Brakes for Working Meccano Models

Reliable and Easily-constructed Mechanisms

MOST model-builders at one time or another find themselves in need of brake mechanisms. In this article therefore we are describing several different types of Meccano brakes suitable for incorporation in cars, cranes, locomotives and other working models. The mechanisms dealt with are based on brakes of various kinds used in actual engineering, and all are simple to assemble and can easily be modified to suit individual requirements.

One of the most popular mechanical brake systems is that known as the internal expanding type. Brakes in this class have one or more brake shoes, which when operated are forced outward by means of cams, springs or levers against the inside of the rim of a steel drum fixed to the axle it is desired to retard. The shoes are made of steel and are lined with a fabric that is tough enough to stand up to the hard usage involved.

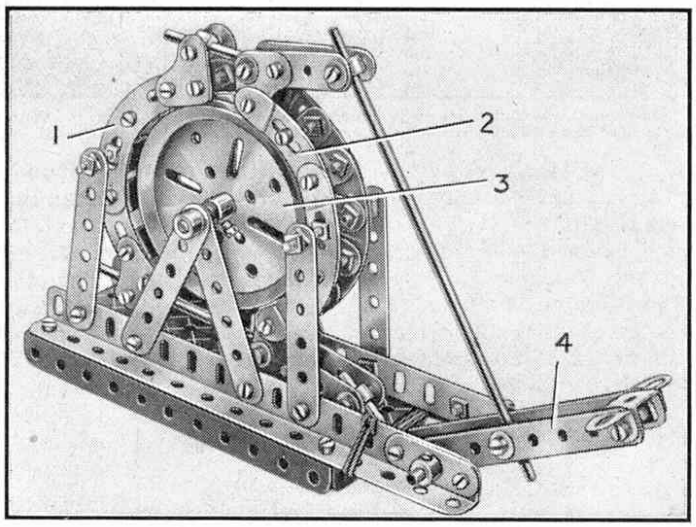

Fig. 1. A powerful model colliery engine brake operated by a foot lever.

Brakes of this kind having only one shoe, which forms almost a complete circle inside the brake-drum, usually are fitted to motor cycles. A typical Meccano brake of this kind is shown in Fig. 5. The drum 1 is carried on the wheel hub and houses the brake shoe 3, which is mounted on the fixed plate 2. The shoe is a 12½" Strip bent to fit closely inside the drum 1, and it is pivoted at one of its ends on a ¾" Bolt. The other end carries two Couplings bolted together, the lower part being fixed on a 1½" Rod, which at its opposite end carries a Crank 4 that is connected by flexible cable to a brake lever. When the Crank 4 is pulled by the cable the Couplings move and force the brake shoe against the inside of the brake drum. A flexible cable can be made by pushing a piece of wire through a length of Spring Cord.

Internal expanding brakes fitted to motor cars usually have either two or four shoes in each drum, and the methods used for expanding the shoes vary considerably. One example is shown in model form in Figs. 2 and 3. The brake drum is formed by a Boiler End. A Face Plate 2 carries the brake mechanism, which consists essentially of two shoes 3 formed by bending 2½" × ½" Double Angle Strips to the same radius as the Boiler End 1. Double Brackets are bolted at one end of the Double Angle Strips, and these are pivotally attached to a 1" Screwed Rod. The other ends of the Double Angle Strips are held in contact with a cam 4 by a short length of Spring Cord.

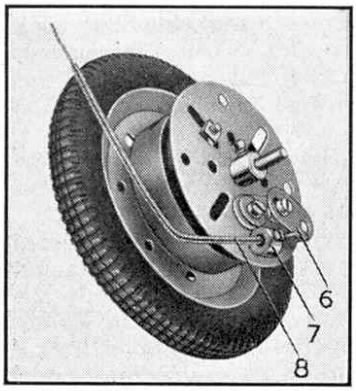

Fig. 2. Brake for a model motor car.

The cam that forces the brake shoes against the drum consists of a Threaded Boss fitted with two set screws, each screw carrying two washers. The Threaded Boss is lock-nutted on the end of a ¾" Bolt, against the head of which is locked a Flat Bracket 6. A bearing for the Bolt is provided by the second Flat Bracket shown in Fig. 2. The brake is operated by a flexible cable 8, which is anchored at one end in the Collar 7. When the wire 5 is pulled, the movement of the Flat Bracket turns the cam 4 and the brake shoes press against the Boiler End. The other end of the Spring Cord should be similarly anchored, and the end of the control wire should be attached to the end of the brake lever.

