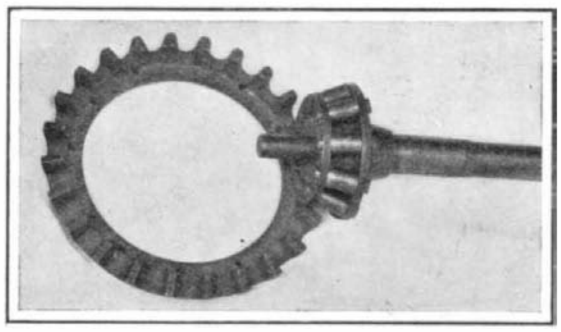
THE HAYNES TRANSMISSION AND ROLLER BEVEL DRIVE.

Two of the distinctive features of the Haynes cars are illustrated herewith. These are the roller bevel drive, which replaces the usual bevel gears at the rear axle; and the use of pawls and ratchet teeth for transmitting the power received by the master gear of the transmission to the hub of this gear, thereby allowing it to revolve idly when not in use, as when the car is running on the high speed, for example, or when it is coasting on the intermediate, and the other gears on the main and lay shafts are in mesh. As a general rule, if the gears are shifted back to intermediate while the car is running at a good speed, there is usually a terrific grating noise and the chauffeur is lucky if he does not strip a gear. The reason of this is that as the two intermediate gears attempt to mesh, they are revolving at a very rapid rate and are being driven one by the rear wheels of the car, and the other by the momentum of the clutch. Under these conditions it is well nigh impossible to mesh the intermediate or low-speed gears at all, or at least to accomplish this without damaging them. The Haynes ratchet device obviates this trouble by freeing the low and intermediate gears on the lay shaft, and allowing them to run ahead of the clutch shaft gear when the change is made from high to intermediate or low. Therefore, when these gears are meshed with those on the main shaft under the conditions stated, since they are at rest and have no inertia, no noise or damage can result. The gears can be shifted back without throwing out the clutch.

The other distinctive Haynes feature is the roller bevel drive. Instead of the usual large bevel gear on the differential, a large sprocket having specially-shaped teeth is used, while the bevel pinion is replaced by one having hardened and ground steel rollers set at an angle to match the teeth on the large ring. So efficient is this form of drive, on account of doing away with side thrust and also because of the diminished friction, due to the use of rollers, that tests of chassis have shown a loss of but 7 to 8 per cent in transmitting the power from the motor to the rear wheels. The cars upon which these improvements are used are of first-class construction throughout. That the material in them is good is evidenced by the fact that the racer which did so well in the last Vanderbilt race was a regular stock chassis equipped with a 50-horse-power engine. After demonstrating what his car could do in so severe a test, Mr. Haynes is engaged in constructing a considerable number of these high-powered machines in addition to his regular 30-horse-power model during this year.

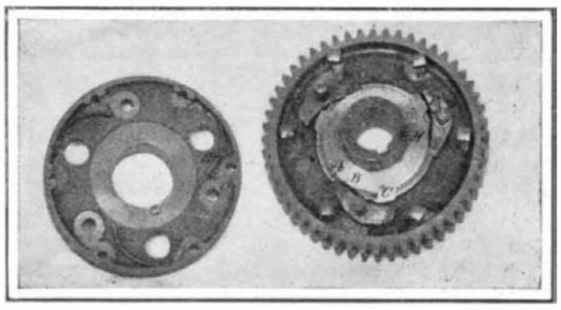
TRANSMISSION GEAR WITH DOUBLE CLUTCHES.

It is a well-known fact that on account of its large size and heavy weight, the usual cone clutch employed on automobiles has sufficient momentum, when it is thrown out, to spin around for some seconds and keep the gears in the transmission revolving at a considerable speed. When passing from a low speed to a high speed there is not so much danger of stripping gears as when the gears are changed in the opposite direction. Nevertheless, the beginner often experiences difficulty in speeding up his car, and before he knows it frequently starts to strip a gear, the result being that shortly after a number of the gears require renewal. An improvement noted on the new Thomas machine is the brake applied on the hub of the clutch when the latter is thrown out. This brings the clutch and gears to a reduced speed, although they still revolve at the speed at which the movement of the car forward drives them. A still greater improvement, which is also of American origin, is shown in the diagram, in which a second clutch is provided between the gear box proper and the differential. This clutch, *B* (see diagram), is in a separate compartment, and has its shifting lever, *D*, connected to the same pedal, *E*, to which the shifting lever, *C*, of the regular flywheel clutch, *A*, is linked. Thus when the pedal is depressed both clutches are thrown out, and brakes (not shown) are applied to the hubs, *V V'*, of the clutches, thereby bringing them and the gears immediately to rest. The gears can then be changed without any noise and without any danger of stripping. A



HAYNES ROLLER BEVEL DRIVE USED AT THE REAR AXLE.

