REALISM IN MILITARY MANEUVERS.

BY W. G. FITZ-GERALD.

The Titanic struggle now being waged in Manchuria between two armies, each approximating half a million of men, in which the line of battle often covers a front of fifty miles or more, has brought to a head the suspicion that the military maneuvers do not represent modern conditions, when guns may come into action at a distance of four or five miles, and small-arm fire likewise has a range formerly undreamed of.

Shortly after the Anglo-Boer war, the various chiefs of staff in the military cabinets of the world pointed out in war councils that the days of dashing cavalry charges, and the advance of infantry in dense masses was a thing of the past; and for the last year or so the great armies of the world have been steadily endeavoring to reproduce, as nearly as possible, in their maneuvers, the actual conditions of modern warfare, as they are shown in the Russo-Japanese battles of to-day.

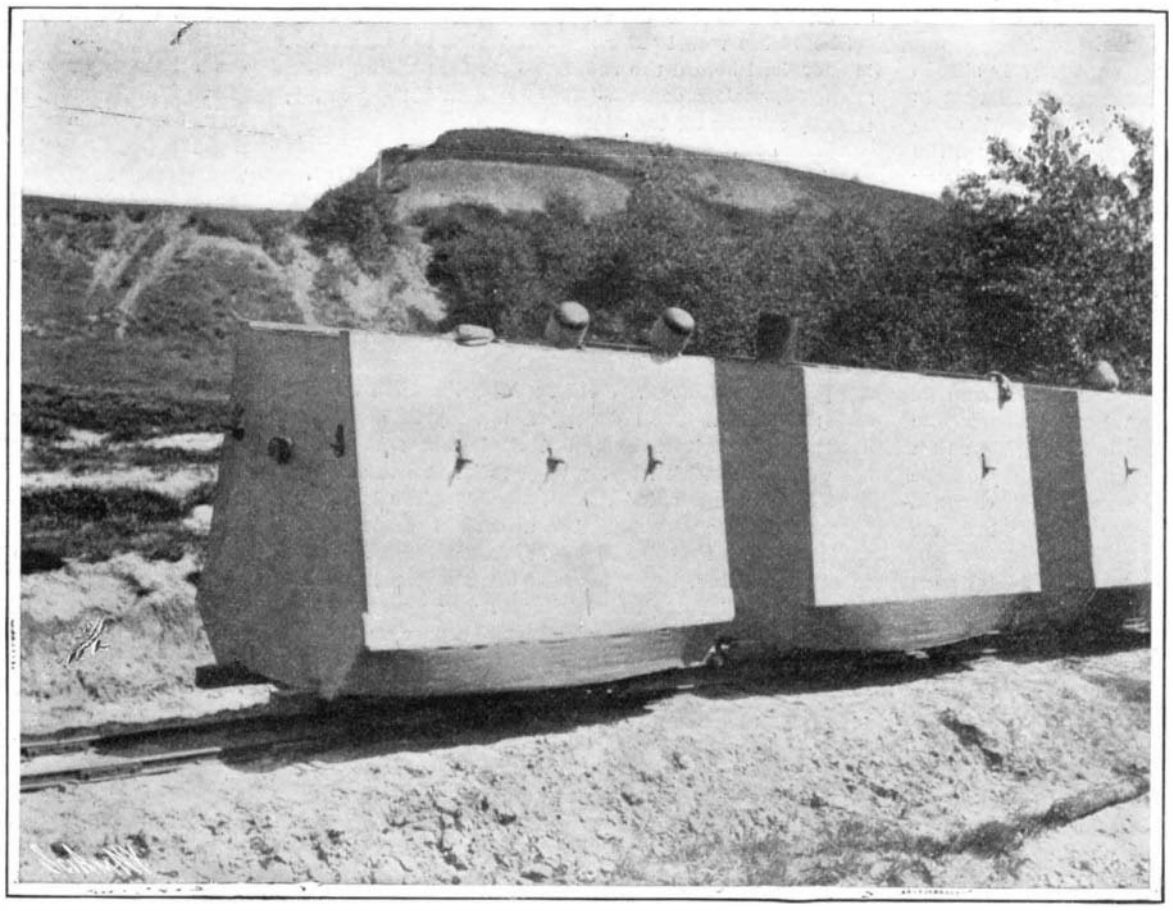
But to reproduce these conditions calls for vastly extended territory—a difficult and costly condition in the case of a very small country like Great Britain. It has been found that the famous military camp at Aldershot is altogether too circumscribed in area for the reproduction of the actual war conditions of to-day. Hence the British war department has acquired immense tracts of land on Salisbury Plain.

