AUSTIN
SYNCHROMESH TRANSMISSION

STANDARD
ON ALL
MODELS

AUSTIN SYNCHROMESH TRANSMISSION

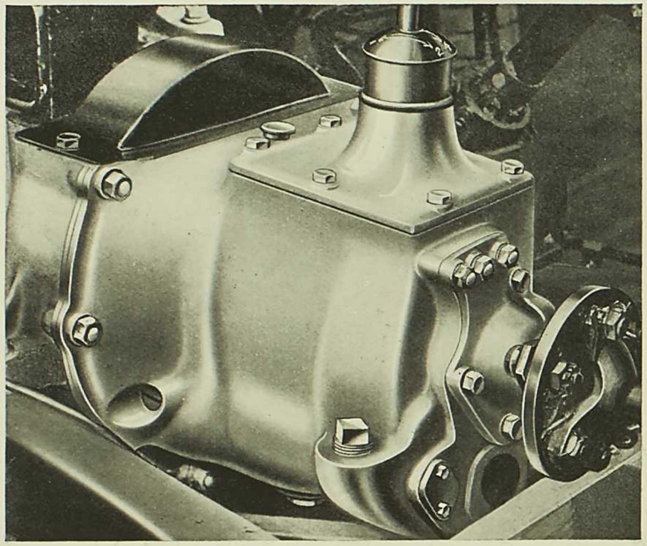
STANDARD ON ALL MODELS

—ITS PRINCIPLES OF OPERATION EXPLAINED IN SIMPLE TERMS

THE AUSTIN MOTOR CO. LTD., LONGBRIDGE, BIRMINGHAM.

EVERY Austin model, without exception, is now fitted with a new synchromesh gearbox, the operation of which, it is the purpose of this booklet to explain on this and the following pages.

Synchromesh may be quite briefly described as an additional refinement for the gearbox, which enables this unit to perform automatically certain operations formerly required of the driver. In short, double clutching is no longer necessary for a perfect gear change. With synchromesh the driver just pushes the gear-lever straight through to third or top gear, whichever he desires to engage, when he has depressed the clutch pedal. For some ninety per cent of driving the gear manipulations become delightfully simple.



The Austin Seven synchromesh gearbox is notable for its compact design. A sectional view appears on page 5.

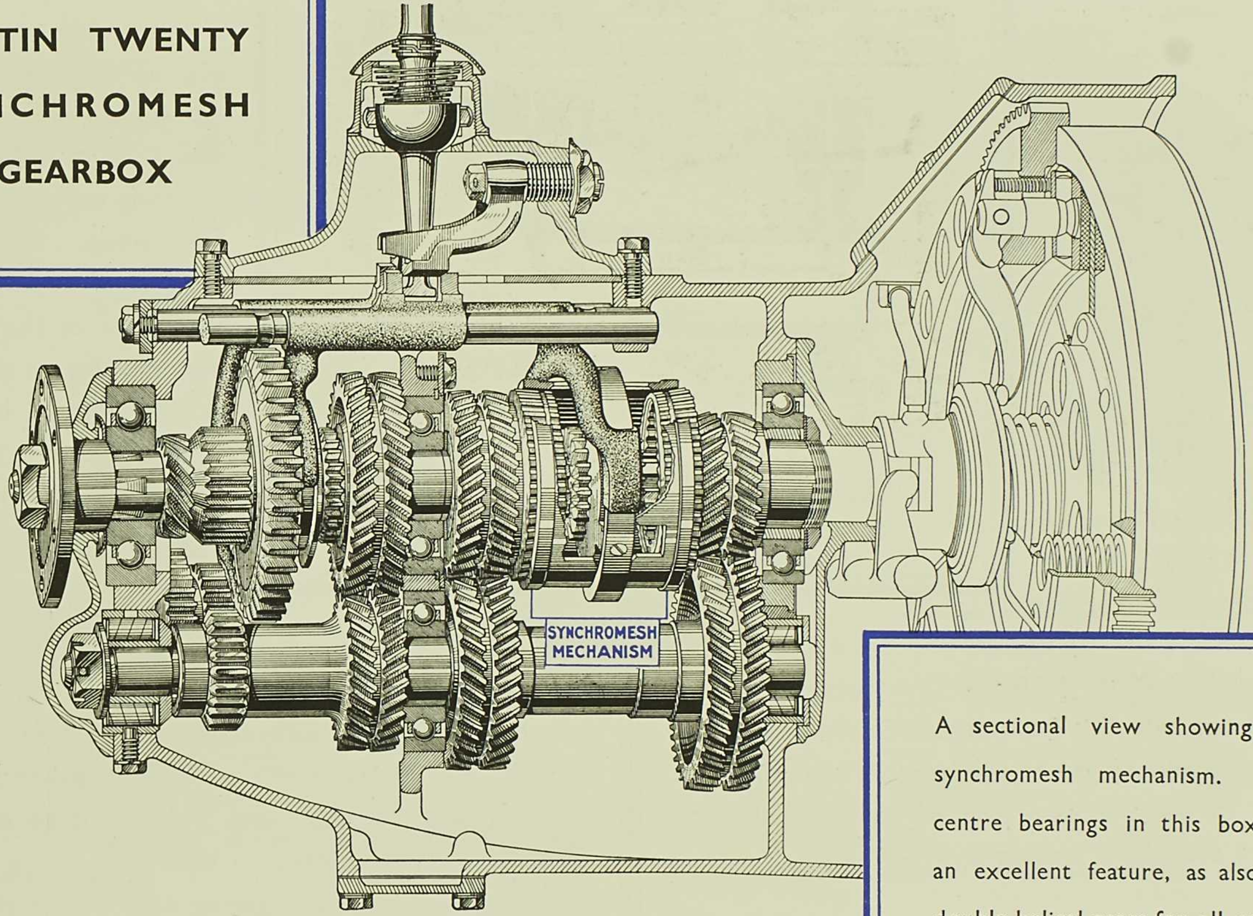
As will be seen on reference to the sectional gearbox illustration opposite, the synchromesh mechanism is located round the gear coupling which engages third or fourth speeds, and to these two speeds and their engagement this description is consequently confined, except to point out that the synchromesh mechanism also operates when changing from second to third. Thus it will be seen that the most frequently required gear manipulations benefit from synchromesh control.

