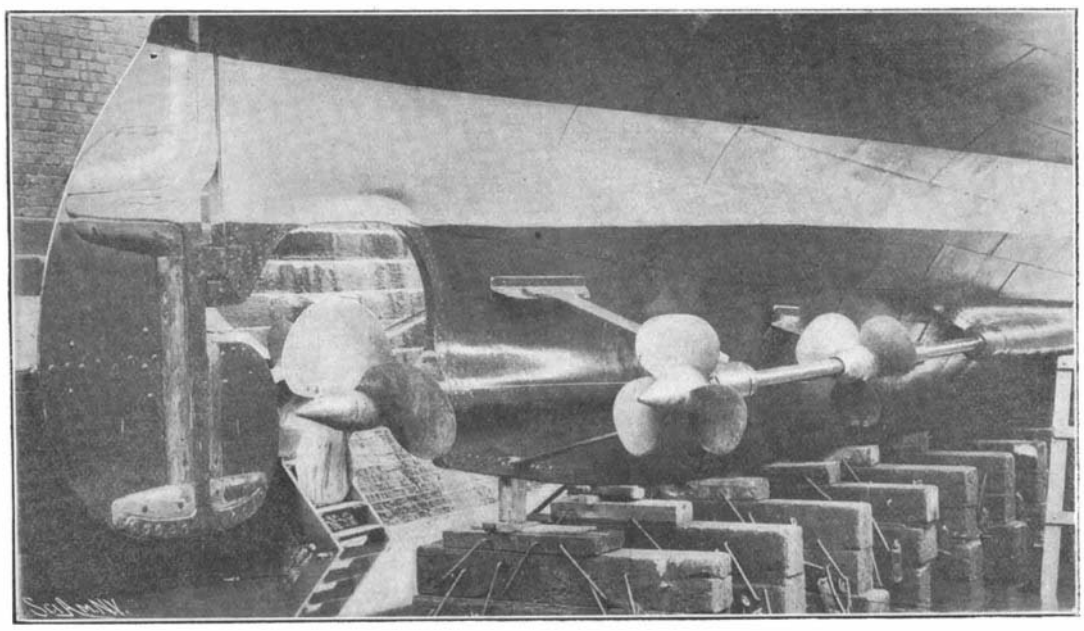
FRENCH EXPRESS ENGINE FOR AN ENGLISH RAILROAD.

Attention has once more been drawn to the splendid French express locomotives compounded on the de Glehn system, by the announcement that one of these engines has been ordered for service on the Great Western Railway, England. There was a time, not so very many years ago, when the English service of express trains was the fastest and most frequent in the world, and its engines, especially designed for fast running, were noted for their economy and the all-around ability with which their work was done. During the past few years, however, the French railways have made a remarkable advance in the speed and general quality of their fast passenger service, until to-day their trains are considerably the fastest in the world. These results are due more than anything else to a remarkably fine type of compound engine, which was brought out and developed by the inventor A. G. de Glehn, Directeur Générale of the Societé Alsacienne de Constructions Mecaniques. The engineers of the various roads that have built compound engines on this system have introduced such minor modifications as were necessary to conform to the requirements of their respective roads. We present a photograph of one of this type which has been doing some great work on the Chemin de Fer du Nord.

The new engine for the English road will be similar to the one here shown, only such modifications being made as are necessary on account of the lower bridges and somewhat narrower distance between platforms on the Great Western Railway. In respect of the number of wheels and method of disposing them, the engine is of what is known in this country as the Atlantic type. There is first a four-wheeled truck beneath the smokebox, then two pairs of coupled driving wheels, followed by a pair of trailing wheels beneath the firebox. The engine is compounded as follows: There are two high-pressure cylinders, 13½ inches diameter by 25¼ inches stroke, carried on the outside of the frames and connected to the rear pair of drivers. Inside the frames and beneath the smokebox is a pair of low-pressure cylinders 22 inches diameter by 25¼ inches stroke, which connects with the forward pair of drivers. All four drivers are also connected by outside coupling rods. The boiler has 2,275 square feet of heating surface, and the working pressure is 225 pounds to the square inch. The driving wheels are 6 feet 8 inches in diameter, and the weight of the engine in working order is 63 tons. The admission valves are so arranged that high-pressure steam can be admitted to all four cylinders, thus giving a high tractive effort and rapid acceleration at starting, and a reserve of power on grades.

