In Search of New Models

Conveyors, Hoists and Trucks

MODERN factories and warehouses provide a variety of attractive subjects for the model-builder. Their efficient working depends largely on the ease and rapidity with which materials of all kinds can be transported from one department to another. Many interesting appliances are used for this work, and most of these possess features that make them fine subjects for models.

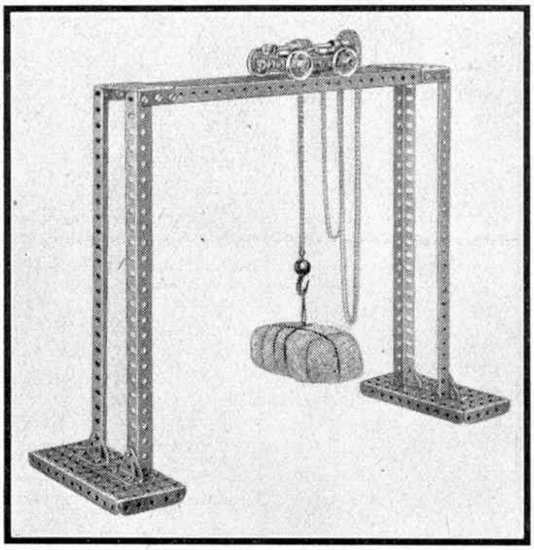

Fig. 1. A model of a manually operated hoist of the type used in workshops for lifting light castings and parts of machinery.

The most familiar transportation devices are the various types of conveyors, hoists and mechanical trucks. In addition there are machines designed for handling special kinds of goods. Examples of all of these have been described and illustrated from time to time in the *"M.M.,"* so that readers who wish to experiment with models of this kind will have no difficulty in obtaining information to guide them.

Conveyors are attractive subjects because of their movement and variety. One of the best types for modelling in Meccano consists of a travelling chain carrying small trays or buckets, which are used for transporting loose materials and small packeted goods. Small Flanged Plates can be used for representing the trays and can be suspended by Strips from an endless travelling belt made of Sprocket Chain.

Model-builders who possess a large Outfit can attempt some of the more elaborate conveyors, such as the scraper types used in power stations and gasworks for carrying coal from the storage hoppers to the chutes that feed the furnaces. These consist of scraper plates attached to a driven endless chain which hauls the plates along a V-shaped or rectangular metal trough. The coal is fed into the trough at one end, and is dragged along by the scraper until it reaches the mouth of the delivery chute. In a model of one of these devices the scrapers can be built up from Triangular Plates and fitted to a belt of Sprocket Chain. It is necessary to construct the trough in such a manner that no bolt heads protrude inwards to obstruct the scrapers in their movement, and a little ingenuity will overcome this difficulty.

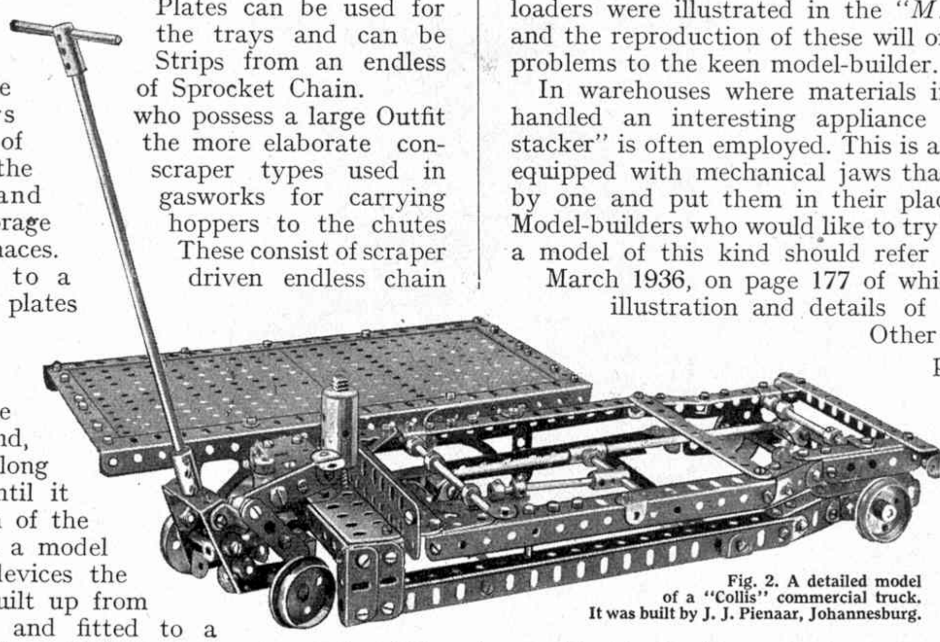

Fig. 2. A detailed model of a "Collis" commercial truck. It was built by J. J. Pienaar, Johannesburg.

