BORING MACHINE

THE Boring Machine that forms the subject of the fine model seen in Fig. 1 on this page is one of the most useful among the large variety of machine tools at the disposal of the modern engineer. In general design it is based upon a real machine and every attempt has been made to reproduce not only the movements of the prototype but also its general appearance and proportions.

The model is driven by an E15R Electric Motor and it will form an attractive subject for those with a good assortment of Meccano parts and experience in Meccano construction.

Framework

Commence building the model by making the two columns of the frame. For these four similar sides are required, and each is constructed as follows: A 12½" Angle Girder 1 is bolted to a 5½" Angle Girder 2. Two 5½" Curved Strips 3 and a 5½" Strip 4 are secured to the ends of the Angle Girders 1 and 2. The frame thus formed is filled in with a 5½" × 2½" Flat Plate 5, two 5½" × 1½" Flexible Plates 6, a 4½" × 2½" and a 3½" × 2½" Flexible Plate 7 and 8, and one 3½" × 2½" and one 3½" × 1½" Triangular Plate 9 and 10. On one column, one of the 5½" Angle Girders 2 is replaced by a 9½" Angle Girder 11, to which is bolted a 3½" × 2½" Flanged Plate and an E15R Electric Motor. The four sides are fastened together by three 9½" Angle Girders 12, 13 and 14. Three 5½" × 1½" Flexible Plates 15 are attached by Angle Brackets to each column of the model as shown in Fig. 2. A 9½" Flat Girder is bolted to the Angle Girder 14. Four Stepped Curved Strips arranged in a circle are secured to the Flexible Plates on each side, and a 2½" Strip 16 is bolted in the position shown in Fig. 3. Looking at Fig. 2 you will see a Hub Disc 17 and a Circular Girder 18. These are connected together with four 5½" × 1½" Flexible Plates and three 2" Strips. A 1½" Strip is bolted across the centre of the Hub Disc, and a 5½" Strip across the Circular Girder to provide bearings for a 2½" Rod on which the worktable, a 6" Circular Plate 19 with a Bush Wheel, is mounted. This Rod also carries a ¾" Contrate Wheel. A 4" Rod 20, Fig. 2, mounted in a 1½" Strip and a 1" × 1" Angle Bracket, has two ½" Pinions secured to it, one engaging with the ¾" Contrate Wheel on the spindle of the worktable and the other with the Worm Wheel 21. The Hub Disc is attached to the 9½" Angle Girder 12 by two Fishplates.

Motor Drive

The Motor side-plates are extended with 3" × 1½" Flat Plates. A $\frac{7}{16}$" Pinion on its shaft drives a 60-tooth Gear Wheel on a 2½" Rod, on the other end of which is a ½" Pinion. This Pinion engages with a 57-tooth Gear Wheel on a 2½" Rod that carries a ½" Pinion 22 and a 1" Sprocket Wheel 23 (Fig. 1). A ¾" Sprocket Wheel 24 is fixed on a 2½" Rod and a 57-tooth Gear Wheel also on this Rod is arranged to engage with the Pinion 22. On the 4½" Rod 25 is secured a 1" Sprocket Wheel, a ½" Pinion 26 (this is not seen as it is inside the framework), another ½" Pinion 27, and a 1" Gear Wheel 28. A ½" Pinion 29 (Fig. 2) is loosely mounted on a ¾" Bolt locked to the Flat Plate of the column by two nuts. A ½" Pinion 31 and a 1" Gear Wheel 30 are fixed in each end of a Socket Coupling and this is placed on a 4" Rod with Keyway 32 held in position by Collars. A 1" Sprocket Wheel is secured on the Rod inside the column, and is connected by Chain to a 1" Sprocket Wheel mounted on a 2½" Rod 33 (Fig. 1). A ¾" Sprocket Wheel on this Rod drives a ¾" Sprocket Wheel 34 on an 8" Rod 35, which has two ⅞" Bevel Wheels 36 (see Fig. 3) fastened to it. A 9½" Angle Girder 37 fitted with two 1" × 1" Angle Brackets, supports the Rod 35. A 5½" Strip 38 fitted with a Threaded Pin is lock-nutted to a ½" × ½" Reversed Angle Bracket attached to the 9½" Angle Girder 11. The inner end of 5½" Strip 38 is attached by a Bolt to a Collar on the 4" Rod 39. Two 1½" Rods fastened in a Coupling 40 secured on Rod 39 engage with the groove of the Socket Coupling to form the drive reverse mechanism.

