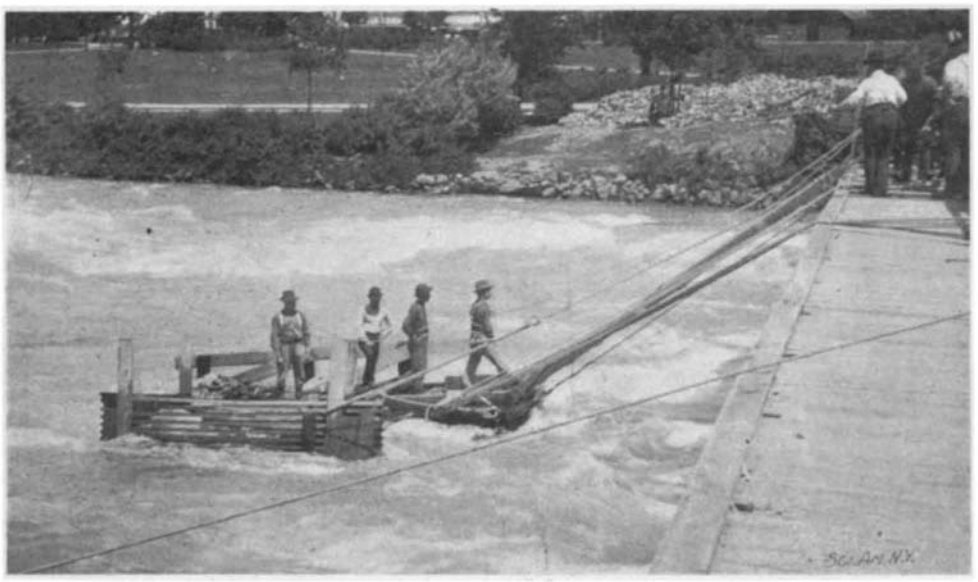
REBUILDING NIAGARA'S RESERVATION BRIDGES.

During the last session of the New York State Legislature the sum of $122,000 was appropriated for the construction of new bridges to connect the mainland with Green Island and Green Island with Goat Island at Niagara Falls. This is a part of the State Reservation at the Falls, and the site of the bridges is right through the upper rapids not over 500 feet back from the brink of the American Fall. In due time the commissioners of the State Reservation, who have charge of the expenditure of the appropriation, awarded the contract for the work to W. H. Keepers & Company, of New York, who are now engaged in carrying out the provisions of the agreement.

This piece of bridge construction is unequaled for interesting conditions by any similar work ever carried on at Niagara, a locality rich in interesting features of bridge erection. It is made worthy of considerable attention by the mere and remarkable fact of its location so near to a precipice of the height of the American Fall, and right in the midst of the upper rapids, where the current runs all of 30 miles an hour. The distance back from the Fall, and the speed of the current, are only too suggestive of the probabilities of death for any of the workmen who might, by accident, plunge from the bridges into the water. Then the fact that these tumultuous waters are to be spanned by concrete bridges is an important feature. The placing of a concrete arch over quiet waters is a task requiring engineering skill, and doubly true is it when a 30-mile current and a maximum depth of 11 feet of water are to be encountered.



WORKMEN PREPARING A FOUNDATION FOR A NEW BRIDGE AT NIAGARA, WITHIN 500 FEET OF THE AMERICAN FALLS. LIFE-LINES ATTACHED TO THE WORKMEN.

This new concrete arch, to connect the mainland with the island that is termed Nature's Temple, will be the fourth bridge built on the river near the site. It was in 1817 that the upper rapids were first spanned by a bridge, which was carried away that winter. With the coming of spring in 1818 another bridge was built, and in 1855 the third bridge was thrown across the riotous waters. It is this last bridge that will give way to the concrete arch. The old bridge was an iron structure resting upon three piers in the river, and there is every reason to believe that the style of the concrete bridges will do much to add to the beauty of this already magnificent section of the State Reservation and river. The design selected is in keeping with the general plan to beautify the locality about the Falls, on which so much progress has been made since the State took possession of the lands in 1885. No work yet done in beautifying the lands has cost so much as this individual step in bridge erection, and it is but continuing the improvements, so praised by all, on truly magnificent lines.