The French war office, as well as the military departments of Germany, Austria, Italy, and Russia, are also expropriating vast tracts of land, which are chosen not only on account of their great size but also by reason of their remoteness from human habitation, and the presence of "cover," rocky dells, hills, and other "conditions."

On Salisbury Plain the British government has laid down a portable railroad on which is run an armored train. One can imagine nothing more curious than to see these queer khaki-colored steel trucks flying along at five and twenty miles an hour under a perfect hail of shot and shell from an invisible "enemy." And yet, the train only contains two living persons—one the driver, and the other a recording officer, whose duty it is to report the number of hits and the general result of the fusillade.

Out of the top of the train, however, stick dummy heads of supposed soldiers, and concealed marksmen on either side of the line take very careful aim at them—for it should be said here that the most important innovation of all is the doing away with the old blank-cartridge system, whether in heavy ordnance or in small arms, and the substitution therefor of ball cartridge and live shell. So severe were British losses in the Boer war from attacks on farmhouses and other dwellings, that the British have erected several most curious structures of canvas and iron framework to represent houses of all kinds. These are defended by troops concealed in pits on the floor of the house, and both they and the attackers, who are deployed over a very wide front, use ball cartridges.

Incidentally it may be remarked that the Japanese, too, have suffered very severely from defended houses in Mukden and elsewhere. The danger to the attacking force under these conditions is sufficiently obvious, and need not further be emphasized. Inside the "farmhouses" which the British build so flimsily that each bullet will make a perforation, there is one officer whose sole duty it is to take note of the number of hits, and also to direct his men's return fire. Accidents are extremely rare, so effectively are attackers and attacked protected. When it is desired to aim at the open target, naturally human beings cannot be used; but in order to reproduce the conditions as nearly as possible, "men" ten feet high and mounted upon small trolley-cars running on rails, are ranged in line, and set in motion. There are similar dummies used to represent advancing cavalry, "head on."

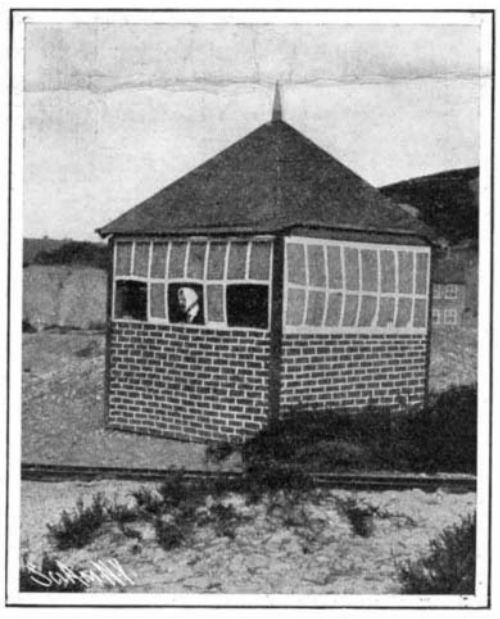


A Dummy Armored Train.

As every one knows, the military cabinets of every civilized nation are represented at the front in each war in the person of their military *attachés*. These officers, specially trained and most competent observers, bring back with them data upon which their chiefs rely to bring the army into line with the very latest conditions obtaining in actual warfare. It is then the business of the various war offices so to arrange that these conditions shall be reproduced as realistically as possible in the periodical war maneuvers.