A 4½" Strip 41 (Fig. 1) fitted with a Threaded Pin and an End Bearing is lock-nutted to the Angle Girder 12. The lugs of the End Bearing engage with the 57-tooth Gear Wheel 42, which is placed on a 4" Rod with Keyway and is free to move to engage with the ½" Pinion 26 inside the column.

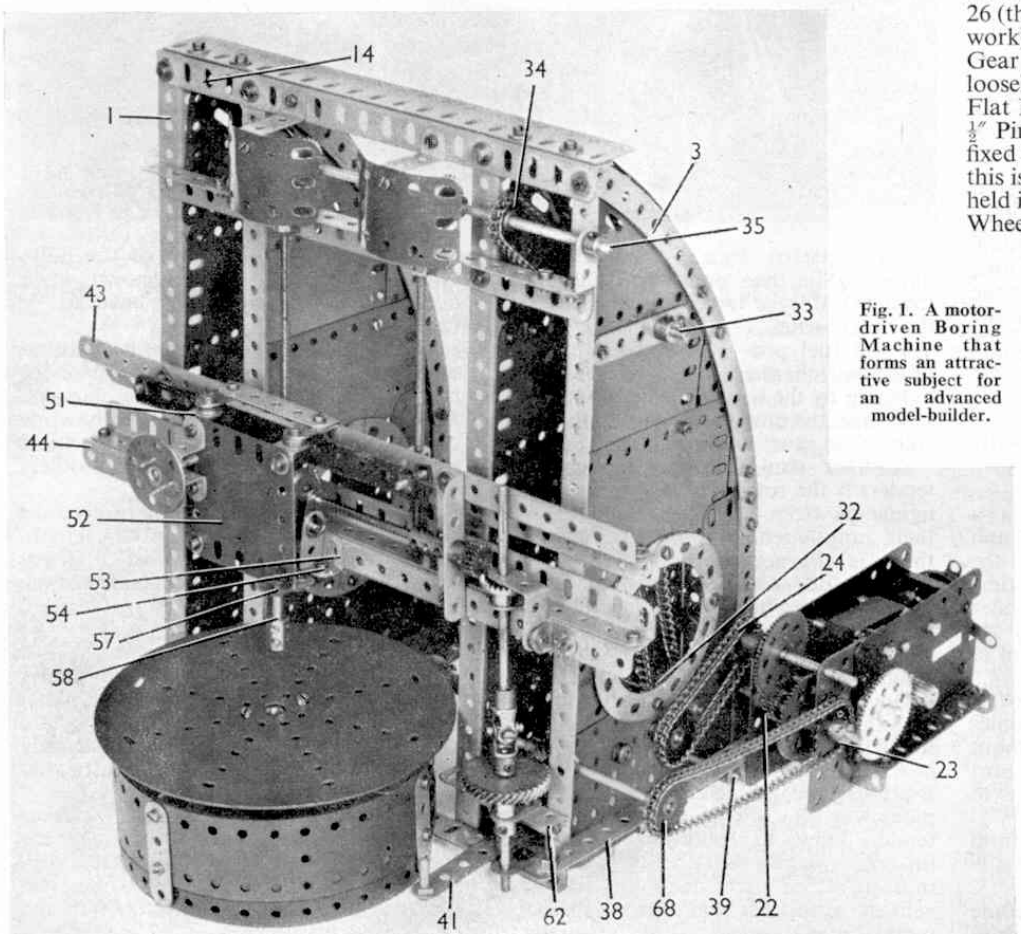


Fig. 1. A motor-driven Boring Machine that forms an attractive subject for an advanced model-builder.