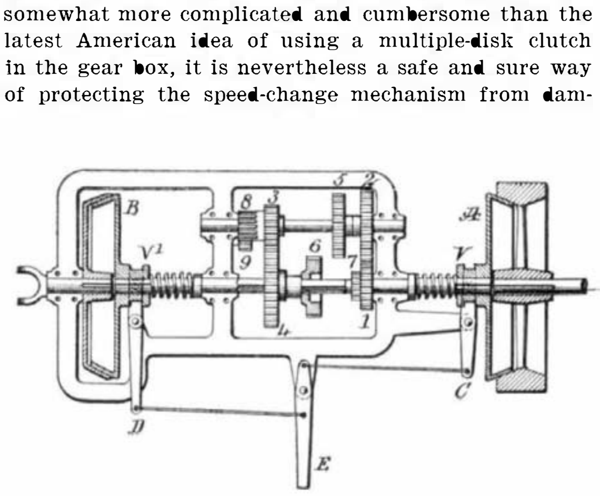
This form of drive does away with side thrust and is very efficient.



HAYNES RATCHET-AND-PAWL CONNECTION IN TRANSMISSION GEARS.

A. Ratchet tooth. *B*. Pawl on gear. *C*. Cam on collar carrying ratchet teeth and attached to hub. *H*. Hub keyed on lay shaft. *P*. Pivot pin of pawl. *O*. Hub in cover that fits over *R*. *S*. Spring for holding pawl against collar.

device of this kind has, we understand, been applied to one of the recent makes of British cars. While somewhat more complicated and cumbersome than the latest American idea of using a multiple-disk clutch in the gear box, it is nevertheless a safe and sure way of protecting the speed-change mechanism from damage where the cone type of clutch is used. The latest forms of multiple-disk clutch are, as a rule, so light and of such small diameter that the driving gears come to rest almost as soon as the clutch is thrown out. The use of a second clutch, however, assures their shifting without damage.



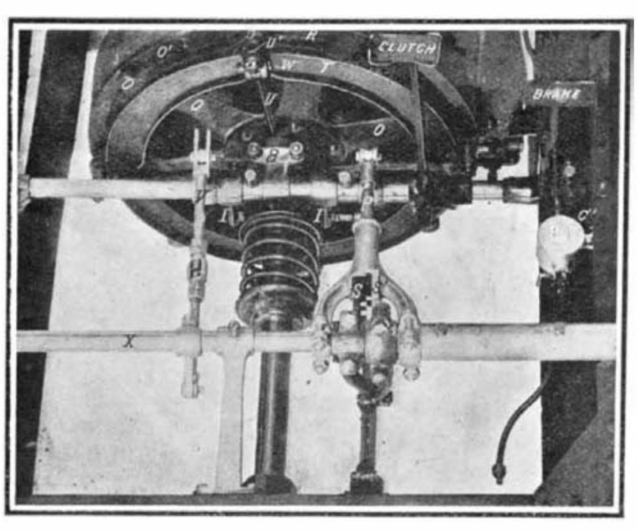
IMPROVED TRANSMISSION WITH DOUBLE CLUTCHES.

A. Regular flywheel clutch. *B*. Extra clutch between gears and propeller shaft. *C*, *D*. Operating levers. E. Clutch pedal. *V*, *V'*. Location of brake shoes for clutches. Gears are on low speed through *1*, *2*, *3*, *4*. Intermediate speed is through *1*, *2*, *5*, *6*. High speed is direct drive, 6 locking with 7. Reverse is through *1*, *2*, *8*, *9*, *4*.

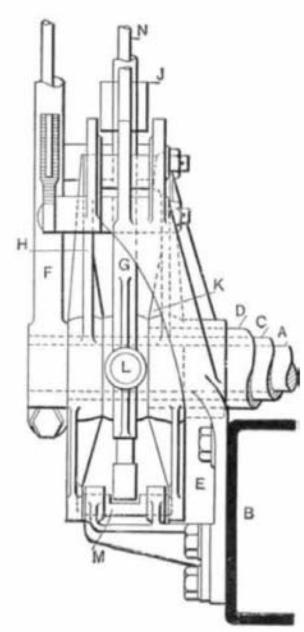
NOVEL CLUTCH AND TRANSMISSION FEATURES OF 1907 CARS.