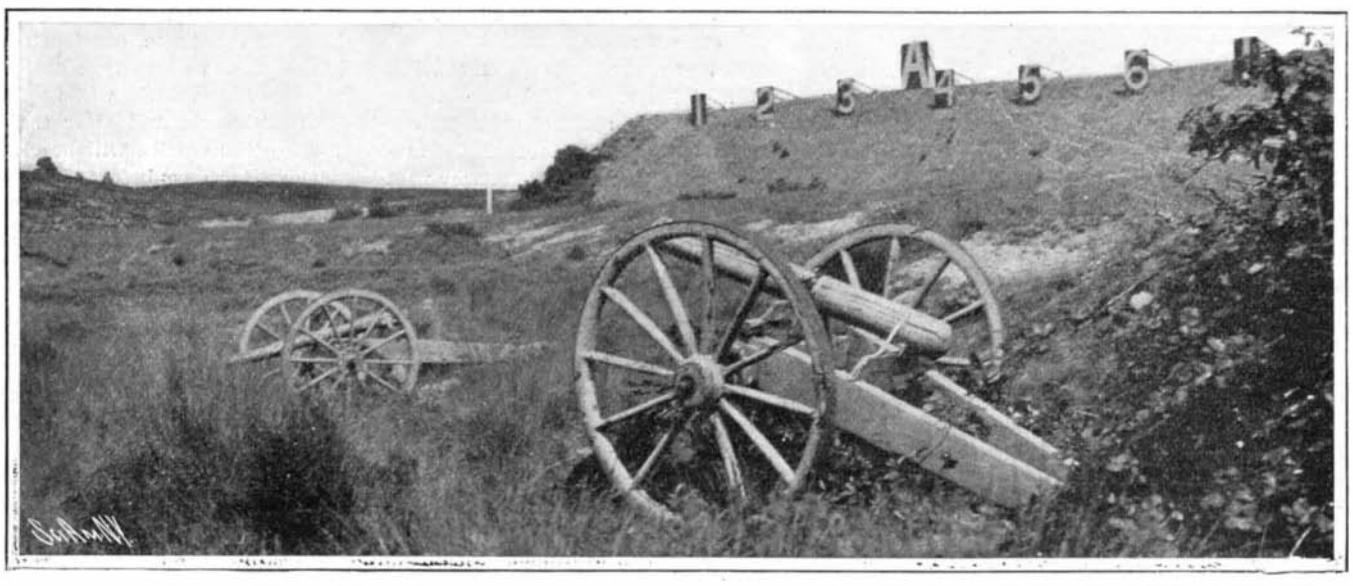
For example, both in the Boer war and the great struggle at present in progress, artillery has been so cunningly concealed that it has been next to impossible to locate it. In the war maneuvers of to-day real guns are mounted in the field in such a way that they can fire their shell and then disappear into a pit, leaving in front of them dummy cannons made of wood and mounted upon ordinary cart-wheels. These remarkable "scapegoats" are commonly pounded to pieces, so that nothing remains of them but the merest fragments.

There can be no doubt that the termination of the present war will see yet another change, even in the most realistic war maneuvers of to-day. It is common knowledge that *attachés* of the military powers of the world are constantly forwarding to the various war offices voluminous reports and suggestions; but so important and far-reaching are the changes involved or suggested, that it is probable the war departments will wait until all is over before inaugurating the new *régime*.



Dummy House Made of Lath Work and Sheet Iron, Defended by Troops and Attacked by Others Using Ball Cartridges.

Inside are special officers in ditches to register the percentage of hits.



Dummy Guns Made of Wood Are Placed in Position on the Field. A Firecracker or Two is Attached, Revealing Its Presence. Often the Wooden Guns Are Blown to Pieces.

THE CONCRETE AMPHITHEATER AT BERKELEY, CAL.

BY ENOS BROWN.

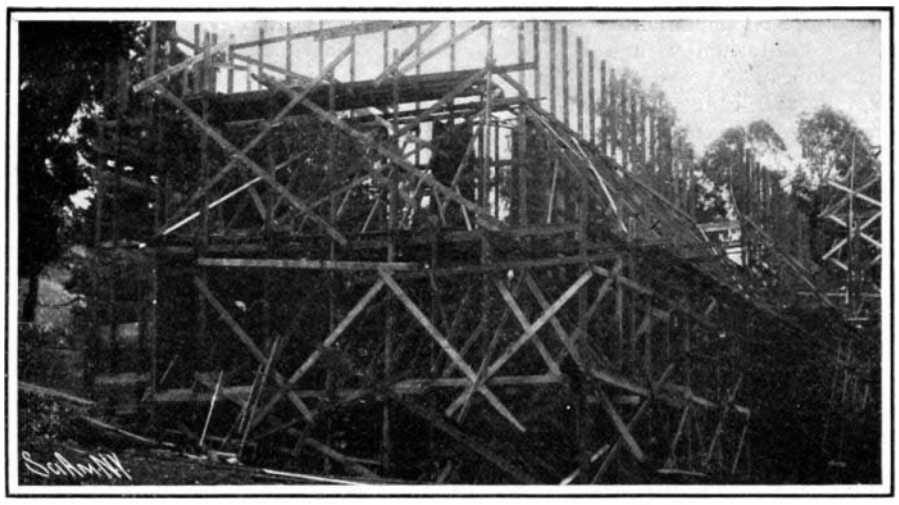
The Greek amphitheater of the University of California at Berkeley, ten miles east of San Francisco, was completed about eighteen months ago. As an essential adjunct of that great institution it has proved its utility and, structurally, its perfect success.

It has been the scene of important academic functions in which the President of the United States has taken the leading part, and witnessed the production of classic plays, performed by students in the garb of antiquity and recited in the sonorous tongue in which these monuments of Grecian literary genius were written over twenty centuries ago.

