

shaped pieces of leather or rubber riveted upon it at intervals, so as to adapt it for running in the grooved pulleys, as shown in our engravings.

Obviously the most important problem presented by this arrangement is the great variation in the speed of the dynamo, and in the voltage generated. There is also the necessity of lighting the car when it is not in motion. Railway cars run at any speed between ten and sixty miles an hour, and as the armature is driven directly from the axle, the speed of the latter will vary directly as the speed of the train. For reasons which are well understood, the voltage generated increases with the speed of the armature, and hence it is evident that if the constant electric voltage which is necessary at the lamps in electric lighting is to be secured, some kind of regulation of voltage or pressure must be provided. Moreover, as the car may run in either direction, provision has to be made for maintaining the current in a constant direction. Furthermore, as there will be times when the dynamo is not running at all, but when it will be necessary that the lamps shall remain lighted, there is a necessity for storing up the surplus current generated while the dynamo is in motion and yielding it when it is needed. Such an agency is found in the ordinary storage battery. Various means of regulating the voltage have been adopted. One method that has been attempted is to allow the belt to slip as the speed increases; but the impossibility of finding any means of automatically adjusting this slippage has rendered such a device impracticable. Another attempt at regulation is that known as the differential field winding, which is so arranged that as the magnetism due to the shunt winding increases with the speed of the train, the demagnetism caused by the reverse series winding comes into action, the result being a nearly constant pressure.

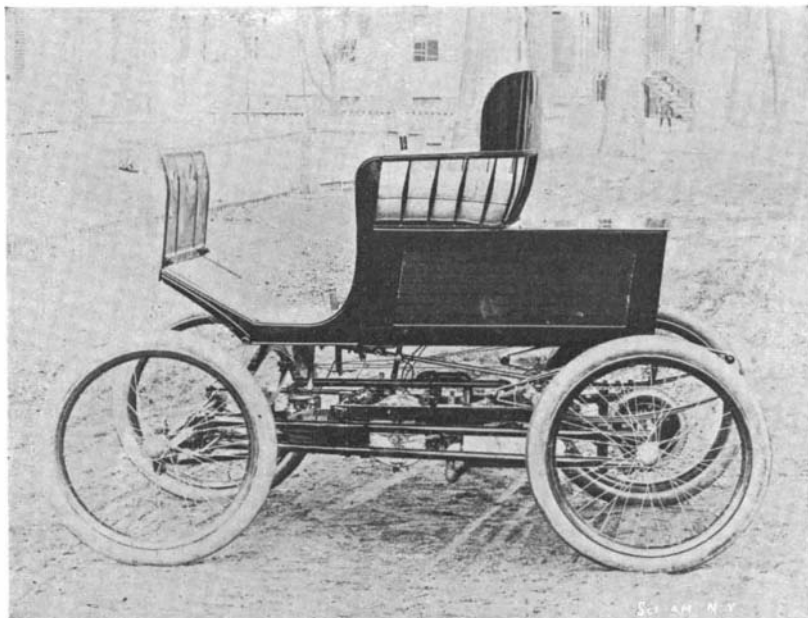
The Consolidated Railway Electric Lighting and Equipment Company has proceeded on the lines followed by the great electric lighting companies in the matter of regulating the pressure. Constant pressure is maintained by cutting out resistance in the field windings, shunt-wound machines being employed. Thus, if the current increases and the pressure falls, resistance is cut out of the field windings, necessitating a greater flow of current through the field, the effect of which is to increase field magnetism and, therefore, the pressure. On the other hand, if the pressure rises, resistance is cut into the field winding, and the field magnetism and therefore the current pressure is reduced. This system of control is operated automatically by means of a "Regulator" which contains a motor operating in connection with a rheostat and a double pawl and gear movement. The result is an absolute protection against the burning out of lamps or the overcharging of the battery.

In any system of electric lighting from the axle the problem of a proper drive from axle of car to shaft of armature is necessarily a serious one. Attempts have been made to overcome the many and obvious objections to a belt drive by substituting, first, a gear drive, which was found to be unsuitable on account of the extreme vibration set up, and then a friction drive which, because of the vertical motion of the axle, led to heavy pounding of the driving pulley against the driven pulley and an ultimate fracture of the armature shaft. In the gear which forms the subject of the illustration, the difficulty is overcome by combining the positive action of the gears with the flexibility of a belt transmission. The flexible gear consists of a suitably armored belt with V-shaped segments arranged on its inner side, so as to permit the use of a hollow pulley. With this belt, curves of a very short radius may be rounded without the belt slipping off.

Storage batteries are provided for the purposes of storing up the surplus current and yielding it again when the dynamo is running below its whole output, or not running at all. Thus, in the day time, the full output of the dynamo passes into the batteries, and is stored. This current is available when the train is standing on a siding or at a station, or when the speed of the train is so small as not to yield the current needed for the lamps and fans.

