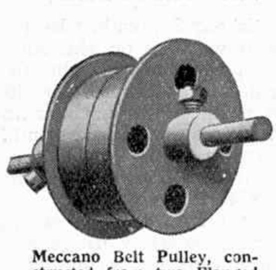

Meccano Belt Pulley, constructed from two Flanged Wheels

Suggestions Section

Edited by "Spanner"

The "Mystery Model" Explained

THE competition centring round the mysterious movements of the Meccano reversing gear described in the October (1926) *"M.M."* attracted a large number of very interesting entries. It is hard to imagine a more exacting test of our readers' model-building skill than that afforded by "problem" competitions of this description, and the work of the majority of the competitors cannot be praised too highly.

One side only of the model was illustrated in the October *"M.M.,"* as shown in Fig. A below, and it was explained that rotation of the Crank Handle A imparts rotary motion to the shaft carrying the wheel B. The latter shaft, however, persists in turning in a clockwise direction, no matter in which direction the Crank Handle is turned. Readers were asked to think the matter out for themselves and to describe the mechanism, or to suggest a similar method by which this curious result could be obtained.

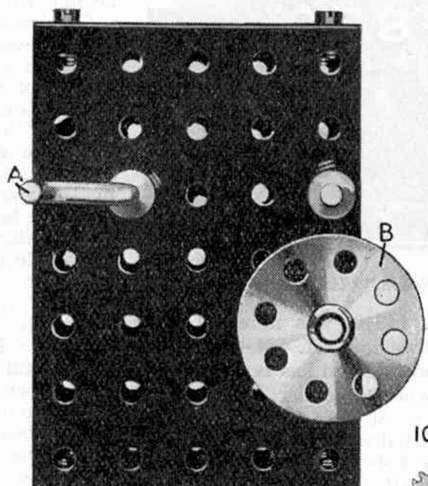

Fig. A

The Prize-Winners

As we had anticipated, the solution of the problem called for much thought and patience. Nevertheless, a large number of competitors succeeded in devising various methods by which the movement could be reproduced. Many of the entries received show really remarkable ingenuity, but only two or three resemble closely our own solution, which we believe to be the simplest possible method by which the required results can be obtained effectively.

Of these entries, those sent in by David C. Young of Sheffield, and H. A. Davies of Gwytherin, Llanrwst, North Wales, were almost identical with the correct solution, while W. F. Hughes of Barnwood, near Gloucester, and B. Dennis of Honor Oak Park, London, were very close "runners-up." We decided therefore to increase the prize originally offered and to award each of the two first-mentioned competitors Meccano products to the value of half a guinea, and each of the second two competitors with Meccano products to the value of seven shillings and sixpence.

In addition, the following competitors, who have been selected as deserving special mention, will each receive a special Certificate of Merit, together with a complimentary copy of the "Meccano Standard Mechanisms" Manual:—K. Compton, Colchester; D. H. Williams, Ipswich; John Willis, King's Heath, Birmingham; Ronald Gilbert, Finsbury Park, London, N.4; and Victor S. Smith, Dublin.

Certificates of Merit will be presented also to the following:—Francis Newman, C. F. Floyd, G. W. G. Tew, Stanley Wiggett, G. T. Earp, Raymond Stokes, E. Watson, G. Boedeker, T. N. Nesbitt, R. H. Wiegold, A. D. Smalley, and K. Helmore.

How the Model Works

Fig. B represents the reverse side of the model and the details shown therein comprise the correct solution to the mystery.

The end of the Crank Handle ("A" in Fig. A) may be seen at 3, while 9 is the driven rod carrying the Bush Wheel B. The lever 1 and Simple Bell Crank 2 are free to turn about the shaft of the Crank Handle 3, but are held in place by the Collar 4. Pivot Bolts 5 and 6 are passed through the Bell Crank and secured by the setscrews of ½" Pinions, sufficient play being allowed to permit the bolts to turn freely in their bearings. The Pinions remain constantly in mesh with a 57-teeth Gear Wheel 7 secured to the shaft 3.

