MECHANICAL ORE UNLOADER.

BY WALDON FAWCETT.

The men who are striving for the development of the iron and steel industry of the United States seem close upon the consummation of another innovation which will prove vastly important, quite as important in its way as any which have preceded it. In every step of the process from the time the ore is taken from the ground until it is placed in the furnaces, from which it is to emerge as pig iron, vast improvements have been made. So complete has been the evolution of economic methods that the producers of iron and steel some time ago came to the conclusion that the only stage at which it would be possible to effect any considerable saving of time would be in the transference of the iron ore from the ships which bring it down the Great Lakes to the cars which carry it to the furnaces.

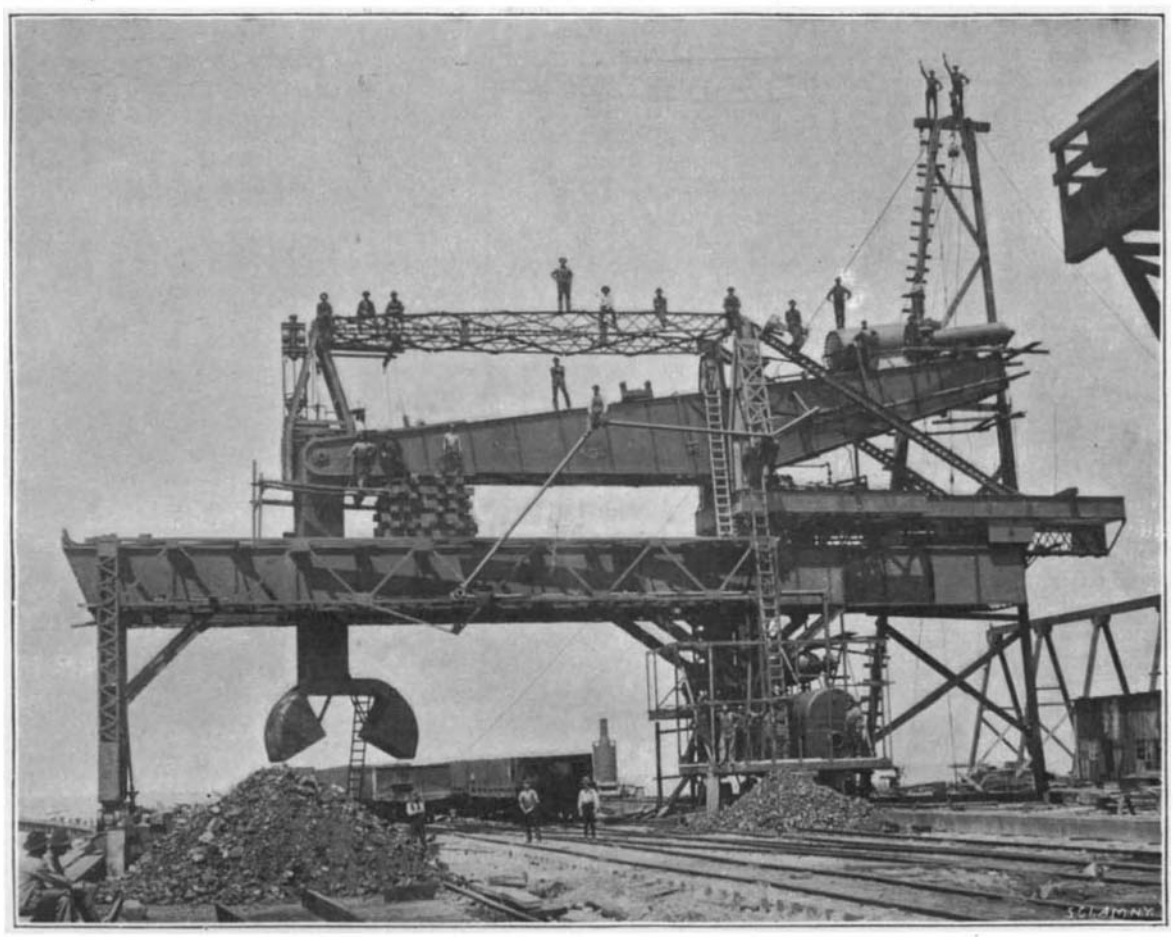
It is not intended in the foregoing remarks to disregard the cheapening influence which has been exerted by the larger lake ships and the cars of greater capacity which have come into service within the past few years, but they may truthfully be said to constitute a factor separate and apart. The manner in which cargoes are transferred to and from ships at ports on the Great Lakes has long been the wonder of engineers from all parts of the world and in this system, the unloading of iron ore, by means of huge buckets, traveling at a high rate of speed on bridge tramways extending from the ships to cars has been one of the devices which excited the greatest admiration. Still it did not entirely satisfy the iron ore men. They saw coal shippers in possession of a device which picks up a loaded car, empties its contents into the hold of a vessel and returns the car to the track, all in the space of a minute, and they call for something correspondingly speedy.

