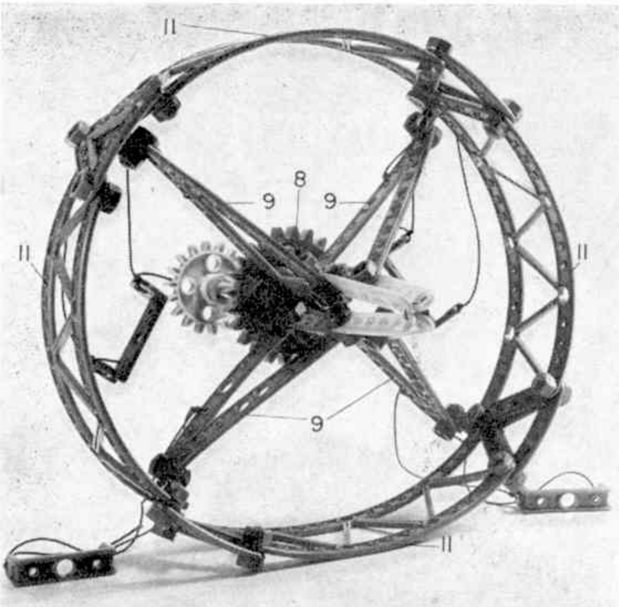


The revolving top section of the model as it appears removed from the tower structure.

PARTS REQUIRED

12—2-hole Strips	1—Axle Clip
6—3-hole Strips	3—6" Axles
6—5-hole Strips	4—2-hole Triangular Girders
4—Bases	1—Handle
56—Bolts	1—24-teeth Gear Wheel
2—1" Bolts	1—18-teeth Gear Wheel
51—Nuts	1—12-teeth Gear Wheel
9—Angle Brackets	1—20-teeth Sprocket Wheel
11—Double Angle Strips	1—10-teeth Sprocket Wheel
2—Road Wheels	4—Bridge Girders
1—Pulley Wheel	4—3-hole Triangular Girders

MECCANO CONSTRUCTORS GUIDE by B. N. Love

PART 7: CRAWLER TRACKS

MACHINERY WHICH TRAVELS on self-laying tracks fall into three basic categories and it is important to understand the different requirements of each. They may be listed as follows :

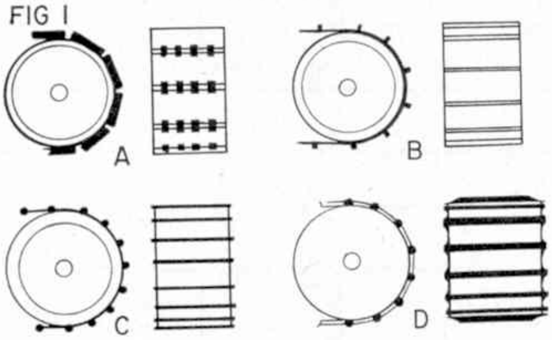


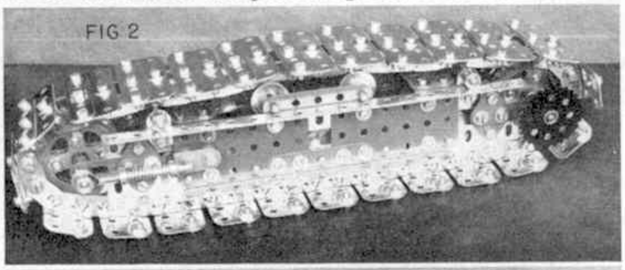
Fig. 1a. The heavy-plate slow-moving track used on Excavators, and, Fig. 1b, the lighter, but powerful-grip track form of the Bulldozer or Crawler Tractor. Fig. 1c. Highly-flexible track for high-speed Tanks and some small Tractors or "Calfdozers" and, Fig. 1d, tracks for medium and heavy Tanks. Note convex shoe form to reduce "scrubbing" when steering.

