FRICTION-DRIVE CARS

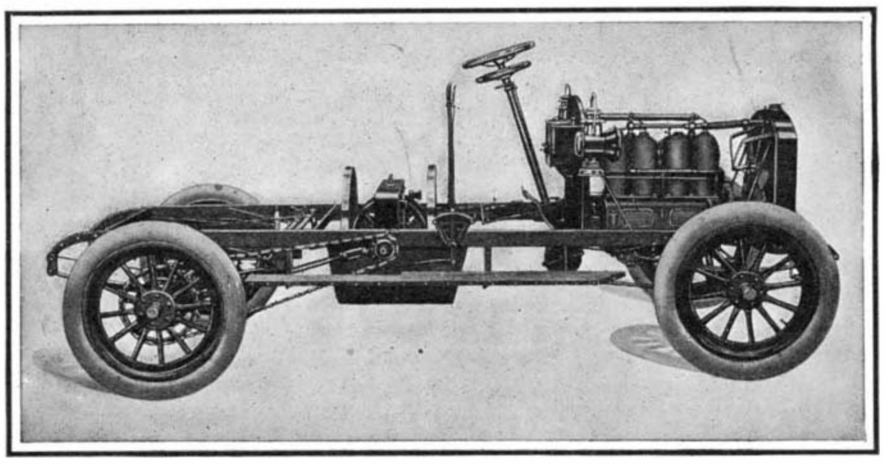
A NEW DOUBLE-DISK TYPE OF FRICTION-DRIVE AUTOMOBILE.

In the view of the chassis shown herewith, upon close examination the reader will note the tops of two transverse disks that project upward at about the middle of the frame. These disks are on an extension of the engine crankshaft, and they not only act as flywheels, but also serve to transmit the power to two short countershafts, whence it is carried by chains to the rear wheels of the car. For this purpose each countershaft has slidably mounted upon it a smaller disk wheel. The short countershafts are pivoted so that, by the movement of a pedal, they can be brought in contact with, or separated from, the main driving disks. Normally, one of the small wheels comes in contact with one disk and the other with the second disk when the pedal is pushed forward. This rotates both small wheels in the same direction. The reverse is obtained by swinging the countershafts so that their respective wheels contact with the opposite disks. The wheels can be moved in unison toward or away from the center of the disks to obtain the variation in speed. This is accomplished by the second wheel seen below the steering wheel. No differential is required, as the differential movement is allowed for by the slip of the smaller steel wheels on the leather-faced disks. This machine is a variation of the usual friction drive arrangement, such as is described below. In doing away with the differential, the designer has hit upon a rather more complicated arrangement. This, however, has the advantage that there are no differential gears to wear or strip, while since the drive to each rear wheel is entirely separate, in case of accident to one side of the transmission the car can still be propelled by the other.

THE HOLSMAN ROPE-DRIVE AUTOMOBILE.

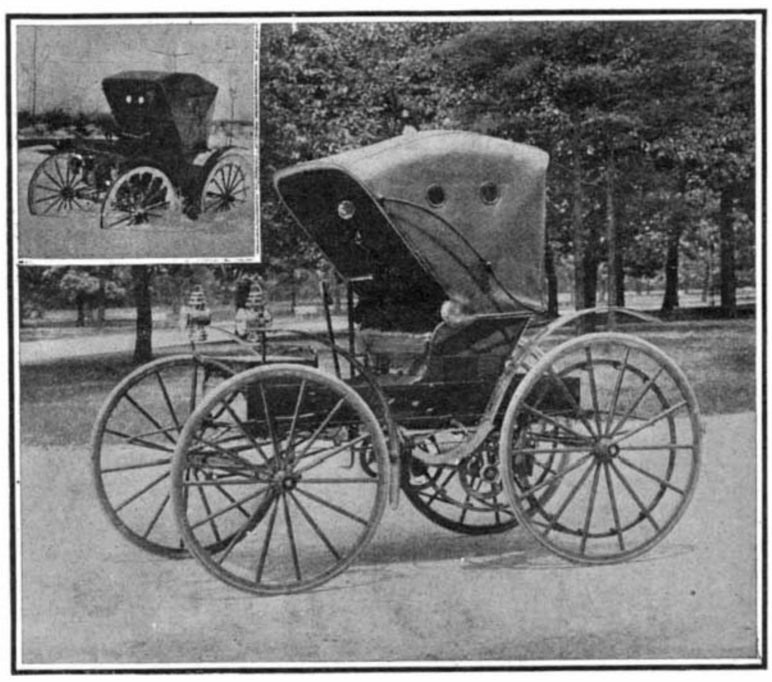
By the use of wire-rope cables for transmitting the power from the countershaft to its large rear wheels, the Holsman automobile is put in the class of friction-driven machines. This buggy, with its large wood wheels and solid rubber tires, is the nearest approach to the horseless carriage type of automobile that has thus far been produced. Save for the fact that it is steered by the usual steering knuckles, instead of by swinging the entire front axle on a fifth wheel, the Holsman machine is in nearly every respect like a horse-drawn buggy. It is fitted with a double-opposed-cylinder engine of 4 inches bore and stroke, placed fore and aft beneath the body, and driving through two Morse silent chains a countershaft placed beneath. Either one of the two sprockets on the engine shaft can be engaged by means of a sliding feather, which is shifted by a small lever on the front part of the seat. Ordinarily, the starting and running can all be done on the high speed. This is accomplished by pulling back the long lever at the right of the driver, which throws forward the countershaft and tightens the ropes, thereby transmitting the power to the rear wheels. A differential is not necessary, as the ropes can slip without damage. These ropes are in reality special wire and rope cables, made of the strongest Manila rope and steel wire. Besides giving a silent drive, their life is considerable. The reverse is obtained by a forward movement of the hand lever, which causes two small grooved wheels on each end of the countershaft to come in contact with the rubber tires on the rear wheels, thus driving the vehicle backward at a slow speed. On account of its large wheels and solid rubber tires, the vehicle runs and rides very easily. It is steered by a lever, and can be run at as high a speed as 30 miles an hour. The motor and the body are mounted on two long side springs, which absorb all the shocks from the road.

