

OVERHEAD STEAM CRANES AT MIDDLESBROUGH DOCKS.

These docks, which have recently been made by the North-Eastern Railway Company to accommodate their greatly increased shipping traffic, possess many points of interest and novelty, prominent amongst which is the system of steam cranes employed.

After careful consideration, on the part of the dock authorities, of the various types of fixed, steam, and hydraulic cranes in general use, it was found that no fixed crane could be kept constantly employed at Middlesbrough, on account of the great variation in the length of the ships, steamers, etc., while, furthermore, as the total area of quay room would be, in the first instance, somewhat limited, the space occupied by a fixed crane would be attended with serious inconvenience. The same objection existed to the adoption of the ordinary construction of portable crane, involving a separate line of rails for them to travel on. There was also the further condition that the cranes must be capable of loading and discharging vessels, the sides of which were fifteen feet to twenty feet above the level of the quay, as rapidly as lighters, which would frequently be twenty feet below the quay level, and that in both cases the driver should have a clear view of his work. Under these circumstances, it was decided to state the leading conditions to various manufacturers of cranes, and invite them to give tenders and prices for what appeared to them best adapted to fulfill these conditions.

The design adopted was that sent in by Messrs. Appleby Brothers, of London; this design, as will be seen from the engraving, consisting of a travelling staging or gantry, on which is mounted a steam crane of the same construction as that sent by the firm to the Vienna Exhibition, and which is in successful use at so many of the docks and harbours in this country and on the Continent.

The travelling staging or gantry of each crane has a span of twenty-three feet centre to centre of rails, one of the latter being laid close to the edge of the quay, and the other in the six feet between rails. The clear height is seventeen feet six inches, which allows the uninterrupted circulation of locomotives, and all kinds of rolling stock on each of the two lines of rails which are spanned by the gantry. The travelling wheels are twelve feet centre to centre. The framing is composed of a pair of timber uprights, braced and strengthened by cast-iron brackets, and two wrought-iron plate girders which are connected to the timber uprights by four wrought-iron plate brackets, strengthened with angle irons. A strong carriage with the necessary roller path and brackets for the gear required to transmit the travelling motion, which will shortly be referred to, is firmly bolted at the extreme end of the girders nearest to the dock, while the girders are planked over so as to form a store for coal and water. The crane and the whole of the superstructure, is designed for a working load of five tons at the maximum radius of twenty-one feet from centre of crane post to the plumb line of the lifting chain, while the crane itself is, as already been stated, of precisely the same construction as those which have given satisfactory working results elsewhere, with apparatus for altering the radius by steam from a maximum of twenty-four feet to a minimum of fourteen feet. The travelling motion is transmitted from the crane engines by suitable gear and shafts to the travelling wheels, and warping drums or capstans are fitted on a counter-shaft on the inner side of each frame, so that these warping drums can be driven independently of the travelling wheels, and they are used for moving the trucks into position below the crane, as they are required for loading and unloading. This simple addition is found to effect a very large saving in manual labour and time, which, it is estimated, amounts to at least £300 per year, because, without this appliance, horses and locomotives must be kept constantly employed, involving working expenses, and wear and tear, in addition to the maintenance of the road, whilst with the capstans the trucks are brought into position by the men employed in stowing and slinging, with no further wear and tear of road than that due to the paying load. As it was decided to adopt this system of crane throughout the dock, the two lines of rails spanned by the gantry are laid with crossings at such intervals as will admit of either line being used for full or empty trucks, or in fact partially for both purposes if desired.

Another great advantage which has been demonstrated by practice is, that the cranes can be so readily concentrated at any point where they may be required, and, indeed, as is shown in the engraving, three of these cranes are brought to load a long screw steamer having three hatchways; this is evidently a most important consideration with owners and shippers, especially under circumstances which so frequently arise where great dispatch is essential. Or two cranes can be brought together for any exceptionally heavy lift. The cranes were tested with the maximum working load of five tons, and subsequently for speed, when each delivered fifty tons per hour from the trucks into the steamer's hatchway.

The arrangement we have described may be modified with advantage, under some conditions, by making the crane portable on its gantry, so that it will travel from end to end, all the other motions being retained, the travelling motion in that case being transmitted through a square shaft with tumbler bearings. This construction is especially valuable for use on a jetty where vessels lay on each side; to suit these conditions the gantry is made to span the whole width of the jetty, and to travel over the ordinary lines of rails and roadway. Another modification of the system consists in having the crane fixed on an ordinary overhead traveller gantry, or it may be made to travel across the gantry; in such a case the fixed staging may be constructed of square timber, or of columns and girders; this class of travelling crane has been rather extensively used in the construction of public works and large buildings.

It might at first sight appear that the road to carry these cranes must be of unusual strength, but on further consideration, it will be seen that this is not absolutely necessary, because the base obtained is so large that there is comparatively little strain on the road; in fact, probably no more than on a line of rails of the ordinary gauge, carrying a portable crane of the usual type, working the same loads at the same radius. Several of these cranes have been in successful operation for some time past, and a number more are in course of construction for the Middlesbrough docks.

The system evidently has great advantages under the condition above-named, as well as for working in crowded railway stations, or in stone quarries, timber yards, &c., and it appears singular that an arrangement at once so simple and efficient, should, until now, not have been brought into more extensive use, especially for dock and railway traffic.

COAL MINES IN CHINA.—Some information is given upon this subject in an official report upon the trade of Tamsui, including Kelung, where coal abounds in great quantities. The system of working these mines—as indeed Chinese mines generally—is exceedingly primitive and imperfect. Places where the mineral is observed cropping out of the hill-side are selected, and an opening 5 ft. high or more by 2 ft. wide is driven horizontally for a distance of some forty yards, terminating in a central chamber, from which workings, 100 yards or more in length radiate in a direction which usually inclines slightly upwards. In these workings, which in many cases can only be entered on all fours, the miner carries on the work of excavation, squatting in mud and water, and breathing a most foul atmosphere. One mine usually employs about twelve or fifteen miners, who earn wages equivalent to 1s. 6d. a man per diem, which is an extremely high rate in China. The usual length of a day's work is about eleven hours. The miner is armed with a pick shaped like a sledge-hammer with one head pointed and weighing about 6 lb. The length of the iron head is about 8 in., and of the wooden shaft 2½ ft. The miner's lamp is a saucer of oil with a rush wick laid into it. The coal is drawn along the pit floor to the mouth in a basket about 3 ft. long, fastened on a board with a rattan cord attached by which to haul. Occasionally the board is fastened on rollers, and travels on planks laid down for the purpose of forming a rudimentary tramway. In consequence of the imperfect tools employed great waste occurs through so great a quantity of the coal being reduced to a powder. The ventilation of the mines is left to itself, and it is stated that no system of pumping out the water is employed. The water runs out at the mouth of the mine, and in cases where the galleries take a downward direction, the only resource left is to abandon the working when the water excessively accumulates. Fire-damp is unknown, but accidents often happen in consequence of the side or roof falling in, which from the insufficient way in which they are secured is almost inevitable.