

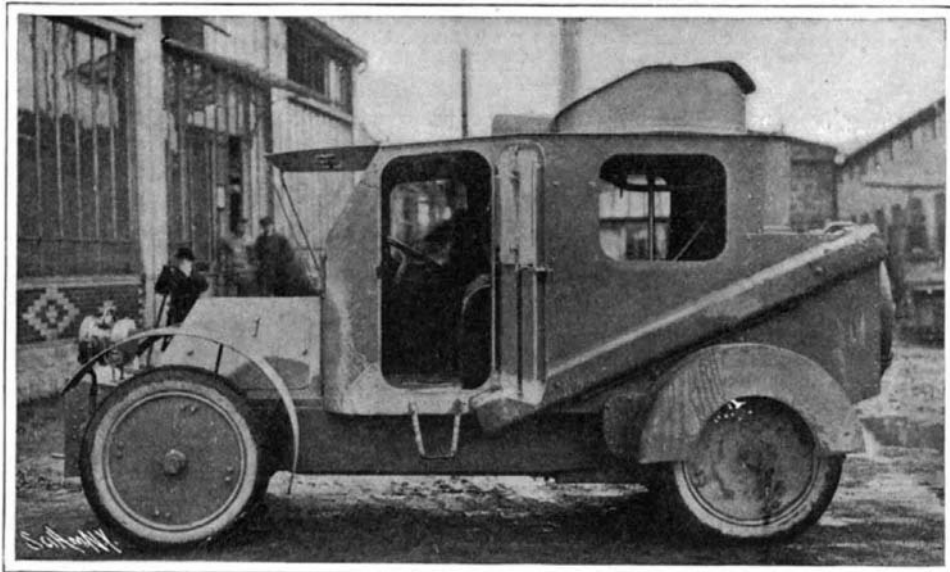
NEW ARMORED WAR AUTOMOBILES.

The new types of armored automobiles equipped with rapid-fire guns, which have been constructed in France and also in Austria, show that a great advance has been made in the way of building a type of car which will answer all the requirements for army use. The maneuvers which have been made with both these cars seem to prove that they are ready for service under all the trying conditions of field work, and that we are much further advanced toward a solution of this important problem. The new Austrian war automobile, of which we give an illustration, was constructed by the Daimler Company at their works at Wiener-Neustadt, near Vienna. This type of car has only been finished recently, and represents the latest ideas in the way of an automobile war car. The experiments and maneuvers of different kinds which were made with the car by the Austrian Etat-Major are said to have been very successful. Especially to be noted is the ease with which the car can be run over uneven ground, across plowed fields and ditches, and the feats which it accomplished in this direction seem to show that it is prepared to meet all the conditions of actual use in the field. By a method of construction which has been kept secret, the car is equipped with four direct-driven wheels, and both the front and rear axles are connected with the motor. The disposition of the front axle and the method of protecting the mechanism will be noticed. The whole car is protected by armor plate of a sufficient thickness, made of special steel. After the box which shields the motor comes a larger protecting house for the driver, which has a hinged door at the side and two lookout holes in front. The top part of the casing has an opening which allows the driver to sit in the position here shown during ordinary times when out of danger, or to lower his seat and thus be completely protected in case of danger. The same maneuver of lowering the seat also operates a device for shortening the steering column to adapt it to the new position. On the rear of the car is mounted the turret which contains the rapid-fire gun. It is of cylindrical form and is topped by a hemispherical dome. The gun itself is carried upon a revolving support, which can also be raised or lowered. At the same time the whole upper part of the turret can be turned about so as to point the gun in any direction.

In France, it appears that the progress in the way of constructing armored cars is even further advanced. It is stated on good authority that the well-known Paris firm of Charron, Girardot & Voigt has actually received an order from the Russian government, for as many as twenty armored cars. The experiments with the new cars have been kept a strict secret up to the present, and it is only recently that the matter leaked out. The maneuvers with the new car were made on one of the large military grounds before a delegation of officers from different countries.

