A NEW AND INTERESTING OVERHEAD TRAVELING GEAR FOR EXPEDITING CONSTRUCTION IN SHIPYARDS.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

A new departure in the facilities for expediting the construction of vessels has been carried out at the Jarrow-on-Tyne shipyards of the Palmer Shipbuilding and Engineering Company. In the majority of yards the practice invariably adopted for the handling of the material employed in the construction of a vessel is by means of overhead gantries, or overhead and transporter cranes. The system recently erected at this well-known British yard, however, is entirely different from the prevailing equipment, and its operation is being followed closely by shipbuilders in general, since it possesses several advantages over the existing type of plant.

When the Palmer Shipbuilding Company received the contract for the construction of the 16,500-ton battleship "Lord Nelson" for the British Admiralty, in order to carry out the constructional work with the greatest possible expedition, it was decided to adopt a new type of traveling and lifting gear. The objects demanded were convenience both in handling and operation, the transit of the constructional materials to the point of erection in the minimum of time and with the minimum of handling, and accessibility to any desired point of the vessel in erection.

The general arrangement of this system can be gathered from the accompanying illustrations. The equipment comprises an application of the suspension cableway which has proved so successful in other constructional work, such as viaducts, bridges, and so forth. At either end of the berth is erected a cross girder of special design carried upon inclined posts or columns. The latter are inclined to about 45 degrees, so that they have an overhang beyond the extremity of the berth at each end. The supporting posts are built upon the lattice-girder principle, tapering somewhat at both ends. They have their footing upon masonry piers or seats, formed to receive them on each side of the vessel, and are anchored by two vertical cables set up with stretching screws. The upper ends of the inclined supports are connected by a bridge built in two sections, with a clear open space between throughout the entire width of the span. The equipment is so erected that there is a clear longitudinal span of 500 feet from support to support, and a transverse clearance of 100 feet.

By inclining the supports outward from the berth at either end, the overhead gear is arranged so that the hoisting and traveling machine can be brought right over the works railroad at the land end, and can remove the material direct from the freight cars to the point of construction. The same facilities are insured at the opposite or water end, it being possible in this case to carry the lifting tackle if necessary clear into the hold of a vessel and hoist it free of the deck. By means of the overhang, also, it is possible to have complete access to a vessel moored at the end of the berth over an area 100 feet in length, and in this way more complete and easier access is feasible for repairing or other purposes, the overhanging bridge serving the same services as sheer legs, with the additional advantage that a larger section of the vessel beneath is simultaneously brought within the scope of the lifting equipment.

There are three sets of cableways, each constituting a complete unit in itself. The system adopted is that of Messrs. Henderson & Co., of Aberdeen (Scotland), which has proved so successful in various other undertakings. The main cables and driving ropes for each cableway, instead of being anchored at the ends, are attached to carriages which run on tracks provided on the lower sections of the end bridges, or cross-girder members. This arrangement enables each unit to travel and operate transversely across the full extent of the berth, and the gap between the two sections of each bridge gives a clear passage for the various ropes. It will thus be seen that every part of the berth can be served by the overhead gear. Furthermore, the three traveling and hoisting units can be utilized, if necessary when handling a large piece of material, in combination.

The cableways have an approximate longitudinal speed of 600 feet per minute, and have a hoisting capacity of 3 tons at 100 feet per minute, or one ton at 150 feet per minute. The traverse or cross-travel speed of the cableway is about 25 feet per minute.

On each of the trolley carriages there is accommodation for the operator, who is able to control therefrom the hoisting, lowering, longitudinal, and cross-traversing motions. The whole of the energy employed for the various motions is electricity, the current being alternating at a voltage of 440.

