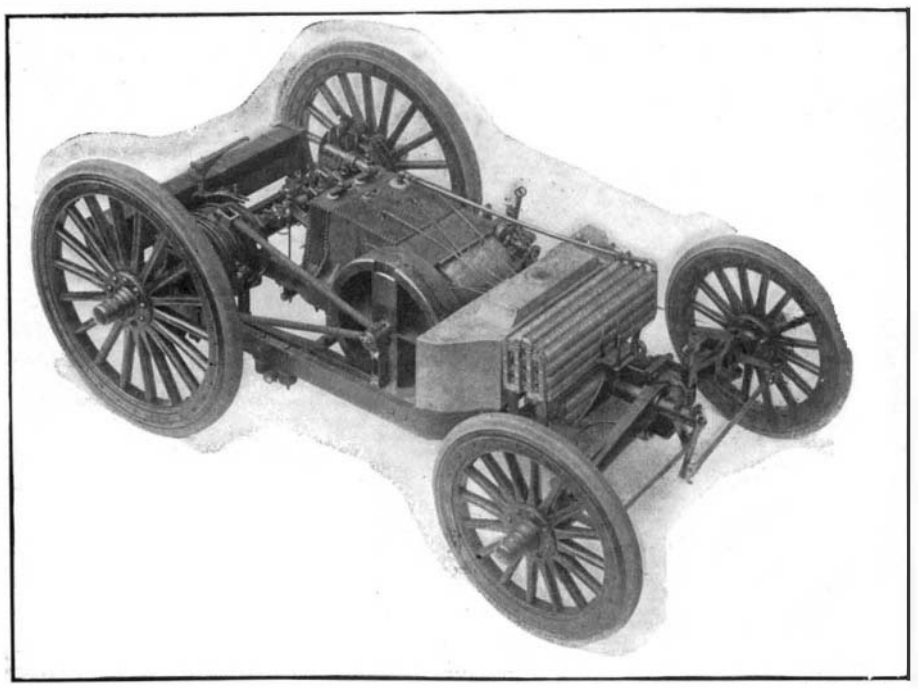
sufficient power to drive the machine over the worst of roads by motor power alone. The weight of the "Orient" motor bicycle serves also to absorb the vibration of the motor and prevent jarring of the machine and fatigue of the rider. A three or four horse power motor, as desired, is used for driving the machine. Great care has been exercised in the construction of these motors. The very best material is used, because weight is not a limiting item. Fluted copper rings are fitted over the cylinder to radiate the heat, instead of the cast flanges that are generally employed. The accuracy and reliability of the carbureter used on this bicycle have had much to do with the success of this type of machine. The spark plug is provided with porcelain insulation, which has been found to be one of the best materials for this purpose. Power is transmitted to the rear wheel through a leather belt especially prepared and heavily stitched. This offers a flat plane surface, which is very reliable. The motor is thrown in or out of gear by means of a jockey pulley on a curved arm forming part of a handle, as shown.



CHASSIS OF UNION MOTOR TRUCK, SHOWING SIMPLICITY OF DRIVING MECHANISM.

A NOVEL TRANSMISSION DEVICE FOR GASOLINE AUTOMOBILES.

Our illustrations show a new transmission device brought out by the Union Motor Truck Company, of Philadelphia, Pa., and first exhibited at the 1903 New York Automobile Show. This device solves, in a simple manner, the double problem of connecting a gasoline motor directly to the driving axle of an automobile, and likewise of furnishing a speed-changing arrangement by which the speed of rotation of the rear axle can be varied without varying that of the motor. The chassis is made up of a U-shaped steel frame carrying a two-cylinder, 12 horse power motor, with a slidable crank-pin in the flywheel, direct connected to a roller ratchet device on the rear axle. When the motor is being started or is running idle, the crank-pin is in the center of the fly-wheel and the connecting rods are at rest. The wagon is started by sliding the crank-pin slightly off the center of the fly-wheel, which gives a slight reciprocating motion to the connecting rods, causing them to turn the rear axle by the series of impulses they give it through the medium of the roller ratchet. A slight throw of the crank-pin gives short, extremely powerful impulses, while a longer throw increases the duration of the impulses and conduces to higher speed. The operation of the roller ratchet is virtually the same as that of the coaster brake on a bicycle, with the exception, however, that the former may be made to propel the vehicle backward as well as forward and may be thrown out of action when desired.

Referring to the diagram, the reader will see the construction of the principal parts of the mechanism. The crank-pin is on a slide in the flywheel, which is fastened to a piston moving in a cylinder in the flywheel casting. A powerful spring holds the piston normally, so that the crank-pin is exactly on the center of the flywheel. The crank shaft is hollow, and has a passage opening through a check valve into the top of the cylinder. There are two other valves (not shown) for the purpose of emptying the cylinder slowly or quickly, as desired. Oil is the fluid used for moving the piston, the oil being forced through the crank shaft by a plunger, which is started or stopped by throwing in or out a small friction clutch. The starting and stopping of the pump, the opening of the two oil relief valves, and the application of a powerful band brake to the differential drum are all accomplished by moving a single lever through an arc of 40 deg. When coasting, the motor can be thrown out of gear temporarily by setting the roller ratchet in the neutral position. The ratchet is instantly reversible also at any speed in case of extreme necessity.