Before entering on a description of the synchromesh action it is desirable to understand the means of transmission for the speeds concerned. In short, it is necessary to visualise the operation of the third and fourth speed gears.

The gear coupling for third and fourth speeds is splined to rotate with the third motion shaft, and can slide for its dogs to engage with smaller dogs cut in

SYNCHROMESH IS AN ADDITIONAL REFINEMENT TO SIMPLIFY DRIVING.

THE AUSTIN TWENTY SYNCHROMESH GEARBOX



A sectional view showing the synchromesh mechanism. The centre bearings in this box are an excellent feature, as also the double-helical gears for all speeds except first.

the gear (A, see Fig. 1) on the first motion shaft. This provides top, fourth speed, or direct drive, whichever we may prefer to call it, by locking the two shafts as one. By moving the other way the gear coupling can engage with dogs on the third speed gear D to lock this gear to the shaft. This provides third speed through gears A, B, C and the layshaft.

Incidentally, on direct drive or top, these gears are just idling.

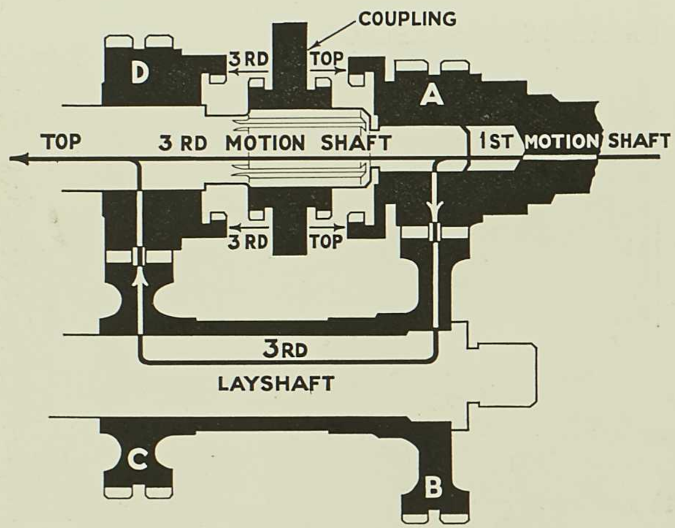


Fig. 1. Showing the transmission of the drive for third and fourth speeds in the normal gearbox. Fourth or top is direct, third being through gears A, B, C and D.

of gearbox is therefore to increase the speed of D when the gear coupling moves from top to engage this gear to its shaft, or to reduce the speed of A when the gear-coupling moves from third to engage top. In other words, the gear-coupling retaining the speed of the gear it has left, requires a similar speed in the gear it is to engage with, if the dogs are to meet and slide together smoothly without a crash or grind.