That this machine, as well as the larger four-passenger one built by the same firm, is quite practical upon ordinary rough country roads, is proven by the fact that one machine of each type won first place in their respective classes in a 105-mile reliability run from Chicago to Aurora and return, held last July. Out of eighty-four cars which completed the run, the smaller Holsman machine and two Maxwell runabouts made perfect scores; while the larger Holsman car (which, however, was fitted with the same engine) was penalized only 14 points, as against 151 of its nearest competitor. The small photograph in the corner of the larger cut shows the advantage of large wheels upon snow-covered roads. A machine of this type can traverse deep snow without any very great difficulty. It will likewise not be found wanting on muddy or rocky roads; and owing to its being equipped with solid tires, which of necessity precludes any tire trouble, it is a great favorite with physicians and other men requiring a machine of extreme reliability.



CHASSIS OF SIMPLICITY FRICTION-DRIVE AUTOMOBILE.

In this type of friction-drive car two large disks on the prolonged crankshaft drive two smaller wheels on two short transverse shafts that carry the driving sprockets.



THE HOLSMAN AUTOMOBILE WITH WIRE-ROPE DRIVE.

This machine is one of the most successful of the "horseless carriage" type. It is propelled by a double-opposed-cylinder air-cooled motor having two different speed reductions to the countershaft.

A SUCCESSFUL FRICTION-DRIVE AUTOMOBILE.

For several years past the friction disk form of variable-speed transmission has been experimented with and used with satisfactory results by a number of western manufacturers. Perhaps the most successful, at any rate the most up-to-date, application of this form of transmission is that found in the Lambert car built by the Buckeye Manufacturing Company, of Anderson, Ind. Combined with an extremely simple propeller shaft and bevel gear drive, and deriving power from a 40-horse power motor, this transmission offers many advantages, chief of which are simplicity and lack of expensive up-keep.

The Lambert touring car has the general appearance of any high-grade 4-cylinder automobile. The large view of the transmission printed below shows practically all the working parts of the car. A very large motor flywheel faced with aluminium (*F* in the illustration) is made to serve as the driving disk, while a large spoked wheel, *W*, having a ring of compressed paper, *X*, bolted to its periphery, acts as the driven. This latter wheel can be slid on its shaft across the face of the driving disk. On one side the reverse is obtained, while when it is slid to the other side of the flywheel, the forward speeds can be had. The lever, *L*, which moves over a quadrant whose notches correspond to the different speeds, operates the long, curved, shifting lever, *S*, by means of the smaller lever, *M*, and the connection, *N*. By sliding the wheel, *W*, from the center to the outside of the flywheel, *F*, any speed from a crawl to 45 miles an hour can be obtained with the motor working at full power. After the wheel, *W*, has been slid to the proper place, it is brought against *F* by a push on pedal *Y*. This pedal, through a connecting link, *A*, and lever, *B*, turns the hollow shaft, *C*, which has at each end short levers connected by links, *D E*, to the pivoted bearings, *G H*, of the transverse shaft. The result is that the whole shaft is moved bodily forward and *W* is pressed against *F*. The pedal is held where set by means of a locking spring, *I*, that travels over a notched track. By pushing on the upper edge of the pedal, the locking spring is released and the pedal, and consequently the transverse shaft, are both drawn back by a spring. This pedal corresponds to the clutch pedal of any ordinary car, but it is exactly opposite in its action. The pedal, *Z*, operates an expanding brake in drum, *D'*, on the transverse shaft, and is interlocked so as to break the contact between *F* and *W* when it is applied. The outer hand lever works, through an equalizer on the differential casing, two expanding brakes in the hubs of the rear wheels.

The new model Lambert car has the shaft drive shown herewith. By employing bevel gears at each end of the propeller shaft, no universal joints are needed, as the up-and-down movement is allowed for by the bevel gears and any slight forward thrust that might occur is withstood by two tubular radius rods, *R R*. As universal joints are dispensed with, the driving shaft can be completely incased in a tube, *K*. Miter gears are used within the case, *J*, instead of the ordinary bevels that are used at the other end of the driving shaft. A bevel gear differential and divided rear axle are employed. The motor is a 4½ x 5 4-cylinder Ru-

(*Continued on page 53.*)

THE LAMBERT FRICTION DISK TRANSMISSION AND SHAFT DRIVE WITHOUT UNIVERSAL JOINTS.

A, B, C, D, E. Levers, sleeve and connections for pushing disks in contact. *D'.* Band brake. *F.* Flywheel disk. *G, H.* Bearings of countershaft. *J, K.* Bevel gear and propeller shaft housing. *L.* Disk-shifting lever for changing speeds. *M, N, S.* Connections and curved lever for shifting wheel, *W.* *O.* Muffler. *R. R.* Radius rods. *P. T.* Timer and connection for shifting same. *V.* Steering column. *Y, I.* Clutch pedal and locking spring. *Z.* Brake pedal.