted with this apparatus, provided that their width is not too great to pass between the jaws 1. There is no fear of the load slipping out of the grasp of the tongs, for the grip of the jaws increases in proportion to the weight of the load to be lifted.

(78)—Connecting Rod End Bearing

We have received a number of queries from readers regarding the construction of a connecting rod for use in conjunction with the Meccano Crankshaft (Part No. 134). These queries appear to be prompted by the fact that the angles of the Crankshaft are too sharp to allow Couplings and similar parts to be placed in the centre of the crank. Fig. 78 shows a simple and realistic "big-end" bearing, however, which should solve our readers difficulties in this connection.

It will be seen that the bearing consists of two $1\frac{1}{2}$ " Strips mounted on the crank and bolted to a Coupling 1 secured to the end of the connecting rod 2. The Strips are held in place by a $\frac{1}{2}$ " Bolt 3 passing completely through the end of the Coupling, and by a pair of set-screws 4, which serve also to grip the connecting rod in the Coupling. The position of the connecting rod in the centre of the crank is maintained by a Spring Clip 5 mounted between two Washers.

A similar device suggested by J. Jackson of Thornton, Blackpool, makes use of two 1" Triangular Plates in place of $1\frac{1}{2}$ " Strips. The Plates are bolted one on each side of a Coupling that carries in its centre transverse hole a Pivot Bolt, the end of which is inserted in the end of an ordinary Coupling (Part No. 63) or a Strip Coupling (63b), so that either an Axle Rod or a Strip can be used as the connecting rod.

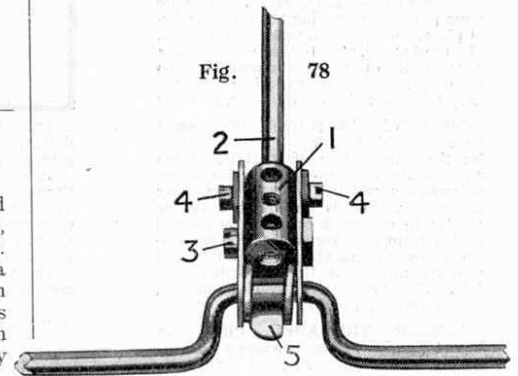
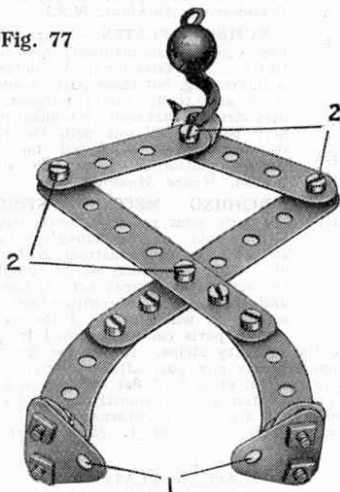


Fig. 78

Fig. 77



6 by a link 9 (three $5\frac{1}{2}$ " Strips placed together) and at the junction between Strips 7 and 9 a brake block 10 is secured as shown in the drawing. The brake is normally held in the "off" position by a powerful spring 11 attached to a $1\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip, which connects the two sets of Strips 6 together, and fastened at the other end by a piece of copper wire 12 attached to a $5\frac{1}{2}$ " Strip 13 clasped round the frame bar.

When pressure is exerted by the heel on

(75) Epicyclic Gear Clutch—

(Continued from previous page)

with the brake fully released, the Rod 2 will still show a tendency to revolve if it is quite free in its bearings. This is due to friction in the gearing, which induces the Pinions to travel round the Contrate Wheel 8 rather than rotate the latter about the Rod 2. The tendency disappears, however, when the device is coupled up to a model, etc., for the resistance on Rod 2 is then usually greater than the friction between the gears.

The various moving parts of the clutch should be kept well oiled.

Among the Model-Builders

By "Spanner"

A COMBINED GEAR-BOX AND CLUTCH

Mr. R. F. Newton, Buckhurst Hill, is a very keen Meccanoite, who has submitted several interesting suggestions to these pages in the past. Another of his achievements is the somewhat unusual gear-box and clutch mechanism shown in Fig. 1. An interesting feature is that the lay-shaft gears are carried in sliding cages at the sides of the model. The Flat Girders 1, which form the sides of the lay-shaft frames, are journaled at each end on Rods, and gear selection is carried out through a gear shift lever 2 shown at the top of the model.

