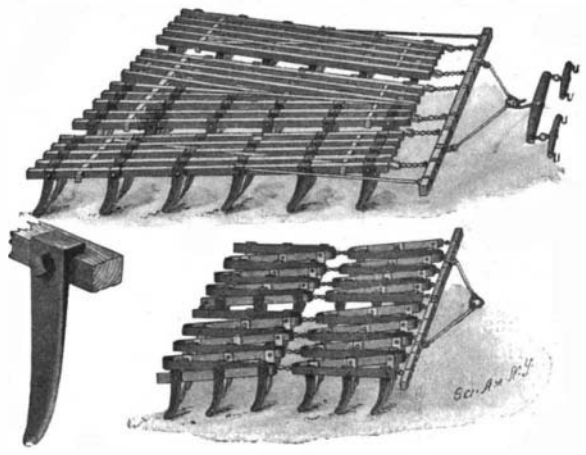
A NOVEL HARROW-TOOTH.

A harrow-tooth that will cut and therefore will not clog is an invention for which Mr. Augustus H. Schaffer, of Ontonagon, Mich., has received a patent.

The tooth is made of flat spring-steel, is tapered, and is formed with a rectangularly-extending flange at its upper edge, which flange is intended to fit snugly over a harrow-tooth bar. The one side face of the tooth is convexed and the opposing side concaved. Furthermore the front, cutting edge of the tooth is sharpened and convexed, and the back concaved. Teeth of this form



THE SCHAFFER HARROW.

cut through the ground and do not clog, but form sharp furrows. After a harrow fitted with the teeth has been passed over a field, the surface of the ground is thoroughly sliced, but still smooth and level.

Mr. Schaffer intends to apply his invention to harrow-frames of peculiar construction. One of his harrow-frames is made of 2 x 2½-inch hardwood, with longer dimension upright. Six teeth are fitted to each full-length piece. A beam, the length of which is as great as the average width of the harrow, is attached to the front of the harrow by means of hooks and links. At each end of this beam a rod extends backward along the side of the harrow, and is attached at a point near the center of the outside piece.

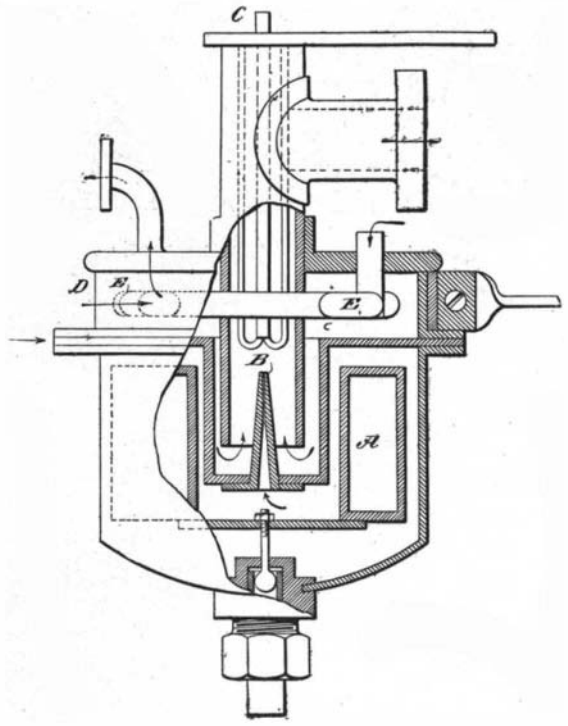
Another form of frame is made of steel sections, bent zigzag and connected by links. The beam running across the front of the frame is hinged at the middle.

ALCOHOL AUTOMOBILES AT THE PARIS ALCOHOL EXHIBITION.