This, in a nutshell, indicates the conditions which brought about the invention of the mechanical ore unloader. The first of the type has recently been installed on the docks of the Carnegie Steel Company, at Conneaut, O., which Andrew Carnegie has announced his intention to make the greatest ore unloading port in the world.

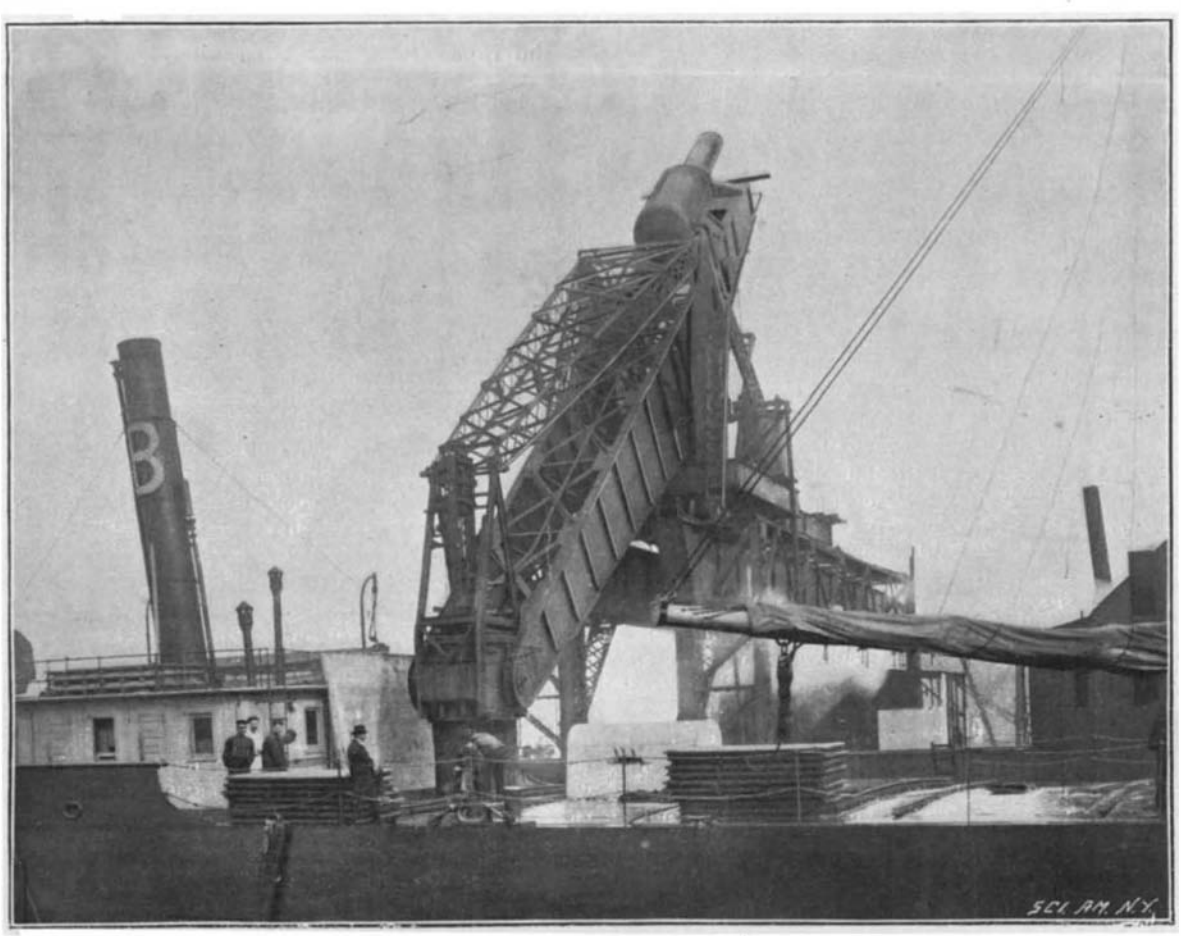
The new machines will, from the very outset, displace large forces of men who have been employed to load the ore into the large iron buckets which, under the present system, carry it from ships to cars. In passing it may not be amiss to say a word regarding these men, who perform, probably, the most arduous manual labor to be found anywhere. Only the hardiest of men can meet the exactions of the work, even temporarily. They work in gangs of twenty-five or thirty men, and their working day often has a length of eleven or twelve hours, in which time a workman of average ability will earn from $4 to $6. One of the greatest hardships of the work is the excessive heat found in the holds of the great steel ships, in which, of course, very little ventilation is possible.