The work of building the new bridges naturally forced a suspension of all carriage traffic to Goat Island, but pedestrians have been provided with a means of crossing by a temporary bridge erected below the old bridge between Green Island and the mainland, and by another temporary bridge erected above the old bridge between Green Island and Goat Island. These temporary bridges are about six feet wide. They are formed of frame trusses resting upon rock-filled cribs or piers.

The length of the bridge between the mainland and Green Island will be 371 feet, and in this length is included the finishing panels. There will be three spans. The end spans will have a length of 103½ feet, while the center span will be 110 feet long. The rises of the end spans will be 10 feet and that of the center span 11½ feet. The piers will have a width of 13½ feet and a length of 53½ feet. On the upstream end the piers will have a granite nose or ice breaker. The width of the roadway will be 20 feet in the clear, and on each side of it will be granitoid walks 9½ feet wide. The length of the bridge between Green Island and Goat Island will be 198 feet, including the finishing panels. This bridge will also have three spans. The length of the end spans will be 50½ feet and that of the center span 55 feet. The piers will be 8 feet wide and 50 feet 5 inches long. They will also be fitted with granite ice breakers. The roadway and walks will be identical with those on the bridge above referred to.

The structure is to be stone-faced throughout, and it is expected to have it completed before winter sets in. To accomplish this, work will progress night and day. The mixers and pumps are operated by electric motors. The piers for the arches will be built in cofferdams surrounded by shields in order to break the force of the current and keep the water out. Life lines and buoy rafts are stretched along the work or float where deemed necessary for the safety of the men engaged on the work. A cableway has been stretched between the mainland and Green Island to facilitate operations, while derricks will handle the material for the bridge from Green Island to Goat Island.

BUILDING ANCHORAGE IN THE RAPIDS FOR THE COFFERDAM.

BUILDING A TEMPORARY BRIDGE TO GOAT ISLAND.

Balloon Accident in Paris.

A curious balloon accident occurred in Paris a short time ago. A throng of people had gathered at Vincennes, just outside the Machinery Annex of the Exposition, to see the balloon ascension. The aeronaut did not start promptly, owing to the high wind which was blowing at the time. The crowd was disappointed, and began to hoot and jeer him. This demonstration caused Captain Mouton, the aeronaut, and his assistant, to give the order to let go. The balloon rose above the housetops, and a sudden gust of wind blew it over and bumped the balloon against telegraph and telephone wires. Ballast was thrown out, and the balloon rose a little, but the wind blew it against the roofs of the houses, and it knocked over a chimney and tore away several window shutters. The car was caught in the network of telegraph wires, which caused a short circuit, and a spark lighted the balloon. This started a panic, as all knew that an explosion must ensue.

The aeronaut opened the safety valve of the balloon, but he was too late to prevent the explosion. There was a report like a cannon, and the correspondent of The New York Times stated that the balloon looked like an immense pear-shaped vessel hissing and smoking, with a blaze that was perceptible all over Paris. The upper floors of one house caught fire, which added to the horror of the accident. The assistant succeeded in coming down by the aid of wires and poles, and was quite badly burned by the flames. Captain Mouton, in trying to cut the car away from the body of the balloon, became entangled in the cords and was burned and bruised, though not seriously hurt. It was two hours before the firemen could get the flames under control.

Inclined Stairways for the New York Elevated.

An inclined stairway or ramp has been built at the Fifty-ninth Street Station of the Third Avenue Elevated Road, with a view of adopting it on a majority, if not all, of the stations of the road. It is of the Reno type, which we have already illustrated. The time has arrived when the traffic is so heavy on the elevated and the stairways are so narrow that some means must be employed for raising the passengers to the level of the platform. Both the elevator and the inclined stairway will be fully tested before anything definite is decided upon. When the roads are equipped with electrical power it will be a very simple matter to put in motors at each station to run either an inclined stairway or an elevator. The inclined stairway now in use has a capacity of three thousand passengers per hour. The receipts at the ticket offices have already increased since the new improvement was introduced.

A New Gutta-percha.