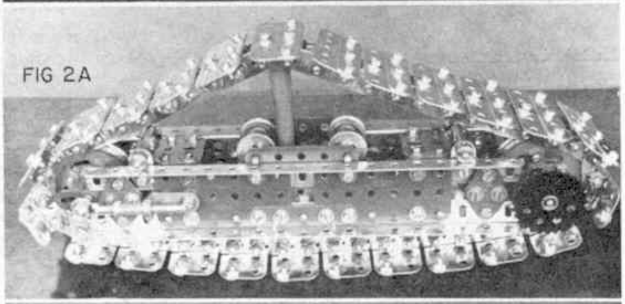
1. **Excavators and Mobile Cranes with heavy-duty turntables.**
2. **Bulldozers and Crawler Tractors.**
3. **Military Track-laying Vehicles.**

In the case of Category 1, the requirements are for simple, but rugged tracks which will provide a firm support for a heavy superstructure and allow it to run steadily but slowly across the site where it is working. Fig. 1a gives the basic pattern for such heavy-duty tracks which are made of thick steel plates hinged at their edges with two or more lugs built into the track shoes themselves. The contact surfaces are quite flat with a small recess moulded into them which assists the tracks in bedding down where the excavator is used in a stationary position. This type of track is mounted on a frame of rollers which is rigidly attached to either side of the superstructure or turntable, giving a stable platform, and the driver will often use his machine to skim a flat surface on the site if a bull-dozer is not available to do this.

Tracks required for Category 2 are generally much lighter in design but are nevertheless strongly made to withstand the stresses of the workload on bulldozers and crawler tractors. Essentially, these machines must be capable of pulling, pushing and winching very heavy loads and their tracks must be designed accordingly. This means that the track must be flexible enough to conform to the contours of rough ground over which the crawler may be working, yet light enough not to absorb excessive power. At the same time they must be capable of a positive grip on the site surface and are therefore fitted with " spuds " or ridges, as shown in Fig. 1b, which bite into the ground. Generally speaking, crawler tracks are capable of working at higher speeds than those in Category 1.

Moving on to Category 3, i.e. Military Vehicles, track requirements are different again. In some cases, high speed over rough terrain is the required performance for infantry carriers and light tanks. It is therefore necessary to fit highly flexible track with short length " shoes ", or track elements, and suspension is vital to cope with sudden changes in ground contours. Bulldozers negotiate rough ground by having their track frames independently mounted, but linked one to the other with compensating beams or cranks. Thus





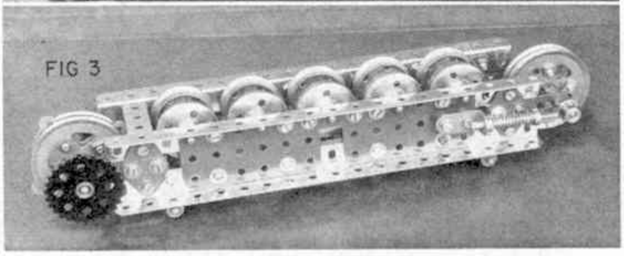


Fig. 2. View of a complete track assembly for a small-scale Excavator. Note the spring slide compensator for track tension. Fig. 2a. This illustration gives a good idea of the excellent scope available from the track-tensioning device described in the text. Fig. 3. A track frame construction for a small-scale Excavator showing under view of load-carrying rollers.

a rise of one track frame causes a fall of the other so that the tractor keeps on a reasonably even " keel " to prevent dangerous tilting. Tanks on the other hand have track drives mounted solidly on the hull and the travelling gear is mounted on multiple sprung units. While such vehicles can double up as towing tractors they are, essentially, high or medium-speed gun platforms. Fig. 1c shows the general form for high-speed tank tracks while that of Fig. 1d is typical of medium or heavy tank tracks. The track " shoes " of some tanks, including the British Chieftain, are shod with rubber blocks to reduce road and track wear.

