panying figure, is capable of sawing bars and girders of 8 x 12 inches. The motor, which is situated under the table, is of the constant speed, inclosed type. It is designed for a speed of 600 revolutions a minute. The driving shaft of the saw is run by a chain, and a speed reduction of 6 to 1 is employed, which gives it a speed of 100 revolutions a minute. The rheostats are fixed to the pedestal, and this permits of the machine being moved about bodily and especially of being lifted by a crane, since there is a ring secured to the machine for this purpose. The current for operating the motor may be taken from an electric light main by means of flexible wires and a lamp socket. The pedestal contains a tank for the lubricating fluid. The table is surrounded by a gutter, and a small force pump, with accessories, keeps up a constant flow of the lubricant. The saw clamp may be fixed obliquely, so as to allow the blade to saw girders, etc., at an angle. It may even be removed, so that the pieces may be bolted to the table itself, which is provided with T-mortises.

The machine, which may be driven by other kinds of motive power than electricity, will probably soon be adopted by metallurgical works and iron establishments, and be utilized at places where metallic constructions are in course of erection, where it will undoubtedly render valuable services.

A REMARKABLE EARLY GRÆCO-ROMAN CHARIOT.

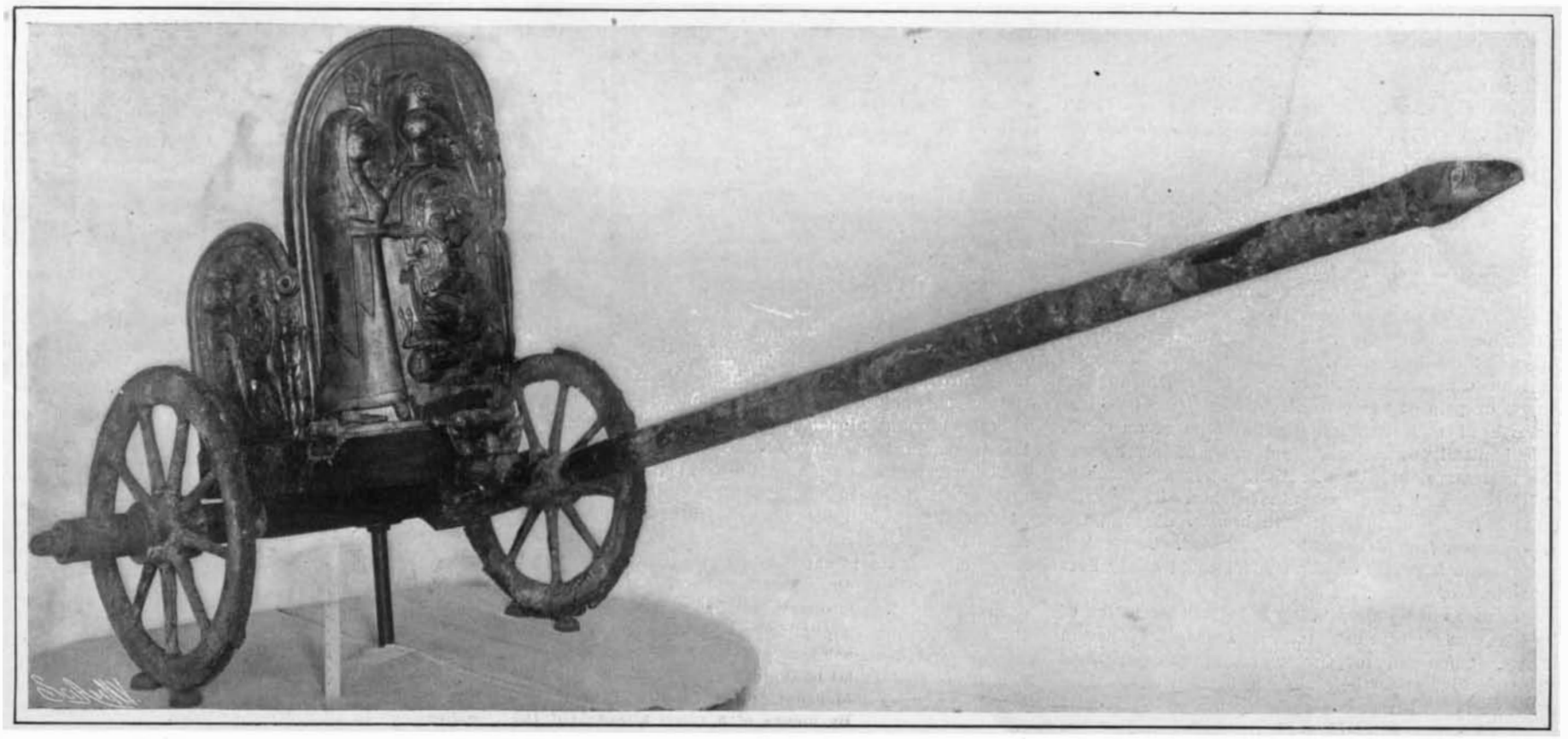
Last January Gen. Di Cesnola, director of the Metropolitan Museum of Art, learned that there was offered for sale in Paris a chariot which had been dug up by some peasants in Italy at the foot of a hill called "Il Capitano," beneath which the road from Monteleone led to Norcia, the ancient Etruscan city of Nursia, fourteen miles distant from Viterbo. The price asked was more than even some of the most richly-endowed institutions could afford to pay. Through the munificence of the late Jacob S. Rogers, the well-known locomotive builder, who bequeathed much of his large fortune to the Metropolitan Museum of Art, Gen. Di Cesnola was enabled to buy the relic for 250,000 francs ($48,382). The *biga* has now been mounted for public inspection in the museum, and forms not only a rare example of pre-Roman art, but also a most skillful bit of restoration.