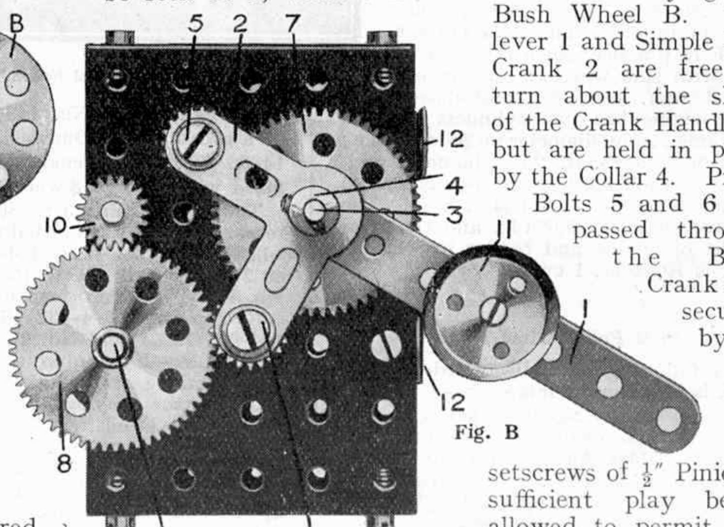

Fig. B

Let us suppose that the Crank Handle, and with it the Gear Wheel 7, is rotated in a clockwise direction, that is from left to right, when viewed as in Fig. B. Owing to the friction set up in the several bearings and between the teeth of the wheels, the ½" Pinions naturally tend to turn as one unit with the Gear Wheel, with the result that the lever 1 and Bell Crank 2 swing about the point 3 until the Pinion on bolt 6 is brought into engagement with another 57-teeth Gear Wheel 8 mounted on the driven shaft 9. In this position of the gearing it is obvious that the shaft 9 must rotate in the same direction as the Crank Handle 3. The direction of the driving force serves to hold the Pinion in engagement so long as the shaft 3 rotates in a clockwise direction.

On the other hand, if the direction of rotation of the Crank Handle is changed the lever unit moves round in an anti-clockwise direction, throwing the lower Pinion out of gear with the wheel 8 and engaging the Pinion on bolt 5 with a further $\frac{1}{2}''$ Pinion 10, which is in constant engagement with the Gear Wheel 8. Thus a secondary Pinion has been inserted in the gear train, and by tracing the rotation of the various wheels it will be found that the Gear Wheel 8, and therefore the shaft 9, continues to rotate in a clockwise direction.

The 1" loose Pulley 11 is bolted to the lever to counter-balance the weight of the Crank 2 and $\frac{1}{2}''$ Pinion Wheels. Two $1'' \times \frac{1}{2}''$ Angle Brackets 12 are bolted to the framework and act as stops to restrict the movement of the lever 1, so preventing the teeth of the "floating" pinions from binding with the constant-mesh gears.

Interesting Solutions

In addition to the correct entry already mentioned, H. A. Davies submitted four alternative solutions, all of which are extremely interesting. David Young's entry differs from the mechanism illustrated in Fig. B only in the substitution of a built-up bell crank unit in place of Meccano part No. 127.

B. Dennis' apparatus is based upon the correct principle and works perfectly, but he uses only one floating Pinion, which necessitates a more complicated gearing between the intermediate shaft and the driven Rod in order to prevent fouling of the teeth. W. F. Hughes employs in place of floating pinions a 50-teeth Gear Wheel, which is mounted in the end of a Crank that is capable of turning about the shaft of the Crank Handle. The operation of the model depends upon friction created by gripping the Crank between two Collars on the handle shaft in such a way that the Crank and Gear Wheel may be lifted through half a revolution when the direction of rotation is changed.

A large majority of the entries favoured the use of pawl and ratchet mechanism with which to obtain the required movement. K. W. Helmore's entry is typical of these and the principle involved will be understood from the following description of his suggested apparatus.

Pawl and Ratchet Method

Two large Pulley Wheels are free to rotate about the Crank Handle, and pivotally attached to the face of each pulley is a Meccano Pawl. The Pawls engage with separate Ratchet Wheels secured to the Crank Handle. These ratchets are opposed to each other, so that when the handle is turned in either direction one pulley revolves with it while the other is free to ride idly in the opposite direction. The pulley that is engaged by the ratchet when the Crank Handle is turned in a clockwise direction is connected by an open belt to a pulley secured on the driven shaft, while the second ratchet pulley, which can be driven only in an anti-clockwise direction, drives a second pulley on the driven shaft by means of a crossed belt (see Standard Mechanism No. 17). Hence the driven Rod rotates always in a clockwise direction.

Another method much favoured by our readers made use of a double Pawl and Ratchet movement operated by two Eccentrics. This movement will be understood if reference is made to the Meccano model Tractor (No. 712 in the Complete Manual), from the illustrations of which it will be clear that the shaft driven by the Pawls must rotate always in the same direction, irrespective of the direction of movement of the eccentric shaft.

