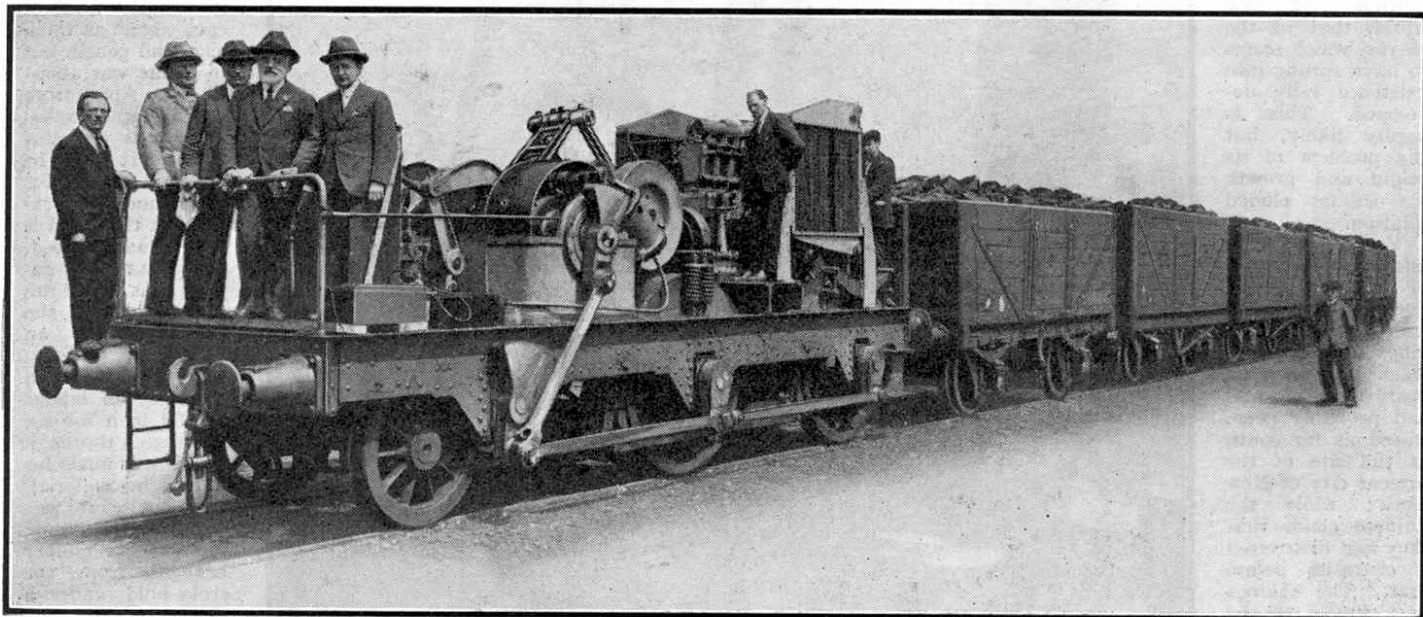


Motor Cars Without Gears

Success of the Constantinesco Torque Converter



IN the first part of this article last month we gave particulars showing how a Meccano model may be built of the interesting Constantinesco Torque Converter. The model described is quite suitable for fitting to the Meccano Chassis, and if so fitted will give some surprising results.

Those who do not wish to build the Torque Converter for fitting to the chassis may demonstrate the principle by a somewhat simpler model. This model may be mounted directly on to the Meccano Electric Motor, or mounted in an improvised framework of Meccano.

This second model, which is illustrated in Figs. 8 and 9 on the next page, is shown also in the Manual of Standard Mechanisms (No. 254). In this model the lever B (Fig. 5, shown last month) is represented by a short Strip 7 (Fig. 8) bolted to the Eccentric 9. The latter is mounted on the driving shaft 10 and imparts the oscillatory movement to the lever 7.