The work accomplished by these engines, when judged in the light of their weight and fuel consumption, is undoubtedly better than the performance of any class of locomotives in the world. The Chemin de Fer du Nord, which for several years has been notable for its fast expresses, provided during the season of 1902 twenty additional express trains, whose running speed averaged from start to stop 55 miles an hour and upward. Eighteen of these trains were scheduled to run at 56 miles an hour and upward; twelve at over 57 miles an hour, nine at 58 miles an hour and over, three at over 59 miles an hour, and two at over 60 miles, the fastest train being scheduled at 63.5 miles an hour. The trains are by no means light, averaging about the same as our Empire State Express, or say 200 tons. The most remarkable work done by these engines has been in hauling heavy express trains on upgrades, when very high speeds have been reached and maintained. Thus, with a 225-ton train on a run of 78¾ miles from Paris in 77 minutes and 44 seconds, a steady speed of 65 miles an hour was maintained up a grade of 1 in 200. On another run a speed of 64.6 miles an hour was made on an upgrade of 1 in 250, the run ending at Arras, the 120 miles from Paris having been made in 115 minutes and 25 seconds, or in 102¾ minutes after deducting delays, of which there were several. The average start to stop speed was exactly 70 miles an hour. An even more remarkable performance in some respects, was a run from Paris to St. Quentin with a load of 360 tons behind the tender, when the distance of 95¾ miles was made in 99 minutes. On this occasion the engine took its load of 350 tons up a grade of 1 in 200 thirteen miles in length at a steady speed of 62.1 miles per hour. In all the history of locomotive performances, either in America or Europe, there is no authentic record of anything to approach this uphill work by an engine weighing only 63 tons.



PROPELLERS OF THE NEW DOVER-CALAIS TURBINE STEAMER.

THE FIRST CROSS-CHANNEL TURBINE STEAMER.

BY H. C. FYFE.

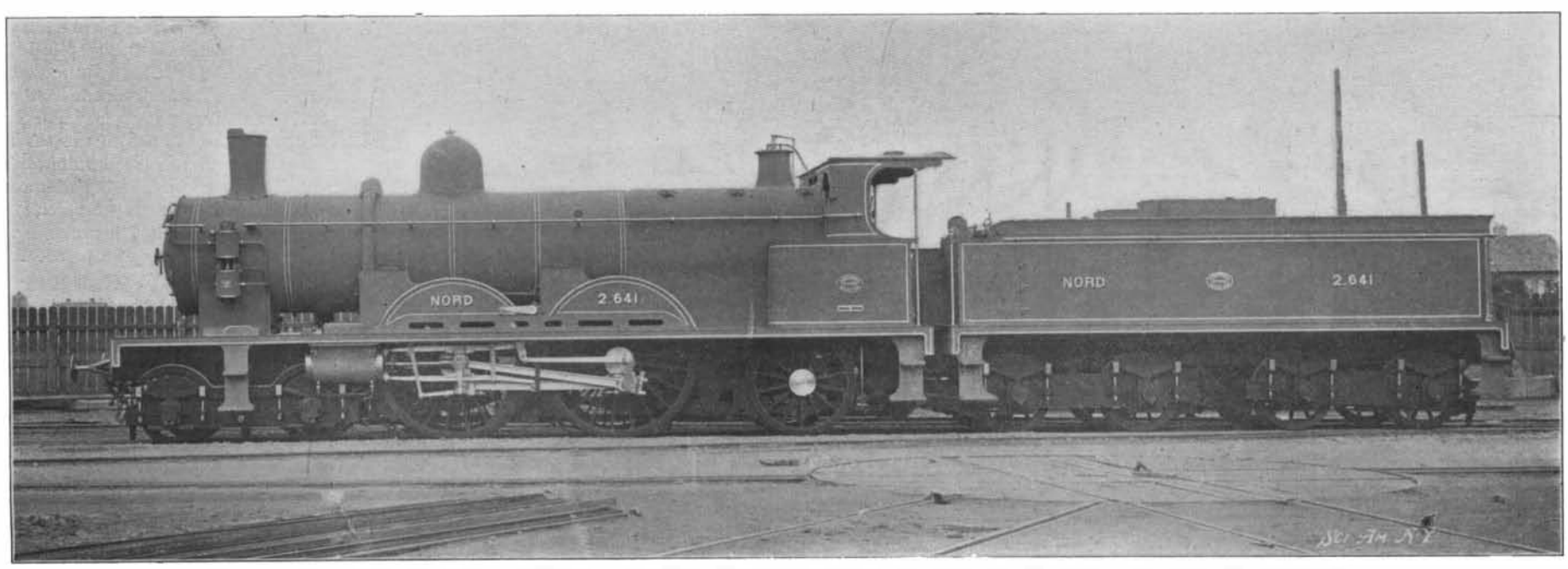
The year 1903 will witness a very important event in the history of ocean travel, for early in the coming year there will be placed on the Dover-Calais service the first turbine-propelled cross-channel passenger vessel ever built. The new vessel now building for the S. E. & C. Railway Company by Messrs. William Denny & Brothers, of Dumbarton-on-Clyde, is expected to create a revolution in cross-channel passenger traffic by reason of her high speed, superior comfort, and great convenience. Her dimensions are as follows: Length, 310 feet; beam, 40 feet; number of turbines, three; number of propellers, five; speed, 21 to 22 knots. With regard to her beam; this (40 feet) it may be noted is five feet broader than any existing cross-channel steamer. She will have effective bilge keels fitted for the greater part of her length. The accommodation for first-class passengers is placed forward of the machinery space, instead of aft, as it is in all the present paddle-wheel vessels on the Dover-Calais service. On the upper deck are the private cabins, and the promenading area of this deck will be covered by a shade or boat deck.