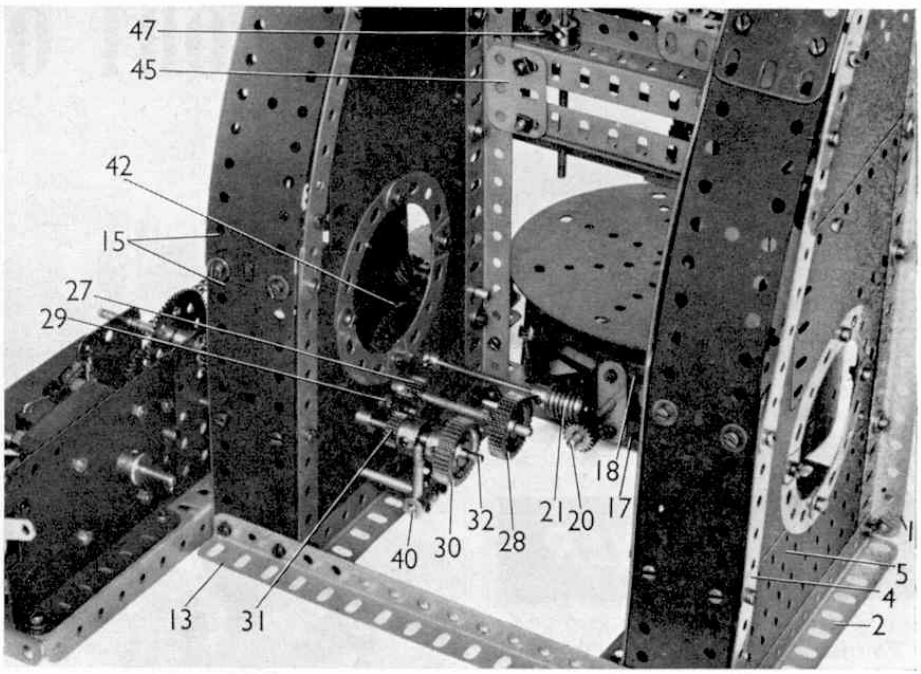
Both the Gear Wheel 42 and the 1″ Gear Wheel 30 have Key Bolts in their bosses.

Two 12½″ Angle Girders 43 are bolted together to form a reversed angle girder (see Fig. 1), and a similar pair of Girders 44 are joined to it by 1½″ Flat Girders 45 (Fig. 2), spaced away from the Angle Girders by two Washers on each of the ⅜″ holding Bolts. A 2½″ Angle Girder 46 (Fig. 3) is fastened to the front. Two Threaded Cranks 47 (Fig. 2) are secured to the Angle Girder 43. Two ⅞″ Bevel Wheels 49 are fastened to Screwed Rod Adaptors fixed in the ends of 6″ Screwed Rods 48, and locked in place by nuts. These Screwed Rods are threaded through the Threaded Cranks 47. Two 2½″×1½″ Flexible Plates are curved to form shields and are attached to the Angle Girder by 1″×½″ Reversed Angle Brackets.

The Tool Carriage.

Two 2½″ Angle Girders 50 are placed together with the elongated holes of one facing the round holes of the other. A Fishplate is placed between them at each end and these are attached to the lugs of a 2½″×½″ Double Angle Strip 51 bolted on each side of a 2½″×2½″ Flexible Plate 52. Three Washers are used to space the Fishplate from the lugs. A similar pair of Angle Girders 53 (Fig. 1) is secured at the bottom of the Plate 52 by Fishplates. A 1″×½″ Angle Bracket 54 (Fig. 1) extended by a Fishplate forms the bearing for a 4″ Rod with Keyway 55, which is secured by a Coupling to a 1″ Rod carrying a ½″ Pinion 56. A Double Bent Strip 57 supports a 2½″ Rod 58 carrying a ⅞″ Bevel Wheel that engages with the ⅞″ Bevel Wheel mounted with a Key Bolt 59 on the Rod with Keyway 55. The tool chuck is a short Coupling fixed in the lower end of Rod 58.

