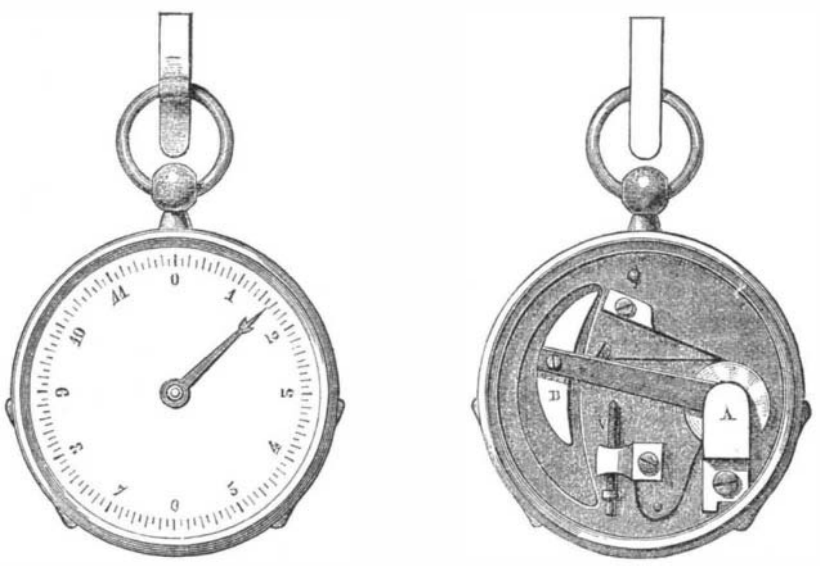
THE PODOMETER.

The annexed engravings show a simple little instrument, sold in many of our New York stores, which, now that pedestrianism is so much in vogue, proves the handiest means attainable for measuring distances walked over. The podometer is no bigger than an ordinary watch, is carried in the vest pocket, and is said to indicate distances with as small a margin of error as five per cent.

The shape is apparent from the illustrations. One side serves as a dial having a single hand, the other may be covered with metal, or, if desired, with glass, to allow the inspection of the interior mechanism. The latter consists of a heavy counterweight, B, secured at the extremity of a lever which oscillates about an axis at A. V is a screw which limits the amplitude of the oscillations, while a small spring acting against the counterweight maintains this last in the position represented in the engraving. A simple counting device, not shown, registers the oscillations of the lever and moves the pointer around the dial.

It is clear that, if the instrument be quickly moved from down up, the inertia of the counterweight overcoming the pressure of the spring, the counterweight will remain down, and the screw, V, will strike the lever. When the instrument returns to its former position, the reverse operation will take place, so that the natural movement of the body in walking will, for every step, cause an oscillation of the counterweight, B, and consequently the advance of the pointer on the dial one degree.

The operator should make preliminary experiments with the instrument between points, the distance of which apart is accurately known. These will give co-efficients with which to multiply (according to the nature and inclination of the road traveled over) the number of steps, to obtain the distance in yards or feet.



THE PODOMETER, OR WALKING DISTANCE INDICATOR.

A POWERFUL CRANE.