The chariot was found in a sepulcher amid a litter of earth, rubbish, and scattered utensils. Although the wooden body had crumbled into dust, still the few remnants showed that black walnut was the material which had been used in its construction. The ornamented bronze sheathing which covered the frame was found in a most remarkably well-preserved state. There seems to have been an ivory rim for the chariot body. The ivory fragments have been carefully preserved, and a few have been mounted upon a

The Front of the Chariot. Hercules Presenting His Helmet and Shield to Minerva.

One Side Panel, Representing Hercules Killing Laomedon, Father of Priam.

The Other Side Panel, Representing Hercules Killing One of Laomedon's Children.



AN ETRUSCAN BIGA OR CHARIOT, USED PROBABLY ABOUT 600 B. C., FOUND AT NORCIA, ITALY, AND ACQUIRED BY THE METROPOLITAN MUSEUM OF ART.

wooden rim shaped exactly like that which was once fitted within the chariot body.

Such is the delicacy of its workmanship, that the vehicle could hardly have been used as a war chariot. Perhaps it was an *ex voto*, or a ceremonial chariot used by its noble owner on rare occasions. Its workmanship is so delicate that it could hardly have withstood the kick of a horse. Indeed, a frieze that runs about the bottom of the body seems to have been partially destroyed by the heels of animals. In size, the *biga* is quite small. Its entire height is not more than four feet; the wheels have a diameter of about two feet. The thin plates of bronze with which the chariot is covered are elaborately ornamented with symbolical figures, and with decorations so minute that they hardly appear in the photographic reproductions herewith presented. The horses which drew the vehicle must have been small, probably not larger than ponies, judging from the length of the pole.

The copper throughout is hardly as thick as a thin sheet of cardboard. A small nude figure is placed at either side of the central panel at the juncture with the others, and a sculptured band, parts of which have probably been kicked away by the horses, runs around the chariot below. The wheels have no decoration except that eagles' heads appear at the ends of the axle.

The meaning of the figures on the front and side panels has not as yet been definitely determined. The *motif* of the front panel is the passing of a shield and helmet. Alexander S. Murray, the British Museum's well-known authority, has given it as his opinion that the decoration represents Thetis handing a shield and helmet to Achilles. Gen. Di Cesnola believes that the figures are those of Hercules and Minerva, basing his theory upon the manner in which the objects are passed. When one soldier offers his helmet to another, he does it so that the recipient can most readily place it upon his head. From this circumstance, it may be concluded that the god is presenting the shield and helmet, and not the goddess. Furthermore, the symbolical decorations of the shield are those peculiarly associated with Hercules. At this early period of art, the lion's head, the emblem of Hercules, was not placed upon the hero's head, but was confined to his shield, a fact which the director of the museum has had ample opportunity of verifying in the admirable Cyprus collection forming a part of the museum's treasures. Curiously enough, the shield has been placed so that the lion's head appears at the bottom in an inverted position. Still another feature of the decoration of this front panel, which bears out the assumption that the figures are those of Hercules and Minerva, is to be found in the votive offering of a doe, which graces the bottom of the panel beneath the shield. From time immemorial it was the custom of Greek warriors to sacrifice to the temple god when any favor was asked. Obviously, in transferring his shield and helmet to Minerva, Hercules is beseeching divine favor, and his prayer is accompanied by the usual sacrifice of a living thing.