The English acting-consul for Zanzibar reports the discovery of a new gutta-percha. This substance is derived from a tree which grows principally at Dunga. When tapped with a knife, a white fluid emanates, which, when placed in boiling water, coagulates into a substance which in character bears a very striking resemblance to gutta-percha. As the material cools it becomes exceedingly hard, but while soft it can be moulded into any required shape. The fruit of the tree resembles a peach in shape, but grows to the size of a small melon. Experts have experimented with this new product to see if it in any way possesses the qualities of gutta-percha, and although it is not expected to prove equal to the genuine article, it is considered that it will be quite suitable for some purposes for which gutta-percha is at present utilized, and it will thus become a marketable article. It is said to abound in Zanzibar, and will be a very cheap product.

Automobile News.

Mr. John Brisben Walker ascended Pike's Peak, Col., September 8 by an automobile. He did not go to the very top, but made an ascent of 11,000 feet, thus making an automobile record. The road was in very bad condition or the top would have been reached. The descent was an exciting one.

A steam vehicle belonging to a Newport resident was recently put in the stable at night, and the owner neglected to turn off the fuel supply. Steam was generated rapidly, and the safety valve blew off at intervals. This continued until all the water in the boiler had evaporated; a fire then started, and the machine was rendered worthless.

At a meeting of the Executive Committee of the National Association of Street Railway Employés, held at Detroit, Mich., September 7, the president was instructed to draw up a plan by which local unions are to be assessed in order to raise a fund with which to purchase automobiles for use by the street railway men in the cities where strikes are in progress.

The Emperor William of Germany has now become a devotee of the automobile. It was constructed under the instructions of the German War Office, and after completion was carefully examined by two engineers from the Daimler manufactory at Stuttgart. The automobile weighs thirty-two hundredweight, and is propelled by a benzine motor capable of imparting a speed of sixty miles an hour, and the vehicle cost $9,000.

The Greater Inter-State Fair of Trenton, N. J., which will be held September 24 to 28, will have some interesting automobile races. The Automobile Club has accepted the cup which the Trenton Fair Association has tendered to the club for a road run from New York to Trenton. A motocycle race of 10 miles has also been added to the programme. All the floor space originally assigned to the Automobile Exposition Department of the Fair, comprising 25,000 square feet, has been taken, and the erection of an annex is in contemplation. The entries for the race close on September 20.

Consul-General Guenther says: On July 25 the motor factory of Oberursel, near Frankfort, exhibited in the presence of a number of experts its new alcohol plow locomobiles. The plow locomobile is a 20 horse power one, and confidence is expressed by competent judges that coal can in some cases be substituted by alcohol, which can be procured everywhere and at a low cost. The alcohol plow is said to have performed its work fully as well as a steam plow operated simultaneously. The problem of using alcohol for power purposes has been solved by the motor factory in evaporating denaturized alcohol of 90°. The construction and operation of the motor is, after this gasification, the same as that of a gas motor. The machine uses about a pint of alcohol an hour for one horse power. It is claimed that the operating expense is 25 per cent lower than that of steam plows.

The question of automobile traction for military service is now being studied in the different armies of Europe. In Germany and Italy especially a number of experiments are being made, and two principal solutions of the problem have been examined. In the first case ten automobile wagons would be used, these being of the normal type, weighing 30 tons, of which 12 constitute the load; the distance to be covered by the automobile is about 47 miles per day. In the second case a large tractor, self-contained automobile, or locomotive with tender would be used, to draw wagons equally of 30 tons, and covering the same distance per day. The main difference between the two systems is that in the first case there are ten motive apparatus to look after, while in the second there is but one. According to circumstances, these two systems have been adopted in several armies. In England two types of automobile wagons are used. The first is an armed automobile used for scouting purposes; this type was constructed during the Egyptian campaign and is adapted to run on a railroad track; it carries a Maxim gun, two officers and one man. The other model is used on ordinary roads and is armor-plated, carrying two Maxim guns and a dynamo which supplies an arc-projector; a device enables the current to be sent into the armor-plate itself, which is a good means of defense when attacked at close quarters. The motor used is of the petroleum type, with electric ignition. As to the lighter automobiles for military use, an increasing interest is being taken in this question. The Emperor William, who has given great attention to the subject for some time past, has just accepted three automobiles from different manufacturers, with the intention of trying them during the grand maneuvers in order to determine personally the services which they may render. The automobile is already playing an important part in the Austrian army, and its efficiency has been tested in the recent military maneuvers. Twelve automobiles have been used for the sanitary service and a great number of motocycles placed at the disposition of the officers. Major-General Maurice followed the cycling maneuvers which were recently held in England, on a quadricycle with petroleum motor of the De Dion type. The opinion as to the service rendered by this vehicle is quite favorable, at least as concerns the transportation of the superior officers at times when combat is not actually engaged.