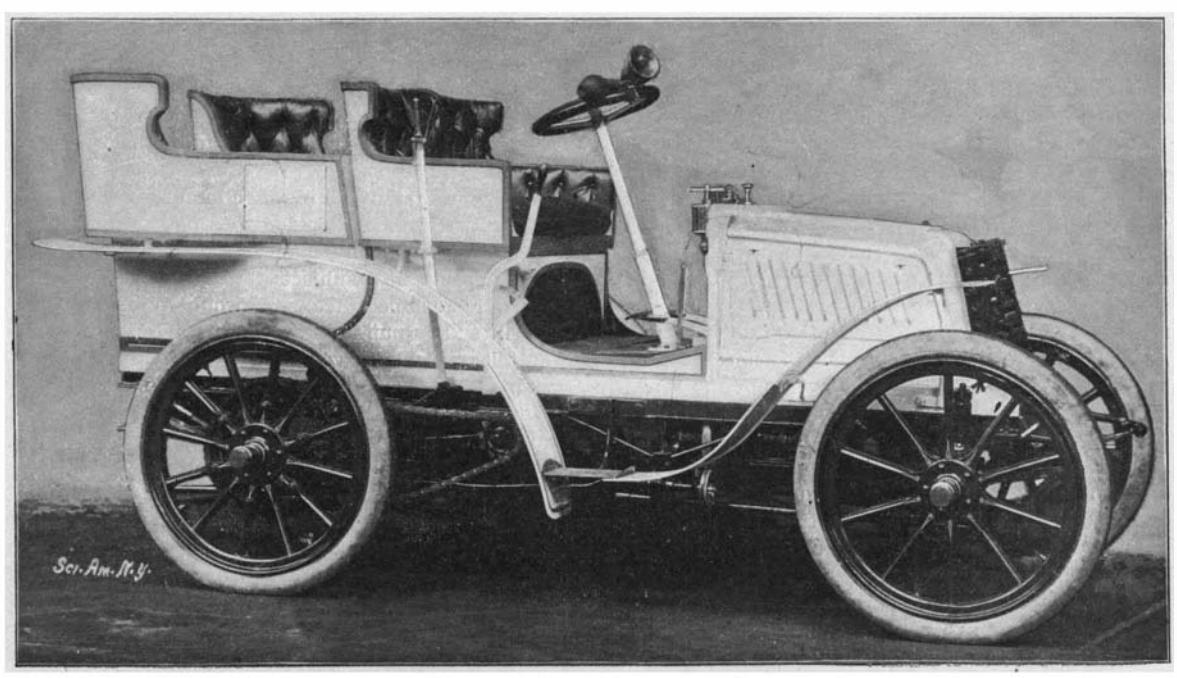
BY OUR PARIS CORRESPONDENT.

II. THE BARDON.

The Bardon automobile, shown in the illustration, is one of the recent type. In this machine the motor, which is horizontal, is placed transversely and in the front of the truck. It has one or two cylinders each provided with two pistons, the explosion taking place between the two. The pistons drive a crank-shaft at either end, and these are connected with the main driving shaft by bevel gearing; the latter shaft, in turn, drives the rear wheels by chain gearing. The motor is thrown in gear by a conical friction clutch operated by a pedal, and the speed-changing device has a set of gears of different diameters which are alternately placed in mesh. Electric ignition is used. The carbureter, of the Leblond type, works on the atomizer principle. It is designed to heat the gaseous mixture before it passes to the cylinder. As shown in the diagram, the chamber contains the hollow float, *A*, which carries below a ball-valve to regulate the admission of alcohol; this arrangement allows for the inclination of the apparatus. Above is the atomizing tube, *B*, from which the liquid is projected upon a set of small heating tubes of copper, traversed by a part of the exhaust gases. These are brought by a large central tube, *C*, and mount through the six small tubes. The alcohol gas is also heated by a copper spiral, *E*, through which part of the exhaust passes. The hot air for forming the gas passes downward and then up past the atomizer nozzle, drawing up the alcohol in the usual manner. The mixture is made at the desired temperature by regulating the temperature of the inrushing air. The entrance of air for the mixture is regulated by a revolving collar with air holes in the top of the carbureter. The gas goes to the motor through the large pipe above the carbureter. The Bardon type is among the most successful of the alcohol automobiles, as it obtained the first prize (gold medal) in October, 1900, in the Paris-Rouen and two other medals in the Paris-Roubaix races of this year. This system is one of the few to use pure alcohol.



THE BARDON PURE ALCOHOL CARBURETER.



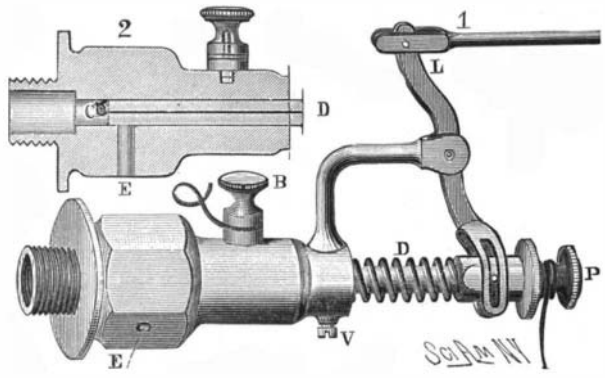
THE BARDON ALCOHOL AUTOMOBILE.

THE WYDTS ELECTRO-CATALYTIC SPARKING PLUG.