The side panels, according to Gen. Di Cesnola, also symbolize the deeds of Hercules. The panel to the left probably represent Hercules killing one of Laomedon's children. A brief recapitulation of the myth will show how plausible the theory is. Laomedon was the son of Ilus and Eurydice, the father of Priam, founder and King of Troy. For an offense against Poseidon he was forced to offer his daughter Hesione to a sea monster. Hercules found her chained to a rock, and agreed to free her for a pair of magical horses which Zeus had given to Laomedon in exchange for Ganymede. Laomedon failed to keep his promise. Hercules waged battle against him, slew him and all his sons, except Priam. In the panel, one of the daughters lies prostrate. The triumphant Hercules has secured the magical horses and has harnessed them to a chariot, in shape much like that of the vehicle upon which the decoration appears. Particular attention should be called to the peculiar curving of the wings of the magical horses, a formation which is found frequently in the symbolical statues of archaic Greek art. The left panel of the chariot may represent Hercules killing Laomedon, father of Priam. Here it will be observed the shield appears with the lion's head uppermost in contradistinction to the front panel. The tongue or pole of the chariot emerges from a bronze boar's head, and terminates in the head of an eagle.

Mechanically considered, the manner of forming the wheels deserves a little attention. They are made of stout wood, and have each nine spokes. The spokes and the felly are sheathed with bronze. Around the felly a heavy iron tire has been mounted. The entire construction is such that the chariot could easily bear the weight of a man.

The means for studying the symbolical decoration of the *biga* are all at hand in the Metropolitan Museum of Art. Thousands of Greek statues of all periods which are placed at the student's disposal enable him to determine with considerable accuracy the precise period to which this work of ancient craftsmanship belongs, and to fix with some definiteness the probable significance of the allegories depicted. The peculiarly-shaped shield is found in many little statuettes in the Cyprus collection. The representation of Hercules with a pointed beard, and the shield with the lion's head, both find their counterparts in many figures. Convincing proof is thus afforded that the figures represented are probably those of Hercules, Laomedon, and Minerva. Still, the question is one which has by no means been definitely answered, and which will undoubtedly give rise to no little discussion among archæologists.

Like Egyptian art, the art of the Greeks, Romans, and Etruscans in its earliest stages was severely fettered by religious conventions. The deities could be represented only in the traditional way. The ornaments of their shields and head-dresses were those which religious belief had associated with them. It is, therefore, a matter of no great difficulty to fix precisely the characters which are represented in many of the archaic statues of Greece and Italy. It is thus that we are enabled also to determine the time to which a given work of art belongs. We know that it was only after 600 B. C. that the head-dress of Hercules was a lion's head, and that before that time the lion was also placed upon his shield. We also know that in the earlier statues he appears with a pointed beard. It is by the study of such details that the date to which this chariot belongs has been placed with a fair degree of certainty between 700 and 600 B. C.

The treatment as a whole is archaic, technically extremely good and decoratively extremely felicitous. When it was new the chariot must have been a gorgeous sight. The eyes of the goddess and the warrior in the central panel, the eyes and lips in the panel of the Medusa, and the eyes of the animals had all been enameled. The reliefs too were very lightly gilded.

The bits of the horses and the yoke by which they were harnessed have also been preserved. A chart has been placed within the case of the *biga*, which shows very clearly how the yoke was probabaly attached to the pole. In passing, it may be well to mention that the jointed bit, which we are accustomed to regard as a modern invention, was a type used by the Etruscans, judging from that which has been preserved.

HUNDRED-TON NAVAL FLOATING CRANE.

In the work of a great naval dockyard like that of the New York navy yard at Brooklyn, there is a constant effort to reduce the handling of heavy material to a minimum—a most important consideration where such heavy weights as boilers, guns, and gun emplacements have to be handled. In past years this navy yard has suffered for want of adequate accommodation for the many ships that frequent it annually for repairs and refitting; and it has long been felt by the officers in charge of the various departments, particularly that of Construction and Repair, that a remodeling of the yard and the plant would mean a great saving of time and cost of work that is done there. Several years ago an exhaustive plan for the reconstruction of the yard was presented, and after the usual exasperating delay on the part of Congress, the changes were authorized and are now being carried out. These include the construction of a series of parallel docks, some of them extending from Cob dock into the East River, and others extending from the mainland into the channel between the Brooklyn shore and the Cob dock. At the same time large additions were made to the plant on shore, many new buildings were erected, and up-to-date appliances for the transporting and handling of material installed. One of the most important machines which has recently been put in service is the large 100-ton floating crane which is illustrated on the front page of this issue. The crane is designed for the special work of handling turrets, heavy guns, armor, or other massive pieces of material which may have to be put in position on warships or removed therefrom during the course of repairs. We illustrated a few weeks ago a large crane designed for this purpose, and erected at a German shipbuilding establishment. That crane was of the fixed type, being located at the edge of one of the docks, and, of course, if any ship is to avail itself of its services, it must be warped into proper position alongside the crane. The new crane at our navy yard has been built upon a floating pontoon, with the special object of securing mobility, so that it may be brought alongside of a vessel, and the time lost in moving the ship be saved.