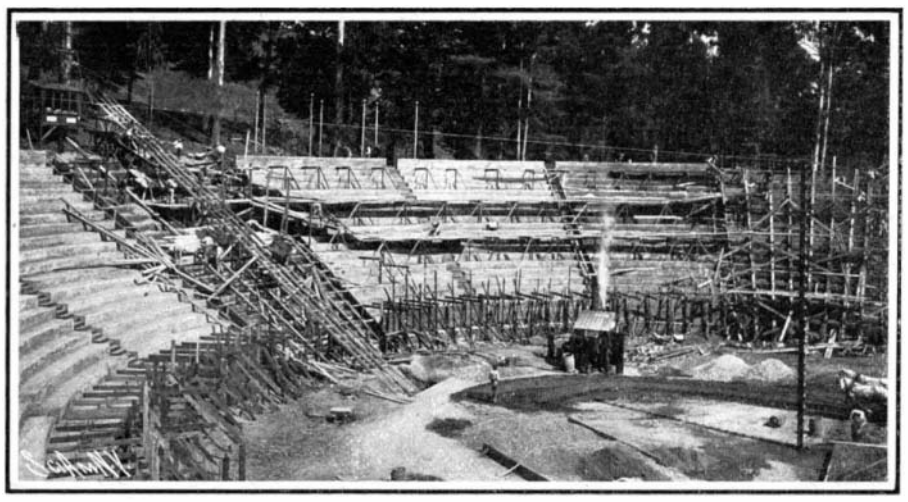
Nature provided a convenient site for this remarkable structure in one of the valleys of the university grounds, which extend in successive undulations from the base to the summit of the lofty range which forms the eastern boundary.

No institution of learning in the world has so incomparably magnificent a site or will (when the present architectural scheme is carried out) be housed in so splendid a group of structures as the University of California. The choice of a location for the amphitheater was decided by the natural advantages possessed by the little valley which, by the foresight of earlier years, had been inclosed in a thick growth of eucalyptus trees. The base formed a level platform, and from all sides the banks arose in regular ascent to a considerable height.