The propelling machinery will consist of three Parsons steam turbines, one high-pressure and two low-pressure, each actuating one line of shafting. The center shaft has one propeller, while the two side shafts each carry two, so there will be five propellers in all. The center turbine will be high-pressure and the two side turbines low-pressure. When steaming ahead, the steam from the boilers is admitted to the high-pressure turbine, and after undergoing expansion about five-fold it passes to the low-pressure turbines, and is again expanded in them about another twenty-five-fold. It then passes to the condensers, the total ratio of expansion being about 125-fold, as compared with 8 to 16-fold in ordinary triple-expansion reciprocating engines.

When going full speed ahead, all the lines of shafting, central as well as side with their propellers, are in action; but when coming alongside a quay or maneuvering in or out of harbor, the outer shafts only are brought into operation; thus giving the vessel all the turning and maneuvering efficiency of a twin-screw steamer. Inside the exhaust end of each of the low-pressure turbine cylinders is placed an astern turbine, controlled like the other turbines by suitable valves which operate by reversing the direction of rotation of the low-pressure turbines. Steam can be admitted by suitable valves directly into the side low-pressure turbines, or into the reversing turbines within the same for going ahead or astern. The center turbine under these circumstances revolves idly, its steam-admission valve being closed and its connection with the low-pressure turbines being also closed by non-return valves. The builders claim that with this arrangement the maneuvering power of a five-screw vessel is in every respect as good as in the case of an ordinary twin-screw steamer, while in going astern they affirm that there will be none of that objectionable vibration which is always felt even with the most modern twin-screw steamers with balanced engines.

The new S. E. & C. Company's turbine steamer is to have a speed of at least 21 knots, and probably this will be exceeded. It is expected that she will accomplish the journey between Dover and Calais in considerably less time than that taken at the present time by the boats on the Channel ferry.

Messrs. William Denny & Brothers are also constructing a second turbine-propelled cross-channel passenger steamer. She is being built to the order of the London, Brighton & South Coast Railway Company, and will



TYPE OF NEW FOUR-CYLINDER COMPOUND EXPRESS ENGINE BUILDING FOR THE GREAT WESTERN RAILWAY, ENGLAND.

Cylinders: Two high-pressure, 13½ inches diameter, two low-pressure, 22 inches diameter; common stroke 25¼ inches. Heating surface, 2,275 square feet; steam pressure 225 pounds. Driving wheels 6 feet 8 inches diameter.