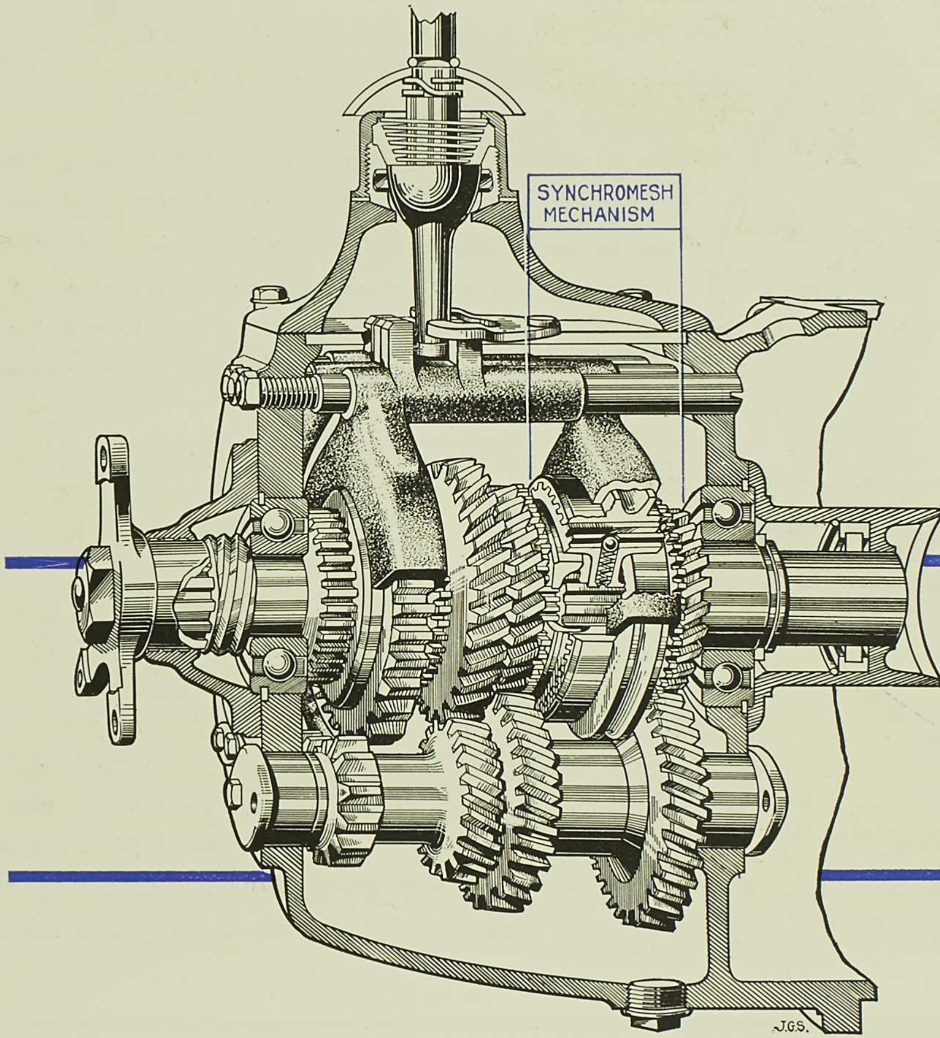
With the direct drive of fourth, the third speed gear D, being geared down by A, B and C, is rotating slower than the shaft on which it is mounted. Conversely, when third is engaged the speed of the gear A, and the first motion shaft of which it is a part, is higher than that of gear D and the third motion shaft.