A 1" Gear Wheel 8 represents the weight C. Two $4\frac{1}{2}$ " Strips 5 are pivoted by bolt and lock-nuts 6 to the lever 7, their other ends being connected to short Rods mounted in Couplings 11 and carrying the Pawls 3. The Couplings 11 are secured by 1" Rods to further Couplings which are free to move about the Rod 1.

The Pawls are opposed to one another, and engage a Ratchet Wheel 2 mounted on the driven shaft 1; portions of Spring Cord 4 exert a slight pressure on the Pawls, to ensure their proper engagement with the Ratchet Wheel.

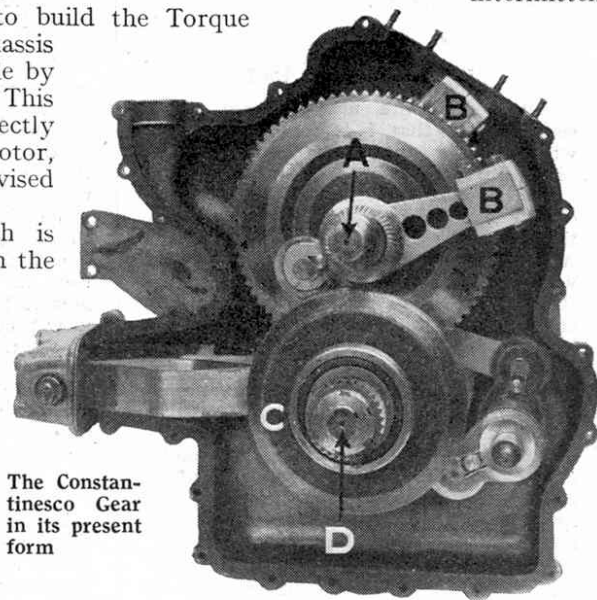
Each Pawl engages with the Ratchet Wheel intermittently, one rotating it during the forward stroke of the lever 5, while the other is brought into operation on the reverse stroke. The combined effort of both produces a constant rotary motion in the shaft 1.

Remarkable Increase in Torque

At the time our experiments were carried out we were amazed at the remarkable increase in power that was demonstrated even by so small a form of the Converter as in the Meccano model. With the rear axle of the Meccano Chassis jacked up to allow the driving wheels to freely rotate, it was found impossible to prevent the revolution of the driving shaft when gripped with the finger and thumb below the universal joint. When it is remembered that the driving force is obtained only from a small Electric Motor, driven by a 4-volt accumulator, the remarkable torque imparted by

the Converter is at once apparent.

By gripping the shaft with greater or less degree of pressure, the Converter in the model is made to demonstrate its automatic adjustment to a varying load or resistance in a remarkably effective manner. Indeed,



The Constantinesco Gear in its present form

this automatic adjustment of the gear to the load and to the gradient is one of the most interesting features of this Meccano model—as it is one of the most important in the Converter itself—and to watch it operate is a fascination that will delight everyone interested in engineering.

The turning movement delivered to the back axle is in the nature of a number of impulses given by the Pawls to the Gear Wheels. In the Meccano models the Pawls make these impulses over a range of from about twelve teeth of the gear wheels (on what is equivalent to top gear) to one or two teeth, when great power is required to overcome considerable resistance. No teeth at all are engaged when the resistance is greater than the engine power, and this fact allows the engine to continue to revolve without declutching—indeed there is no necessity to have a clutch fitted, and no clutch is fitted to the Constantinesco car.