Winches, hoists and similar powerful mechanisms usually are fitted with external contracting brakes. These operate in a manner directly opposite to that of the internal expanding types already described, the shoes being so constructed that they contract and grip the outer surface of the drum.

External contracting brakes differ considerably in design, but the basic principles on which they operate are identical. Fig. 1 shows a model of a powerful brake of this kind designed for retarding a colliery winding engine model. In an actual brake the drum is fixed on the same shaft as the winding drums that hoist and lower the cages.

In the model the brake drum 3 consists of two 3" Pulleys, and the shoes are each built up from 3" Curved Strips joined together with Flat Brackets. These latter parts form the friction surface. Each shoe is supported by a 1" Screwed Rod pivoted to a 3" Strip lock-nutted to an Angle Girder of the base.

A 1" Corner Bracket is bolted direct to each end of the shoe 1, and similar parts are pivoted on lock-nutted

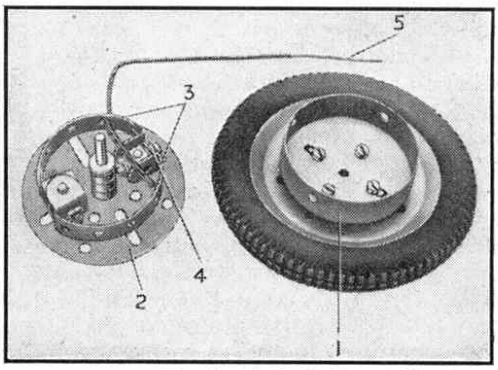

Fig. 3. Internal details of the brake shown in Fig. 2.

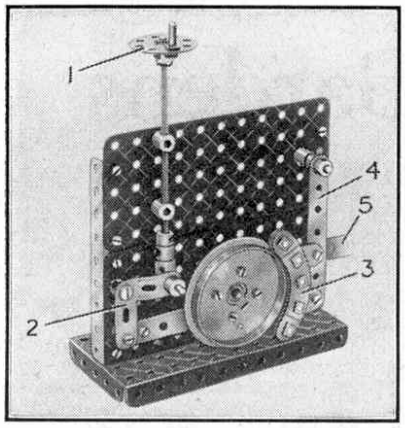

Fig. 4. Brake applied by turning a screw.

bolts to the shoe 2, in the manner shown. To each Corner Bracket of the shoe 2 is bolted a 2″ Strip, and between each pair of Strips are pivoted two Collars, one at each end. Similar parts are mounted pivotally on the shoe 1 and are connected to the corresponding Collars in the shoe 2 by means of short Rods.

The foot lever 4 comprises two 4½″ Strips joined at one end by a Double Bracket and also carrying two Collars between them. It is attached pivotally to a 2″ Rod, and the Collars are connected to those on the shoe 2 by further Rods as shown. Normally the brake shoes are held clear of the drum by their own weight, but when the foot pedal is depressed, the levers formed by the 2″ Strips are moved simultaneously and draw both shoes into contact with the drum.

This brake mechanism is particularly powerful and it is possible to lock the 3″ Pulleys with only a comparatively light pressure on the pedal.

Another form of external contracting brake, which is designed for use in cranes, is shown in Fig. 6. The main feature of this brake is that it is continually "on" and is released only when pressure is applied to the foot pedal by which it is operated. The brake band is a short length of Sprocket Chain passing round the rim of a Flanged Wheel forming the drum. One end of the Chain is fastened to a set screw screwed into a "spider," and the other end is fastened to the Rod 2. Weights consisting of 1″ Gears are mounted on the end of the Rod 2. The foot pedal by which the brake is released consists of a Rod and Strip Connector held on a short Rod fixed in the longitudinal bore of a Strip Coupling. The latter is pivoted on a 1″ Rod as shown, and is connected to the Rod 2 by a 1½″ Strip.

The brake band is normally held in tension by the weights acting on the arm, and is released by depressing the foot pedal when lifting or lowering has to be done.