In addition to the fixed types, there are various kinds le conveyors that can be moved from one part of a factory to another as required. These are usually employed for removing bulk material, such as grain, and loading it into wagons or bins, and an example of a model conveyor of this kind is shown in Fig. 3. The conveyor works at an angle of about 45 deg. to the ground, and the material is lifted on to it by means of a mechanical scoop at the lower end. The trucks into which the material is to be loaded are run under the elevated end of the conveyor.

It will be seen from the illustration that the constructional details of such a model as this are quite simple. Although in this instance the conveyor is of the ordinary plain belt type it can be replaced by a bucket conveyor or one of the scraper type, so that there is plenty of scope for interesting experiment. The model is operated by an Electric Motor, but if a power unit of this type is not available a Clockwork Motor can be used quite successfully.

Another interesting type of conveyor is that used for loading or unloading bananas. An illustration of one of these appears on page 224 of this issue. Other banana loaders were illustrated in the *"M.M"* for June 1936, and the reproduction of these will offer some interesting problems to the keen model-builder.

In warehouses where materials in sacks have to be handled an interesting appliance known as a "bag stacker" is often employed. This is an ingenious machine equipped with mechanical jaws that grip the sacks one by one and put them in their places in a neat stack. Model-builders who would like to try their skill in making a model of this kind should refer to the *"M.M."* for March 1936, on page 177 of which they will find an illustration and details of an actual machine.

Other very useful transport devices used in factories and warehouses are mechanically or electrically propelled trucks of various kinds. These are made in such a wide variety of types that they provide ideal subjects for both large and small Outfits. Here again there is no difficulty in obtaining information, for illustrations and descriptions of such trucks have appeared in the *"M.M."*

Small models can be driven by a *Magic* Motor and a very neat example of the use of this was illustrated on page 174 of the "*M.M.*" for March last. Where a sufficient stock of parts is available it would be interesting to build a similar model on a large scale, and to drive it by means of a 6-volt Electric Motor, which can be mounted on a Ball Bearing unit or a small Roller Bearing. A 6-volt accumulator can readily be mounted on a model of this kind to supply current, and thus to make it fully self-contained.

Fig. 2 shows a model of a well-known commercial truck of a very different type. This consists of a platform, mounted on wheels, which can be raised from the ground to a distance of several inches simply by depressing the handle by which the truck is hauled. The goods to be moved are stacked on trays supported by runners, so that there is sufficient space between them and the ground to allow the truck to be run under them. The handle is then pushed downward and the platform rises, thus lifting the tray and its load, and the latter is deposited on arrival in its new position by simply reversing the movement. It is not difficult to build a model of this truck, as the raising gear consists simply of an arrangement of levers and links. Model-builders who are interested will be able to obtain all the guidance they need on this point from Fig. 2, and there is room for experiment in devising the best means of carrying out the movements.

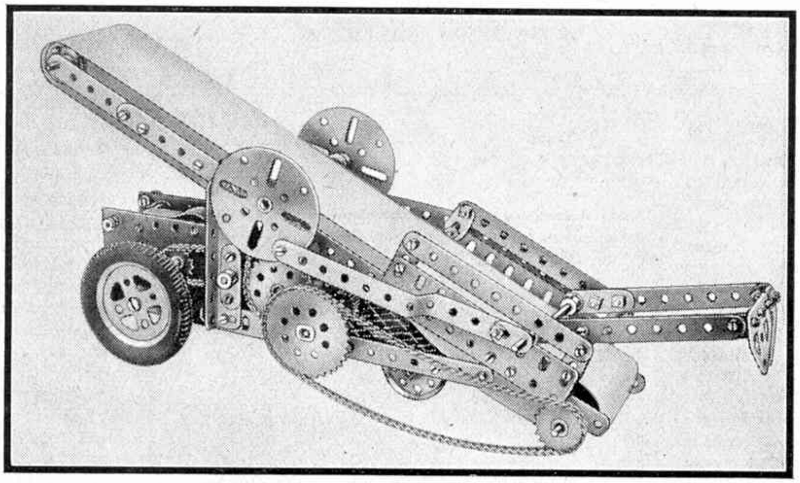

Fig. 3. A novel working model of a portable conveyor-loader designed for loading loose material into trucks. Although simple to build it works in the same manner as its prototype.

