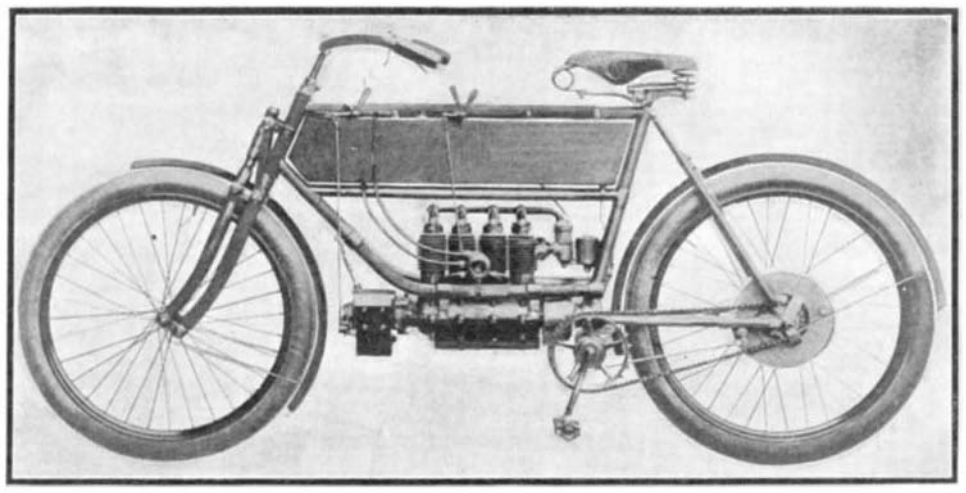
A FOUR-CYLINDER MOTOR BICYCLE.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The four-cylinder air-cooled motor bicycle shown herewith is of 3½ horse-power. The bore and stroke are respectively 57 millimeters (2.24 inches) and 45 millimeters (1.77 inches). Automatic inlet valves are used. Hitherto the four-cylinder motor has only been used in the construction of automobiles, but any one who has had experience in using them will at once recognize their advantages. An explosion every half revolution insures a much more continuous series of power impulses than one every two revolutions, with the further important advantage that the use of the four-cylinder motor permits a perfect balance between the various working parts being attained. Moreover, vibration is minimized, and the strains in the frame of the machine eliminated. The utilization of the four cylinders also allows greater flexibility in the operation of the engine, the speed varying from 5 to 50 miles an hour. The motors are placed in a perfectly vertical position, which insures the best results, as it is the only one that renders regular and uniform lubrication, together with perfect control of the working parts, possible. Furthermore, the motor is placed as near the ground as is feasible with safety.

The system of transmission is similar to that of the chainless bicycle. There are two bevel gears, one of which is on a longitudinal shaft driven by the motor, and the other is fixed on the rear-wheel hub. The whole arrangement is protected by a dustproof case filled with grease, to insure sufficient lubrication of the various parts.



FOUR-CYLINDER MOTOR BICYCLE WITH MAGNETO IGNITION AND BEVEL GEAR DRIVE.

To avoid the shocks due to the explosions in the motor being transmitted to the bevel gears, an elastic coupling contained within the flywheel is interposed between them. The high-tension magneto is of a special type and has a current distributor of an entirely new type. The spark produced by this apparatus is superior to that attained by any other arrangement, and more easily controlled, the working parts being fully protected against mud, dust, or rain.

Although perfect regularity of movement is attained by the four-cylinder motor, smooth running of the machine is, however, considerably affected by bad roads. In order to minimize this as much as possible, the bicycle is provided with a special elastic front fork. This embodies a combination of steel springs and some rubber plugs, and has for its object the avoiding of jerks. The fork is noiseless in its action, and conduces to the steady running of the motor.