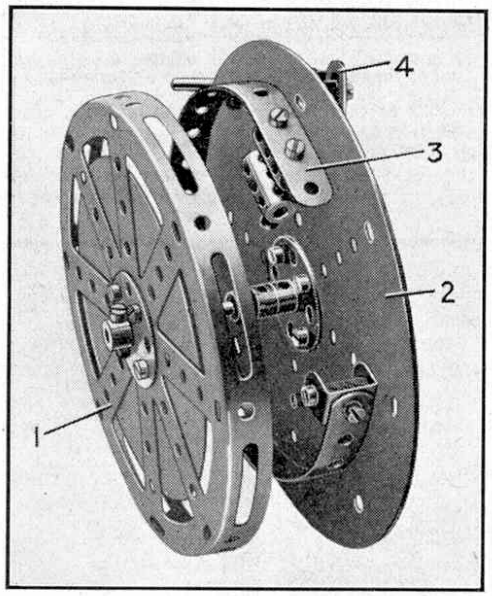

Fig. 5. Internal expanding brake with a single shoe.

External contracting brakes of a rather different type are those used in lift mechanisms. These generally are electrically operated and are applied to a drum on the winding shaft of the lift hoisting and lowering mechanism. While the current is switched on and the lift is in action, the shoes are held clear of the brake drum against powerful springs by electro-magnets. In the event of the electric supply being accidentally cut off, the brake comes into operation immediately, and prevents the lift from falling down the shaft.

Model-builders who are interested in the construction of detailed model locomotives and rolling stock will find it a good plan to incorporate brakes of the kind shown in Fig. 4. This brake is operated by a screw mechanism. The Bush Wheel 1 forms a handwheel, by means of which a Screwed Rod is made to rotate in the tapped holes of two fixed Rod Sockets, so that the Rod is either raised or lowered according to the direction in which it is rotated. At the lower end of the Screwed Rod is a Small Fork Piece that is pivotally connected to a Boss Bell Crank. This is joined by a link to the vertical Strip 4 that carries the brake shoe 3.

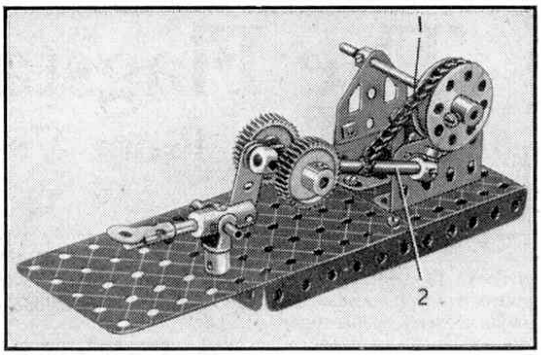

Fig. 6. A foot-operated strap brake for model cranes.

The arrangement shown is a complete mechanism for one wheel. A strip 5 forms a link that connects Strip 4 to the shoe-operating mechanism of the second wheel, so that both shoes engage with the wheel rims simultaneously. When incorporated into a model, the mechanism described would be fitted to both sides of the truck or van.

Another interesting type of brake is the electric slipper mechanism used on tramcars. This is quite easy to reproduce in Meccano and if added to a model tramcar will greatly increase the fun of operating it. It consists of a powerful electro-magnet with a pole of the same contour as the running rails. When the magnet is energised it is magnetically attracted into contact with the rail and retards the progress of the vehicle. Usually there are four shoes on a two-bogie tramcar, one shoe being placed between each pair of wheels. An interesting point about these brakes is the manner in which the current used to energise them is obtained. The driver first cuts off the current to the traction motor. Its armature is then rotated by the driving wheels of the tramcar, and owing to the special system of wiring adopted the motor then acts as a dynamo and generates the current to operate the brakes. This system is known technically as regenerative braking.

Many of the latest tramcars are fitted with a combined wheel and track brake, which is capable of stopping and holding a car on the steepest gradients. The essential parts of this system are the ordinary wheel brake blocks, magnetic track brake shoes, as already described, and a system of levers so arranged that when the shoes are drawn into contact with the rails the ordinary brake blocks are applied to the wheels.

In a model the brake shoes can be built up from Strips bolted together, face to face, with a similar set of Strips joined to them at right-angles to form a T-shaped structure. Coil cheeks consisting of discs of cardboard are then fitted to the leg of the T, and several layers of No. 23 S.W.G. Cotton Covered Wire are wound between them. The shoe is then attached to the frame of the tramcar and small Compression Springs are arranged to hold it from the track when the current is switched off.

minutes. Construction of the model is commenced with the fuselage, each side of which is built up by joining a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate 1 to a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate 2 by means of a $12\frac{1}{2}''$ Strip. The forward end of each of the larger Flexible Plates is then bent inwards and the two are bolted together. The nose is formed by two more $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates. The underside of the nose is closed in by a $1\frac{11}{16}''$ radius Curved Plate 3.