Practical Applications

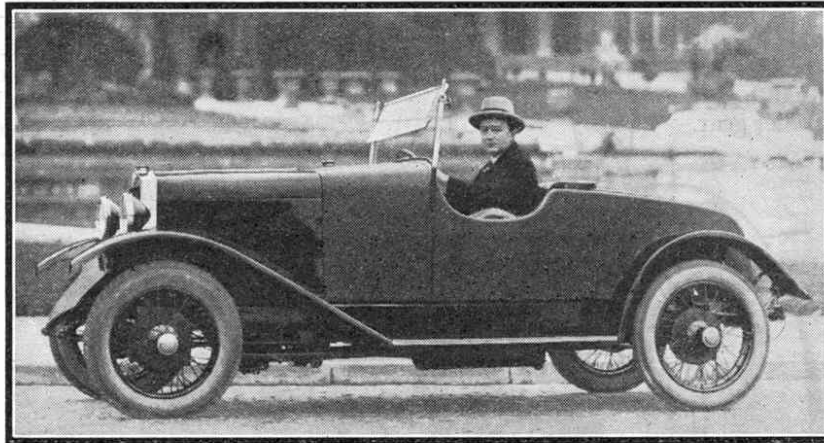
To come now to the practical application of the Converter to the road. Some time ago a 10 h.p. engine was fitted to a large chassis, and it was demonstrated that this car, fitted with the Converter, would do many things that a car of similar horse-power, fitted with the ordinary gear-box, could not do.

Some of Mr. Constantinesco's friends had told him that his invention, although very interesting in theory, would not work in practice. He therefore built an experimental model—one that had been built for bench tests only—into an old 45 h.p. Sheffield-Simplex chassis. Instead of using the big engine, a 10 h.p. Singer engine was substituted. The car went splendidly and was driven about the outskirts of London with a load of ten men! This feat was illustrated on page 350 in our issue last month. Later the same car towed a lorry up a steep incline and when 6 in. wooden blocks were placed in front of the wheels and the engine started, the car climbed smoothly over the blocks without hesitation—to the great astonishment of the people who happened to be present!

The Constantinesco Car

Since that time many improvements in the details of the Converter have been made, and the car exhibited at the Paris Salon embodied all these improvements.

The Constantinesco car consists of a chassis fitted with a 500 c.c. two-stroke engine, built in unit with a Torque Converter. From this, a propeller shaft extends to a simple back axle with a 1 to 1 final drive.



A Constantinesco two-seater on the road, with Mr. Constantinesco at the wheel

As the Converter replaces the ordinary clutch and gear-box, the controls are of the simplest possible character. The car is controlled, indeed, entirely by the throttle, and the usual clutch pedal and gear lever are absent. Instead there is an accelerator, a brake, and a lever with three possible positions—forward, neutral and reverse. In the ordinary way this lever is

placed in the forward position and the car is controlled entirely by the accelerator and the brakes.

A motorist who recently subjected the Constantinesco car to a test thus describes a trial run in heavy London traffic:—

"When I took over the car the engine was ticking over and the car was stationary, although the lever was in the forward position. Even though there is no clutch, it is a feature of the Converter that no power is transmitted to the road-wheels when the engine is running light.

"First of all, the throttle was opened wide and the engine revolutions increased to about 1,200 r.p.m. in the space of about a second. As soon as this high engine speed was reached, the Converter commenced to operate, and the car got under way in a

perfectly smooth manner. Then followed the unusual experience of acceleration in a car requiring no gear changing, for the Converter is automatic in action and provides an infinite range of speed ratios. The ratio between the engine and the back axle adjusts itself automatically and without any abrupt alterations in speed.

"From the driver's point of view the most curious feature, perhaps, is that as the car's speed increases the engine speed gets less. Acceleration occurs to the sound of an engine that is slowing-down instead of, as is usually the case, being accompanied by a noise of the rising pitch of the engine revolutions. This is explained, of course, by the fact that the gear ratio gets higher and higher as the car speed increases. Finally, it reaches a limit when the maximum rate of travel of which the vehicle is capable is attained. In the car tested,

fitted with a 500 c.c. engine and with the driver and passenger up, this speed is just under 40 m.p.h."

