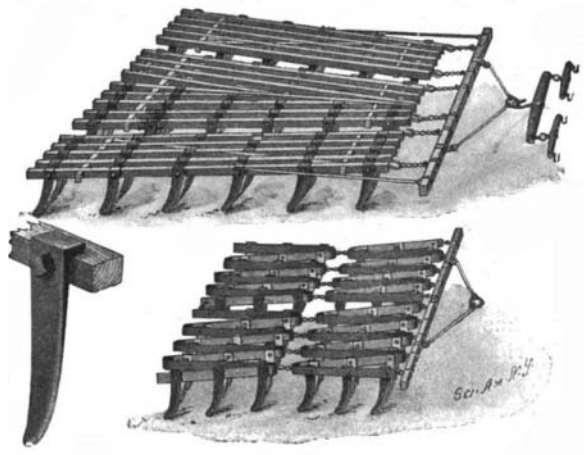
A NOVEL HARROW-TOOTH.

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.

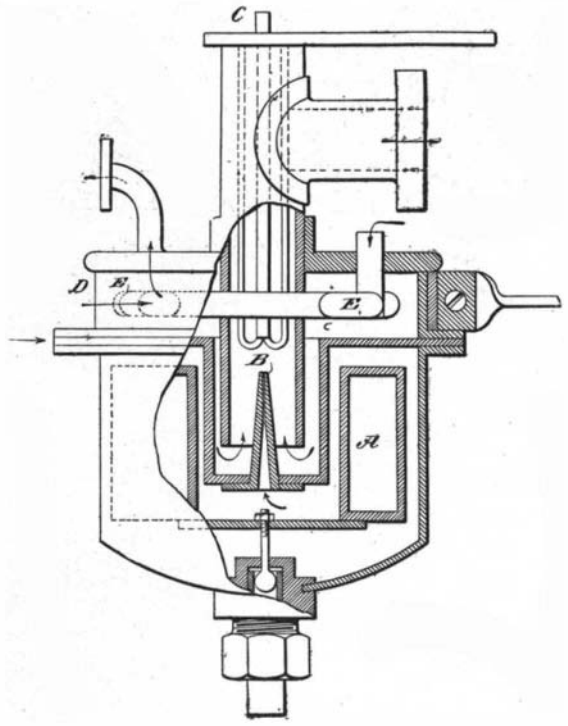
Another form of frame is made of steel sections, bent zigzag and connected by links. The beam running across the front of the frame is hinged at the middle.

ALCOHOL AUTOMOBILES AT THE PARIS ALCOHOL EXHIBITION.

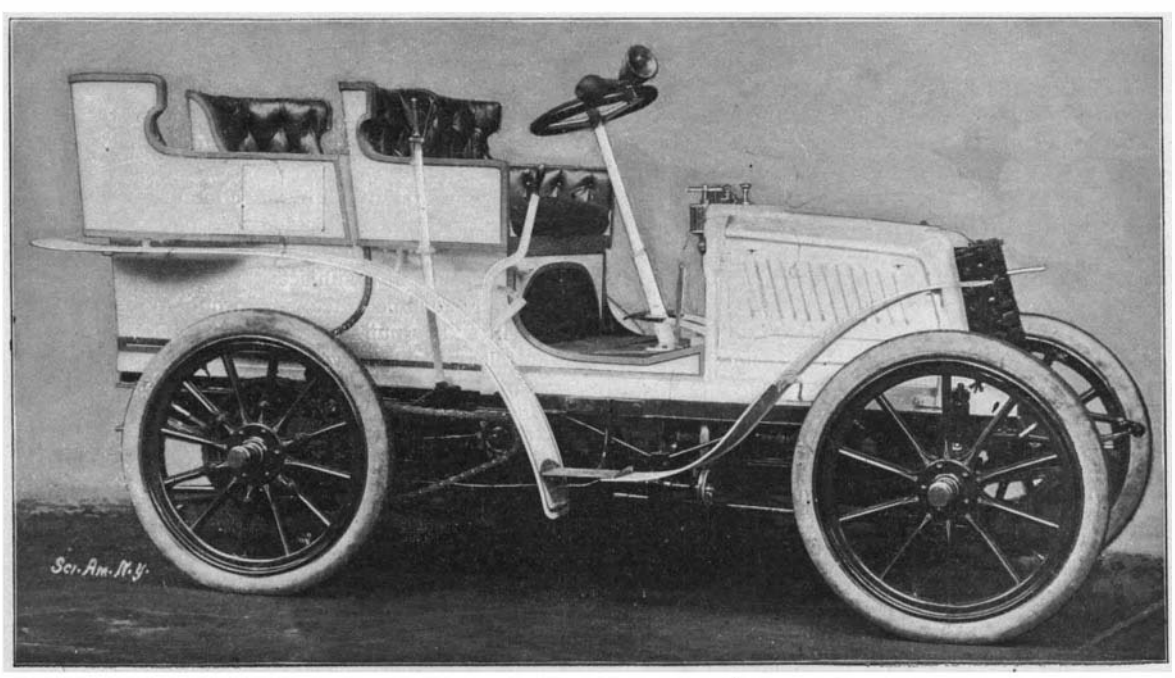
BY OUR PARIS CORRESPONDENT.

