TESTING MOTOCYCLES.

Speed in a motor carriage is desirable, but it is not, however, the first requisite, for general utility and safety are of more real importance than great speed. That this is now recognized is shown by the fact that in the Engineer horseless carriage contest, which will be held in 1896, no speed greater than ten miles an hour will have any weight with the judges. When the Chicago Times-Herald made their offer of $5,000 to be awarded to successful horseless carriages, it was with the earnest desire that the contest should add to the sum of our mechanical knowledge in this branch of transportation. The race of November 28 was not quite as picturesque as those held in France, owing to the fact that the number of contestants was small and the roads were in a very bad condition; but it is probable that this race will really be of more permanent value than those held abroad in the advancement of the art and in the stimulating of American inventors to renewed efforts. It is stated that more than five hundred applications for improvements in motor carriages have been filed in a few months in the Patent Office. The excellent rules which obtained in making the awards were largely responsible for the scientific value of the race. The following rules were adopted:

"1. A preliminary test of all vehicles entered for competition shall be held by the judges under such rules as the judges may determine on, and for such a distance as they may decide. At this test the judges may debar such constructions as in their opinion do not possess features entitling them to further consideration. It is stipulated, however, that all motor vehicles which won prizes or honorable mention in the Paris-Rouen contest of 1894 or in the recent race between Paris and Bordeaux shall not be compelled to compete in the preliminary test, but shall be admitted upon proper application to the final competition.

"2. In making awards, the judges will carefully consider the various points of excellence as displayed by the respective vehicles, and so far as possible select as prize winners those constructions which combine in the highest degree the following features and requisites, rating them of value in the order named:

"3. General utility, ease of control and adaptability to the various forms of work which may be demanded of a vehicle motor. In other words, the construction which is in every way the most practical.

"4. Speed.

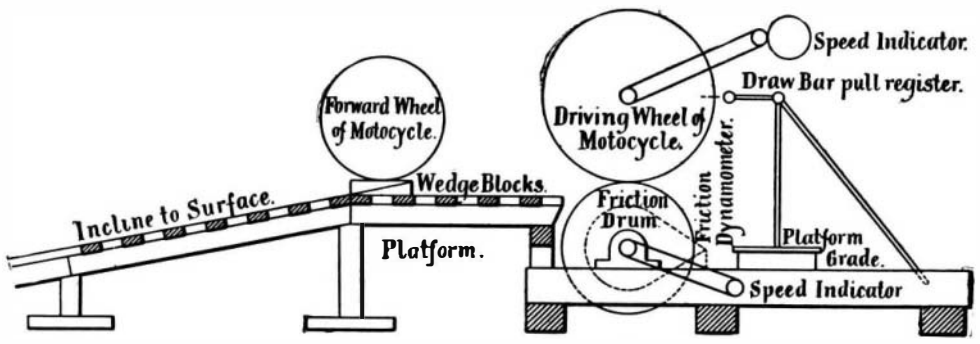
"5. Cost; which includes the original expense of the motor, and its connecting mechanism, and the probable annual item of repairs.

"6 Economy of operation, in which shall be taken into consideration the average cost per mile of the power required at the various speeds which may be developed.

"7. General appearance and excellence of design. While it is desired that competing vehicles present as neat and elegant an appearance as possible, it should be assumed that any skilled carriage maker can surround a practical motor with a beautiful and even luxurious frame."

The tests to which the motocycles were put were of a purely scientific nature, as it was intended to separate the chimerical from the practical machine. By this means positive proof was obtained that the problem of horseless carriages was one that inventors and manufacturers are in a fair way to solve. A complete detailed report of the judges was published in SUPPLEMENTS 1058, 1059 and 1060. To test the motocycle, a very complete testing plant was installed first at Washington Park and later on in a building which had been put at the disposal of the judges by Studebaker Brothers. We give a diagram of the apparatus used and also a view of the testing plant when it was erected at Washington Park. It was designed by Mr. L. L. Summers and Mr. John Lundie. As will be seen by the diagram, the apparatus consisted of two distinct parts, one an absorption brake dynamometer and the other a pull bar or traction dynamometer.