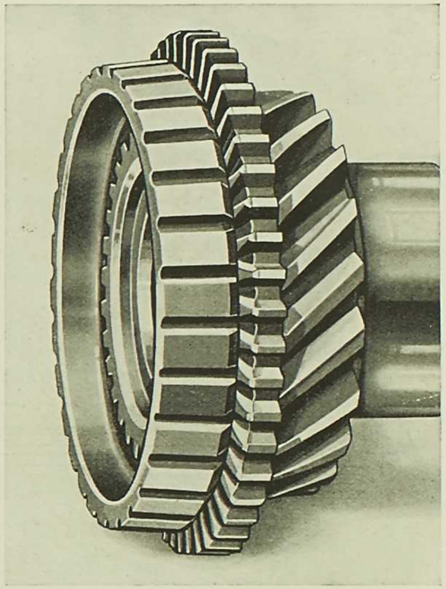
The purpose of double-clutching with the normal type

This is the particular duty of the synchromesh mechanism. In the short space of time occupied in moving the gear lever from one gear position to the next, the synchromesh device must eliminate the disparity between the peripheral speeds of the gear-coupling and the gear with which it is to mate. This will be readily apparent on reference to Fig. I above, in which the two sets of engaging dogs on the gear coupling and third and fourth speed gears are shown light.

THE PARTICULAR DUTY OF THE SYNCHROMESH MECHANISM

THE AUSTIN SEVEN SYNCHROMESH GEARBOX





Above shows the first motion shaft gear with its synchromesh cone and dogs.

Left, a sectional view of the Austin Seven synchromesh gearbox. It will be seen that the synchromesh mechanism is located 'round the gear coupling for third and fourth speeds. The compact, workmanlike design and silent helical gears for all speeds except first are also evident.

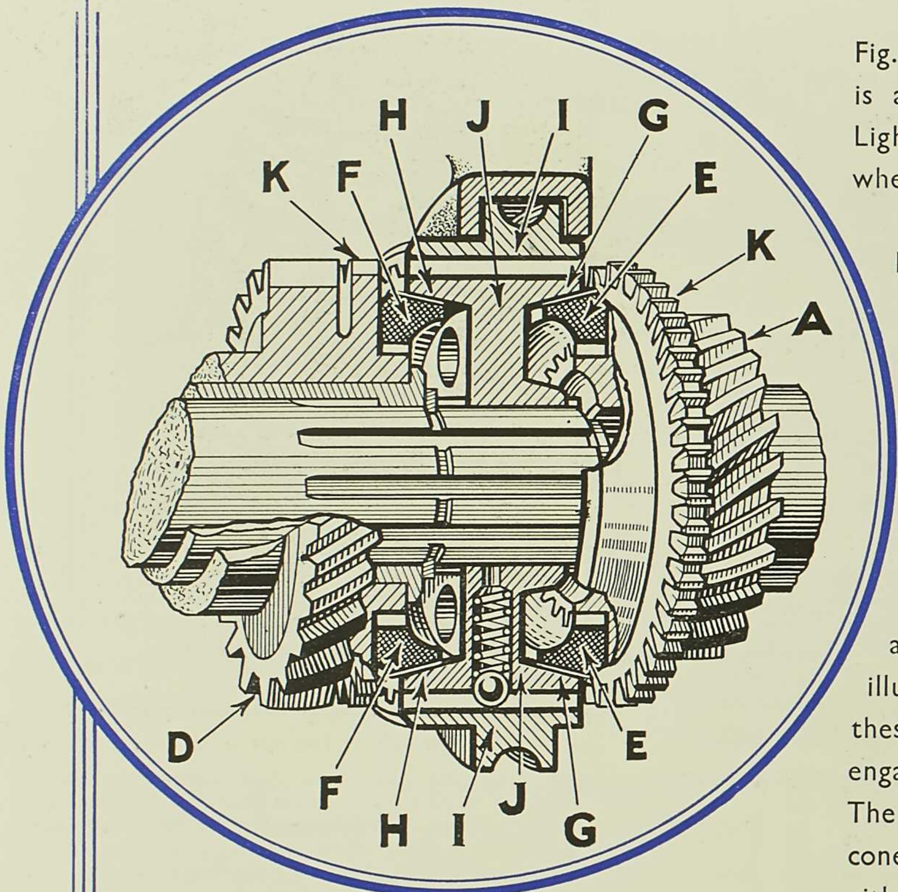


Fig. 2. The above section of the Austin Seven Synchromesh mechanism shows the two pairs of synchronising cones (G.E. and H.F). The outer member of the coupling (I.), continues its movement to complete engagement with the gear dogs (K.) after the cones have met.

Fig. 2, a section of the Seven synchromesh system, which is also used on the Ten-Four, Light Twelve-Four, and Light Twelve-Six, shows the very simple and effective means whereby this is done.