The results obtained with the overland train on the Sante Fe Railroad are stated to have been highly satisfactory, a decided gain being shown, especially when the superior nature of the illumination over that afforded by the ordinary gas system is taken into account. The weight of the installation on each car is less than 2,000 pounds, a very insignificant percentage of the total weight of a

modern Pullman coach. Apart from the first cost, the expense attached to this system is exceedingly light, the flexible gear, in spite of the extremely severe duty imposed upon it, giving efficient wear for a period of six months, and the repairs to the electrical equip-



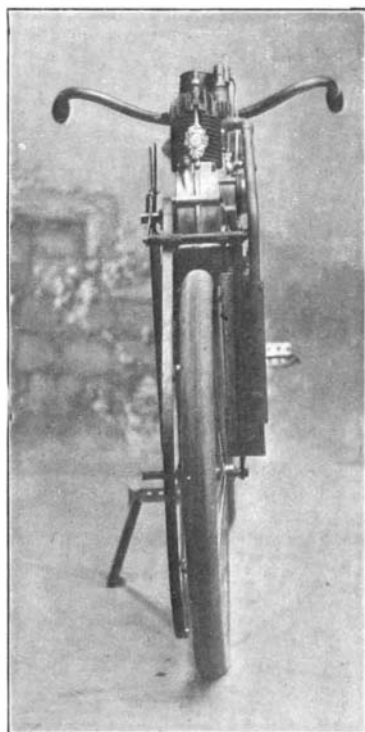
THE LOOMIS GASOLINE RUNABOUT.

ment, although the dynamo runs at a speed of over 2,000 revolutions a minute, have proved to be very light.

#### RECENT GASOLINE AUTOMOBILES.

The automobiles on view at the Cycle and Automobile Show in Madison Square Garden, of this city, last week, although comparatively few in number, were yet of considerable interest, and in but a few cases were they a repetition of exhibits of the previous shows.

The Loomis Automobile Company, of Westfield,



FRONT VIEW, SHOWING MOTOR, DRIVING BELT AND PULLEY ON FRONT WHEEL.

Mass., exhibited two runabouts which are a great improvement over the one shown last year as far as propelling power is concerned. These carriages, which are built with and without a box behind (the box being



MOTOR-CYCLO WITH MOTOR CARRIED ON FRONT FORKS AND DRIVING FRONT WHEEL.

in this case so much spare space for carrying packages), are equipped with an air cooled Crest duplex nominal five horse power gasoline motor, neatly arranged on the running gear. The running gear is triangular in shape, and is made of a double frame of steel tubing horizontally pivoted to the front axle at the apex of the triangle. The Upton countershaft is used between the motor and the rear axle. This device permits two speeds ahead of five and fifteen miles per hour and one slow reverse. A chain drive is employed throughout. The steering arrangement of this vehicle is a newly patented device. The handle shown beside the seat, in the same position as the throttle of most steam carriages, is moved slightly back and forth to steer in either direction. The lever is pivoted on the under side of the carriage body and attached to a rocker which shifts the steering arm of the wheel by means of a rod connection. The universal ball joint generally used between the steering arm of the wheel and the lever on the carriage is dispensed with, and the arrangement of the handle, besides giving twice the leverage generally to be had, is such that access to the seat is unimpeded.

The Loomis runabout we illustrate was frequently seen running in the basement of the Garden, and it climbed the rather steep incline from the basement to the main floor. It is equipped with mufflers of a new design which effectually deaden the exhaust, and also with a novel carbureter, which we shall illustrate later.

Other gasoline vehicles noted at the show were the "Trimoto" of the American Bicycle Company, the "Warwick," and the "Rambler." We hope to illustrate these in a later issue.

#### THE ANNUAL BICYCLE SHOW AT MADISON SQUARE GARDEN.

The first impression made upon a visitor to the bicycle exhibition at Madison Square Garden was that the bicycle as such has unquestionably reached its final type. There is less difference between the wheel of 1901 and the wheel of 1900 than between those of any other successive years in the history of the bicycle. But having said this, it must be admitted that there is a marked improvement in the details and finish of many of the machines; and during a tour of the exhibits, we failed to find a single machine that exhibited roughness and clumsiness of design or carelessness in finish.

The chainless bicycle is evidently gaining in favor, if we judge from the proportion of this type that are on exhibition. Both the outside and inside drive are in evidence, the former being the type which was identified so largely with the Columbia bicycle, and the latter with the Spalding wheel. The price has come down, as was predicted, until it approaches that of the ordinary chain-driven machine.

The coaster brake has won its way in popular favor, until now every company is prepared to furnish it, as an extra, with new bicycles. Apart from its convenience in coasting, it has the value of affording an absolutely reliable and extremely powerful emergency brake, as well as one that may be applied with any desired amount of pressure.

Another invention designed for increasing the comfort of riding is the well-known cushion frame, which may be purchased in preference to the rigid frame from most of the leading makers. Perhaps the most noticeable departure of the year, because of its conspicuous position on the machine, is the extension handle bar, which owes its existence to the present tendency to narrow the wheel base of the bicycle. This shortening of the wheel base brings the seat so near to the head of the machine that it is necessary to carry the handle bars on an extension in order to clear the knees of the rider. The change—it can scarcely be called an improvement—was introduced by the riders in paced races, and it is not likely that it will find very much use among the average road riders. Indeed, the roadster machines, in which class is included the vast majority, will still have the old wheel base of 44 inches.

Several designs of motor bicycles were shown at the exhibition, in most of which the motor is carried within the frame and either belted to a pulley attached to the side of the rear wheel, or fitted with an ordinary sprocket and chain drive. Among these may be mentioned the Thomas Auto-Bi, in which the motor is carried parallel with the bottom bar of the frame, and belt transmission is used, a half-round pulley being attached to the left-hand side of the rear