A 6½″ Rack Strip 60 (Fig. 3) is attached to the reversed angle girder 43 by ¾″ Bolts and three nuts, leaving a space of half-an-inch between Rack Strips and Girder. A Bush Wheel 61 is mounted on a 2″ Rod carrying a ½″×½″ Pinion that engages with the Rack Strip.



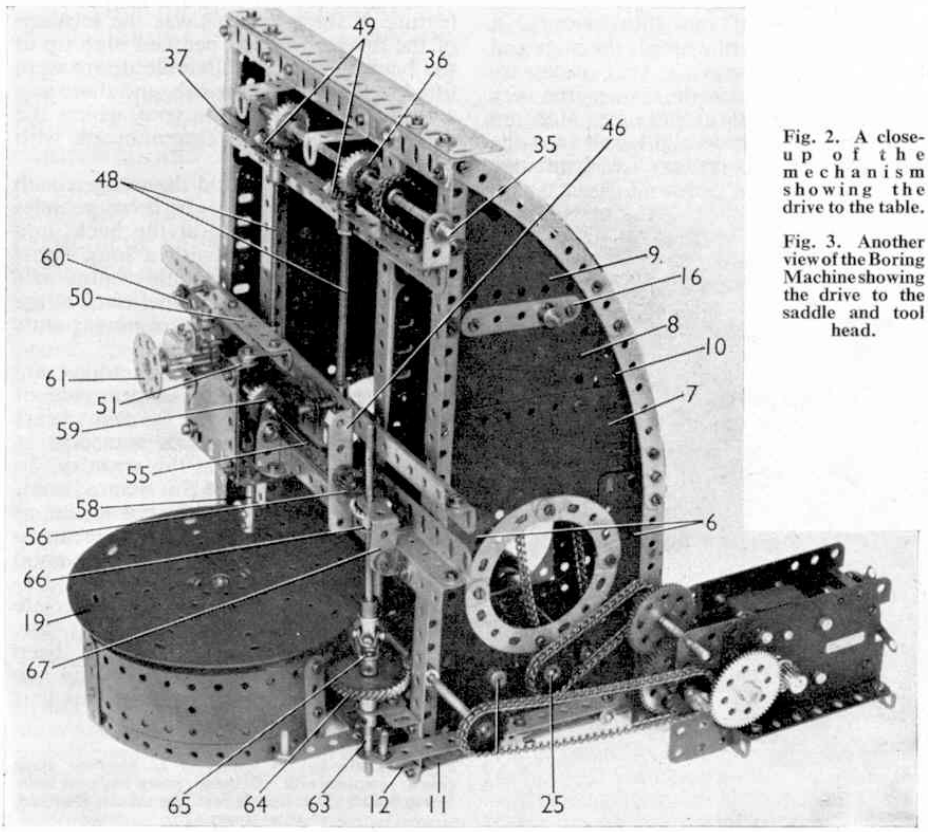


Fig. 2. A close-up of the mechanism showing the drive to the table.

Fig. 3. Another view of the Boring Machine showing the drive to the saddle and tool head.

The Tool Drive

Two 1″ Corner Brackets are bolted to the Angle Girders 12 and 62 and a 2½″ Rod 63 that has a 1½″ Helical Gear Wheel 64 and a Universal Coupling 65 secured to it, is placed in them. A 1″ Triangular Plate 66 bolted to the Angle Girder 44, and a 1″×1″ Angle Bracket 67 attached to an Angle Bracket fixed on the Angle Girder, support a Rod with Keyway, which is fastened in the Universal Coupling 65 the other end of which is fixed on the 2½″ Rod 63. A ¾″ Contrate Wheel with a Key Bolt in its boss is placed on the Rod so as to engage with the ½″ Pinion 56.