The shovel of the machine, which has just been installed, is of the clamshell type and has a capacity of fully ten tons of ore. The shovel, which is operated by a hydraulic cylinder, is attached to a mast which revolves in a complete circle and in which an operator is stationed. By means of the walking-beam to which it is attached the mast is run out over a boat, lowered through a hatch, and turned in any direction, its radius being about nine feet, which enables the scoop to reach the bilge of any vessel on the lakes. After the shovel has been closed it is lifted from the hatch and run back over the cars into which it is desired to load the ore.

The whole machine is of heavy steel structure, with principal members of plate girder construction. The machine of course travels lengthwise on the dock while the heavy walking-beam traversing the top of the main structure moves at right angles to the dock. The depending leg or mast is always kept in a vertical position by means of a parallel motion. The bucket end of the walking-beam is counterbalanced by means of the hydraulic accumulator located at the opposite end.



MECHANICAL ORE UNLOADER—IN THE COURSE OF CONSTRUCTION.



MECHANICAL ORE UNLOADER—REMOVING ORE FROM A VESSEL.

The movement of the whole ponderous machine lengthwise of the dock is accomplished by means of a pair of engines geared to the wheels on each main leg of the structure, and this facilitates to a considerable extent the loading of the lake steamers, which are provided with from ten to twelve hatches. It will thus be seen that it will be possible to put several of these machines to work on one boat or simply one machine may be employed and moved from hatch to hatch.

All the movements of the machine other than the one just noted are accomplished by hydraulic power through suitable cylinders. All the operating levers are grouped in the depending leg or mast, in which, as has been explained, the operator is stationed, and thus he at all times travels with the machine, his position being directly above the bucket.

The clamshell bucket will not only discharge its contents into hopper cars on either of the two railroad tracks at the front of the dock but may, if it is desired, be made to empty into a hopper at the dock in case it is desired to stock the ore. This hopper may either be drawn back and dumped into a storage bin, or its contents transferred to a tram car capable of being drawn back on the conveyer bridge.

These conveyer bridges are a novel feature of this new system of unloading iron ore. The bridges are of wood and rest at either end on towers placed on regular standard gage railroad tracks. In order to ease the strain of the long span of the bridges they are supported in the middle by a trestle. The ore is taken from the holds of vessels by the new machine and placed in side dumper iron cars, each of which is capable of holding about three tons of ore. The cars are propelled by hand along the bridges and dumped onto stock pile below. On the Carnegie Company's dock there are nine wooden bridges, each one hundred and fifty feet in length, and in the rear of these are located three bridges, each seventy-five feet in length. The arrangement of the bridges is such that the three last mentioned may be placed in the rear of any of the first mentioned bridges, thus making a continuous run of two hundred and twenty-five feet in case it is desired to stock ore on piles at a considerable distance back from the water front.

Hydraulic power for all the movements of the machine except the traveling along the dock is provided at a pressure of seven hundred pounds by means of a duplex compound pressure pump and steam accumulator. It is claimed that the machine will handle about three hundred tons of ore per hour from boats to cars, and that it will take out from ninety to ninety-five per cent of all the ore in the hold of a vessel. Only two men are required to operate the machine, while three men are employed to clean up the remnant of ore which cannot be caught by the shovel.

It will thus be seen that with three or four such machines at work unloading a vessel the ore would be removed from her hold quite as expeditiously in proportion as it is loaded at the ports on Lake Superior, where by means of elevated docks with pockets and chutes it is possible to load one of the largest vessels in three or four hours. The construction of the mechanical unloader presented many perplexing engineering problems, not the least of which was that of guarding against any injury to the ship from the operation therein of so ponderous a machine. Not all of these questions have even yet been fully determined, but there is little doubt that the season of 1900 will demonstrate the thorough practicability of this very interesting labor-saving machine.

AN International Congress of Mining and Metallurgy will be held in Paris the middle of June next, and a large attendance is expected.