Interesting subjects for models of a very different type from those already mentioned are the hoists used for lifting castings and machine parts. The simplest kind is the manually-operated hoist, which consists usually of two chain wheels of different diameters and is suspended from a gantry along which it can travel. The lower sheave consists of one chain wheel to which the hoisting hook is attached. The chain by which the hoist is operated is an endless one passing first round the large upper wheel, then round the lower sheave and finally over the smaller upper wheel, the rest of the chain hanging down in a loop. The load is hoisted simply by pulling on the loose chain. Meccano Sprocket Chain and Sprocket Wheels are ideal for use in modelling such an appliance and the only other parts required are a few Strips, Rods and Pulleys.

Hoists of the kind described suffer from the disadvantages that when a load is raised it is maintained in position only by the friction on the spindles of the sheaves, so that it is suitable only for light loads. This difficulty is overcome in another kind of manual hoist, a model of which is shown in Fig. 1. In this the chain drive is transferred to the hoisting wheel through worm and pinion gearing so that there is no danger of the load falling when the chain is released. As will be seen from the illustration a very neat model of this can be built.

Model-builders who possess an Electric Motor will find an electrically-operated hoist a good subject for their attention, as such models allow scope for experiment with different methods of control. A model of this kind is shown in Fig. 4. This is based on an actual Royce hoist designed for lifting loads up to 5 tons, and it is very simple to assemble and operate. Two chains hang from one side of the hoist and these form the sole controls, the pulley block being raised by pulling on one chain, and lowered by pulling on the other. Current for the Electric Motor is collected from an overhead conductor wire by a ½" Pulley, fitted above the neat trolley. The Motor is covered by a casing of Flexible Plates.

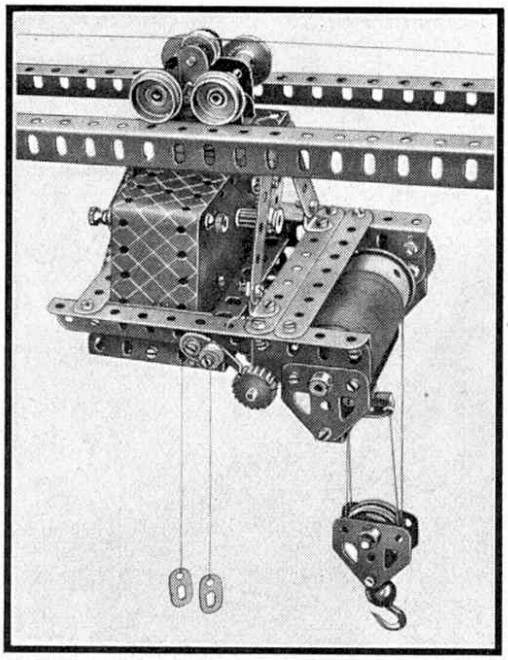

Fig. 4. Electric hoists provide plenty of scope for variety in design and methods of control. The model shown above incorporates a novel reversing mechanism.

Sometimes electric hoists are fitted with powerful electro-magnets instead of ordinary lifting hooks. Hoists of this type are used in metal stockyards for lifting and transporting steel plates, and they are often to be seen in scrap metal warehouses, where they are used to lift a heavy iron ball known as a "skull cracker." This is dropped from a height of several feet onto scrap metal to break it into pieces of a size suitable for the melting furnaces. A typical hoist of this kind was illustrated on the cover of the "*M.M.*" for May 1936, and this would make an ideal subject for an interesting and unusual model. The mechanism of the hoist itself is very similar to that of an ordinary mechanical hoist, and no difficulty should be experienced in building up a magnet of sufficient power to carry out actual lifting operations. For this purpose the Magnet Coils included in the Elektron series of parts will prove useful, and by using two or more of these together a really powerful unit can be assembled. Meccano Bobbins (Part No. 181) wound with wire, also can be used.