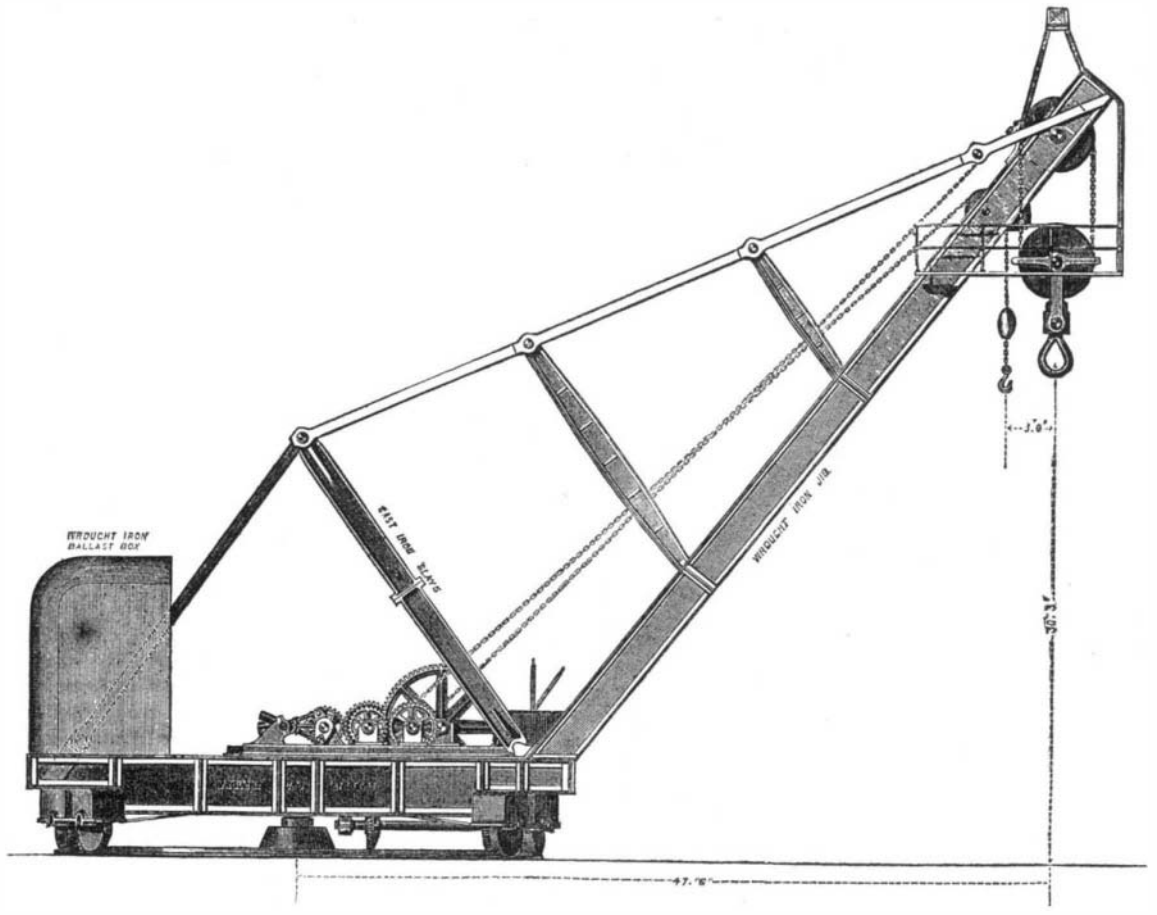
There has recently been erected at Woolwich Arsenal, England, a crane capable of lifting and handling a weight of 85 tuns through a hight of 60 feet. It is intended for lifting the heavy ordnance now constructed at Woolwich, and 80 tuns is considered to be a safe load for it. We publish herewith an engraving of the machine, which has a rake of 47 feet 6 inches from the center of the pivot to the center of the swivel block.

The stipulated speed of lifting the extreme load of 85 tuns is fixed at 4 feet per minute, a second speed being provided of about 7 feet per minute for loads up to but not exceeding 40 tuns, and a third speed of about 40 feet per minute for raising the unloaded swivel block for any necessary purpose. An auxiliary chain is to be provided, having 3 feet less rake than the main block, this being intended for the purpose of lifting loads up to 8 tuns at the rate of about 25 feet per minute. The details of arrangement are shown in the engraving. The speed of turning the crane on its axis is provided to be at the rate of five minutes for the accomplishment of a single complete revolution. These, of course, it is needless to say, are only estimates of the actual working capabilities of the crane now under consideration.

The jib is of wrought iron, 55 feet long, and is attached at the bottom to a platform composed of wrought iron girders mounted upon four pairs of cast iron rollers, which run along the sweep plate or roller path. Two of the pairs have a cogged wheel inside, worked by the hydraulic gear, for revolving the crane within the circle of the roller path; the other rollers are plain. Each pair of rollers is carried in a cast iron roller box, provided with gun metal bearings for the axles to work in. The roller path is of cast iron, and the central pivot or bed, for the crane to work on, of the same material. The latter will be bushed with a gun metal socket for the central pin of the crane, and it will be connected with the cast iron summit length of the 7 feet screw pile by four wrought iron bolts each 3 inches in diameter. The central pin is of wrought iron, and about 13¾ inches in diameter. It connects the crane to the center pivot or bed. The platform girders are to be floored on the top with timber, to which, and direct to the girders themselves, the bed plate of the hydraulic engine for winding the chains and revolving the crane will be bolted. The stays for the jib are of wrought iron, and are supported from the jib by other cross stays, as shown in the engraving. The main stays are of cast iron, and trussed together by diagonal stays of the ordinary character. A wrought iron platform, lightly constructed, is to be suspended at the extremity of the jib, for facilitating the means of access to jib-end sheaves. A wrought iron ballast box, capable of holding about 100 tuns of gravel or slag ballast, is to be attached to the platform girders at the back of the crane, for the purpose of counterweighting the full weight of the load. This counterweight, together with the natural stiffness of the crane, will, it is anticipated, be sufficient to overcome the resistance of a far heavier load than 85 tuns, the greatest test to which it is intended ever to submit it.