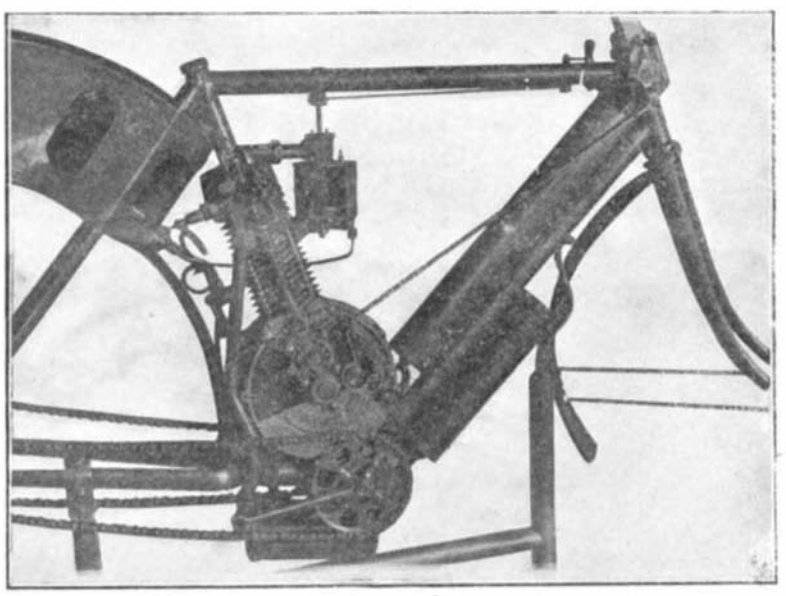
The bicycle is also fitted with a new type of vaporizer, in which a special arrangement produces a perfect mixing of air and gas, thus insuring a complete homogeneity of the mixture. The automatic valve regulates the admission of the supplementary quantity of air at various speeds. There is also a new arrangement for lubricating the various parts of the motor, and distributing oil to the four cylinders in a uniform manner, while the machine is completed by a back-pedaling brake.

The design of the frame has been remodeled in order to embody the new features of this motor cycle. The inferior median part, which supports the motor, resembles a bridle, made of oval tubing, to which the case of the motor is fixed. At the rear end of the case an iron flywheel containing the elastic coupling is fixed on the motor. Above the motor, in the upper part of the frame, are two tanks, the forward one being for oil and the rear one for gasoline. To facilitate starting, a lever is placed on the handle bar, by means of which the exhaust valves in the cylinders can be raised to release compression. The motor can then be started by pedaling a few strokes.

The regulation of the speed is obtained by moving one or both of two levers placed above the gasoline tank, one of which varies the ignition, and the other limits the quantity of gas entering into each cylinder.

The machine has two brakes; one of these is operated by back-pedaling. The ratchet wheel fixed on the bottom bracket actuates a rod, which moves two jaws, which thus exert pressure upon a drum fixed on the rear-wheel hub. The other brake is composed of two long shoes acting upon the rear-wheel rim. This brake is operated by means of a lever placed on the handle bar and which, by the intermedium of rods, forces the shoes in contact with the rim of the wheel.

besides the two-to-one gears and cam for operating the exhaust valve. The contact device is also shown on the side of the crank case at the front. A curved spring attached to the contact box rubs against a spring-pressed button, from which a wire runs to the spark coil. This curved spring acts as a switch, and in the position shown in the photograph, it makes contact and completes the circuit to the batteries. When the contact box is moved back as far as it can travel by means of the rod connection running to a lever on the front fork, operated by a rack-and-pinion arrangement from the lever on the handle bar, the curved spring just mentioned moves away from its opposing contact and breaks the ignition circuit. At the same time the top of the box strikes a lever, which raises the exhaust valve and holds it open. This lever, and its withdrawing spring, can plainly be seen in the illustration, beside the curved spring and contact box. It will thus be seen that when the exhaust valve is raised, the current is always automatically cut off. The carbureter is also shown in section, but is too minute to be described here. It draws its air from around the ribs of the motor through a small funnel at its base. Another feature to be noted is that the inlet valve stem projects through its housing, so that if the valve should stick it could readily be punched away from its seat by pressing the stem on the outside. The motor is oiled from an oil cup on its base, which in turn is fed from an oil tank above. The gasoline tank is arranged over the back wheel, while the forward member of the diamond frame carries the batteries in a case above it and the spark coil below. The motor, as can be seen, is built in the diamond frame in such a way that it forms part of the upright