Many factories are equipped with goods elevators or lifts. Model-builders with the necessary parts will find plenty to interest them in constructing working models of this kind, as there is ample scope for introducing various automatic starting, stopping and safety devices. Safety devices usually consist of catches fitted to the roof of the lift cage. If the hoisting cable breaks, the catches spring outward and jam the lift in its shaft.

Meccano Suggestions Section

By "Spanner"

(403) Synchronous Motor for Electric Clocks

Model-builders who experiment in the construction of electric clocks will be interested in the synchronous motor shown in Fig. 403. The special feature of a motor of this kind is that its speed depends on the frequency of the alternating current supply to which its windings are connected. It is therefore suitable for driving clock mechanisms.

The motor is built from Meccano parts, with the addition of certain Elektron parts, and is not difficult to construct. Each side of the stator, or stationary part of the motor, consists of a Circular Strip 1, and between these are eight Magnet Coils 2, fitted with Magnet Cores. The Circular Strips are clamped together by fastening a Threaded Boss 3 between each pair of Magnet Coils, the Boss being spaced from the Circular Strip by means of four washers. The other Circular Strip is then assembled in position by screwing $\frac{1}{2}''$ Bolts into the Threaded Bosses.

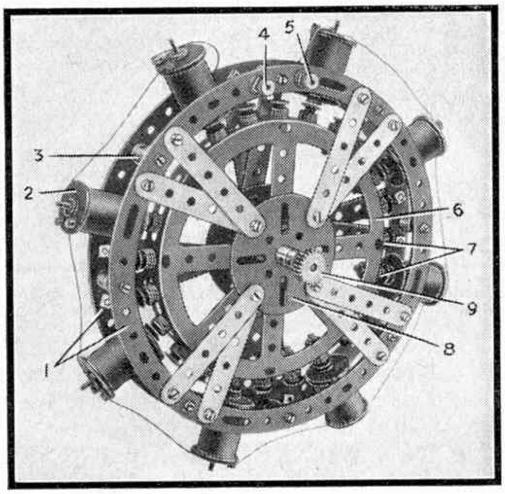

Fig. 403

The rotating part of the motor consists of a Hub Disc 6, around the rim of which are bolted 24 buffers 7, removed from Spring Buffers (Part No. 120a). Each of the buffers carries nine washers, four below its head and five on its shank, the whole being fixed to the Hub Disc by means of a nut. The buffers form the poles of the rotor, and care should be taken to space them at equal distances apart around the rim of the Disc. A Bush Wheel is bolted at the centre of the Hub Disc and in its boss is fastened a $3\frac{1}{2}''$ Rod. The rotor is now ready to be fitted in the housing.

Bearings for the rotor shaft are provided by two Face Plates 8, each of which is supported by eight 3″ Strips arranged in the manner shown. Two Collars secured on the rotor shaft ensure that the poles of the rotor are maintained in alignment with the Cores of the Magnet Coils. The $\frac{3}{4}''$ Pinion 9 serves as a grip to facilitate spinning the rotor when starting up the motor.

The Magnet Coils are connected together in series, that is the inner terminal of each Coil is connected to the outer terminal of the next. When the last Coil is reached its free terminal and that of the first are connected by leads to the Terminals 4 and 5 bolted to the Circular Strip 1. As a final adjustment, the Core of each Magnet Coil is moved as close to the poles of the rotor as possible without coming into actual contact with them.

The motor is designed to operate from any of the Meccano T6 series Transformers, and on a frequency of 50 cycles the rotor has a speed of 250 r.p.m. If the motor is required to work on frequencies other than 50 the speed of the rotor can be ascertained by multiplying the frequency of the mains supply by 120 and dividing the product by the number of poles on the rotor.

To start the motor it is necessary to spin the rotor at a rate slightly higher than its normal working speed, and a little practice is all that is necessary to ensure a quick start-up.