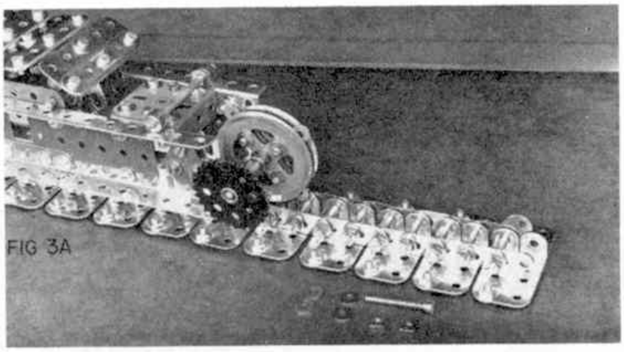


Fig. 3a. Driving sprocket arrangements and general view of a track construction using Fishplates and Double Brackets as track plate hinge components.

Meccano modellers obtain great pleasure from making track-laying vehicles and some ingenious efforts have appeared in the Meccano Magazine from time to time where Sprocket Chain, Rubber Driving Bands, paper clips and Meccano Cord have all been pressed into service for elementary models. The system does, however, lend itself to the construction of authentic tracks falling into some of the above categories. Fig. 2 shows what can be done in the way of making a small-scale excavator track assembly of realistic appearance and performance. It is strongly constructed with a compound girder frame carrying both lower and upper rollers and the journals for the track sprocket and idler wheel, with its tensioning device. This last is provided by spring-loaded Rod and Strip Connectors applying tension via the slots in 2 in. Slotted Strips, as shown, and Fig. 2a shows the remarkable degree of adjustment available with this arrangement.

Fig. 3 shows an inverted view of the track frames displaying the bottom rollers on which the entire weight of the model is carried—an important aspect of the prototype as superstructure weight should always be relieved from the driving or idler wheels which are raised clear of the ground. This can be seen quite clearly in Fig. 2. Fig. 3a, showing a portion of the track laid out, clearly shows the constructional system used. Each track plate is made from a $2\frac{1}{2}$ in. Flat Girder, overlaid with a $2\frac{1}{2}$ in. Perforated Strip for appearance sake to hide the slotted holes, while a centre Bolt fitted with a Washer maintains the level of the plate in the second row of holes. Hinge elements are made from pairs of Double Brackets, bolted directly to the track shoes and reinforced with Fishplates, a further pair of Fishplates linking the shoes together, with long Bolts fitted with a pair of lock-nuts being used as hinge pins. One-inch Axle Rods may also be used as track pins, secured with Spring Clips, Collars or Cord Anchoring Springs.

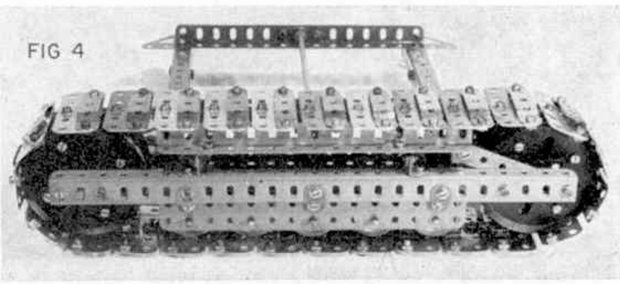


Fig. 4. General view of a track assembly for heavy-duty Excavators.

The dogs on the driving sprocket are $2\frac{1}{2}$ in. Narrow Strips bolted between a pair of 2 in. Pulleys and suitably spaced with Washers. The $1\frac{1}{2}$ in. Sprocket Wheel mounted on the same rod receives a chain drive from the side of the excavator.

Passing to a more sophisticated track form, Fig. 4 shows a track assembly suitable for a larger model. Experienced constructors will raise an eyebrow at the peculiar shape of the $2\frac{1}{2}$ in. Perforated Strips which appear in the photograph as they are bent deliberately to the form shown. The close-up of Fig. 4a shows the shape more clearly and at this stage the reader is warned that there is no intention of pursuing a policy of mutilation in the course of the Meccano Constructors' Guide. However, probably the most common part in the system is the $2\frac{1}{2}$ in. Perforated Strip which has been turned out by the million at Liverpool over the last half-century. Literally thousands of them linger at the bottom of store boxes where they have been relegated as " tatty " or slightly bent parts devoid of most of their paintwork. Now is the chance for all ambitious constructors to put their old stock to good use ! Crawler tracks, etc. never have painted surfaces for obvious reasons and they are soon scrubbed to bright steel by a run across the site where they are employed. Readers can give their surplus or redundant $2\frac{1}{2}$ in. Strips similar treatment by dunking them in paint stripper (reading the instructions thereon very carefully!) and finishing off the stripped parts with an emery cloth rub. The fact that the finished Strips will be bare, scratched and well worn will simply add to their appearance in the right place.