Both A and D carry a cone, these appearing in the diagram as E and F. These cones are analogous to the early type of cone clutch used at one time almost universally for motor car transmissions, and in their engagement they act in exactly the same manner, except that they do not transmit any power.

The gear coupling I carries the double cone member J, and these two members are splined together, the actual splines being perhaps more clearly shown in the illustration on page 7 opposite. The important feature of these splines as provided within I, is that they serve to engage the dogs K of the top and third speed gears. The inner member J of the coupling incorporates the cones G, H, that make contact with the gear cones before either gear is engaged. Thus cones G and E meet before the dogs of gear A are engaged: cones H and F meet before gear D dogs are engaged by the coupling, and they serve to synchronise the speeds of both members, acting as a brake

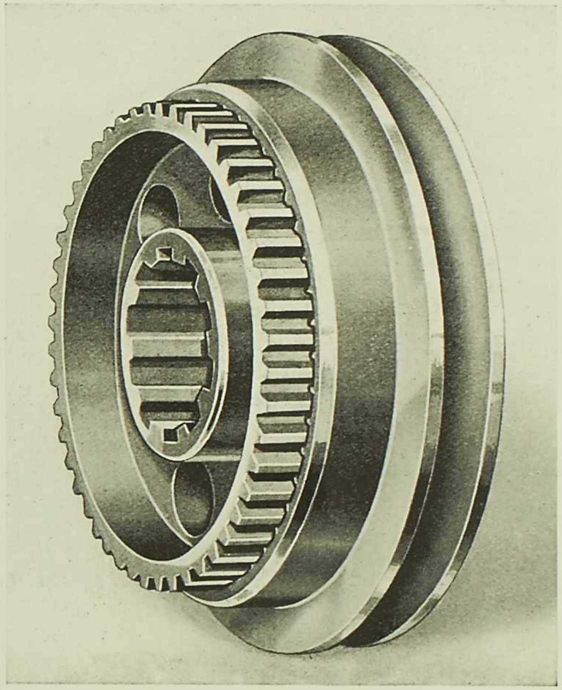
THE "SEVEN" SYNCHROMESH MECHANISM — SIMPLE AND EFFECTIVE.

on the faster member, or a clutch to speed up the slower, until the speeds of the two members are the same and the dogs can slide smoothly into mesh and so take up the drive.

It will be obvious that the dogs on the gear coupling which engage with the gear dogs must continue their movement after the cones have made contact, and therefore the synchromesh mechanism embodies two main units forming the gear coupling, the dog member I and the cone member J.

Before engagement of any gear (i.e., when the mechanism is in neutral) these two members are located together by spring loaded steel balls, one of which is shown in the sectional view. Until the cones make contact these serve to retain the two parts of the gear coupling together as one assembly, but when the cones engage and so resist further end movement of the centre member J, the continued pressure on the gear lever overcomes the resistance of the spring loaded balls and the outer member I moves on so that its internal dogs can engage with the external dogs K which are part of the gear.

The resistance provided by the spring loaded balls is very carefully determined to ensure that the cones engage

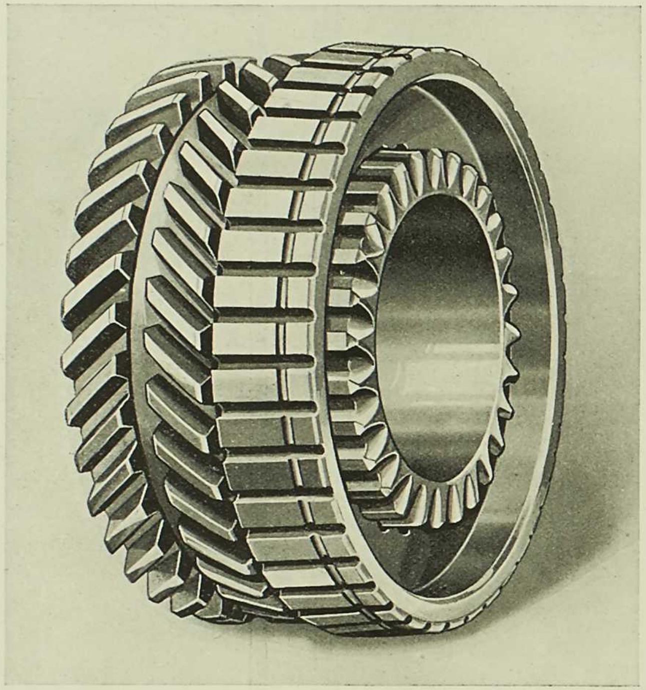


The Austin Seven gear coupling, of which the inner member embodies the cones, the splines within the outer member engaging the dogs.

with sufficient pressure to synchronise the gear and coupling speeds before the outer member of the coupling continues its movement to complete the engagement under the continued pressure transmitted from the gear lever.