The Sprocket Wheel 23 (Fig. 1) drives a 1″ Sprocket Wheel 68 on a 4″ Rod which is fitted with a ½″ Helical Gear Wheel that engages the Helical Gear 64.

The tool is traversed across the work-table by turning the Bush Wheel 61, and the tool saddle can be moved up or down the columns by the Motor. The work-table can be either rotated by the Motor or allowed to remain stationary, by manipulating the lever 41.

Parts required to build the Boring Machine: 6 of No. 2; 1 of No. 2a; 2 of No. 5; 3 of No. 6; 2 of No. 6a; 8 of No. 8; 5 of No. 8a; 3 of No. 9; 6 of No. 9d; 7 of No. 11; 17 of No. 12; 4 of No. 12a; 1 of No. 12b; 1 of No. 13a; 1 of No. 15a; 3 of No. 15b; 7 of No. 16a; 1 of No. 17; 2 of No. 18a; 1 of No. 18b; 2 of No. 24; 9 of No. 26; 1 of No. 26a; 1 of No. 26c; 3 of No. 27a; 1 of No. 27d; 2 of No. 29; 6 of No. 30; 2 of No. 31; 1 of No. 32; 193 of No. 37a; 175 of No. 37b; 82 of No. 38; 2 of No. 45; 2 of No. 48a; 1 of No. 53; 15 of

(*Continued on page 467*)

Hornby Railway Company—

(*Continued from page 457*)

its livery of I.C.I. transport blue, to use the official title, with the wording *Bulk Salt* and the characteristic I.C.I. emblems.

Another Hornby-Dublo newcomer is the No. 4652 Machine Wagon, representing a special type of four-wheeled vehicle familiar, in various forms, on railways for many years. The code name *Lowmac*, so useful for working reference, implies its low build, and its purpose. The centre section of the vehicle is depressed, much like that of a bogie well wagon, so that it can carry bulky loads which might otherwise exceed the loading gauge.

The Hornby-Dublo Machine Wagon *Lowmac* is essentially a once-piece moulding. The stout side girders supporting the "deck" of the wagon are modelled in excellent detail. The upper part of the miniature wagon forms an excellent reproduction of the deck of the real thing, with the floor planks running crosswise.

The Hornby-Dublo Machine Wagon is coloured in bauxite brown and in view of its low-built character the moulded spoked wheels are of smaller diameter than the standard ones.

Further welcome news for Hornby-Dublo Two-Rail owners is the appearance of No. 2460 Level Crossing, for single track, so that road and railway can cross one another, with interesting and realistic effect. The Level Crossing consists of a moulded base, concrete in colour. Mounted on the base are two pairs of gateposts, each pair with a single gate that can be swung across the roadway or the railway. Gates and posts are finished in white, each gate having a characteristic red warning disc in the centre.

The base is shaped to provide a sloping approach for the roadway on each side of the track, and two standard rails, equal in length to a Straight Two-Thirds Rail, with a moulded representation of the usual built-up crossing between them, form the running lines. These are situated in a channel or recess in the base, so that the Level Crossing does, in fact, live up to its name.

The Set of Gradient and Mile Posts now available provides you with a total of 12 of these useful lineside items. Mile Posts showing respectively quarter, half and three-quarter mile markings are included, as well as one marking a full mile. The Gradient Posts cover several situations such as change from level to an ascent, change from level to a descent, a summit, the bottom of a dip, and the intermediate changes, ascending and descending.

For station platforms, and for the surroundings of the railway generally, the Dublo Dinky Toys range now includes the eleven pieces of No. 052 Railway Station Passengers. There is no space now to give you "personal" details of these lifelike little people, but I must endeavour to do so at a later date. They are illustrated in the advertisement pages.

