used with advantage for dumping the material into boats from special buckets, which are transported from mines or sand pits to quay by special bucket cars.

Instead of slewing cranes, loading towers operated by steam or electricity are supplied where larger quantities of material are to be handled expeditiously. Nine of such loading towers, shown in Fig. 1, are used for handling iron ore in the Imperial Steel Works of Japan. The hoisting apparatus for the trolley is placed on a small rear cantilever and the very light trolley runs with high speed from boat to the tower, where the ore is dumped into hoppers and from these into cars.

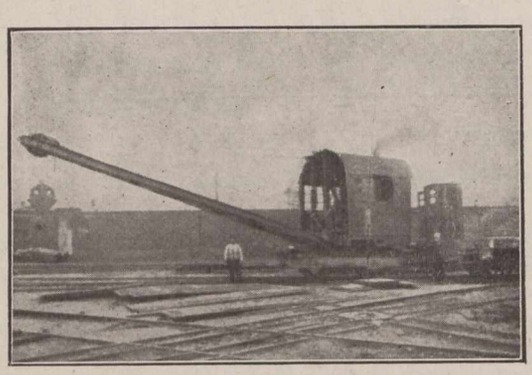

Fig. 3.—Steam-Driven Slewing Crane.

Such towers can be built up to an hourly capacity of 250 tons of coal and a weighing device may be adjusted if desired. In most other cases, where the material is to be stored in piles adjoining the quay, a loading bridge, supported by rigid legs, is the usual equipment. These bridges can be stationary or travelling, and are in most cases driven by electricity. A trolley with grab bucket running either on top or between the bridge girders with high speed, can reach from a waterside cantilever to the outmost hatch of the boat. This cantilever can have the form of an apron to clear the masts of the boats, as illustrated by Fig. 5. This loading plant is built in Rotterdam and consists of 4 bridges with 160 ft. span and 90 ft. cantilever. The trolleys have a capacity of 8 tons each and are equipped with a slewing cantilever of 23 ft., which makes it possible to reach a large part of the boat as well as the storage without moving the boat or travelling the crane.

This is a much better scheme than the scewing bridges where one portal can travel somewhat ahead of the other, which can only be done at the cost of the rigidness of the whole structure. If the waterside apron is not required very large, the jib connected with the trolley can take its part and serves as further extension of a short rigid cantilever. Instead of a trolley with slewing jib, a travelling slewing crane can be supplied, running on the tops of the bridge girders. With this type the structure of the bridge can be kept lower and lighter in construction, having the same advantage of

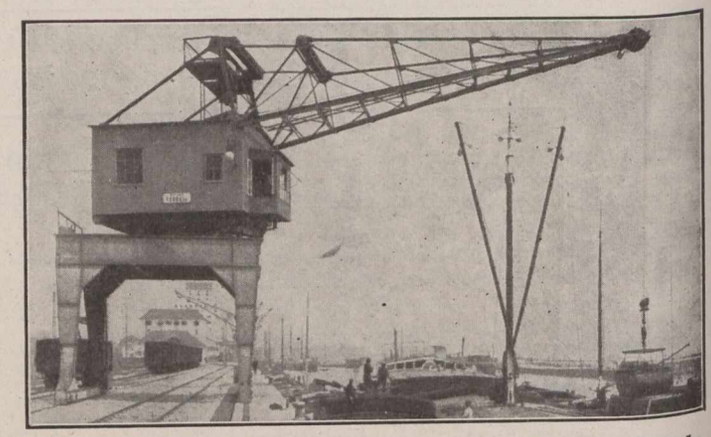

Fig. 4.—Arrangement of Crane to Clear Railroad Track and Vessels' Masts.

large working circle and avoiding the waterside apron for clearing the masts.

A bridge crane of this type is shown in Fig. 2. This crane is manufactured also with a trolley for reloading purposes. This bridge has the interesting feature that the second bridge, if needed as elongation, can be safely coupled to the main bridge in such a way that the trolley is able to run smoothly from one end to the other.

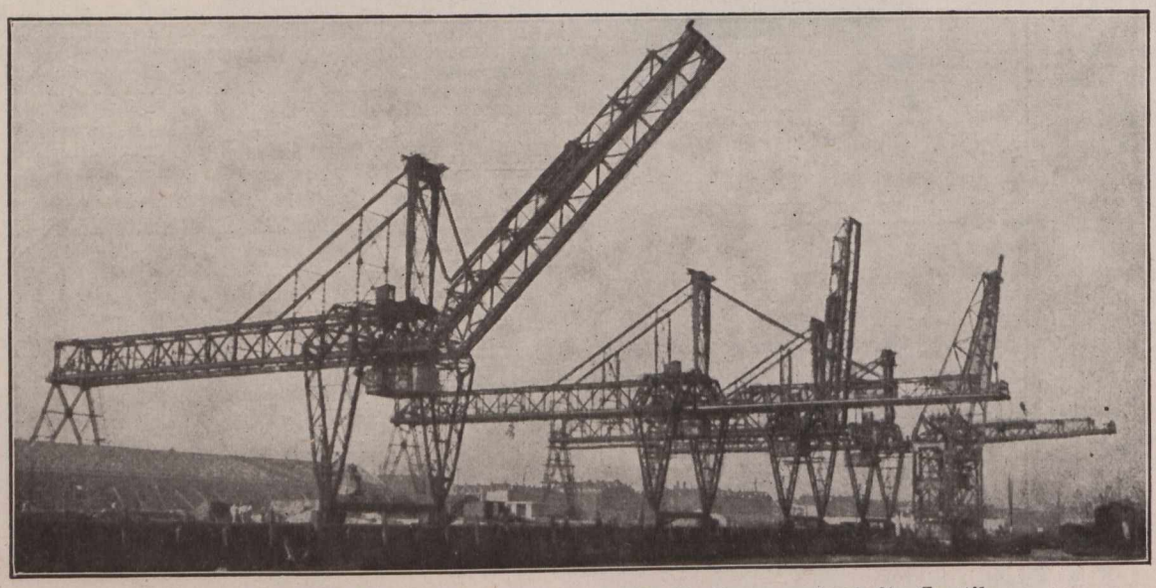

Fig. 5.—Loading Plant with Bridges of 160 ft. Span and 90 ft. Cantilever.

The writer is indebted to the Deutsche Maschinenfabrik, A.G., of Duisburg, Germany, for the photographs illustrating this article, the photographs showing a few of the many loading and unloading devices which have been built by their plants.