The Home of the Krupp Gun.

BY C. E. CARPENTER.

A remarkable record of commercial enterprise and colossal industrial development is contained in the annual report for 1899 of the steel works of Friedrich Krupp, the great German ironmaster. Krupp, as is well known, occupies the position in Germany that Andrew Carnegie does in the United States. There is much of resemblance between the two men. Each possesses the wonderful executive ability and tireless energy for carrying out, without heed of odds, the inventions of his active brain. Krupp's millions have been piling up with a speed and steadiness equal to the Pittsburg iron king's, and although his business has grown to a degree the magnitude of which would seem to belie the possibility of further increase, the bounds of his prosperity are by far not yet in sight.

In the United States, the general public's knowledge of Krupp pertains almost entirely to his reputation as a maker of war materials. Few people are aware that his huge steel works turn out every variety of iron and steel products, from railroad trains to machine tools. Cannons and guns form merely a small part of his output. A fair idea of the amount of business captured yearly by the Krupp plant is given by the figures of labor employed during the calendar year 1899. These consisted of no less than 49,679 persons, 3,559 of whom were engaged in the offices alone; 27,462 men were employed in the main steel plant at Essen; 3,475 at the Buckau branch (near Magdeburg); 345 at the Germania shipyards in Kiel; 6,164 in the coal mines and 6,128 at the various ore mines and trial shooting grounds.

One would rightly think the caring for so large a body of men to be a most difficult undertaking. And yet no army is under better management than the men who turn out the grim instruments of war that find their way to every quarter of the globe and deal death to many thousands of all nationalities annually.

The workingmen live in settlements, in dwellings erected for their comfort by their thoughtful employer. At the Essen plant alone Krupp had erected up to the first of April, 1900, 4,853 family dwellings for the housing of his married employes. The houses are rented to the men at a very nominal rate, the firm receiving no profits therefrom and stipulating only that the buildings shall be kept in good condition by the tenants. Besides these homes, there are two large lodging houses for the accommodation of single men, a hospital, two barracks for epidemic cases, a convalescent home, a workingmen's eating house, a club house for clerks, a casino for works' foremen, a housekeeping school for girls, an industrial school for adults with three for children, a library and several minor institutions. The "Wirthshauser" (beer restaurants) are under the direct supervision of the officials, and intoxication is a rare sight among the laborers.

The form of protectorate thus exercised over employes outside of the works, strange as it may seem in this country, causes no friction in the community, Krupp's idea not being to exercise a rigid restraint over his men, but merely to build up their daily life on lines that will in the end prove most beneficial to them. His success in this is amply attested by the general content and cleanliness of the settlement.

Returning to the actual business of the plant, it should be mentioned that the firm of Krupp proper comprises the steel works at Essen and at Annen, in Westphalia; the blast furnaces near Duisburg, Neuwied, Engers and Rheinhausen (the latter possessing three furnaces each of 230 tons capacity per diem); a plant near Sayn; four coal mines near Hanover and shafts at Salzer and Neuack, besides part ownership in various other mines; more than five hundred iron ore mines in Germany, of which eleven are deep borings fitted with mechanical equipment; various deposits near Bilbao, Spain: shooting grounds near Meppen 10 miles in length with a possible firing distance of 15 miles; three ocean steamers; several stone quarries and clay and sand deposits, besides the control and operation of the shipbuilding and machine company "Germania" at Berlin and Kiel.