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.



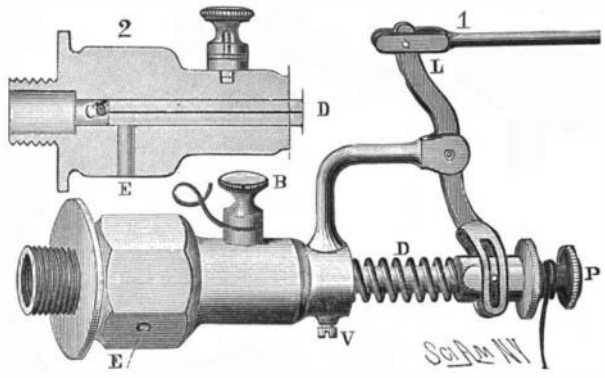
THE BARDON ALCOHOL AUTOMOBILE.

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

traversing this, make its exit through the insulated wire and the binding post, *P*. A single cell of dry battery is all that is needed, as it is only necessary to produce a sort of excitation in the bit of alloy at the start, and as soon as the motor is under way the current can be cut off. The electrical apparatus used is certainly of extreme simplicity.

As soon as the motor is well started, the point of ignition becomes somewhat advanced, for the incandescence of the bit of alloy increases gradually till its maximum is reached. It then has a temperature of 1700 deg. C. (3092 deg. F.), a temperature superior by 750 deg. C. (1382 deg. F.) to that obtained by the best burners.

It is noteworthy that this temperature is lower than that of the electric spark, which is generally conceded to be in the neighborhood of 3000 deg. C. (5432 deg. F.). But, in a unit of time, the number of calories disengaged by the osmium (and this is the important point in the discussion) is much greater than the number disengaged by a spark. A piece of wool saturated with gasoline, and approached in a closed jar toward the osmium and toward the spark, takes fire three centimeters away from the former and only ignites when within one-half a centimeter of the latter.

The inflaming alloy, therefore, forms in the Wydts plug an incandescent center comparable to that which the burner forms in a platinum tube. But the great difference consists in this, that in the system just described, this incandescent center, *C*, can be moved while, when produced by a burner, it is fixed. The result is that while in order to produce advance ignition in a motor with burners, it is necessary to use a platinum tube longer than the one ordinarily employed, and thus render necessary in this tube a lower compression, that is to say, a compression more quickly obtained by the piston, inversely it is necessary with the Wydts igniter to shorten the length of the chamber by advancing the incandescent point toward the cylinder.

The useful ignition advance for a given motor can be calculated by the constructor, who can set the piston in the plug and fasten it by the screw, *V*; or it may be obtained by hand by moving the piston when the motor is in operation. The sudden stopping of ignition can be accomplished by withdrawing the incandescent mass past the hole, *E*. The introduction of the oxygen of the atmosphere affects the incandescent piece of alloy, in that it suddenly lowers the temperature to a point sufficiently to interrupt ignition, while at the same time it spoils the explosive mixture in the cylinder. The motor consequently stops at once. To start it again, all that is necessary is to push in the piston sufficiently to close the hole, *E*, connect the battery in circuit, and give a turn of the crank. Twenty seconds after, the current is cut out, and the motor runs as before. If the motor had been stopped in some other manner, and the igniter piston left as far in as possible, the operator need have no fear of its kicking back when he attempts to start it, for the incandescence of the osmium would then be at its minimum, and the explosion would occur at a point sufficiently behind that where it occurs when the alloy has reached its maximum incandescence to make a back kick impossible.

Finally, after having taken the Wydts plug out of the motor and smeared it with oil and soot by means of a brush, I saw the motor start at the first turn after the plug had been re-inserted. Five minutes later, upon taking out the plug again, I found the osmium alloy bright and showing no trace of the foreign substances.

Prevention of Malaria.