Air News—(*Continued from page 437*)

wheels, climb to a high altitude and then open up its two de Havilland Gyron Junior turbojets for many minutes of valuable research at speeds of between 1,500 and 2,000 m.p.h. This is equivalent to 2½-to-3 times the speed of sound.

At such speeds, even in the intense cold of the upper atmosphere, air friction will heat the aircraft's skin to a temperature of as much as 280 degrees C. To withstand this, it is built almost entirely of stainless steel and there is a large-capacity refrigeration system to keep the pilot cool. For the record, the Bristol 188 is 71 feet long and spans 35 ft. 1 in.

Drilling the Mohole—

(*Continued from page 427*)

necessary to protect it from bending by having a bell-shaped guide fixed to the bottom of the ship, and another guide pipe at the sea-bed (see diagram at the foot of page 427). These guides, together with the outboard motors, proved successful in the recent trials, and holes 600 feet or more in depth were drilled into the sea-bed.

One thing could not be done during the trials—it was not possible to change the drilling bit when it wore out. In order to do this, it would have been necessary to haul the bit to the surface and replace it by a new one. But if this had been done, it would have been impossible to find a small, eight-inch hole at the bottom of the ocean! Therefore, the distance the drill could penetrate into the sea-bed was limited to the life of one drill bit. Even with the diamond cutting bits—which are used for drilling hard rock—the depth that can be drilled with one bit is only a few hundred feet.

If we want to be able to change the drill bit in order to go on drilling deeper, it will be necessary to have a tube joining the ship to the sea-bed. We can then slide the drill pipe up and down the tube. But such a tube will be very heavy, and its weight would be more than *Cuss I*—which was the name of the ship used in the experiments described—could support. However, all the information needed for planning a much larger drilling ship has been obtained, and the next stage in the Mohole experiment will be in a few years' time, when this special ship has been constructed.

One other special tool was tried during the experiments. This was a turbo-drill, which has a turbine motor held at the bottom of the bore-hole. The turbine is driven by water pumped down the drill pipe, just as the modern dentist's drill works. The advantage of this type of drill is that the drill pipe does not have to be rotated and so there is no risk of the pipe twisting off and breaking. In addition, the turbo-drill can cut more quickly than the ordinary one.

Other improvements in drilling are being considered. For instance, when a hole from which it is possible to extract a bit is several miles deep, it takes hours to haul the drill pipe out in order to fit a new drilling bit. At the present time use is made of a block and tackle, like a crane, to pull the drill pipe up. A new idea is to use a hydraulic lift which will extract the drill pipe from the hole three times as quickly as in the past. Then again, diamond drill bits are being made so that they will last much longer. There is no doubt that all the new ideas connected with drilling will help in the collection of a sample of the rock from which the mantle is made.

Meccano Boring Machine—

(*Continued from page 453*)

No. 59; 2 of No. 62a; 2 of No. 63; 1 of No. 63d; 4 of No. 70; 2 of No. 73; 1 of No. 77; 2 of No. 79a; 8 of No. 89; 16 of No. 90a; 46½" of No. 94; 5 of No. 96; 3 of No. 96a; 1 of No. 103a; 2 of No. 103h; 1 of No. 110a; 3 of No. 111; 8 of No. 111c; 2 of No. 115; 1 of No. 118; 2 of No. 124; 1 of No. 125; 2 of No. 133a; 1 of No. 140; 1 of No. 143; 1 of No. 146; 1 of No. 166; 1 of No. 171; 1 of No. 173a; 2 of No. 188; 18 of No. 189; 1 of No. 190; 4 of No. 190a; 4 of No. 191; 1 of No. 211a; 1 of No. 211b; 4 of No. 224; 4 of No. 226; 4 of No. 230; 4 of No. 231; 1 E15R Electric Motor.

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2. Holly berry, 3. Epic, 4. Arrive, 5. Hymnal, 6. Bad loser, 7. Uses, 11. Stocking up, 13. Aneroids, 16. Encore, 17. Stroll, 18. Tact, 20. Leap.

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