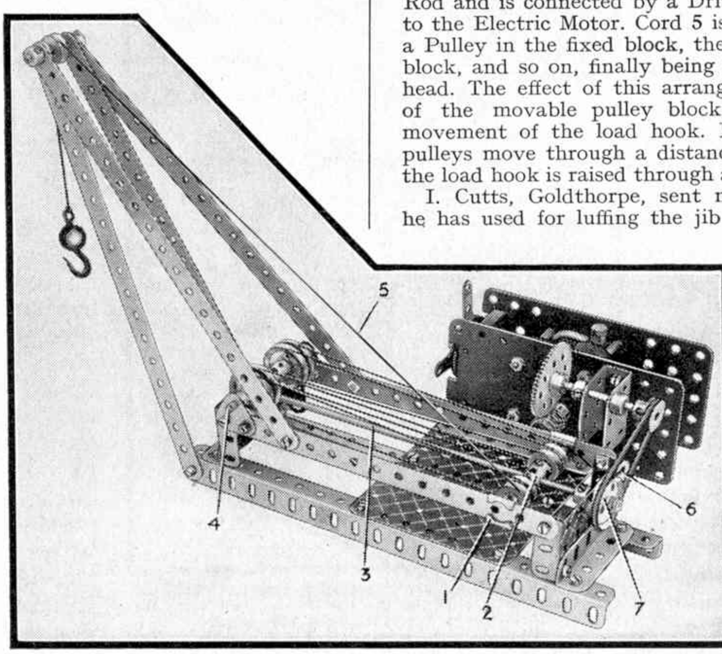

Fig. 404

(404) Interesting Screw Mechanisms

(W. Howard, Burnley, and I. Cutts, Goldthorpe)

W. Howard, Burnley, has submitted an interesting suggestion for a hoisting mechanism that can be used in model cranes as an alternative to the usual method of winding the hoisting cord around a driven drum. The mechanism he suggests is shown in model form in Fig. 404. It is based on that used in hydraulic cranes, in which the hoisting cord is passed around a system of pulleys, one set of which are fixed, while another set is arranged on the end of the piston of a hydraulic ram. As the piston moves outward the two sets of pulleys move apart and thus draw in the hoisting cord, which is attached to the load.

Howard's mechanism reproduces this system of working very closely. The framework carrying it consists of two $2\frac{1}{2}''\times1\frac{1}{2}''$ Flanged Plates, which are joined by $7\frac{1}{2}''$ Strips and are mounted on a base composed of Angle Girders. Four 1″ Pulleys are mounted on a 3″ Rod 4 and are spaced by a Coupling and Washers. The pulleys on the movable set are mounted on 1″ Rods fixed in the longitudinal bore of a Coupling 2. An 8″ Screwed Rod 3 passes through the threaded transverse bore of the Coupling, and is journalled at one end in a Rod Socket and at its other end in a $2\frac{1}{2}''\times1\frac{1}{2}''$ Flanged Plate. The other ends of the 1″ Rods are fixed in the bosses of Eye Pieces 1 working on the $7\frac{1}{2}''$ Strips.

A 1″ loose Pulley 7 is fixed by lock-nuts to the end of the Screwed Rod and is connected by a Driving Band to the $\frac{1}{2}''$ Pulley geared to the Electric Motor. Cord 5 is tied at 6. It is passed first round a Pulley in the fixed block, then round a Pulley in the movable block, and so on, finally being passed over the Pulley at the jib-head. The effect of this arrangement is that a small movement of the movable pulley block results in a considerably larger movement of the load hook. For example, when the movable pulleys move through a distance of 3 in. along the Screwed Rod the load hook is raised through a distance of 24 in.

I. Cutts, Goldthorpe, sent me details of a screw mechanism he has used for luffing the jib of a model crane. An advantage of this system over the ordinary method is that it does away with luffing cords, which are liable to slip off the Pulleys and become entangled. His idea is to pivot a Coupling halfway down the jib of the model and connect it by a Rod of suitable length to a large Fork Piece that is pivoted to an Octagonal Coupling. The latter works on a horizontal Screwed Rod that can be rotated by a Bush Wheel, or through a gear train coupled to a Clockwork or Electric Motor if the model is driven by this means. When the Screwed Rod is rotated, the jib is either raised or lowered as the Octagonal Coupling traverses the Rod. Another type of screw operated luffing gear was described in "*Suggestions Section*" for December 1934, and consists of a lever, one end of which is connected by links to the jib while the other end is attached to a Coupling that traverses a Screwed Rod. When the Screwed Rod is rotated the Coupling moves downward, and its motion is transmitted through the links to the jib. A feature of this system is that the pull is applied almost at right angles to the jib, irrespective of its position.