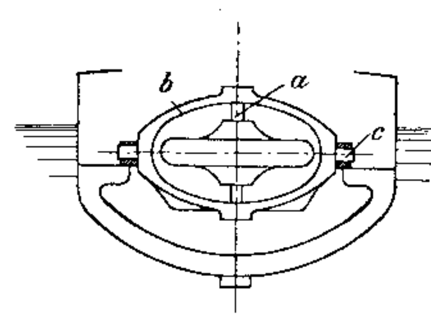
Owing to the fact that the gear is able to serve every part of the berth, the convenience and value of the system from labor and time-saving points of view are readily realized. It is also possible to control the hoisting operations with greater facility and celerity than by the orthodox methods; and the rapidity of the traveling and hoisting motions, which are far in excess of those attainable with cranes or gantries, enables the workmen to be better supplied with materials. When the contract for the "Lord Nelson" was awarded to the Palmer Company, owing to the short time allowed for the construction—the warship has to be completed and placed in commission within three years—it became imperative to devise a more expeditious system of handling the constructional material, and that system now in operation was designed by Mr. Twaddell, the company's shipyard manager, as being the most suitable method of attaining this end. The value of the plant from this point of view has already been conclusively established, the constructors having been able to work a greater quantity of material into the vessel, and to advance the erection to a stage which would have been impossible with the former equipment. An appreciable economy in the cost of the undertaking has also been effected.

Although this plant was erected largely as an experiment, it has proved so satisfactory that the system is to be extended throughout the yard. A second structure on similar lines is to be built almost immediately, only in this instance it will be of greater dimensions, so that it will cover and serve two berths simultaneously, each 700 feet in length. The plant has been inspected by many of the most prominent British shipbuilders, and it is stated that the system is to be applied to several other yards.

SCHLICK'S MARINE GYROSCOPE IN USE.

The Schlick gyroscope, which was described in the SCIENTIFIC AMERICAN of July 16, 1904, and which is intended to minimize the rolling motion of a ship, has been practically applied.

It will be remembered that Schlick utilized the forces set up in a freely-hung gyroscope by inclination



SCHLICK'S GYROSCOPE FOR THE PREVENTION OF SEASICKNESS.

of its support. The apparatus consists, therefore, of an Archimedes wheel which is rotated at a high speed. The forces brought into play by the rocking of the flywheel support are the result of the rolling motion of the ship. This motion must be considered in designing every vessel. For if the period of a vessel's oscillation, that is the time which elapses in rocking once from side to side, is not carefully determined, it may happen that the period of the rolling motion may agree with the wave period with the result that the ship will be capsized. According to Schlick, the waves of the Atlantic Ocean have an average length of 600 to 700 feet, and a period of about 12 seconds. During storms, however, they may attain a length of 2,800 feet, and a period of 23 seconds. Naval architects, therefore, give their vessels a period of oscillation considerably greater than that of the period of the smaller waves. The dangerous forces set up by rolling are supposed to leave the ship unharmed if the gyroscope is used.

Schlick's gyroscope is mounted with its vertical axis, *a*, in a frame, *b*, turning freely on a horizontal axis, *c*. If the ship begins to roll, the gyroscope is set in motion and by reason of its inertia will tend to continue in motion. The result is a partial rotation of the frame *b* about its axis. But forces are then set up which oppose this rotation of the frame *b*, so as to retard it and to restore it to its initial position. Since the rolling of the ship is the cause of the frame's inclination, it follows that this very rolling is opposed. If the rolling motion should be considerable it may happen that the frame *b* will rotate through an angle of 90 degrees, thereby completely overcoming the opposing effect. In order to prevent such an occurrence, a brake is employed. Furthermore, it is essential that some device be employed which will tend to keep the flywheel in its original position, for which purpose the frame *b* is provided with a weight at its lower part.

Schlick recently described his invention to the Hamburg Nautical Society. It was objected by some member that the flywheel would assume such large dimensions, and would weigh so much, that its use on seagoing vessels was impossible. To this Schlick replied that for a vessel of 6,000 tons displacement, having an oscillation period of 15 seconds, a flywheel 4 meters in diameter, with a weight of 10 tons, would be sufficient to overcome the rolling motion. It was furthermore objected that a ship should adapt itself to the heaving of the sea. To this it was replied that sailing vessels roll heavily with reefed sails, and ride along steadily under full sail without the slightest rolling motion and without any injury to the hull.