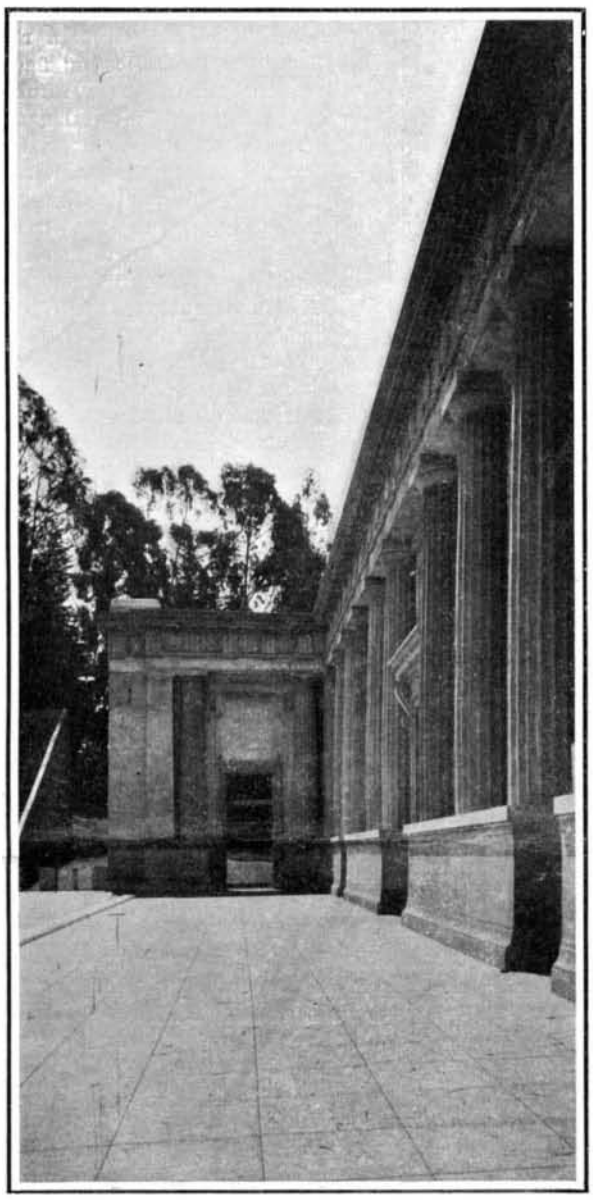
Prior to the



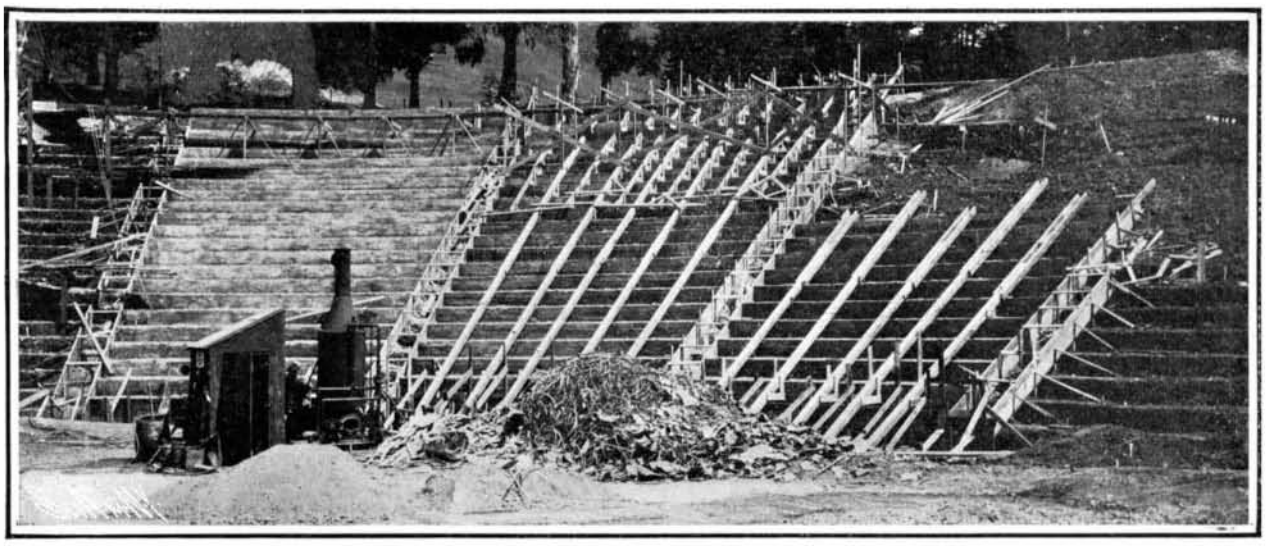
Scaffolding for Concrete Forms of Stage.



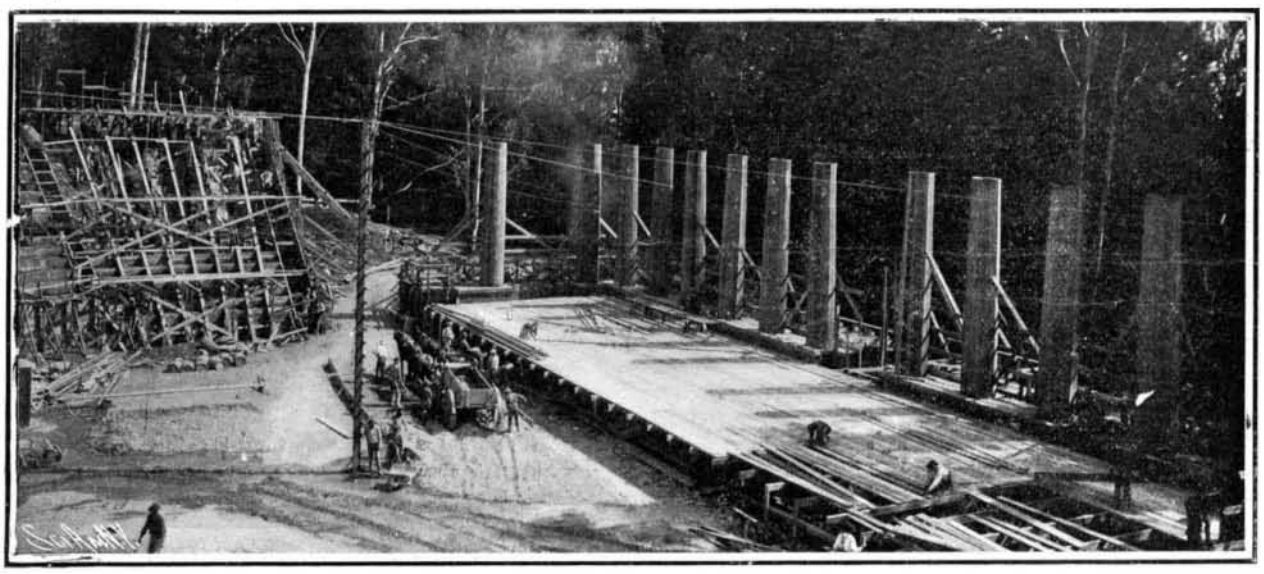
Preparing Concrete and Conveying to Steps of Amphitheater.