The structure consists of a steel pontoon which measures 100 feet in length by 60 feet in breadth and 11 feet 3 inches in depth, the normal draft being 9 feet 3 inches. Above the pontoon and parallel with its longitudinal axis is carried, at a height sufficient to give a lift of 45 feet and a reach of 45 feet beyond each edge of the pontoon, a pair of trusses which form the runway for a traveling crane trolley. The runway is carried upon massive latticed posts and struts, whose position and functions will be clearly seen in our engraving. The pontoon is divided into three compartments by two longitudinal bulkheads. The center compartment is given over to a 300-ton movable counterweight, the two outer compartments containing, one the hoisting and racking engines, and the other the boilers and coal bunkers. The counterweight moves over four lines of 100-pound steel rail, and it is operated by means of an endless wire cable, which passes from the trolley to sheaves located at either end of the pontoon, and from them is led to the drum of the racking engine. At each end of the pontoon is located a tank containing a non-freezable liquid, and each of these has a floating valve which rises and falls with any alteration of the level of the pontoon. The valve is connected to a longitudinal rod, which passes along the wall of the longitudinal bulkhead and serves by its movement to control the racking engine. The mechanism is so arranged that the movement of the counterweight may be automatic, or may be directly controlled from the engineer's platform. Its action is such that when a heavy load is being lifted, the counterweight is drawn back toward the opposite end of the pontoon, to a position in which equilibrium will be maintained and the pontoon kept on a level keel. An ingenious safety clutch is provided, as shown in our illustration. This consists of a pair of heavy wedges at each end of the counterweight, which are normally held clear of the counterweight by the pull of the wire rope by which the counterweight is moved. The wedges are keyed to a horizontal shaft carried at the front of the counterweight, which has a horizontal projecting arm at its center, to which the racking cable is securely attached. Ordinarily the pull of the cable keeps the wedges lifted clear of the car; but should the cable carry away, the wedges will swing down with their own weight and become engaged between the car and the floor of the pontoon, preventing any further movement.

The hoisting ropes are of 1⅛-inch plowed steel, there being eight parts to each block. The hoisting engine cylinders are 12 inches in diameter by 15 inches stroke, and they run at a speed of 200 revolutions per minute. The counterweight engine cylinders are 11 x 18 inches, and the speed of hoisting with a full load of 100 tons is 8 feet per minute; with 50 tons on one block, 9 feet per minute; while the speed with a light load is 25 feet per minute.

The Hatching of Chickens from Preserved Eggs.

The London Lancet recently published an article describing some experiments which had been made for the purpose of determining whether eggs could be hatched which had been preserved for twelve months by immersion in a ten per cent solution of sodium. It was said in the article that chickens had been hatched from these eggs. A correspondent of the Lancet now writes to that journal, narrating some experiments which friends of his undertook for the purpose of verifying the statements made. Twelve eggs were collected in June, and immediately placed in a ten per cent solution of sodium silicate and completely covered by the solution. On September 5 four eggs were taken from the solution and marked and with nine other newly-laid eggs were placed under a hen. All the newly-laid eggs hatched out within three weeks, but the four preserved eggs did not hatch. One of these eggs was boiled and was quite fresh; the other three were broken and the yolk fell out separately from the white. The whites were whipped up and became quite stiff. This is stated to be the best test of a fresh egg. It is of interest to note that these preserved eggs, even when they had been incubated for three weeks, still remain perfectly fresh, seeming to indicate that the shells were still impermeable to external influences.

Assuming that the remarkable preserving effect of the sodium silicate is due to the formation of an insoluble glass with the lime salts of the substance of the shell it is curious that it has been possible to hatch out a chicken without first making the shell again permeable to air. The experiment is one which should be repeated after the shell has by some method again been rendered permeable, for it seems improbable that the hatching of such preserved eggs can take place if the shell remains impermeable to air.

The Current Supplement.

The current SUPPLEMENT, No. 1456, presents the first installment of an article on the Viennese Metropolitan Railway, a road which should be of no little interest to those who have been witnessing the development of rapid transit in New York, Boston, and Chicago within late years. The article is illustrated with photographs that clearly show the engineering features of the work. O. F. Cook writes upon the Central American rubber tree. D. E. Salmon, Chief of the United States Bureau of Animal Industry, read a paper at the recent Farmers' National Congress on Infectious and Contagious Diseases of Farm Animals and Their Effect on American Agriculture. The paper is republished in the SUPPLEMENT. Lord Kelvin in a pleasant way recounts his early training in natural philosophy, and presents an interesting picture of his first teacher. The usual Trade Notes, Selected Formulæ and Consular Reports will be found in their proper places.