

A Meccano Working Spinning Mule

Accurate Model of a Complicated Machine

FROM time to time we have described in the "M.M." notable models built by readers that demonstrate the remarkable accuracy with which great engineering masterpieces can be reproduced in model form with Meccano parts. The illustration on this page shows another model of this kind, which was built by Mr. A. Lord of Petersham, New South Wales. It is a reproduction of a modern spinning mule, one of the most complicated machines used in the textile industry, and was referred to briefly in the "M.M." for March 1935. Recently Mr. Lord sent the model to us for examination, and as it contains several ingenious mechanisms that are easily adaptable for use in other kinds of models, we now give further details of it.

The purpose of the spinning mule in the manufacture of cotton or woollen thread is to spin smooth strong material, suitable for weaving, from the rough weak thread produced by the earlier processes of carding, drawing and slubbing.

The thread is placed in the mule wound on a spool, and from this it is led to a revolving spindle that applies a peculiar twist to the fibres and winds up the finished material in the form of a conical-shaped bobbin, known as a cop. Mr. Lord's model carries out all these operations in exactly the same manner as an actual mule. The cop is formed on a spindle 3, which is mounted on a travelling carriage that consists of a Strip bent to form a $3\frac{1}{2} \times 1\frac{1}{2}$ double angle strip. The carriage slides on a horizontal Rod 2, and a second Rod 4, which at one end has a Collar that engages the slot of a special cam 5, causes a wire finger attached to a pivoted $3\frac{1}{2}$ Strip to move up and down the cop spindle 3. The spindle is a Rod filed to a point at its upper end, and it revolves in bearings in the carriage. The drive is taken from the main gear-box by means of cord.

The following is a brief description of the operations that take place. The cop carriage commences operations at the right-hand end of its slide. It first of all travels slowly to the left. Thread is drawn from the spool, and at the same time the cop spindle revolves at high speed. When the spindle first begins to rotate, the fact that the cop is tapered and inclined from the vertical, causes the thread to travel upward and finally to slip off the end of the spindle. It is this slipping-off movement in conjunction with the rapid rotation of the cop spindle that applies the necessary twist to the thread.

At the end of its travel the carriage strikes a stop and operates mechanism that causes the finger on the pivoted arm to travel rapidly down the cop, drawing all the upper turns tightly together and placing a binding thread down the cop in a steep spiral. The carriage then travels slowly back to its original position and winds the thread on to the cop, and simultaneously the Rod 4 allows the wire finger to rise slowly. At the end of the travel cam 5 rises quickly and lifts Rod 4 and the wire finger, so that the latter is well clear of the cop and ready for the next draw.

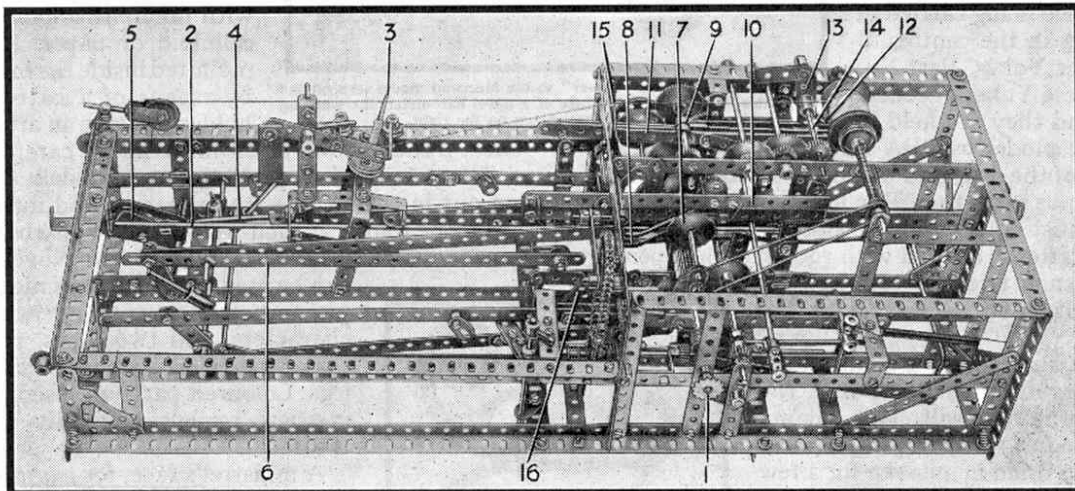
The carriage is operated by an ingenious return mechanism. A Strip attached to the carriage slides in an Eye Piece, and has a short length of Rack Strip bolted to it. At each end of the travel of the carriage the Rack Strip is just out of mesh with a Pinion that is driven continually, but in opposite directions during each

half of the complete cycle of operations. The carriage is pushed forward slightly by means of a system of Strips provided with projecting pins as in the case of Strip 6, until its Rack Strip engages the rotating Pinion, which carries it along until it is thrown out of gear at the other end. Another pin then throws it into mesh again, to travel in the reverse direction.

One of two interesting reverse gears incorporated in the model is shown in the illustration at 9. It is used for altering the gear arrangements that control the cop spindle and the cam 5. A reciprocating Strip 11, bent so that its ends are parallel but about $\frac{1}{2}$ in. out of alignment engages between two Collars 9 on a Rod that slides sideways across the machine. It is actuated by a Rack and Pinion mechanism and as it travels, the sliding Rod is moved a distance equal to the misalignment in the ends of the Strip, and its movement is utilised to throw certain gear trains into reverse.

The second of the two reversing gears is actuated by a special slotted Strip 8 that is bent roughly at 60° to the axis of the Gear Wheel 7. The Rod of this gear passes through the slot in the Strip,

and a Collar on the side of the Strip opposite from the gear prevents the Rod from sliding freely. The Strip is bolted to the assembly 6, to which the travelling carriage imparts a reciprocating motion. As the Strip moves from right to left, or vice-versa, the gear and its Rod slide through a distance of about $\frac{1}{2}$ in., and the various



A remarkable model spinning mule designed and constructed by Mr. A. Lord of Petersham, New South Wales. This works in exactly the same manner as the spinning mules installed in textile factories.

gear arrangements are altered.

During the operation of changing from one of the main gear trains to the other, a gear wheel on the sliding Rod engages momentarily with a special narrow-faced pinion that forms part of the driving mechanism of the cop spindle. The result of this action is a momentary increase in the speed of rotation of the cop at the end of the draw.

As the model was required to work continuously for display purposes, Mr. Lord devised an ingenious gear for re-winding the thread from the cop on to the spool at the end of every 80 draws. This operates as follows. At the end of each draw the Angle Bracket 12 makes contact with the lower end of the $2\frac{1}{2}$ Strip 13 that is bolted to a Crank on Rod 14. The assembly 13 is provided with a Pawl that engages a Ratchet Wheel, and each time the Strip 13 is struck the Rod 14 is rotated $1/20$ th of a revolution. A 4:1 gear reduction between this and a Rod that operates the rewinding gear ensures that 80 draws are completed before rewinding takes place. The final Rod of the 4:1 gear train has a pointed striking cam secured to its end, and as it rotates this forces down a lever that throws the mechanisms that control the carriage and cop out of gear. The cop spindle now being free to revolve the thread is rewound on to the spool and the distributing arm 15 guides the thread backward and forward and fills the bobbin evenly. The rewinding of the thread on to the spool is automatic, as during the whole of the normal spinning period the spool is rotated against the action of the spring clip clutch. When the cop is thrown out of gear the clutch friction is strong enough to turn the spool.

While these operations are being performed, the pointed cam 16 is rotating slowly, and when all the thread has been wound on to the spool, the cam returns the various gears to their original positions.