In order to prove the practical value of his invention, Schlick has installed a gyroscope in an old torpedo boat. The cast-iron flywheel has a diameter of about a meter, and weighs 700 kilogrammes. It is mounted well forward of the boilers. At its lower end the shaft of the flywheel runs in ball bearings, thoroughly lubricated by means of an oil pump. The flywheel itself is driven by a steam turbine, having a speed of 1,600 revolutions per minute. How great is the energy stored up in the rotating wheel, may be gathered from the fact that after the steam of the turbine had been cut off, during one experiment, the wheel persisted in spinning for some three hours before it finally came to rest. In order to control the flywheel frame, a double-acting hydraulic brake is employed, the cylinders of which are filled with glycerine. It is said that the experiments which have been made with this torpedo boat have more or less proven Schlick's point.

Silicide of Copper.

In a paper recently presented to the Académie des Sciences, M. Paul Lebeau gives an account of his researches upon an industrial silicide of copper which is obtained in the electric furnace. He had occasion to work with a silicide containing 50 per cent of silicon. The analysis which he made of this body gave some interesting results which may give some new ideas as to the silicides of copper. These bodies have been studied at times, but a definite compound does not seem to have been formed before M. Vigouroux prepared a $SiCu_2$ by heating copper and silicon in the electric furnace. The excess of copper distilled off, and when cooled very slowly the remaining mass had a crystalline texture and corresponded to the above formula. About the same time Chalmot showed the existence of a silicide of copper $SiCu_2$ which he prepared by heating a mixture of sand and charcoal in the presence of copper in the electric furnace; afterward he showed that the silicide he obtained was in reality a mixture of $SiCu_2$ and free silicon, and found also that the silicide $SiCu_2$ is easily decomposed, for free silicon is found in copper treated with 14 per cent of silicon. M. Vigouroux, by passing a current of silicon chloride vapor over copper heated to 1,200 deg. C., obtained an ingot containing less than 5 per cent of combined silicon. By treating this compound with silicon chloride a second time he could not exceed 10 per cent of silicon in the combined state. He considers that the silicides of copper of high values which are prepared in the electric furnace are perhaps only the result of a special equilibrium obtained by the high temperatures and can only be maintained by a quick cooling which prevents the separation of a part of the combined silica. The industrial silicide which the author observed has a slaty blue color on the surface, with a brilliant crystalline section when broken, having the brilliancy and color of silicon. On a polished surface the microscope shows large crystals of silicon between which is solidified the silicide of copper. In the middle of the latter are smaller crystals of silicon of a second formation. Separating out the combined silicide of copper he finds that it does not reach the proportion of $SiCu_2$, but is near $SiCu_4$, corresponding to 10 per cent of combined silicon.

The Current Supplement.

The current SUPPLEMENT, No. 1569, opens with an interesting review by the Paris correspondent of the SCIENTIFIC AMERICAN of the Novelties of the Paris Automobile Show. Lieut. Henry J. Jones's most excellent treatise on armored concrete is continued. It was but natural that the evolution and success of the steam turbine, occurring at practically the same time as the development of the internal-combustion engine, should lead to the invention of the gas turbine. For this reason an interesting type of gas turbine which has recently been invented is described in the SUPPLEMENT. Mr. S. P. Newberry's splendid practical observations on concrete building blocks are concluded. Of the minor articles we may mention those on the Production of Natural Gastric Juice, Treatment for Electrical Shock, Artificial versus Natural Dyes, Lunar Photography. "The Electric Spark" is the title of a very instructive and exhaustive paper by Dr. G. A. Hemsalech. The usual notes will be found in their accustomed places.

A decision has been rendered in the United States Circuit Court for the Southern District of New York, relating to the well-known escalator employed at various elevated railway stations and in many department stores. The case arose under the basic patent on the escalator, which was obtained through the SCIENTIFIC AMERICAN patent agency by George A. Wheeler in 1892. The particular feature involved is the use of a traveling handrail, and Judge Wallace held that the patent is infringed by the use of a traveling handrail on a traveling stairway of any kind. The claims to the main features of the escalator were not involved in the suit.