FIG 4A

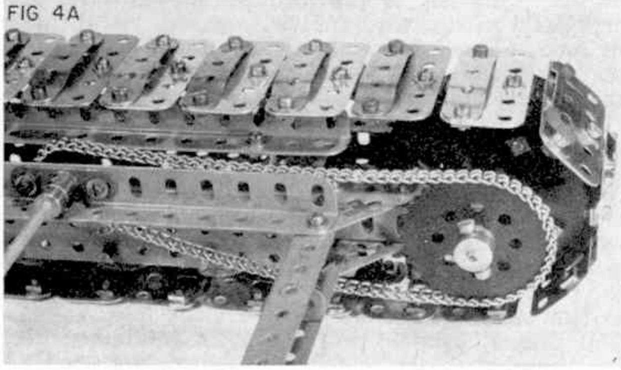


Fig. 4a. The sprocket chain drive and general track arrangement of the assembly shown in Fig. 4.

The problem of getting the correct shape to these Strips is solved by making a tool from parts inside the system. Fig. 5 shows a little hand-screw Press which does the job quickly, neatly and with constant regularity, the " exploded " view in Fig. 5a showing the component parts of the Press. The bed is a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate on which from four to six $5\frac{1}{2}$ in. Flat Girders are trapped by a locking plate, as shown. The screwing and guide posts are mounted on a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plate which is inserted from below so that the Pins and Bolt shanks protrude up through the Flanged Plate. These pins form a register for the strip-forming jaw which is made from two 3 in. Angle Girders rigidly spaced by a 2 in. Screwed Rod packed with Washers. The guide post plate remains in position under the Flanged Plate because the serrations of the Bolt threads bind slightly against the edges of the holes in the Flanged Plate.

Fig. 5 shows a $2\frac{1}{2}$ in. Strip inserted in the Press ready for forming. The butterfly screws are made from Threaded Couplings fitted with 2 in. Axle Rods