The motocycle was run up the inclined surface and the front wheels were firmly wedged up with blocks. The rear or driving wheels rested on friction drums, as shown in the diagram and illustration. A pulley on the shaft of the friction drum was connected with the lever of the Prony brake, which is a typical form of the absorption dynamometer. It consists of a lever



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connected to the revolving shaft in such a manner that the friction induced between the surfaces in contact will tend to rotate the arm in the same direction in which the shaft revolves. This rotation is counterbalanced and weighed by means of a platform scale. The horse power or work of the shaft is determined with the aid of a simple formula from Kent's Pocket Book: Let W equal the work of the shaft which equals the power absorbed per minute, P equal the unbalanced pressure of weight in pounds acting on the lever arm, let L equal length of lever arm in feet from center of shaft, V equal the velocity of a point in feet per minute at a distance equal to the length of the lever arm in feet to the center of the shaft, if the arm were allowed to rotate at the speed of the shaft, and N equal the number of revolutions per minute; from these factors the horse power is easily obtained. $W = PV = 2\pi LNP$. Now, since the horse power (H. P.) $= PV \div 33{,}000$, we have the following formula:

$$\text{H. P.} = 2\pi LNP \div 33{,}000.$$

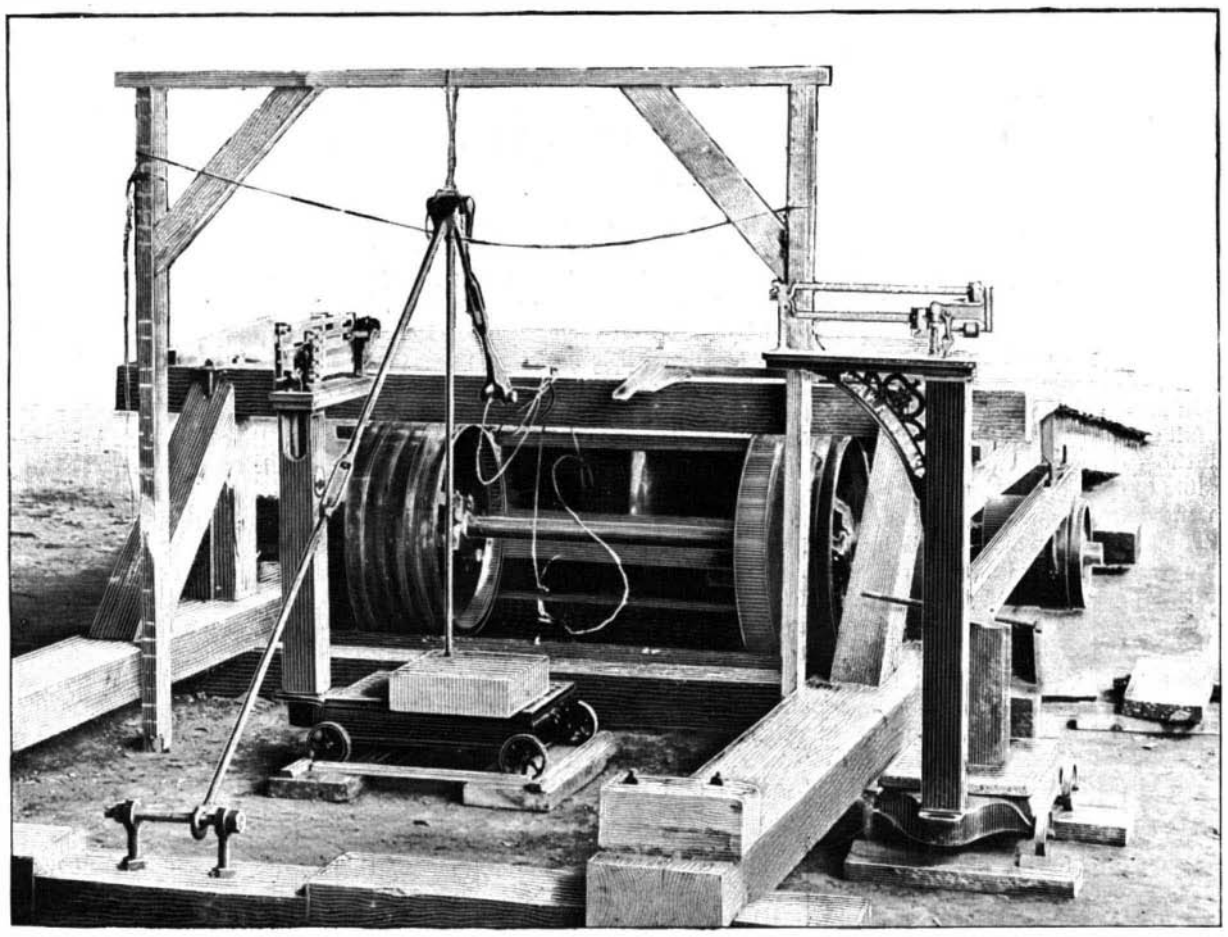
The drawbar pull test made it possible to obtain the power exerted by the vehicle and the tendency it will be able to exert in going ahead, which is technically known as the "drawbar pull." This pull is limited by the traction or friction which exists between the wheel of the vehicle and the surface of the road. The traction varies with the kind of road, and in the tests of the vehicles, roads of all kinds were represented by changing the surface of the revolving drum. The results obtained do not determine the facts alone, but show the relation between the artificial surfaces and the testing machine and the actual road conditions, and thus enable corrections to be applied to all vehicles and enable the determination of their actions on any road to be accurately made. This drawbar pull and the horse power were both measured with the aid of platform scales.