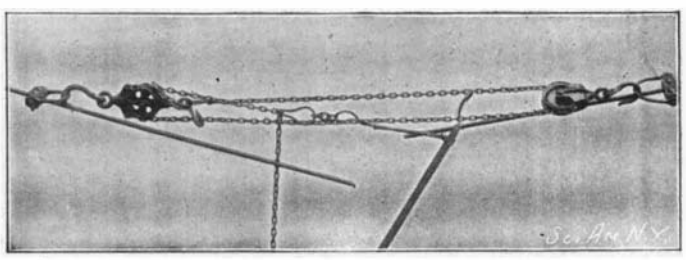
Major Ronald Ross has practically succeeded in ridding Freetown, the capital of Sierra Leone, from malarial epidemics. Malaria, yellow fever, and elephantiasis have all been sufficiently shown to be carried by tropical gnats. These are the principal and possibly the sole means of infection; and although that has yet to be demonstrated, his "object lesson" will probably settle the doubt. The gnats in question are Anopheles, Stegomyia, and Culex, the first of which breeds in puddles, the second and third in rubbish heaps. Dr. Logan Taylor, the head of his Freetown staff, was therefore instructed to hire a body of scavengers who would drain or fill up pools and puddles in the streets, and to clear the back yards of broken bottles and buckets, empty tins, old calabashes, and so forth. The Culex gang, under a native headman, removed the rubbish into carts and subsequently discharged it into an assigned rubbish shoot. At the same time, they showed the larvae to occupants of houses, and instructed them in the manner of destroying them by emptying the vessels, or by dropping a little oil on the surface of water in which they live. By this means about fifty houses were cleaned. In less than three months the gang had visited 6,500 houses in a town of 40,000 inhabitants, and disposed of more than 1,000 cart loads of rubbish. The effect can be imagined when it is remembered that about one-third of the tins and bottles contained larvae during the rainy season, at which time they were destroyed. Every house had been breeding mosquitoes in its own backyard, or garden. The Anopheles gang had a more difficult task. The streets, yards, and gardens possessed numerous pools of rain water. Some were filled with earth, rubble and turf. Others were evacuated by cutting through the rock which contained them, or by making channels in the soft earth. Several men were specially employed in brushing out with brooms, or treating with crude petroleum or creosote, those puddles which the rest had not had time to touch.

A LEVER-DEVICE FOR OIL-RODS.

In oil fields, a central power is often connected by pump-rods with the several pumps located at a distance. Sometimes a pump-rod breaks and the several portions move apart. An extremely useful device for enabling a single operator to draw the parted ends together has been invented by Mr. Asahel C. Smyth, of Bolivar, N. Y.

Mr. Smyth reeves a hauling-chain through two pulleys attached respectively to the severed parts of the pump-rods. A pivoted grappling-hook and a grabring connect the free end of the chain with a link pivoted on a lever having a grappling-hook embracing the main run of the chain. By locking the lever grappling-hook and chain together and swinging the lever in one direction, it follows that the attached pump-rod is drawn along. When the lever has reached the end of its stroke, its grappling-hook is disengaged from the chain, and the chain will be locked by its grappling-hook. By swinging the lever now in the opposite direction a new fulcrum is obtained for a repetition of the operation. In this manner the free end of the chain is gradually moved along with the chain passing around the pulleys, thus drawing the sheave and rod along half the distance the free end of the chain has been moved.

By means of a short branch-chain for engagement with the link, a pair of connected hooks for securing the runs of the chain in front of the one sheave, and an S-hook for taking up the slack of the chain, it is possible to continue the successive pulls on the rod, when the lever device reaches the fastened end of the chain and the two parts to be drawn together are still separated.



SMYTH'S LEVER DEVICE.

THE YEAR OF 1901 IN THE KLONDIKE.

BY JAMES HAROLD THOMPSON.

It is the history of a "Placer Mining Camp" that its life is short and eventful, while it lasts, and that it springs rocket-like into prominence and sinks gradually after having reached its years of plenty into a thing of the past.

The Klondike has reached the crucial year of its existence. "For hope's sake" many have continued their confidence in the future of Dawson; the hub of what has been the richest placer mining camp of this and possibly any other decade. The hope of those interested in commercial enterprises along the Canadian Yukon is the discovery of quartz in paying quantities.