(405) A Gearless Speed Reducing Mechanism (R. Simpson, Hull)

R. Simpson, Hull, required a simple device for transmitting a drive from one shaft to another in such a manner that the driven shaft would rotate always in the same direction, no matter in which direction the driving shaft were rotating. He also wished to make the driven shaft rotate at one twentieth of the speed of the driving shaft. He solved the problem by the device shown in Fig. 405, an interesting feature of which is that it does not incorporate any gears or pinions.

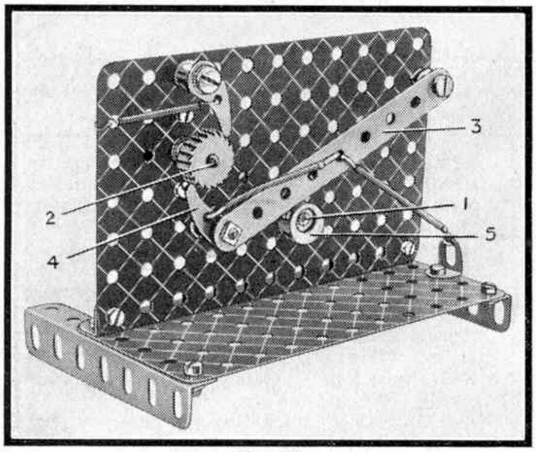

Fig. 405

The driving and driven shafts 1 and 2 respectively are mounted in the positions shown, the former carrying a cam 5 formed from a Kemex Universal Stand Clamp (Part No. K31) and the latter a Ratchet Wheel. A 5½" Strip 3 is fitted at one end with a Pawl, which is carried on a Pivot Bolt and is tensioned by a short length of Spring Cord. The other end of the 5½" Strip is held against the head of a Pivot Bolt lock-nutted in the position shown. The Strip is held in contact with the cam by a second length of Spring Cord. It will be seen that for each revolution of the cam 5 the Ratchet Wheel is advanced one tooth by the Pawl 4, the second Pawl being arranged to prevent the Ratchet Wheel from rotating in the reverse direction on the return stroke of the Pawl 4.

This device is particularly suitable for operating feed mechanisms, and can be used in clock gear trains. It should be noted that other ratios than 20 : 1 can be obtained by suitable arrangement of the 5½" Strip and cam, and by replacing the Ratchet Wheel with a Sprocket Wheel of suitable diameter.

(406) A Useful Woodworker's Clamp

(J. Usher, Dundee)

From time to time I have described in "*Suggestions Section*" several tools and miscellaneous gadgets that can be put to practical use in the home workshop. A further addition to this series is the woodworker's picture-framing clamp shown in Fig. 406. This was designed by J. Usher, Dundee, and is a practical tool for small work.

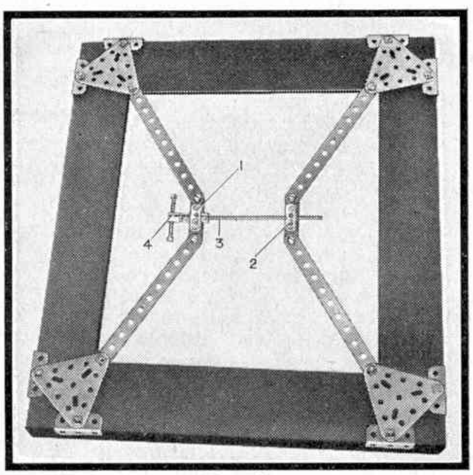

Fig. 406

The device consists of four arms composed of 5½" Strips, to one end of each of which is lock-nutted a 2½" Triangular Plate. Two 1½" Angle Girders at right angles to each other are bolted to each Triangular Plate. The arms are then lock-nutted in pairs to a 2" Strip, each of which carries a Coupling. The 5" Screwed Rod 3 passes through the centre plain transverse bore of Coupling 1, but is prevented from moving longitudinally by two Collars. One end of the Screwed Rod is fitted with a handle consisting of two ¾" Bolts screwed into a Threaded Boss 4, which is held on the Rod by a nut. The other end of the Screwed Rod works in the centre transverse threaded bore of the second Coupling 2. The clamp is set up as shown, and is tensioned by rotating the Screwed Rod. The pivoted joints make the clamp suitable for use with either oblong or square frames.