The C.-G.-V. firm had already exposed a type of armored car at the 1904 Automobile Show, but this was rather an elementary form. The question seems to have attracted more attention from other countries than from France, and, soon afterward, the Paris constructors were encouraged to take up this line of work, and began designing an armored automobile which should meet all that was required of it. At the time of the official trials it is said that all the principal Etats-Major sent representatives to the maneuvering field. The conditions which had to be met with were not easy to fill, as the car was required to work in the same way as a field battery, that is, to run at a good speed over plowed ground and to clear ditches and all the obstacles of a like nature. The armor plate had to resist the infantry balls, and especially the tires had to be made so that they could not be easily punctured by a ball like the ordinary ones. A view of the new French car is shown herewith. It has a 30-horse-power motor and is of much lighter build than

the Austrian car which we have just mentioned, its weight complete being but 6,393 pounds. It is completely armored, with the exception of the tires, and the driver and mechanic are not visible from the outside. In the rear is the turret which contains a rapid-fire gun. All the details of the car were designed and constructed under the supervision of competent military authorities. The turret, for example, was specially designed by M. Guye, commandant d'artillerie, with the idea of suppressing as much as possible vibrations of the gun and of its supporting platform. By a spe-



A 30 H. P. French Armored War Automobile With Hotchkiss Rapid Fire Gun in Turret.

cial arrangement the rigidity of the gun and its mounting have been assured, thus making possible accuracy of aim under all circumstances. The turret is revolvable so that the gun can be pointed in any direction. Like all the rest of the armor, the turret is made of a special steel which has sufficient strength to withstand rifle balls without complete penetration at as close a range as 100 feet, and which, when 360 feet away from the gun, is unaffected. In recent experiments with this war car volleys of bullets were discharged at it from the standard French Lebel rifle without damaging it

an incline over the rear wheels can be used for crossing ditches or climbing out of holes or soft spots. The car will climb an incline of 25 per cent in this manner.

Within the car, behind the driver's seat, is a 31.7-gallon gasoline tank and a 15.8-gallon oil tank. At the extreme back of the car are the seats for the officer and his men. Immediately in front of them is the apparatus for the Hotchkiss rapid-fire gun mounted above in the turret, and which is capable of discharging 600 bullets a minute.

The motor of this machine can be started from within the car, so that it is not necessary for the driver to expose himself to the enemy's fire while attempting this important function.

A word may be said about the experiments which were made not long ago at the maneuvering grounds. First the car was run over all kinds of irregular ground such as would be met with in the field, and it showed a good performance in this regard. Next the maneuver was made against a battalion of infantry. The machine gun, which came from the Hotchkiss firm, fired 1,800 rounds in three minutes, and not a single man would have remained on the ground after such a fire. Then a regiment of dragoons was sent across the plain at full charging speed. Neither the regiment nor the armored car was aware of the other's presence. The car saw the enemy when at a distance of 1,000 feet, and then commenced work with its rapid-fire gun. This would no doubt have annihilated the regiment of dragoons. After the firing was finished, the car retired from the field at full speed.

Firing tests made by a company of infantry upon the armor were quite instructive. The armor plating is of a very light steel, but of more than ordinary resistance, and is about $\frac{1}{4}$ inch thick. Balls from the Lebel rifle could only penetrate it when fired as close as 60 or 80 feet, and besides most of their force was lost. At 150 feet the balls remained in the plate, while they only made a slight indentation at 300 feet and fell off. Specially to be remarked is the construction of the pneumatic tires. During the trials it was found that the tires could be pierced with ten balls and yet still be able to keep on running for 20 minutes before losing their air. This would give the car sufficient time in which to escape. The automobile carries supplies for a 400-mile run, and 10,000 rounds of ammunition for the rapid-fire gun.