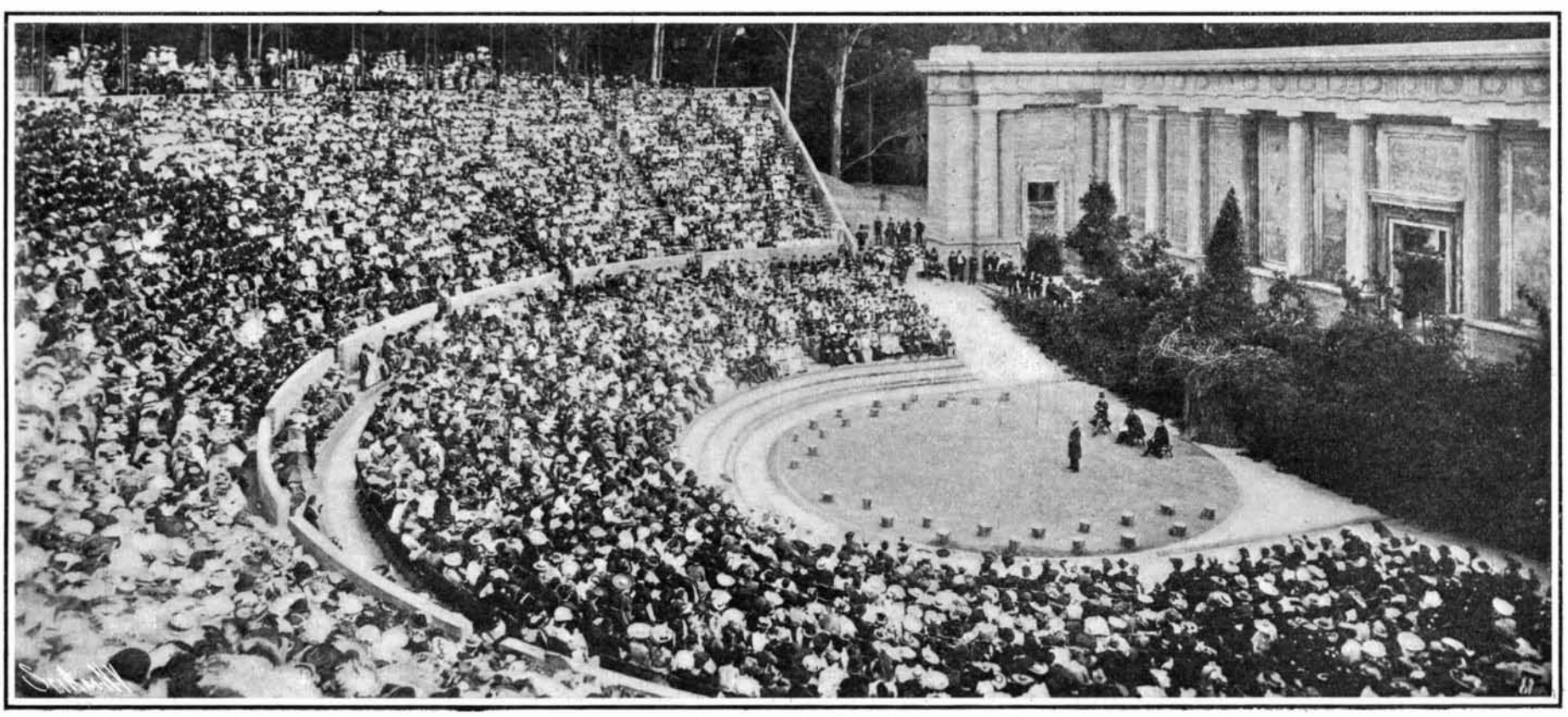
Stage Looking South.



Tiers of Seats Cut into the Embankment.—Covering Steps with Concrete.



Forms for Stage, Concrete Columns.



Class Day in Amphitheater.

THE CONCRETE AMPHITHEATER AT BERKELEY, CAL.

THE CONCRETE AMPHITHEATER AT BERKELEY, CAL.

building of the amphitheater, the University of California had no structure large enough to accommodate its own students, much less the multitudes which at certain periods throng to the various commendatory exercises of the scholastic year.

Construction began in the middle of February, 1903, and progressed so rapidly that in May the President of the United States delivered from the stage an address that excited the rapt attention of an audience of over 8,000 people. In the following September the amphitheater was completed to its present stage, the "Birds" of Aristophanes being performed in the original tongue by a company of students.

The building is composed of two unconnected parts, the auditorium, or theatron, of the Greeks and the stage.