A new sparking plug for gasoline engines has recently been invented by Mons. A. Wydts, a French electrician and physicist of note. This plug accomplishes the rather startling feat of exploding the charges of gas in a gas or gasoline engine without the use of electricity (except a very small current when starting) or heat. It is not affected in the least by a sooty mixture or by oil, and is in fact the plug *par excellence*, according to M. L. Baudry de Saunier, the editor of La Locomotion, who has given it a thorough trial, and from whose description of it we give the following facts:

It is well known that certain precious metals have the extremely singular property of bringing about merely by their presence the sudden combustion of two or more gases in which they are placed. This phenomenon occurs the more easily when the metal is finely divided, for while it has the same volume, there is a greater surface exposed to the gas. If, for example, a piece of osmium is placed in a mixture of hydrogen and oxygen, it has to be heated to about 200 deg. C. (392 deg. F.)—a temperature far too low to bring it to a red heat, however—in order to produce an explosion. If this compact piece is replaced by a piece having the same volume, but in a finely divided state—by some osmium sponge, in other words—it is only necessary to heat it to 40 deg. or 50 deg. C. (102 deg. to 122 deg. F.) for the phenomenon to occur. Finally, if for the spongy piece a piece of the powdered metal having the same volume be substituted, the explosion will occur without any heating being necessary.

The metals which produce, to use the expression of the physicists, this catalytic effect, are platinum and those that are mined with it, such as osmium, iridium, rhodium, and ruthenium, which are found in the nuggets or grains contained in the auriferous earths from which platinum is extracted. Theoretically, therefore, it is only necessary, in order to automatically spark a motor, to mount on the piston a piece of spongy platinum. Several attempts have been made to do this, but they have all proved abortive; and thus it is demonstrated once again that, if theory and practice are sisters, they spend the greater part of their lives quarreling. The fact is that platinum, even in the spongy state, has not sufficient catalytic power, when cold, to explode a mixture, and motors that are provided with this metal for ignition purposes must have it heated by a burner when starting. Afterward, when the internal temperature of the cylinder has become sufficient, the burner is extinguished and the



THE ELECTRO-CATALYTIC SPARKING PLUG.
1. The plug with operating lever. 2. Cross-section of plug.

spongy platinum alone effects the explosions. Spongy platinum produces the same result as a heated point in a motor run without cooling water; it causes explosions at the wrong time and haphazard. Moreover, spongy platinum can only be obtained by causing meerschaum (an extremely fragile substance) to absorb a platinic chloride, which is then reduced to the metallic state. It has no resistance and will only last throughout a laboratory experiment, the length of a morning.

In order to evolve from these curious experiments a really practical spark plug, capable of traversing the highways on an explosive motor, numerous minor discoveries remained to be made. An experimenter of ability was needed to undertake them, and such a one was found in Mons. Wydts, who not only had the ability, but also the inventive genius to bring them to a successful and practical termination.

It was necessary, in order to make a successful igniter on this principle, to find a solid, homogeneous, indestructible, unoxidizable substance capable of a sufficient catalytic effect, even at low temperatures, to inflame any carbides of hydrogen whatever mixed with a small proportion of oxygen and a large proportion of nitrogen and other gases.

After long research, Mons. Wydts discovered an alloy, made in determined porportions, of osmiridium and ruthenium, an alloy which forms a metal of an extreme porosity although always dense, and which possesses in the highest degree the power of condensing with elevation of temperature any carbides of hydrogen whatsoever mixed in any quantity whatsoever with nitrogen, oxygen, carbonic acid, etc. The presence of an infinitesimal quantity of hydrogen causes its immediate incandescence.

At the same time the inventor discovered that the passage of an electric current through this mysterious alloy produced a sort of molecular bombardment, the effect of which was to drive out the inert gas condensed in the pores of the metal, to purge it in some manner, and by so doing to increase its catalytic power. A feeble current (one-half an ampere at one volt, or one-half a watt) is sufficient, and its application is necessary for a few seconds only. After making some experimental plugs, Mons. Wydts has now devised a standard type suitable for any gasoline engine. This consists of an outer shell or casing that screws into the regular spark-plug hole in the motor. Within this shell there is a metal piston, *D*, which can be moved in or out by means of the lever, *L*. An insulated wire passes through the piston, terminating in the bit of metal alloy, *C*, on the inner end and having a binding post on the outer end. The bit of alloy is mounted on the end of the piston, and as this fits tightly in the outer shell, the current can enter through the upper binding post of the latter, pass through the shell and piston to the alloy, and, after