(407) Creeper Track for Model Excavators

(J. Wilson. Milford-on-Sea)

Many types of excavating machines and tractors, as well as army tanks, are mounted on creeper tracks, and in building models of these machines the problem arises as to the best means of making satisfactory creepers with as few parts as possible. Several methods of constructing creepers have been described from time to time on these pages, and this month I am giving details of a further method that is put forward by J. Wilson, Milford-on-Sea. A track built up on the lines suggested by Wilson is shown in Fig. 407. It is constructed from short Strips and Sprocket Chain, and rides quite freely over ground irregularities.

The flexible belt consists of 28 2½" Strips, each of which is fitted with two bolts 1. The nuts on the shanks of the bolts are tightened up with sides parallel to the edges of the Strip. The Strips are then laid side by side, touching each other, with the nuts upwards, and a length of Sprocket Chain 2 is laid over the end holes of the Strips. Cord 3 is then threaded through them. It is passed through the hole in the first Strip, round one of the links in the Sprocket Chain, and then back through the hole in the same Strip. This process is repeated with each Strip, until all are threaded to the Sprocket Chain. The other ends of the Strips are then threaded similarly. It will be found quite easy to pass the Cord through the Sprocket Chain and Strips if a large darning needle is used for the purpose. The ends of the Sprocket Chain are then joined together in the normal way, and the free ends of the Cord are tied together.

The band is carried on eight 1⅛" Flanged Wheels, and is driven by means of Bush Wheels mounted on Rod 4. There are two Bush Wheels on this Rod and each carries eight bolts, the shanks of which are on the same side as the boss. The shanks of the bolts act as teeth and engage the bolts of the 2½" Strips. The four centre Flanged Wheels are mounted on a bogie consisting of two 2½" Angle Girders bolted to a 2½" × 1½" Flexible Plate. The Flanged Wheels are fastened on 3" Rods journalled in the elongated holes of the Angle Girders. A 4" Rod 5 passes through the centre holes of the Angle Girders and is journalled in the 5½" Strips as shown.

To mount the tracks in a model long Rods are journalled in the base or chassis of the model and on them are fastened the front and rear pairs of Flanged Wheels. In some cases the bogie can be pivoted to the chassis, and the 5½" Strips can then be dispensed with.

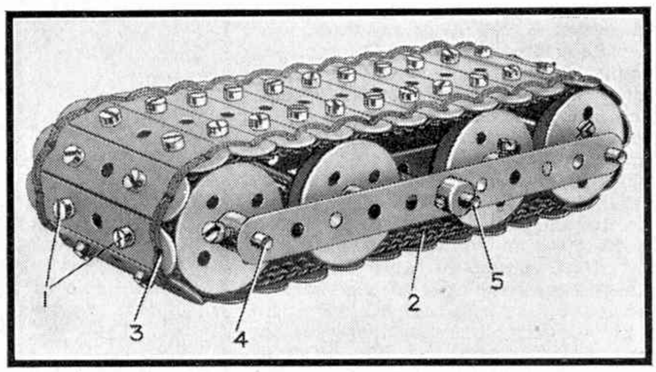

Fig. 407

The track illustrated is intended for use with shafts 5 in. apart, but tracks of any length can be built if desired. The width of the track also can be varied and if 1½" Strips are used, it is necessary to fix a bolt only in the centre hole of each Strip. The Cord is threaded through the end holes of the Strips as before.

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(M.203.) The Helical Gears (Parts Nos. 211a and 211b) are designed for use in all kinds of mechanisms where it is required to transmit a reversible right-angle drive from one shaft to another when the two are not in line. J. Walsh, Cardiff, suggests that the adaptability of these parts for other purposes could be greatly increased by drilling holes in the 1½" Helical Gear in similar positions to those in the 1½" Bevel Gear or Bush Wheel. The part could then be used in much the same way as the 1½" Bevel Gear is used in differentials and other mechanisms. The suggestion is one that will be given careful consideration.