The gate is built up from two $3\frac{1}{2}$ " Angle Girders joined by two $\frac{1}{2}$ " Bolts. Each Bolt carries a Fishplate spaced from the Girders by Nuts. These Fishplates

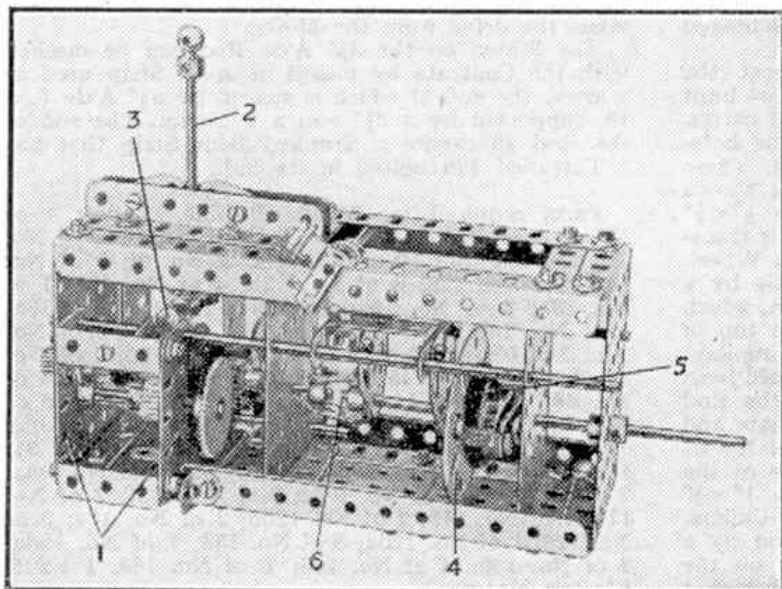


Fig. 1. A combined gear-box and clutch designed by R. F. Newton, Buckhurst Hill.

are arranged to form an H-type frame with four positions, indicating three forward speeds and a reverse. The gear lever is made from a Screwed Rod, and a ball-bearing mechanism is built up from Cranks and Couplings. A $2\frac{1}{2}$ " Rod 3 fitted with a Coupling at each end is used as the selection lever and slides the lay-shaft cages into the required position.

The clutch plates 4 and 5 are made from a Face Plate and a 1" Pulley fitted with a Motor Tyre. The Pulley is held against the Face Plate by two Springs, and a withdrawal mechanism is built up from two Flat Trunnions and two $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips. A lever for the clutch release mechanism is made from a Crank mounted on a 3" Rod. The arm of the Crank causes the withdrawal cage to slide longitudinally on its guide Rods, and by means of an extending Coupling 6, built from Fishplates and Collars, the driving shaft is levered forward and the Face Plate unit of the clutch disengages.

The $\frac{1}{2}$ " Pulley held in the

end of a Coupling, seen at the side of the model, forms the clutch pedal. The Coupling is held on the end of the 3" Rod that carries the Crank, so that when the pedal is pressed it actuates the withdrawal mechanism and the clutch disengages.

NOVEL SPEED INDICATOR AND CONTROLLER

Various speed indicating and controlling devices have been described in the "M.M." from time to time, and this month I am able to include a particularly novel arrangement sent to me recently by an enthusiastic model-builder living at Flixton, Lancs. Unfortunately this contributor's name and address has been mislaid, and I shall be glad if he will write to me.

The device is shown in Fig. 2. It consists of a governor, which is made up from four $2\frac{1}{2}$ " Strips bolted to Collars 1. These are fitted with two weights each consisting of twelve $\frac{1}{2}$ " Washers 2, spaced on each side of the $2\frac{1}{2}$ " Strips and held in place by a lock-nutted 1" Screwed Rod. The Screwed Rod also carries a Fishplate 3, which is used as a means of attachment for a tension Spring.

The speed indicator is made up from a sliding Rod that is actuated by the governor, and a rack 4, built up from $\frac{1}{2}$ " Washers equally spaced by Washers. A Rack Segment carrying a pointer engages the Washers, and as the governor weights fly outward under centrifugal force the Rack Segment is pulled around its pivot and the Pointer moves across a fixed scale.

A sliding Coupling used in conjunction with the indicator is built up from two Bush Wheels as follows. Two Threaded Bosses are bolted diametrically opposite on the face of one of the Bush Wheels, and they carry $1\frac{1}{2}$ " Rods that pass through corresponding holes on the other Bush Wheel.

A FINE PRIZE-WINNING LOCOMOTIVE

The model shown in Fig. 3 is an excellent reproduction of an American "Austerity" type locomotive.

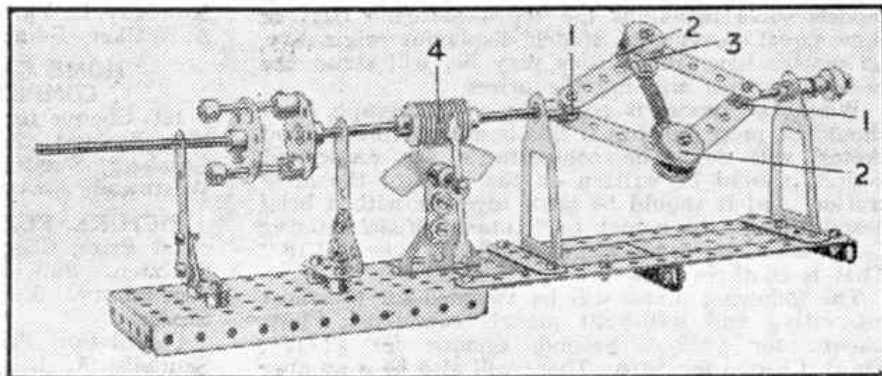


Fig. 2. A novel disc gear is used in this interesting speed indicator.



J. E. Meggitt, Ipswich, a keen Meccano model-builder.