Mechanics.

THE MIGHTIEST LEVER IN THE WORLD.

The colossal crane at Woolwich, which has been upwards of four years in process of erection, recently assumed a definite shape in the operation of fixing the great girder, and the character of perhaps the most powerful piece of mechanism in existence can now for the first time be understood at a glance. The girder radicates upon a central pile, with the outer extremity of the arm supported upon a wheeled tower, travelling on a circular railway which encloses about a quarter of an acre of ground. The extent of the work is further illustrated by the weight of the iron employed in its construction, which in the aggregate exceeds 1,800 tons, while the brass bearings alone amount to more than three tons. When completed, the crane will be capable of lifting three or four 100-ton guns at once ; but the purpose for which it has been provided is not to do work which other appliances could accomplish in detail, but rather to meet the probable necessity for dealing with specimens of ordnance so enormous as to defy all the means at present available for mounting them on their carriages. The motive power will be steam, supplied from the adjacent boiler-house, and working a pair of cylinders suspended from the central crown and revolving with it, but inside a group of eight colnmns, which support the structure. Along the upper surface of the girder the lifting carriage travels, bearing below the lifting blocks, the whole of the gear being put in action and controlled by one man at the central cylinders. The girder traverses at a height of 50 feet from the ground, and the carriage upon it makes the total height 70 feet. It is 75 feet long from the center to the revolving power, which consists, like the central group, of iron pillars firmly bound together. The carriage upon which the power rides is a double bogie truck, riding on rails, 12 inches in breath, with the ordinary gauge of 4 feet 8 inches. These rails run completely round the compass, making a circumference of about 430 feet, and the sweep can be made in either direction at a fair speed. Although calculated to raise 1,200 tons in case of need, the apparatus will also be fitted with a light gear for raising small weights at accelerated speed, and it is anticipated that even in the ordinary daily works of the Royal Gun Factories, to which department it belongs, it will prove a valuable auxilliary.—*Manufacturer and Builder.*

THE FARMER'S DEPENDENCE ON MACHINERY.

Following is an extract from a well thought article in *Capital and Labor* of London : which is well worthy the attention of farmers who are too short-sighted to move with the times.

The mechanical power of the age is like a series of concentric and eccentric circles, of which the farmer stands out in the principal center. These all revolve with and about agriculture, and the same force sets all in motion. It is the farmer's duty now to make the most of his opportunities. He should be the foremost man of the age. His influence should be felt everywhere. It is felt everywhere, for the wealthiest merchants and capitalists, and the most active politicians, all ask themselves how far the farmers can be depended upon before they make a movement in their special pursuits. But the farmer should feel this himself. It is one thing to have a power, and another thing to be cognizant of its possession. Let the farmers consider now their position, and as take a view of it let them consider what they owe to the power and influence of machinery. One most conspicuous example of the results pointed out may be noted. A few years ago Minnesota spring wheat was graded very low in the grain markets and brought a low price. Unfortunately for the Western farmers, this grade of spring wheat was the only one they could produce. A new process in milling was introduced. Elaborate machinery was invented to perfect the process. The best wheat by this process was the grade known as "Minnesota Spring," therefore despised and rejected—literally "rejected," in fact, in the markets. Afterward this grade became sought by millers, and the value advanced to a point equal to and sometimes more than that of the previously much-sought winter wheats. If Minnesota farmers produce forty million bushels of wheat annually, this advanced value, due to the new process, put several millions of dollars yearly into their pockets ; and what a vast amount of comfort and happiness may be secured by the right use of so much money! This is but one instance of the vast concentration of circumstances which points out the moral here alluded to.

IMPROVED HYDRAULIC ELEVATORS.

Of late much attention has been directed to the improvement of hoisting apparatus, and the greatest amount of skill and ingenuity has been expended in increasing their safety and convenience. Much of the improvement in the character of this class of machinery is directly traceable to the constantly increasing introduction of elevators for passenger service. For this purpose the elevator has become absolutely indispensable, and it is fair to infer that the increasing concentration of business in certain quarters of our cities, which is accompanied with an increase in the value of land, and a correspondingly increasing tendency skyward of business houses, hotels, etc., will cause an increasing demand for machinery which saves so much time and muscular effort, and which materially enhances the value of the upper stories of high buildings by making them as readily accessible as the lower ones.

The first passenger elevators were simply improvements on the freight cages, but their liability to accidents did not recommend them to public favor. Safety appliances in the form of extra supporting ropes, clutches, catches, etc., were provided in time, and by doing away with many of the objections to this class of machinery, fairly inaugurated the era of passenger elevators, until to-day a large building without an elevator is regarded quite incomplete as though it lacked heating apparatus and similar indispensable conveniences.

An objection urged against the introduction of elevators, was the necessity of employing steam as the motive power, in the use of which it was impossible to avoid a certain amount of roughness of action. This objection, in turn, was happily overcome by the substitution of hydraulic power for steam, and in the improved hydraulic elevators generally in use to-day, we have an apparatus which very fully meets the public requirement of a smoothly operating and safe means of ascent and descent.

Otis Brothers & Co., of 348 Broadway, New York, have devoted much time and attention to the perfection of the hydraulic elevator for freight and passenger service, and having succeeded in securing for their apparatus an excellent reputation for convenience, simplicity and safety. We illustrate in the accompanying engravings the hydraulic elevator for passenger service made by this firm, accompanied with a brief description of its details.

The motive power for running this elevator is derived from the pressure or weight of water in a tank situated in the upper portion of the building, or from the water pipes of the city. This pressure is brought to bear upon the top of the piston B, while below it the normal pressure of the atmosphere is utilized. These forces are applied to raising the car, the water being also drawn from the cylinder below the piston. The car is connected with the piston by a number of wire ropes which are passed up over a fixed pully wheel, and thence to the traveling sheave A, and their standing parts are secured above, as shown in the cut. By a recent improvement, the counter-balance weights connected with the traveling sheave have been placed in the cylinder. The united weight of the sheave and the piston counter-balances that of the car. The piston is secured to the sheave, and works up and down in the cylinder C. When the piston reaches the upper extremity of the cylinder, the car is at the bottom of its route, and if the operator then desires to make the car ascend, he pulls the valve rope, which the cut shows him in the act of grasping ; the valve D is then opened, which causes the water to enter the pipe E to the top of the piston, and at the same time F is also opened, which permits the water in the cylinder below the piston to escape. Our readers will observe that by discharging the water during the ascent of the car, the pressure of the atmosphere is utilized down to the level of the discharge, and thus the maximum of power is secured, while the water in the cylinder acts as a brake in lowering the car ; and it is these features especially which give these machines a special advantage over others in the market.

The weight of the car is counter-balanced, as above mentioned, by that of the piston and sheave, and, therefore, the resistance to be overcome reduces itself to that of the load to be carried together with the inertia of the various parts. Opposed to this we have, first, the weight of the air, which is 15 pounds per square inch above the piston, which is obviously gained through the escape of the water below, the cylinder being always full ; secondly, the absolute weight or pressure of the water itself acting on the piston which may be derived from the city mains, or may be due to a difference of level between the bottom of the cylinder and a tank located in the upper story of the building. The result will be the elevation of the car, and the water escaping may be raised to the tank in the upper story if desired, and used over again.