As to the future of the mining district which in 1897 so startled the world and which since then has been such an abundant gold producer, known as the Klondike mining district of the Northwest Territory of Canada, its future depends upon the discovery of well placed quartz. It is acknowledged by the conservative knowing ones that the days of big profits in mining and commercial enterprises are past and are only present now in reminiscence. Overland and water navigation from the coast, with its difficulties, are now subject to modern systems of railroad and steamboat transportation, and when the Arctic winter has put its seal upon this northern country, the telegraph daily voices the events of the world in Dawson.

Heretofore merchants and tradesmen reaped big harvests, 100 per cent being not an uncommon profit. Yet it was seldom that capital profited its owner more than once a year because of navigation and railroad facilities. The short season beginning in June and ending in October, coupled with the lack of telegraphic communication, allowed time for but one shipment during the year. As a consequence the necessities of life were ofttimes cornered and prices in some instances reached prodigious heights. As competition became a factor many of the larger commercial enterprises drew together and amalgamated their interests. Two companies now control the market. In every department of mercantilism competition is keen, excepting in one which is a very essential one here. That one is the oil trade. The Standard Oil Company has complete control, and it retails a case of kerosene at $12.50 per case. The same case of oil sells for from $2 to $3 in the States. Merchandise is delivered in Dawson for from $70 to $90 per ton, just about half of what it was in 1899. And yet this price is deemed abnormal by the importers and a strenuous effort is being made to have it reduced to $50 per ton. The cost of mining has been cheapened by the use of steam and machinery, enlarging the yearly output of gold much over what it would have been under the crude methods of the "sour dough."

Government regulations have somewhat hampered the prospector, but withal he has been quite vigilant and has as yet discovered nothing since 1898 to perpetuate the reputation the Klondike has had as a gold producer. Claims upon the banner creeks whose reputations as gold mines have equaled the wildest hopes of the pioneer prospector are gradually being deserted and to-day half, I might say two-thirds, of Eldorado Creek has been worked out. The same is true of the other rich spots of a few years past. The life of the camp, from what is in sight, can be estimated at this date.

Prospecting for quartz is occupying the attention of many hard-rock miners along the Yukon and its tributaries. Upon the successful solution of the quartz question depends the present prominence of Dawson as a mining camp, and it is the one thing talked of and hoped for by the present inhabitants of this district. As yet nothing of any permanent value has been discovered, although many of the numberless claims staked and recorded are being worked quite thoroughly. Companies have been formed and their stock is on the market. Their hope is that the present prospects will lead to the substantial vein, or the "Mother Lode," as it is called. To facilitate the sorting, handling and assaying of these prospects two fine stamp mills have been erected in Dawson and are now crushing quartz rock.

Prior to the discovery of the Klondike district it was found practical to thaw the frozen earth to almost any depth by the use of wood fires. Hence as the gold lies in or above the bed rock ground, when the bed rock was one hundred feet below the surface it could be worked as well as that of twenty-five feet. The winter season being the longest and driest season it became the busy season for the miner. But steam and machinery have reversed this order of things, and as in the days of the oldest "sour dough" miner, summer, although the season is but six months long, has become the time of activity. The majority of heavy operators discontinue altogether the operation of their properties and spend the winter months at their ancestral homes, wherever they may be. As a consequence, the work accomplished this winter will not compare at all favorably with that done during the preceding winters. It also means a busy summer season for 1902. Considering those changes, the consensus of opinion of those conversant with this district is that the output of gold will decrease from this year.

Gold mining will continue here for some time. This is the history of similar camps. Capital will gradually withdraw, and individuals who will be content with wages for their labor will work the old workings. These are known as "snipers" in the vernacular of the miner.

The development of the unknown resources of the vast land known as Alaska and the Northwest Territory should be of constant interest to the farmer, merchant and manufacturer of the United States and Canada. Directly and indirectly it is of vital importance to these mother countries. The actual necessities of the man living next door, too, and within the Arctic circle will support a larger portion of labor than the similar necessities of any individual living in any other portion of the globe. Good pure food; plenty of it; abundance of well-made clothing are absolute necessities for the health and preservation of life in this cold climate. If peopled as it should be, were the resources of this vast territory but opened up in a limited degree, the commercial world of the North American continent would have a market open to their products which would be the surest in times of depression, the most profitable and congenial for the absorption of the congested material.

Experiments have proved that the hardier cereals and vegetables can be successfully raised within the Arctic circle, but the season is so short that competition in this line will not become a factor for many years. The advent in the manufacuring line, factories, etc., is not to be considered. Beef has thus far come from the Western States and British Columbia, and the winters are found too severe for stock raising.

Legislation can greatly facilitate the work of those who are destined to develop and pioneer the many industries which will some day flourish here.

American granite is being shipped to Liverpool.