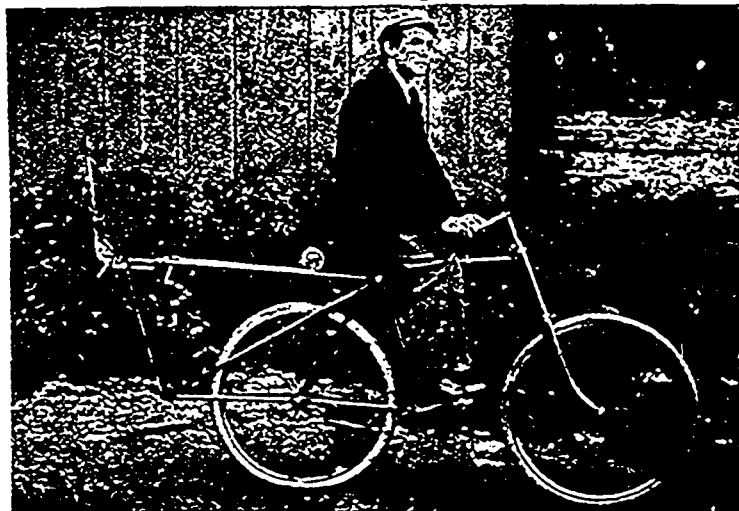


which is so far kept a secret—is simple to look at, but gives no hint of its two-current refrigerator powers. The cylinders are made of steel tubes ground inside, "and not a very close approximation to a cylindrical form." The pistons and open cylinders appear to be wholly free from any deposit. The trunk pistons are a slack fit in the cylinders. After the representative of the *American Machinist* had made a trial trip on one of



KANE-PENNINGTON MOTOR.

these motors, he felt the water jacket of the cylinder and found it barely blood warm, which seemed strange considering the absurdly small size of the cooling water tank. When asked how this could be, Mr. Pennington replied that all fluids took up vast amounts of heat in the change to vapor, and that as his engine used no carburetter, but vaporized the charge directly in the



FAN-DRIVEN BICYCLE—KANE-PENNINGTON.

cylinder, the fluid in vaporizing absorbed the heat which the cylinder walls had derived from the last explosion. The charge, he went on to say, was exploded only when the effective stroke crank-angle was 45 degrees, and that previous to the delivery of the igniting spark to the charge, there was a "mingling" current of electricity put through the air and gas in the cylinder, and that by virtue of this non-igniting current delivered to the mixture, the heat absorption capacity of the gas in the cylinder was so incredibly augmented that the cylinder temperature could be and was so greatly lowered that the walls of the cylinder were kept cool within working limits.

As will be understood, the motors themselves are of the four-piston stroke cycle variety. There is no visible discharge of vapor and no perceptible odor, except when there is an over admission of oil, and in this case there is an immediate loss of efficiency, and then the odor ceases. The one great mechanical mystery is the coolness of the naked cylinders, which should be red hot before fifty strokes are made.

#### CASE'S IMPROVED PROPELLER WHEEL.

Since the old-fashioned paddle-wheels on steamers began to be superseded by propellers, marine inventors have been continually experimenting for the purpose of discovering a shape of propeller that will exert a greater power of propulsion than is possessed by the ordinary rearward thrust wheel. The results of these years of experiment have been a number of highly ingenious devices, most of which have been characterized more by their ingenuity than their utility.

A. Wells Case, the well-known Highland Park, Conn., inventor, some years ago became possessed of an idea that propellers on steamboats were not exercising their full possible amount of power, and he immediately set to and worked until he matured a distinctively new style of propeller. This new wheel permits of an outward and non-rotating thrust, and the results over the old style rearward thrust wheel have been proved to be 13 per cent. greater pressure. Mr. Case says that the object sought in the construction of this form of screw is to obtain, as far as possible, a solid backing or resistance to the blade of the screw while in motion, and by experimental tests it has been demonstrated that the outward thrust principle, as applied to the Case propeller wheel, is theoretically, mathematically and practically correct, whether working in a liquid or under atmospheric conditions. It is an indisputable fact that the direct astern or concentrated thrust wheels do not have solid water resistance while in motion. Water thrust against by any one blade of these wheels is backed by water already put in motion by the preceding blade, consequently the wheels are working in a current of water moving in a line directly from the wheel. In the Case outward thrust wheel the blades are backed by solid water, or water outside of the course of the wheel and undisturbed by it. The superior effectiveness of the Case wheel has been frequently demonstrated.

One of the severest competitions into which an invention of this kind could take part was held at the Gas Engine & Power Company's at Morris Heights, New York. A great number of tests were made, records of four of which were given, the Case wheel, in every test made, beating the others. Of those recorded in the first test the Case wheel beat that of the Gas Engine & Power Company, by 20½ seconds per mile, the second time by 14½ seconds per mile, the third by 27½ seconds per mile, and the fourth by 3¼ seconds against a new specially designed wheel by Mr. West. On November 20, and long after the experiments had been completed, Mr. West wrote Mr. Case a letter in which he said: "I frankly admit you have produced a wheel that has proved itself, on trial, superior to anything that has come to my notice. It is not pleasant to admit defeat, but facts are stubborn things, and after repeated trials of wheels from two to six feet in diameter, of many kinds, I find the results show a gain in speed very flattering to you, and very discouraging to competitors. Few men would have had the courage to place a propeller on a boat, with a guarantee that it would increase the speed of the boat, or it would be removed at no expense to the owner, as in the case of the yacht 'Orienta.' This yacht was built in 1882, and has tried eight wheels during that time, some of them good, and some of them far from good. Yet the first trial of a Case wheel showed a gain in speed of 15 seconds per mile over any wheel that was ever on the yacht, and I am confident that the racing speed will be greatly in excess of this gain per mile when a chance is offered to make time. In calling the attention of steamboat owners to your improvement over the old type, you have the advantage of many who estimate the result of their inventions in a statement of facts that should convince them that your wheel is not a result of guess work, but has come to stay, and has made better speed in every trial than its competitors, and can do it again."

The next vessel on which the Case wheel was applied was the steam launch "Nora," owned by C. W. Shields, of Philadelphia