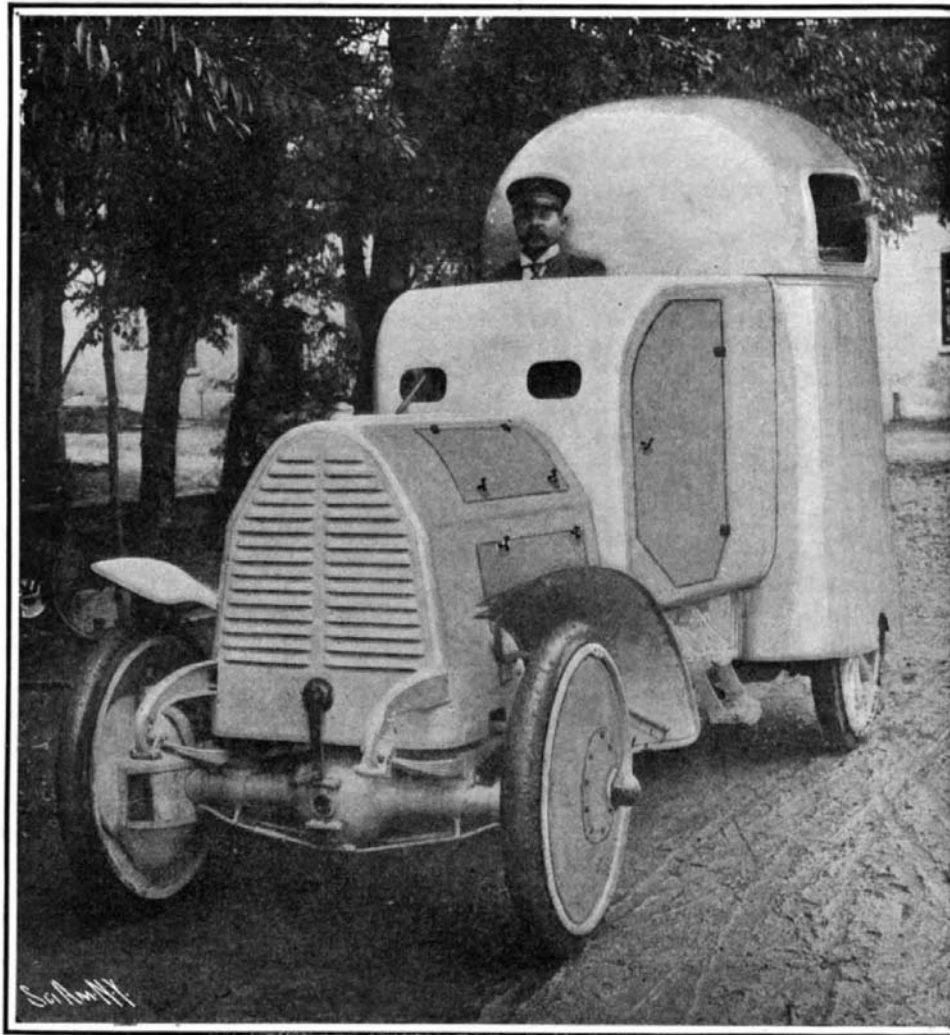
Theory of the Tempering of Steel.

M. Grenet, chief of the laboratories of the Saint Jacques works, in a communication to the Société de l'Industrie Minérale, reviews the theories that have attempted to explain the tempering of steel, one of the most commonly accepted being that it keeps the metal in an unstable state, while normally it is stable cold. He does not think that tempered steels owe their properties to the fact that they preserve the stable state hot, but because they undergo at a comparatively low temperature the conversion that brings them to the stable state cold. He has studied carbon steels, special nickel steels, chrome-nickel steels, and manganese steels.

For nickel steels, as for carbon steels, whenever the conversion takes place at a low temperature, the steel is hard, its microscopic texture is fine, and it remains magnetized after having been submitted to a magnetic charge. This hardness and remaining magnetism may, according to him, be attrib-

uted either to the fine texture, due to the separation at low temperature of the elements in a metal not sufficiently malleable for these elements to collect, or to a phenomenon of hammer-hardening due to the change of structure in a metal but slightly malleable and susceptible to hammer-hardening.

In America last year 27,840 automobiles of a total value of \$47,768,600 were manufactured. Of these, 22,970 were sold within the year. 1,036 foreign cars were sold for \$6,700 each.



AN AUSTRIAN ARMORED WAR AUTOMOBILE. ALL FOUR WHEELS ARE DRIVERS.

in the least. The armor is about $\frac{1}{4}$ inch thick—to be exact, 6 millimeters, or 0.236 inch. At 150 feet distance the bullet entered, but did not penetrate, the armor, while at from 325 to 450 feet the armor was simply dented. In the experiments which were made bullets were also shot into the 5-inch Samson tires, the air tubes of which were filled with a special compound intended to make them self-healing. After about a dozen bullets had been sent into the tires at close range the machine was still able to run for some 20 minutes. Two troughs seen attached to the body on