FIG 5

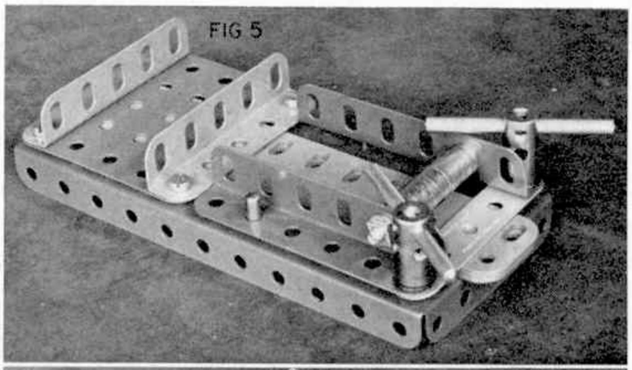


FIG 5A

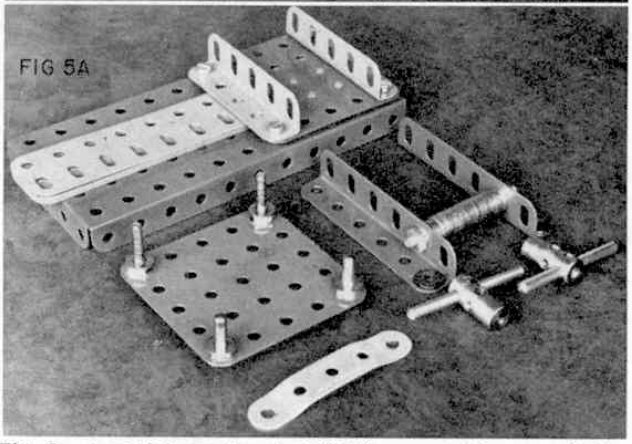


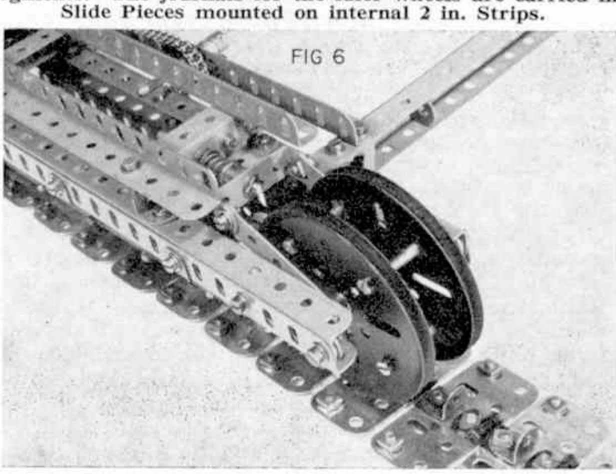
Fig. 5. A useful pre-forming Jig for scrap Meccano Strips used for smooth-faced track segments. Note the $2\frac{1}{2}$ in. Strip in the jaws ready for bending. Fig. 5a. The pre-forming Jig with the locating plate and pressure jaw removed. Note the formed Strip in the foreground.

for leverage. Pressure should be applied equally at the same time until the butterfly screws are tightened right down. The object is to produce a bridge shape in the $2\frac{1}{2}$ in. Strip with sufficient clearance below its arch for a bolthead. It may be necessary to adjust the number of Flat Girders laid on the bedplate to get the clearance required. The forming process does, of course, shorten the overall length of the $2\frac{1}{2}$ in. Strip, but not so much as to prevent it being located at standard spacing with Meccano Nuts and Bolts.

Referring back to the track plates shown in Fig. 4a, it will be seen that the bridge-formed $2\frac{1}{2}$ in. Strip gives a smooth contact surface to each " shoe " so that

Fig. 6. Top view of Excavator track frame showing idler wheels, tension ram and centre-hinged formation of track segments. The journals for the idler wheels are carried in Slide Pieces mounted on internal 2 in. Strips.

FIG 6



no scuffing of boltheads occur and thus the tracks steer with great smoothness. The same illustration shows the chain drive to the excavator tracks taken from the turntable framework. Flat Plate tracks can be made from other lengths of Flat Girders of Flat Plates, hinged at their extremities with Meccano Hinges, Part No. 114. However, the track assembly shown in Fig. 4 has 27 track plates on one track frame. This means a total of 54 track segments for both sides of the model and, if double hinges were used, some 108 Hinges would be required—a prohibitive cost for most modellers. As an alternative, therefore, the centre-hinge track section shown in Fig. 6 is perfectly satisfactory and construction is very straightforward, as can be seen. The idler wheels shown are pairs of 3 in. Pulleys spaced by long Bolts and fitted with a tension yoke made from a pair of 3 in. Strips bolted to a $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip fitted with a Rod Connector and Compression Spring. The Axle Rod carrying the idler wheels runs in bearings made from Slide Pieces running inside the channel girders on 2 in. Perforated Strips attached to the channel girders with Bolts and Washers. Fig. 6a shows the under view of the track frame with bottom rollers displayed. One-inch Pulleys with Rubber Rings are used for a cush-

FIG 6A

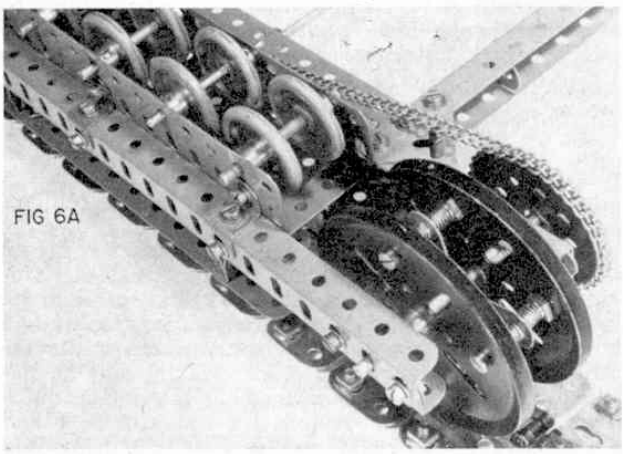


Fig. 6a. An underside view of the heavy-duty track frame showing support rollers and drive sprocket containing $2\frac{1}{2}$ in. Strips used as driving "dogs."