THE CONES SYNCHRONISE THE GEAR AND COUPLING SPEEDS

The Austin Twenty gearbox illustrated on page 3 in perspective section to show the essential units, reveals a somewhat different mechanism which is also employed on the Sixteen and Twelve. Here (see Fig. 3 opposite) the cones effect synchronisation of gear and coupling speeds and the dog member of the coupling can continue its movement after cone contact, as in the Seven and Ten-Four etc., mechanism. With this design, however, the dogs for the gears are inside the cones instead of outside, as in the mechanism earlier described. Further, the movement is controlled by a special device so that the dogs cannot be engaged until the cones have effected the synchronisation of speeds.



The third speed gear of the Austin Twenty, showing the Synchromesh Cone with the drive dogs inside—a wonderful example of modern machining and metallurgy.

From Fig. 3 it will be seen that the outer ring which the selector fork moves, and the centre dogs which engage the gears are one unit L, being connected by three arms or spokes N which pass through three slots O in the cone member M. Spring loaded balls P accommodated in L and locating in a groove inside M, serve to connect the two members for their movement in neutral until the cones meet.

When the cones meet the further movement of L independent of M is allowed by the slots O through which the arms N project. But these slots are of a special shape. Fig. 4 shows one full size and it will be noted that midway on each side there is a vee notch. It is this notch which interferes with the movement of the arm N, and so delays gear engagement until the speeds of the gear and coupling dogs are identical.

THE SYNCHROMESH MOVEMENT IS CONTROLLED BY A SPECIAL DEVICE

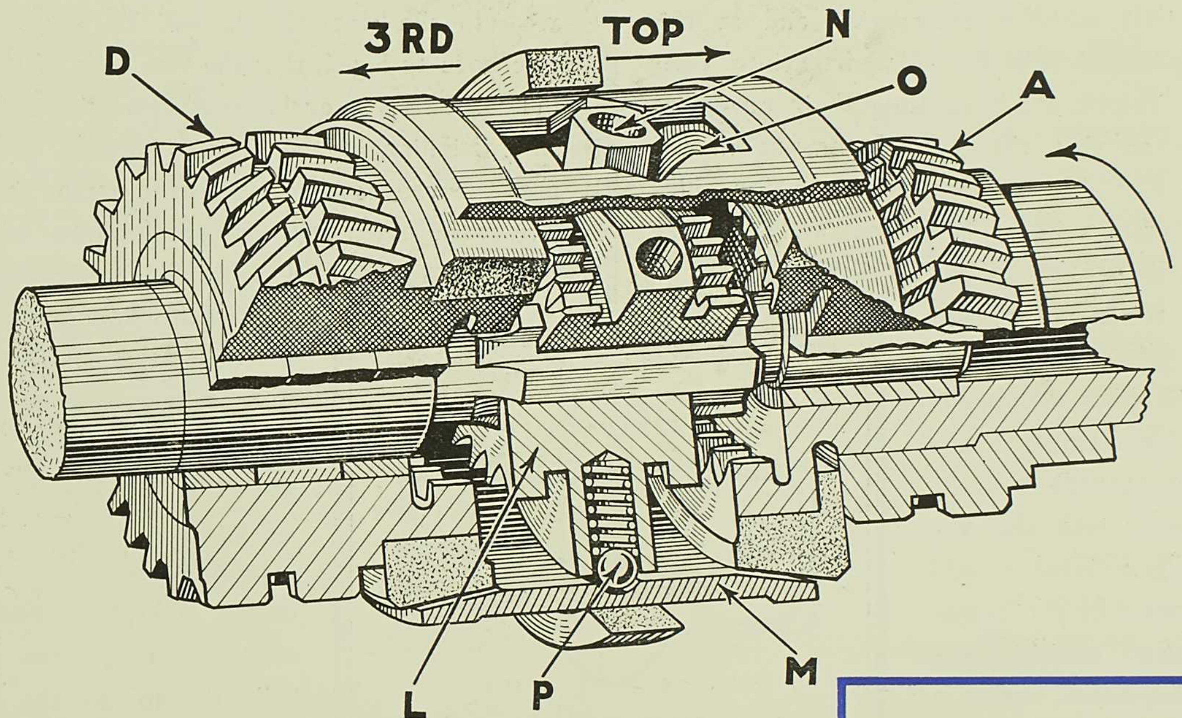


FIG. 3. A section showing the construction of the synchromesh mechanism on the larger Austin models. L is the inner dog member and M the outer member with internal cones to make contact with the gear cones.