The auditorium is a great semi-circle, 254 feet 8 inches in diameter, with two tiers of seats. The center is a level circle, 50 feet 8 inches in diameter, and 5 feet 5 inches below the stage floor. It is distant from the stage 7 feet. The circle corresponds to the orchestra of the ancient Greek theater, the part appropriated to the chorus. Surrounding this circle rise twelve steps each 3 feet in width and having a rise of 5 inches. Upon these steps 1,600 chairs may be placed. Between the lower tier and the upper sections of seats an aisle, the diazoma, extends 9 feet in width, on an exact level with the stage floor as well as of the side entrances between the auditorium and the stage. On the outer circle of the diazoma, or aisle, is a wall 10 inches thick and 5 feet high. A bench at the foot of the inner base of the wall will seat 160 persons. Above the wall, at an incline of 30 degrees, so as to afford spectators a perfect view of the stage, rise the main seats of the auditorium arranged in nineteen rows of steps each having a width of 30 inches and an 18-inch rise. Eleven aisles lead from the lower wall and divide the seats into ten sections, the steps in the aisles being 15 inches wide and 9 inches high. A wall, two feet high and pierced by nine openings, surrounds the outer circumference. Each end of the auditorium is flanked by a retaining wall rising 3 feet above the steps and 10 inches in thickness at the top. The walls step out under the seats in 1-foot ledges to a total width of 10 feet at the foundation.

The stage of the amphitheater is the only portion of the edifice in which the simplicity of the design has permitted the introduction by the architect of a certain amount of well-judged ornamentation. The inclosing wall is faced by sixteen fluted Doric columns which support a classic cornice with triglyphs and metopes, enriched by bosses. The end walls terminate in massive pylons. There are five entrances—one at each end and one on each side of the great central door opening in the rear wall of the stage. The height of the stage floor corresponds with the elevation of the diazoma or aisle surrounding the central circle and the paradoi or entrances on each side between the stage and auditorium. The total length of the stage is 134 feet. The paneled wall on the back and ends is 42 feet high. The inside wall, following the ancient types, is designed to represent a castle or temple, and is purely classical.

The original design of the architect calls for an open parapet with clustered columns and bronze ornamentation on top of the stage wall while an encircling colonnade and covered promenade will surround the top of the auditorium. It is also in contemplation to cover the concrete work of the auditorium with stone, marble or other permanent material.

The amphitheater, as it stands, is a work of distinction. Its architectural features deserve high encomium, but the chief merit of the structure consists in the fine use of material and the success with which concrete has been employed for so complicated a purpose. The courage to undertake and erect so noted a building of concrete has been justified. The architect has scored a triumph and the builders immense credit, but the achievement would have been impossible but for the remarkable quality of the material furnished by the makers of the cement. The writer lately carefully inspected the work, going over those portions where the wear of the elements would most likely be shown, but no evidences of disintegration were to be observed. The flutings of the columns and the outlines of ornaments of the stage were as sharp and perfect as when molded. Some little subsidence was seen in the upper tiers of the auditorium, but so slight was the effect as to be hardly noticeable. The great structure looked as though it might last for centuries.

The amphitheater was the gift of Hon. William Randolph Hearst, who contributed $42,000 for its erection.

South Corner During Construction.—Form for Concrete Columns for Stage.

Observations with the Portable Astrolabe.—M. Driancourt, engineer, has tested the Claude astrolabe in Madagascar, and confirms the high precision which won for it a prize in France. The determinations did not exhibit an error of more than half a second. Tests at the observatory at Montsouris tend to show that it furnishes results as precise as those of the fixed instruments of the observatories.

Chemical Reactions at Extremely High Temperatures.

Very high temperatures may be attained by the burning of aluminium in air or oxygen. According to Prof. C. Zenghalis, in the Elektrotechnische Zeitschrift, Goldschmidt succeeded in obtaining a temperature of 3,000 deg. C. through the direct burning of aluminium by means of combined oxygen. The theoretical calculation for the burning of aluminium in free oxygen permits us to expect temperatures far exceeding this, in fact the astonishing figure of 19,062 deg. C. should be reached. The experiment was carried on in this wise: The aluminium was placed in a highly-heated crucible, and burned while passing through it a stream of oxygen. The collected data resulted in the following findings: The temperature reached is not below that of the electric arc light; platinum, lime, and magnesia melted and volatilized immediately, while the lime and magnesia further combined to form aluminates. The unconsumed aluminium took on a spherical shape. Another interesting circumstance is this: When a mixture of either powdered graphite or soot and aluminium was burned together, the result was aluminium carbide. When, instead of oxygen, nitrogen was supplied, as much as 38.57 per cent of the aluminium could be converted into a nitrite. In the presence of carbon dioxide and carbon protoxide, aluminium burnt violently at a temperature of over 1,000 deg. C., the burning of the carbon went forward without incident, and aluminium oxide or carbide was formed. N_2O and NO will react equally as violently with aluminium under like conditions, that is always presupposing a very high temperature.