ioned and quiet motion and, again, these are set to keep the driving and idler sprockets clear of the ground. $2\frac{1}{2}$ in. Perforated Strips are set at 90° between the 3 in. Pulleys on the driving sprocket to engage with the elongated slot of the $\frac{1}{2}$ in. Angle Brackets attached to each track plate hinge.

With the exception of half-tracked vehicles, track-laying motions are always steered by locking one of the tracks and maintaining drive to the other. This means that one track is skidding or "scrubbing" as the vehicle turns. Tanks and crawler tractors need to be far more manoeuverable than excavators and their axle boxes must be designed to transmit the necessary power both for traction and steering. Fig 7 illustrates an excellent design of axle reduction box suitable for transmitting a very powerful drive to a Meccano Crawler Tractor. The final Axle Rod is a "dead" axle, i.e. it does not revolve, and is supported externally by the outrigger bearing shown alongside. The drive to the large track sprocket shown is directly via Pinions and Gear wheels in a reduction arrangement.

Finally, an "economy" track is featured in Fig. 8 for the benefit of readers who have a limited supply of components. The track shoes have already been

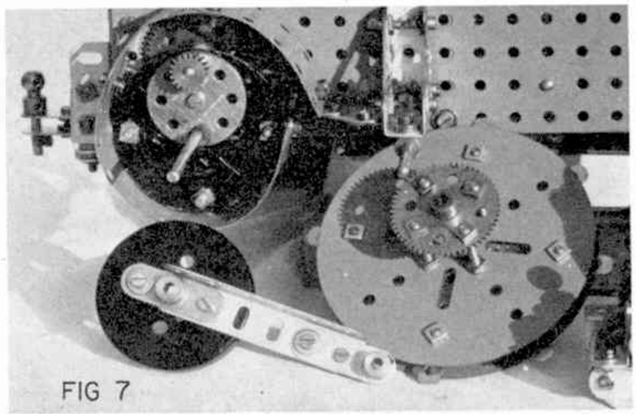


FIG 7

Fig. 7. Heavy-duty reduction gear in a rear axle assembly for a Crawler Tractor. Note the outrigger arm with journal for supporting the fixed sprocket shaft.

described but they are attached on this occasion to $2\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plates. This produces a highly flexible track with the following advantages. It is very quick and simple to construct, is light in weight, flexible enough for "high-speed" models, is realistic in appearance and not bulky. By using $2\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plates (recent production types with a hole punched in the centre), a smooth path is provided for the travelling gear rollers, as shown, and centre dogs can be bolted to the tracks at $1\frac{1}{2}$ in. spacing. These boltheads will be *under* the formed $2\frac{1}{2}$ in. Strips so that the finished model tank has perfectly smooth-faced tracks capable of running on domestic surfaces, without creating damage or havoc!

Fig. 8 shows only a section of "economy" track and the 2 in. Sprocket Wheels shown are included for scale appearance sake. The actual drive to the centre dogs bolted to the Plastic Plates would be via a pair of Bush Wheels mounted between the 2 in. Sprockets. These Bush Wheels would be fitted with Strips, Brackets or Bolt shanks suitably mounted to engage the Angle Bracket centre dogs. To give these Brackets additional support, each formed Strip may be reinforced by a normal $2\frac{1}{2}$ in. Strip, bolted on with it at the same time (on the outside of the Plastic Plates).

Hull details for tanks are readily modelled in Meccano parts and with the "Economy" track described quite a realistic model of the Royal Tiger or the British Chieftain is well within the scope of the Meccano system.

Fig. 8. A specimen length of "economy" tank track made from pre-formed $2\frac{1}{2}$ in. Strips mounted on Plastic Plates.

FIG 8