In the Meccano models mentioned above, the

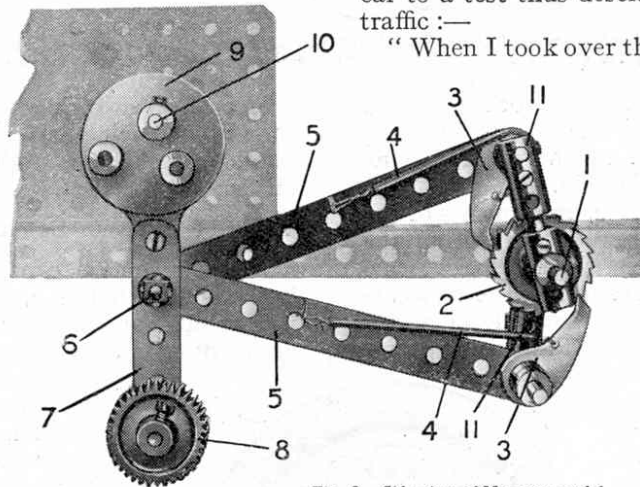


Fig. 8. Side view of Meccano model

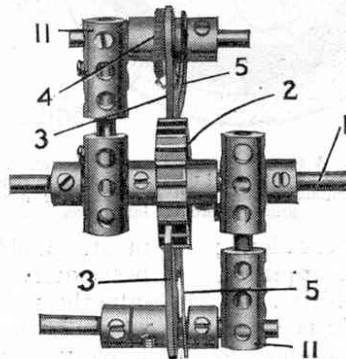


Fig. 9. End view of same model

transmission of the power to the main driving shaft is effected by two pawls engaging on a toothed wheel. In the actual Converter, however, the power is transmitted by devices that Mr. Constantinesco calls "Mechanic Valves."

Although these valves act on the driving shaft both on the forward and on the reverse strokes, their action is quite different from that of a pawl and ratchet gear.

Their purpose is to convert the alternating nature of the received impulses into intermittent impulses of the same direction, which impulses act on the resistance shaft in a cumulative manner. One valve rotates the resistance shaft on the forward stroke, and the other valve rotates the shaft in the same direction on the reverse stroke.

These mechanic valves, which are the subject of separate patents, consist of an oscillator, a series of

rollers, a gripper and a rotor. The oscillator is eccentric in shape and is the part driven by the lower connecting rod, whilst the rotor is secured to the shaft driving the propeller shaft and back axle (Fig. 10).

As long as the parts remain free, movements of the oscillator simply cause the gripper to run within the rotor without conveying any drive, there being a clearance space between the two. If, however, the crescent-shaped gripper is moved slightly to one side (a movement that occurs when the forward-neutral-reverse lever is moved), movements of the oscillator in one direction are conveyed to the rotor by a wedging action. In the opposite direction no drive is transmitted. If the gripper is shifted to the opposite side of the neutral position the movement of the rotor is reversed (Fig. 11).

An Invention that will Revolutionise Transport

The Torque Converter has many advantages, including the fact that when it is adapted vehicles will require engines of only about half the size of the engines used to-day.

"I believe that my invention will revolutionise all forms of transport," Mr. Constantinesco told the writer. "It is not confined to the motor car alone; it may also be applied to locomotives, aeroplanes, ploughs, tractors, tanks and all similar vehicles. At least a quarter of the cost of these vehicles will be saved by using the Converter. Their engines will require to be only about half the size of engines used to-day, so that petrol and oil consumption will be considerably lower."

"By using an engine with one or two cylinders—such as a two-cycle engine of low cost—the four, six

or eight-cylindere engine is abolished and all the complicated mechanism in the working of such an engine eliminated. What is more important, the invention does away with the costly material and machinery entailed in the manufacture of multi-cylindere four-cycle engines, expensive gears and clutches.

"The control of all vehicles is considerably simplified. A simple lever gives the forward, neutral and reverse positions. In the case of a motor car the engine is started, the throttle opened, and

the car immediately glides forward. Increased speed is obtained simply by opening the throttle and there is no trouble with gears or clutches.