The hydraulic engine, for lifting and revolving, will have three cast iron oscillating cylinders, with cast iron plungers, and will be provided with valves, working gear, and reversing apparatus of the ordinary description. All the shafts for the spur and bevel gearing, for communicating the power of the hydraulic engine to the lifting drums, and to the front rollers for turning the crane, will be provided throughout of wrought iron, and will have gun metal bearings to work in. Wrought iron cupped drums of large and small sizes are provided for the large and small lifting chains respectively, and a separate brake and pawl wheel is connected to each several drum.

The multiplying power of the main lifting block is to be four to one, and the lifting chain for this block to be 1½ inches in diameter, or 4½ inches chain. The auxiliary power is to be direct without any multiplying power, and the lifting chain for its block is to be 1 inch in diameter, or 3 inches chain. Both the main and the auxiliary lifting chains are to be tested to an endurance of 10 per cent over and above the ordinary Admiralty proof.



THE EIGHTY-TUN CRANE AT WOOLWICH, ENGLAND.

The Youngest Volcano.

A new volcano was born on the 1st of May, 1871, and at the present time has attained the hight of 1,950 feet. It was recently discovered by the Challenger, in the course of her voyage in the China seas, on the small island of Camiquin, near the coast of Mindanao. For some months previous to the formation, violent earthquakes occurred throughout the islands. These ceased after the first eruption, which gave vent to the imprisoned forces. At the end of four months, the mountain had risen 400 feet and had increased to about a third of a mile in diameter.

The new comer appears to have worked sad desolation. The island had a population of 25,000 people, and was one of the most fertile of the group, producing hemp, sugar, and tobacco of the finest qualities. The base of the mountain has extended so as to cover the entire site of the town of Catarman, which once contained 14,000 inhabitants, but now is a mass of ruins. But a few hundred people remain upon the island, and the fields and groves are choked with new jungle or destroyed by the sulphurous exhalations of the volcano.

Steel Bronze.

No small degree of attention has been attracted throughout military and scientific circles in Europe toward a metal lately used for artillery by General Uchatius, Director General of the Imperial Arsenal at Vienna, and prepared by a process invented by that officer. The name "steel bronze," or "bronze steel," which has been given to the material, is somewhat calculated to mislead, since no steel whatever enters into the composition; and it would appear that the word is used mainly as a synonym for hardness. The metal itself is nothing more than the ordinary bronze, commonly known as gun metal; and to the treatment to which it is subjected it owes its remarkable resisting qualities.

The principal objections to the use of bronze for cannon, as given in standard works on gunnery, are that the work done, in stretching to the elastic limit and to the point of fracture, is less for bronze than for low steel and for wrought iron of maximum ductility; and further, to this defect is added the costliness of bronze, its softness, its injury by heat, and rapid wear and compression. Again, guns cast of bronze, even from the same mass of metal, have exhibited diversities for which no satisfactory cause could be assigned. All of these disadvantages obviously aggravate each other, and, when taken in connection with rifling and excessive pressures, have been deemed conclusive evidence as to the unfitness of the material to meet the conditions of greatest effect.

General Uchatius' plan is based on the well known principle that, after a certain degree of compression, malleable metals assume their closest and most condensed states. This compression he applies to the interior of the bore, since in bronze guns, under the strain of repeated firing, this portion enlarges without any corresponding alteration of the exterior of the piece. The gun is cast in the usual manner, hollow, and with the bore of a somewhat less diameter than it is intended ultimately to be. Thirteen punches, each a bolt of steel, having rounded edges and mounted on the end of a bar of the same metal, are forced through by hydraulic pressure, each punch being slightly larger in diameter than the preceding one. By this means the bore is gradually enlarged, and at the same time the metal subjected to a friction and compression which results in causing it to become extremely hard, and of a nature well suited for the subsequent rifling.

We learn from a well known cannon manufacturer, to whom we are indebted for the foregoing information, that twenty guns thus prepared have been tested in Austria during the past two years. The results obtained have been such that the Austrian Government is now constructing two hundred batteries, or twelve hundred guns, at the rate of six batteries a week. A single gun of steel bronze has withstood 3,000 rounds without any perceptible deterioration, and others, even after being subjected to the severest tests, —shells burst in their bores— appeared to lose nothing in point of accuracy of fire. In estimating the relative cost of steel bronze guns with those of other metals, the value of the bronze for remelting, after the gun has become worn out, must be taken into consideration. This done, the first cost of the steel bronze cannou is placed at less than half that of a Krupp steel piece, and very much below that of a Whitworth compressed steel gun, which, at a rough estimate, is about twenty per cent more expensive than Krupp's.

There is another important advantage in bronze guns, especially if they are breech-loaders of complicated construction, as compared with steel weapons of similar character, and that is their non requirement of attention during periods of non-usage. Not being subject to deterioration from rust they need little protection, and thus the cost of such care, necessarily considerable in a large armament, is greatly reduced.

THE price of artificial alizarin has fallen about 35 per cent