The Morris & Salom electrobat, which received the gold medal, and which we illustrated in the issue of November 16, 1895, was tested as follows:

Tests were made first by ascertaining the internal losses of the motors and gearing and the friction of the wheel surface and bearings. These determinations were made by driving the mechanism from an external source of power and measuring accurately the speed of the vehicle and the pull exerted. It is possible by this method to make a most delicate test of the power developed. In the Morris & Salom vehicle these determinations were thus made, and as the vehicle is driven electrically, when the motor on the vehicle was operated, the power imparted to the motor could also be accurately determined, and the power developed at the wheels, added to that lost in the mechanism, was thus ascertained. As the power developed was measured by means of the dynamometer, adding the losses previously determined gave the same results as those obtained by the electrical method, so that the accuracy of the determinations was thus checked and found to agree identically. That the electrical and mechanical methods should thus agree speaks well for the system of making the determinations, the care of the observers of the instruments and the accuracy of the instruments themselves.

Determinations of the losses between the driving motor and the run of the wheel upon the road surface were thus made. These determinations were made independently of the motor on the vehicle proper, as the testing apparatus had been equipoised with a power driving device which allows very sensitive measurements to be made.

In one of the tests a determination was made of the friction of a ball bearing pneumatic-tired wheel, running on a perfectly level surface. Although there was no load imposed on these wheels, the testing apparatus was so delicate that this determination was made without difficulty, and whenever the hand was placed gently upon the vehicle the effect was instantly apparent upon the dynamometer, which was specially designed for motocycle testing. In all methods of testing vehicles heretofore practiced, the dynamometer measurement has been one of the most difficult determinations to make.



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Experiments in Frozen Water.

It is quite generally supposed, says Public Opinion, that the sudden and complete freezing of lakes and watercourses must necessarily be fatal to all their inhabitants. Recent experiments by a French scientist, M. P. Regnard, have proved this to be an error. He cooled the water in an aquarium containing live carp to different degrees below freezing. At 0° C. the fishes seemed to fall asleep, but were not frozen. At —3° they were apparently dead, but retained their flexibility. The water being then gradually warmed, they revived, began to swim, and showed no signs of suffering. This would indicate that the polar seas, whose temperature never falls below 3° C., may be a congenial abode for creatures inured to this degree of cold.

ACCORDING to a cable dispatch the Governor of Yakutsk reports officially that the inhabitants of Ust-Yansk have not heard anything about Dr. Nansen, the Arctic explorer, who was recently reported to be returning after having reached the North Pole.