The centre part of the fuselage is next built up by fastening two Flanged Sector Plates 4 in position. These are then extended to the rear on each side by two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, which are bolted together at the tail. The bolt used for this purpose serves also to hold the rudder in position, and this should now be assembled. It consists of a framework of $2\frac{1}{2}''$ Strips and Curved Strips filled in by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate.

The inner lower edges of the Plates used in the construction of the fuselage are strengthened by $5\frac{1}{2}''$ Strips, and the sides are spaced apart by two $2\frac{1}{2}'' \times \frac{1}{2}''$ and one $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip to give correct shape.

To make the tail plane the centre pin is removed from a Hinged Flat Plate, the two parts of which are used separately. Each half is extended by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, and is braced at the edges by two $5\frac{1}{2}''$ and one $1\frac{1}{2}''$ Strip. The two are then fastened to the fuselage and to the rear end of the rudder by Angle Brackets.

Each wing is constructed from a $12\frac{1}{2}''$ Strip Plate that is braced along its underside by a $12\frac{1}{2}''$ Angle Girder. The Strip Plate is bolted to a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate attached to the fuselage side by a $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip.

The landing wheel units comprise a 1" loose Pulley with Rubber Ring mounted on a $1\frac{1}{2}''$ Rod between a Collar and a 1" fast Pulley. The fast Pulley is locked on the Rod, and a 3" Screwed Rod is then screwed into one of the tapped holes in its boss, the upper end of the Screwed Rod being fastened by lock-nuts to the wing.

Two $5\frac{1}{2}''$ Strips bolted between two $1\frac{1}{4}''$ Discs are used for the propeller, which revolves on a $3\frac{1}{2}''$ Rod supported in the Bush Wheel at the nose. The Bush Wheel is fixed in place by an Angle Bracket.

Parts required to build Hawker "Hurricane": 8 of No. 1; 14 of No. 2; 2 of No. 3; 4 of No. 5; 2 of No. 8; 1 of No. 11; 9 of No. 12; 1 of No. 16; 2 of No. 18a; 3 of No. 22; 2 of No. 22a; 1 of No. 24; 104 of No. 37a; 99 of No. 37b; 3 of No. 38; 1 of No. 44; 1 of No. 48; 2 of No. 48a; 2 of No. 48b; 2 of No. 53; 2 of No. 54a; 4 of No. 59; 2 of No. 80c; 2 of No. 90; 4 of No. 90a; 1 of No. 111c; 2 of No. 155a; 1 of No. 188; 4 of No. 189; 1 of No. 190; 2 of No. 191; 4 of No. 192; 2 of No. 197; 1 of No. 198; 2 of No. 199; 2 of No. 200; 2 of No. 214; 3 of No. 215; 2 of No. 217a.

Fig. 3 shows a model of a popular type of truck used in factories for transporting goods from one department to another. The goods to be moved are stacked on a tray raised from the ground on runners. The truck is then pushed under the tray and the handle shaft is pressed downward. This movement causes the lifting platform of the truck to rise and lift the tray of goods ready for transportation. When the goods have been conveyed to the desired place, the truck handle shaft is raised and the tray and goods deposited on the ground. The truck is then withdrawn and is ready for another load.

All these movements can be reproduced with the model, the main frame of which consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. A $3\frac{1}{2}''$ Rod journalled in the flanges of the Plate carries two 1" Pulleys fitted with Rubber Rings, and a Flat Trunnion is bolted to the forward end to provide a support for a second Flat Trunnion, which is secured to it by a lock-nutted bolt. Angle Brackets bolted to the underside of the second Flat Trunnion form the bearings for the front axle, one of the bolts holding also an Angle Bracket above the Flat Trunnion. The latter forms the point of attachment for the shaft of the handle, which consists of two $5\frac{1}{2}''$ Strips bolted together and spaced apart by a nut on each bolt.