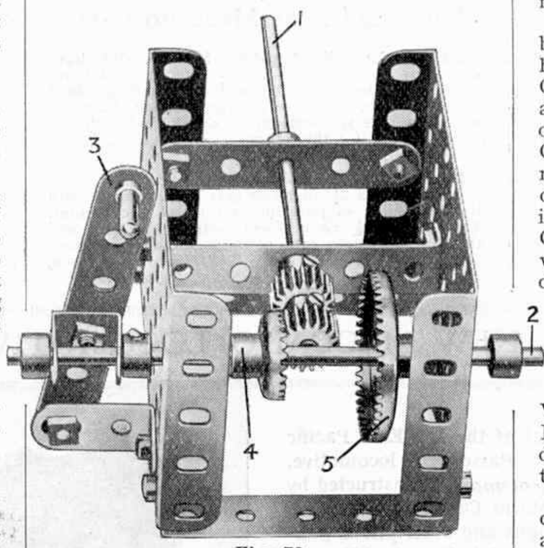

Fig. 73

Differential Gear

Mr. George Bowdler, of Kidderminster, sent in a unique and very interesting solution in which use is made of a differential gear of similar design to that used in the Meccano motor chassis (see Standard Mechanism No. 251). The Crank Handle is inserted in one side of the differential and carries one of the $\frac{3}{4}''$ Contrate Wheels, while a 57-teeth Gear Wheel bolted to the differential frame (in place of the $1\frac{1}{2}''$ Contrate Wheel shown in S.M. 251) is controlled by a Pawl. The latter allows the differential unit to move in a clockwise direction only; hence if the Crank Handle is turned anticlockwise, the differential frame is locked in position and the motion is reversed by means of the Pinions and Contrate Wheels.

We wish to repeat that this "mystery model" was prompted by a suggestion for a new Meccano reversing gear received from Harold Dunhill, of New Southgate, to whom we have already accorded our thanks. We should be glad to receive further suggestions for similar competitions; the senders of any ideas that we are able to adopt will be rewarded.

We also wish to mention that while this competition was in progress we received a suggestion for a similar reversing gear from G. Bellairs, of Sydenham, London, S.E.26. This contributor will receive a special Certificate of Merit and a copy of "Meccano Standard Mechanisms" in recognition of the merit shown in his work.

This Month's Awards

Charles Blackburn and G. Baillie will each be presented with 5/– and a Certificate of Merit for Suggestion No. 73, and J. Morris and D. J. Davis will each receive 2/6 and a Certificate for their work in connection with No. 74.

(73)—Two-Speed Reversing Gear

(Charles Blackburn, Hetton-le-hole, and G. Baillie, Glasgow)

We have received from each of the above two readers a suggestion for a simple but very efficient reversing or change-speed gear of the type shown in Fig. 73. The mechanism is designed to give a slow forward speed and rapid reverse, or vice versa, and either Rod 1 or Rod 2 may be used as the driving shaft.

The Rod 2 is capable of sliding in its bearings and is controlled by a suitable hand lever 3. This Rod carries two Contrate Wheels 4 and 5, which are $\frac{3}{4}''$ and $1\frac{1}{2}''$ in diameter respectively, and on operation of the lever 3, one of these Contrate Wheels is brought into engagement with one of the two $\frac{1}{2}''$ Pinions secured to the Rod 1. Hence if the Rod 2 is used as the driving shaft and the large Contrate Wheel 5 is thrown into gear with its respective Pinion, the Rod 1 is driven nearly three times as fast as the Rod 2. (As stated in Section 1 of "Meccano Standard Mechanisms," the gear ratio between a $\frac{1}{2}''$ Pinion and $1\frac{1}{2}''$ Contrate Wheel is approximately $2\frac{2}{3} : 1$).

Alternatively, if the small Contrate Wheel 4 is thrown into engagement, the Rod 1 revolves only a little faster than the driving Rod, the approximate ratio between the two being $1\frac{1}{3} : 1$.

If the sliding Rod 2 is required to remain constantly in gear with toothed wheels on a further driving rod, the necessary adjustment may be obtained by placing two Pinions end to end on the Rod 2, making sure that their teeth coincide exactly. The Pinions act as a single toothed unit that may be engaged by a Gear Wheel on the further shaft, and the extra width of teeth on the Rod 2 allows for the required longitudinal sliding movement.

A similar suggestion for a speed-changing device secures a Certificate of Merit for J. Petrie, of Rock Ferry.

(74)—Meccano Tweezers

(J. Morris, Chateau d'Oex, Switzerland, and D. J. Davis, Bedford)

The Meccano tweezers illustrated in Fig. 74 are extremely simple to construct, and they may be adapted to a number of very useful purposes. Stamp collectors, for example, will find that they form an implement with which valuable specimens may be handled with proper care, while photographers will find the tweezers useful in removing prints from one dish to another. In addition, Meccano boys can put them to very practical use in model-building, for it will frequently be found that with their aid a nut can be held in positions that are out of reach of even the most nimble fingers!

As will be seen, the tweezers consist of

Fig. 74

two $5\frac{1}{2}''$ Perforated Strips bolted together very rigidly at one end and slightly bent towards the other. The "springiness" of the Strips causes the tweezers to remain open until pressure is applied by the hand.