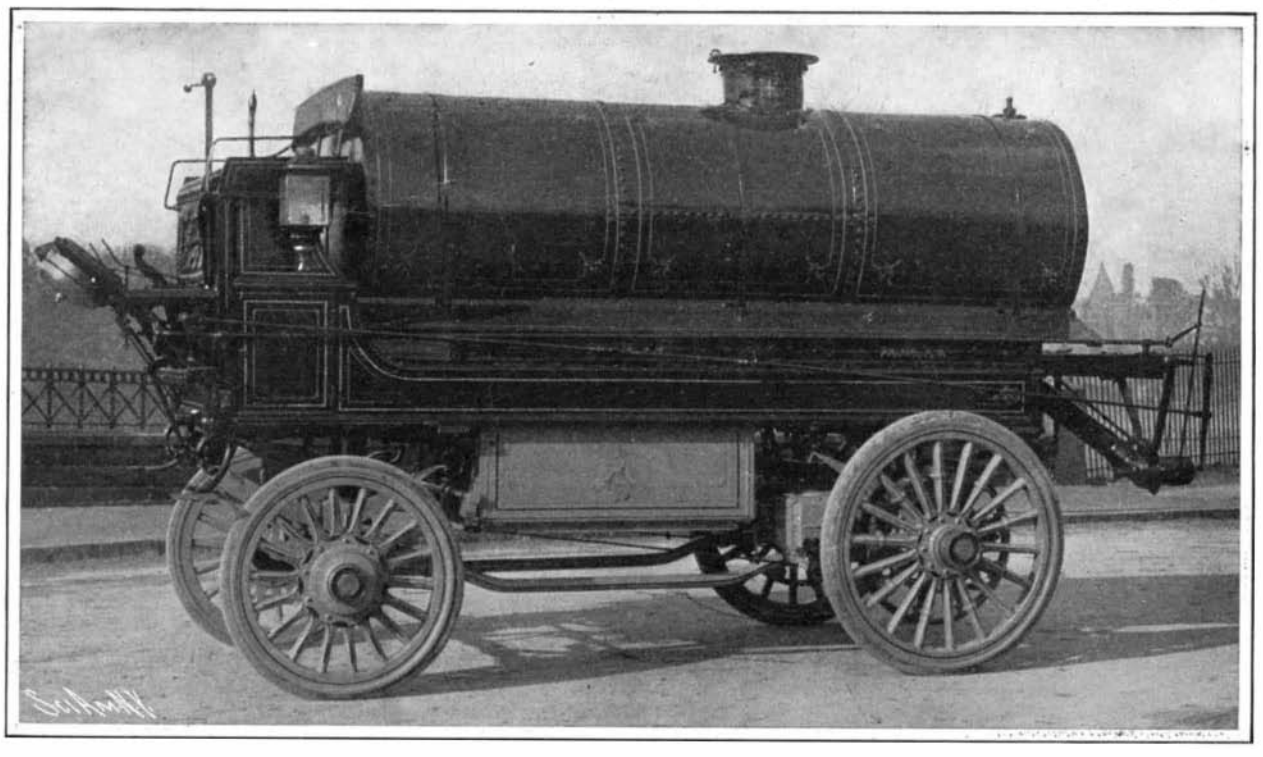
AN ELECTRIC STREET SPRINKLER.

A few weeks ago the Edward Balf Company, street sprinkling contractors, of Hartford, Conn., placed an order with the Electric Vehicle Company for an electric sprinkler. The machine was delivered last week and immediately put into commission. It is pronounced a complete success and has attracted a great deal of attention in daily use on Hartford's principal thoroughfares.

In general style the sprinkler resembles the ordinary build of horse-drawn sprinkler. The iron water tank is of the usual boiler pattern and has a capacity of 600 gallons. This tank is mounted on a medium-weight truck chassis, power being derived from an underslung Exide battery of 44 cells. There are two motors, normally rated at from eight to ten horse-power, and the normal speed is six miles per hour.

The machine covers from 30 to 40 miles daily in actual use, or about twice the mileage of a two-horse sprinkler with one change of horses; in other words, the machine does double the work of four horses.

As this is the first attempt to substitute automobiles for horses in street sprinkling, the outcome of the experiment will be watched with a great deal of interest. From present indications it will be thoroughly successful. One obvious advantage is that at times when the sprinkler cannot be used on account of the season of wet weather, the owner is not obliged to maintain horses in idleness. The maintenance of the storage battery should cost but little in the present case, as the service it has to perform is light.



AN ELECTRIC STREET SPRINKLER IN USE IN HARTFORD, CONN.