"In actual practice the Converter is built into the engine-casing and for an average small four-seater car it fits comfortably into a box of about one cubic foot dimension. No matter what type of engine is used, its drive is converted into

a smooth even-turning movement, without jerk, even though the engine may be racing. The engine may be placed either horizontally or vertically, and may be air or water-cooled."

Value of Meccano Demonstrations

If the invention can be marketed successfully there is no doubt that a great increase in motor car sales will result, for the Converter will not only make the art of driving almost fool-proof, but it will also reduce the prices of the lighter cars to within the scope of a much larger section of the community. Our readers will do well, therefore, to equip themselves in advance with practical information concerning this wonderful apparatus. As previously indicated, they will learn as much from the construction of a

Meccano model of the Converter as they could from a lengthy study of any amount of drawings, plans and technical description.

Many readers wrote to us after the first reference to the Torque Converter appeared in the "M.M." three years ago and remarked upon the thrills to be obtained from building a model of an entirely new mechanical move-

ment. Incidentally, much satisfaction appears to have been derived from the subsequent initiation of Dad into the mysteries of a piece of mechanism concerning which he had hitherto been entirely ignorant!

We hope that new interest in the subject will now be aroused and that readers will experiment with the possibilities of the Torque Converter as applied to Meccano models. We shall be very pleased to receive particulars of such experiments and if they are of sufficient general interest, to deal with them in the pages of the "M.M."

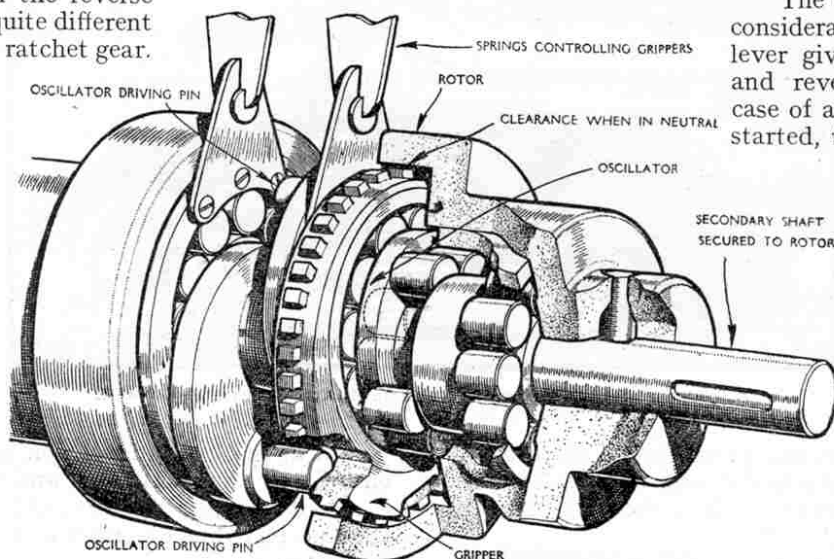


Fig. 10. One of the methods in which a pair of "mechanic valves" can be mounted. The springs controlling the grippers are actuated by a "forward-neutral-reverse" lever in the case of a car

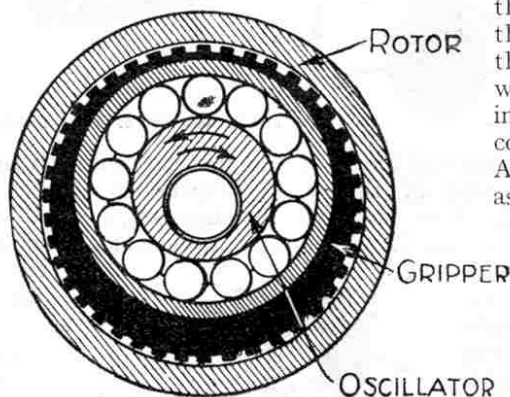


Fig. 11. A section of one form of "mechanic valve." Oscillating movements of the central shaft are converted into continuous rotary motion at the rotor when the gripper is brought into action