The details of the roller ratchet can be readily comprehended from our diagram. A steel hub 8 or 12 inches long by 7 inches in diameter is keyed to the axle. On the periphery of this hub there are 12 longitudinal hollows ⅛ inch deep by ¾ inch wide at the bottom, with sides flaring out to a width of 1¾ inches at the circumference of the hub, and forming an angle of about 10 deg. with a tangent to it at the point of intersection. In the hollows are placed ⅝-inch hardened tool steel rollers, 3½ inches long. Two or three sets of these rollers are placed end to end, properly spaced and separated by a slotted bronze cage, *C*, according as two or three connecting rods are used. The guiding cage of the rollers fits loosely over the steel hub, and is but ½-inch thick, thus allowing the rollers to project 1-16 inch above and below it. It is keyed to the hub with two keys, *K*, wide and straight where they fit in the latter, but having a narrow feather

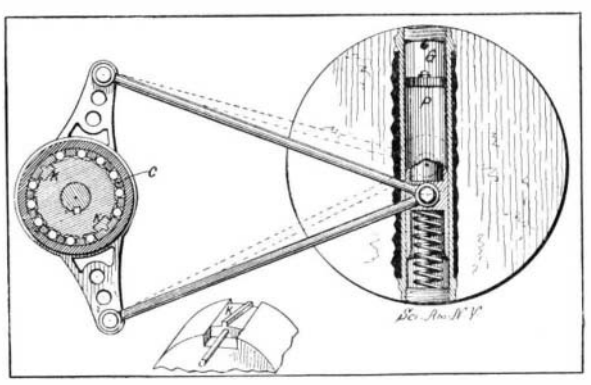


DIAGRAM OF THE POWER-TRANSMITTING DEVICE.

running at an angle across their surfaces, which slides in a corresponding groove in the cage. By sliding the key sideways in the hub, therefore, the cage is made to revolve around it slightly in one direction or the other (about ½ inch each way), and thus to move the rollers till they jam between the inclined portion of the hollows in the hub and the outside sleeve which encircles them and to which is fastened the connecting rod. The push or pull of the rod is then transmitted directly through the jammed rollers to the hub. Upon the return stroke of the rod, the rollers slide back off the incline sufficiently to free themselves and allow the sleeve to roll back over them. In the center, or neutral position, it can move either way without becoming locked, while the forward and reverse movements are obtained by sliding the cage and rollers either forward or backward upon the surface of the hub. There are as many separate sleeves and sets of rollers as there are connecting rods, three being the number now used. This gives three power impulses per revolution to the axle and drives it very steadily. As the rollers run in oil, they are noiseless, and as all the wearing surfaces are of the best hardened steel, the wear is found to be very slight. An experimental truck has been in operation for two years and has shown the wear of the roller ratchet to be almost inappreciable.

The company expect to have a truck in the commercial vehicle contest of the Automobile Club of America this spring, and its operation will no doubt be watched with interest by many.

UNION GASOLINE MOTOR TRUCK, SHOWING CONNECTING RODS FROM MOTOR TO REAR AXLE.

The Manufacture of the Deadly Dart Poison of the Sarawak Indians.

A close investigation has been made by Mr. C. G. Seligmann into the manufacture of the deadly poison used for darts by the natives of the Baran district of Sarawak in the course of a visit to Long Tamata on the Barem River. This poison, which is of vegetable origin, is generally known among the up-country tribes of this region by the name "ipoh." The poison is a nitrogen-free glucoside which affects the muscle of the heart and the central nervous system of the individual who is struck by a dart. It is a poison existing in its raw state, being the sap of the upas tree. The process of collecting the poison is very simple. Upon the bark of the upas tree a number of little channels are cut by means of a special gouge, extending in oblique directions, and all converging at their lower points into one vertical channel. The sap thus tapped by this scoring runs down the oblique cuts into the vertical channel, and is there collected in tubes of bamboo. In its raw condition the upas sap is of a yellowish white color, and bitter to the palate. Shortly after exposure to the air, it darkens in color and becomes sticky, and in course of time develops to brownish black. The juice is subsequently submitted to a prolonged boiling, the vessels for this purpose being of an extremely primitive nature, since they are fashioned from palm leaves. The upas tree sap is poured into these vessels, which are then suspended a few feet above a fire. The boiling process is somewhat protracted and during the whole time the sap is constantly stirred. During this operation the liquid is transformed into a thick, viscid mass, and in this condition it is withdrawn from the fire and set on one side to cool. When cold, the sap is a solid, hard, yet brittle substance, though before it is quite set the leaf is rolled up with its soft contents, the two ends tied with rattan and the poison thus kept until required.

The darts, which are projected by the natives through blowpipes, consist of strips of palm wood from 20 to 30 cm. in length, are pointed at one end, and a quantity of the poison is then removed from its palm leaf receptacle, and ground up until it is of the consistency of flour. It is then mixed with water and stirred up until it becomes a thin paste, which is smeared upon the points of the darts. The process of preparation takes place before a fire, and when completed the darts are placed with their points toward the fire, until the ipoh has dried into the wood. In the case of the darts that are required for the large game, the point of the weapon is split open, and a thin metal wedge or plate is inserted, and the whole point is then smeared with the poison. The opposite end of the dart comprises a small conical butt made of the soft pith of the sago palm. The darts are carried in small bamboo quivers, points downward, fixed into the loin cloth of the native, with the points protected by a piece of animal skin.

Improvements under way by the railroads of the United States aggregate nearly $400,000,000.