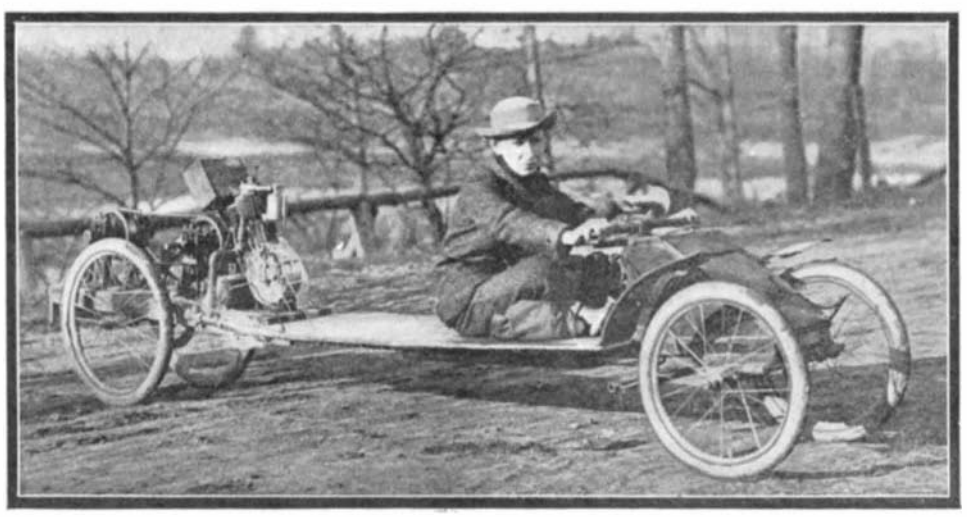


SECTIONAL VIEW OF THE THOR MOTOR AS USED ON A BICYCLE.

THOR MOTOR BICYCLE WITH SIDE CHAIR ATTACHED.

A NOVEL SIDE-CHAIR ATTACHMENT FOR MOTOR BICYCLES.

The accompanying illustrations show an entirely new arrangement for carrying a second person with a motor bicycle, and a photograph of a motor showing the parts in section. The attachment and motor bicycle are both made by the Aurora Automatic Machinery Company, Aurora, Ill. The motor is known as the "Thor" motor, and the sectional photograph is made from a working model exhibited at the New York Automobile Show. This sectional model of the motor, which is a very neat piece of work, shows the inlet and exhaust valves operating in their valve chamber, into which the spark plug projects. The crank case has been cut away so as to show the flywheel revolving therein, post which screws into its head. It drives the rear wheel through a chain and an ingenious cushion sprocket having a diamond-shaped groove in which a brass ring of the same cross section is clamped between the driving and driven parts. This, and the method of confining the wiring to the motor, and thus dispensing with running the wires through the handle-bar, are the main features of the Thor motor bicycle. The bicycle attachment consists of an extensible axle attached to the axle of the rear wheel, and a curved tube extending from the end of this axle to the steering fork, where it is firmly attached. A wide seat is mounted upon this side carriage. It is so constructed that it can be quickly converted into a box for packages. The side carriage can be quickly removed when not needed. The attachment forms one of the neatest solutions of the small automobile problem that has yet been made. The motor bicycle has ample power to draw it over not only ordinary, but also poor roads.



A BOY'S HOME-MADE BUCKBOARD.

The buckboard automobile, also shown on this page, was constructed by two New York boys after their own designs. A Thor motor is used for propelling it, and this drives a countershaft by means of a belt, from which the transmission is made by chain to the rear axle. The machine is mounted on 28-inch bicycle wheels, and steered after the manner of a bob sled, with a handle.