The Thomas clutch, which is of the three-ring metallic type, is shown in one of the illustrations, as is also the interlocking arrangement, which makes it impossible to shift the gears until after the clutch has been withdrawn. The central clutch ring, *R*, of manganese bronze, is attached to the main shaft extending forward from the transmission. It has sixteen cork inserts that extend out 1/32 of an inch beyond its face and form much of the friction surface. The clamping disks, *O*, *O'*, are of gray iron and are attached to the flywheel by four studs that terminate in caps hollowed out to receive the ends, *U'*, of the levers, *U*, which are pivoted on pins, *W*, carried in lugs in an outer ring, *T*. The large coiled spring shown presses against the levers, *U*, and causes their tips, *U'*, to bear upon adjustable screws, *a*, in the ends of the hollowed caps, the result being that the fulcrums, *W*, of the levers, *U*, are forced toward the flywheel and the rings, *T O*, clamp the ring, *R*, between themselves and *O'*, which is attached to the flywheel by screws. A novelty is a brake shoe, *B*, that is applied to the clutch collar when the clutch is withdrawn, and which checks the rotation of the latter caused by the momentum of a rather heavy ring.

Another point about this clutch is that the pressure of the compressing spring is exerted through the levers upon the peripheries of the clutch disks, where the friction surface is greatest. This makes it impossible for the disks to become sprung or fail to take hold. The clutch is interlocked with the gears in such a manner that it is impossible to change gears without first throwing it out. This is accomplished by means of a short lever, fastened on the same transverse shaft that carries the clutch pedal and clutch shifter (the two arms of which are seen at *I I*). This lever, as it moves forward with the pedal lever when the clutch is thrown out, withdraws from engagement with the two notched sectors, *S S'*, the plunger, *P*. When this plunger is in engagement with these sectors, the gears are effectually locked. The sectors are on two hollow sleeves, one within the other, that extend to the gear-shift lever on the outside of the frame. Should the gears not be completely in mesh, the plunger, *P*, cannot slip back into place, and, consequently, the clutch cannot be thrown in. This arrangement, therefore, makes it well-nigh impossible to damage the gears. These are of wide face and large diameter, the face and pitch being respectively 1 3-16 inches and 8. Ball bearings are used throughout the transmission with the exception of that at the forward end of the main shaft, which is a Hyatt roller bearing. Annular ball bearings are also used on the differential and the sprockets. The transmission and differential are in a single case, which is suspended from three points on cross members of the frame. The gear-shifting system is altogether new. It is easy of operation and practically fool-proof. By referring to the diagram of the gear-shift lever, the reader can see how this mechanism works. The two sleeves which carry the sectors, *S S'*, are shown in the diagram at *C* and *D*, while the emergency brake shaft, which extends across the car inside of a smaller sleeve, is shown at *A*. This shaft carries a lever, *F*, upon its outer end. The two sleeves, *C* and *D*, have fastened to them vertical levers, *H* and *K*, respectively, and these levers have at their upper ends notches to receive the latch *J*, when the gear shift lever, *N*, is moved to one side or the other through the gate of the H-shaped plate that is usually employed in a four-speed selective transmission. When moved sideways, the lever, *G*, turns upon suitable pivots, *L*, while when moved forward and backward it rotates around sleeve, *C*. The bottom part of this lever consists of a curved sector, which engages in a slot in pin, *M*. This pin sets in two eyes

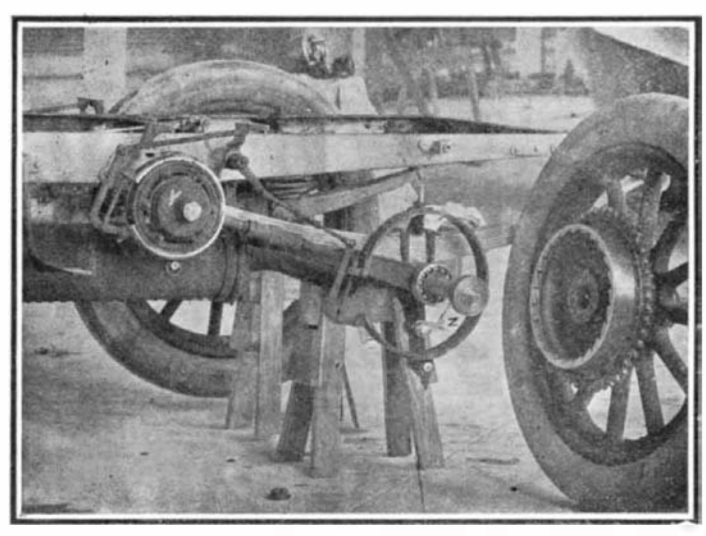


THREE-DISK METALLIC CLUTCH AND INTERLOCKING MECHANISM OF THOMAS CAR.



INTERLOCKING GEAR-SHIFT LEVER.

B. Chassis frame. *E*. Bracket.



RADIUS ROD, BRAKES, AND REAR WHEEL OF 60-HORSE-POWER THOMAS CAR.