Referring to Fig. 4 and assuming top gear to be engaged with the arm N at position 1 in each slot, to engage third it must move to position 4. Under the influence of the gear-lever it moves readily to position 2 (neutral) without obstruction and at this point the spring-loaded balls P, in L, drop into their groove inside M. Then L and M continue their movement together as one so that the arm N remains in the centre position 2. But when the cones for third speed make contact there is immediately a drag on the cone member M of the coupling because the slower-moving gear cone acts as a brake. Thus the rotation of the cone member M lags behind the dog member L and each arm occupies position 3 in its slot—it has moved into the vee notch. As the gear lever is still being pushed forward by the driver towards third speed position the arm N in each vee notch exerts a thrust towards the third speed gear to apply more pressure to the cones and therefore to accelerate the process of synchronising their speeds, but when this synchronisation is effected there is naturally no drag on the cone member M, and the arm N is quite free to slide to its position of third speed engagement, i.e., at 4 in the slot O. It will be noticed on further reference to Fig. 4, that the two ends of the slot are not in line. This is an exclusive Austin feature which precludes all possibility of the arm N moving straight through past the vee notch, as it cannot escape contact with the face of the notch opposite the slot from which it moves.

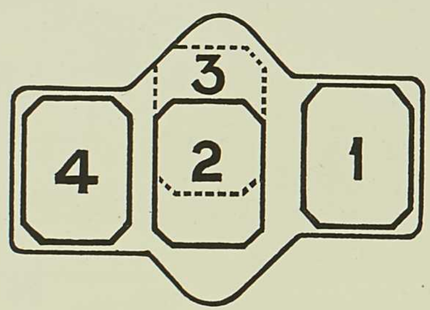


Fig. 4. Showing the positions of the coupling arm in the slot of the outer cone member.

It must be appreciated that these movements and interactions all take place in that instant of time in which the gear-lever is moved from the neutral position into the next gear and the successful functioning of such a mechanism depends essentially on the most careful design and production of the pre-contacting cones, the spring loaded balls (which on the Austin Seven type of mechanism determine the pressure of the cone engagement) and (in the Twenty type) the slots

SUCCESSFUL FUNCTIONING RESULTS FROM THE MOST CAREFUL DESIGN and arms which control the engagement of the dogs.

Actually, apart from the simplicity of changing gear when the synchromesh mechanism eliminates the need for skilful judgment of speeds and times, quicker gear-changes can be effected between third and fourth, and this is an undoubted advantage when accelerating for the purpose of changing up on an easing gradient, or when changing down in order to achieve quicker acceleration past slow traffic.

It should be realised, however, that it is still necessary to control the engine speed to suit the gear being engaged, but this merely means that in changing from third to top the foot must be lifted off the accelerator pedal and when changing down from top to third, the foot must be left on the pedal to give the engine more speed. If this is not done, although the gears will engage perfectly, there will be a slight shock on the transmission when the clutch takes up the drive on being re-engaged.

The two illustrations of complete sectional gearboxes appearing on pages 3 and 5 will no doubt be studied with interest, and here we should like to draw attention to the fact that they are exemplary of Austin thoroughness in design, as all speeds except first have helical gears which ensure a high degree of silence in operation. Additionally, on the Twenty, the layshaft and third-motion shaft are supported at the centre of the gearbox by large ball-bearings which materially assist in ensuring accurate running and consequently continued silence.

Apart from the confidence given by synchromesh transmission to the most inexpert driver, the simplicity of the mechanism obviates any likelihood of obscure troubles arising, and thus, every Austin owner can feel assured that the dependability of the new synchromesh gearbox will be fully that of the rest of his car.

Materials of the highest quality most carefully machined additionally ensure real durability.

QUICKER CHANGES CAN BE EFFECTED BETWEEN THIRD AND FOURTH

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