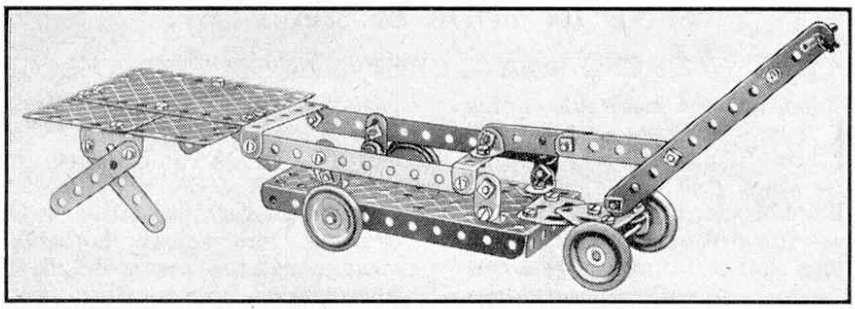

Fig. 3. Another novel subject for Outfit No. 2. This model lifting truck is based on an actual truck used in factories for transporting goods from one department to another.

The frame of the lifting platform is built up by joining two $5\frac{1}{2}''$ Strips together by two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. Four Flat Brackets are lock-nutted to the $5\frac{1}{2}''$ Strips in the positions shown, and the other ends of the Flat Brackets are lock-nutted to four Angle Brackets bolted to the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. The Flat Brackets must be free to move easily. The forward $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip of the lifting platform is linked by a compound strip to the handle, the strip consisting of two $2\frac{1}{2}''$ Strips overlapping two holes.

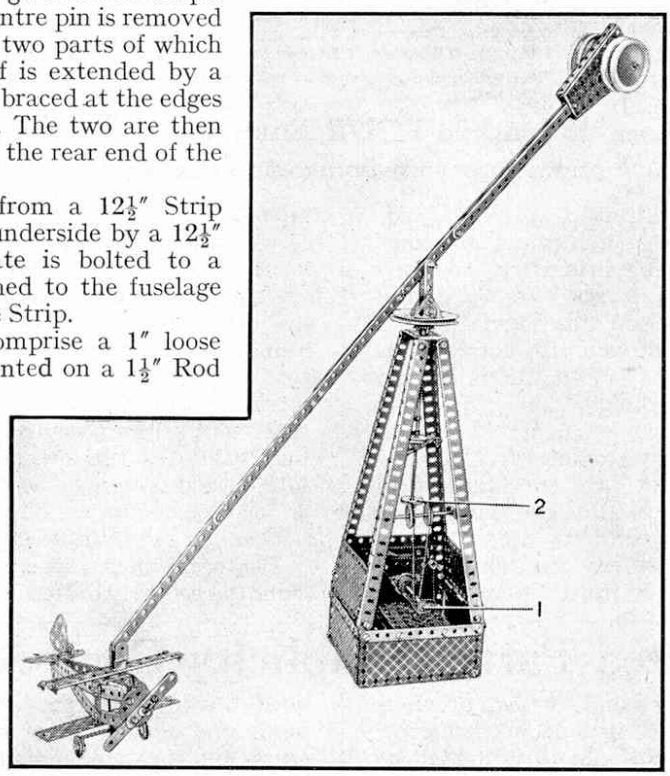

Fig. 4. All the parts required to build this motor-driven aeroplane roundabout are contained in Outfit No. 5.

Parts required to build the model lifting platform truck: 4 of No. 2; 6 of No. 5; 4 of No. 10; 7 of No. 12; 1 of No. 16; 2 of No. 17; 4 of No. 22; 2 of No. 35; 46 of No. 47a; 31 of No. 37b; 2 of No. 48a; 1 of No. 52; 2 of No. 126; 2 of No. 126a; 4 of No. 155a; 2 of No. 190; 1 of No. 191.

Owners of an Outfit No. 2, or indeed of any Outfit of greater size than this, have another good subject for their attention in the novel mobile searchlight unit shown in Fig. 2. The lamp housing is made by bolting a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate and a $1\frac{11}{16}''$ radius Curved Plate together to form a cylinder. A Road Wheel carrying a 2" Rod in its boss is then pushed into the end of this structure, and a Bush Wheel also is fastened to the 2" Rod, but outside the Road Wheel. A $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, the ends of which are curved downwards, is mounted on top of the searchlight by a $2\frac{1}{2}''$ Strip and two $\frac{3}{8}''$ Bolts.

Parts required to build model searchlight: 2 of No. 2; 5 of No. 5; 2 of No. 12; 2 of No. 16; 1 of No. 17; 3 of No. 22; 1 of No. 24; 3 of No. 35; 28 of No. 37a; 28 of No. 37b; 4 of No. 38; 1 of No. 48a; 1 of No. 90a; 3 of No. 111c; 2 of No. 126; 2 of No. 126a; 2 of No. 188; 2 of No. 190; 1 of No. 191; 2 1" Rubber Tyres (not included in Outfit).