The principal articles of manufacture at Essen are cannons, guns, ammunition, gun barrels, armor plate and sheet armor for all protected parts of warships, as well as for fortifications, iron and shipbuilding material, machine parts of every sort, sheet iron and steel, rollers, tool steel and scores of other articles, the enumeration of which would occupy too much space here.

The Essen plant is divided into the following departments: 2 Bessemer works containing altogether fifteen converters; 4 Martin works; 2 steel casting works; puddle works; crucible steel plant; welding mill; iron castings works; works for casting guns and brass; glowing rooms; hardening halls; crucible chambers; block rolling mill; rail rolling mill; sheet rolling mill; bolt and spring steel works; spring machine shop; mill press and armor plating rolling mill; hammer works; wheel foundry; open sand and hoof foundries; tire rolling mill; boiler foundry; field railway construction shops; mechanical workshops (with file factory) 4 repair shops; railway machine shops; testing laboratory; 2 chemical laboratories; 1 chemi-physical testing laboratory; shops for construction, mechanics' saddlery and cutting; a boiler house; electrical plant; gas works with one plain and two telescoped gas tanks holding respectively 5,700, 17,500 and 37,500, altogether 60,700 cubic meters; water works with three separate water sources; factory for fire-proof brick and briquettes; brick kiln; lithographic and photographic establishments, together with a book bindery, freight office, telegraph, telephone, fire and safety departments and food supply stores.

The most interesting estimate of the size of the plant, however, is gained from the figures bearing on the consumption of gas and water, the telegraph and telephone lines, etc., inside the works. For example, the consumption of water at the steel plant amounted in 1899 to 15,018,156 cubic meters (49,054,468 cubic feet), or as much as the city of Cincinnati. The combined length of the subterranean water conduits was 107 miles, that in the buildings 66 miles, with 451 hydrants and 604 fire plugs. The use of gas for lighting purposes amounted to 60,708,045 cubic feet (or as much as the city of Leipzig, Germany), the same supplying 2,596 street lights and 41,745 lights in the buildings of the plant. The total length of the underground conduits was five and a half miles; that of the interior conduits 145 miles. The Krupp gas plant is the seventh largest in size in the German empire.

The electrical plant of the steel works possesses three machinery rooms with six distributing stations, eighteen miles of underground and fifty-odd miles of overground cable for lighting, and feeds 877 arc lights, 6,724 small lights, and 179 electro-motors.

As regards means of transportation, Krupp's plant is singularly well supplied; a standard gage railway net is in direct track connection with the Essen railway station, North Essen and Berge-Borbeck. Communication with these three stations is effected daily by fifty complete trains. In all, the net comprises 36 miles of track, 16 tender locomotives and 707 cars; furthermore, there is a narrow-gage railway net with 28 miles of track, 26 locomotives and 1,209 cars.

Even more suggestive than the foregoing are the figures relative to the telegraph and telephone systems connected with the works. Krupp's telegraphic net contains 31 stations with 50 Morse apparatus and 50 miles of wire. It connects with the imperial telegraph office in Essen, and the yearly business between the factory and the city amounts to no less than 22,787 sent and received dispatches. The long distance telephone possesses 328 stations with 335 apparatus and 200 miles of wire, while the daily usage averages 900 to 1,000 conversations.

The fire department is composed of ninety-five men. The works proper contain 347 and the outbuildings 121 hydrants; while in addition there are 35 extra water sources for use in case of necessity, 82 electric fire alarms, besides the 330-odd telephone call stations, the latter being also used for alarm calls.

Lastly the statistics of coal and ore are of sufficient interest to deserve mention. At the mines, an average of 1,877 tons constituted the daily output of ore, while the production of coal in the mines proper averaged 3,738 tons per diem. Coal and coke were consumed at the steel plant to the extent of 952,365 tons—an average of 3,174 tons daily, or eight railway trains of 40 cars holding ten tons each. The total consumption at the remaining works was 622,118 tons, or in all 1,570,483—5,000 tons daily.

The Current Supplement.

The current SUPPLEMENT, No. 1290, has many articles of great interest. The first page illustrates and describes the "Tour du Monde" at the Paris Exposition. "American Engineering Competition—X." deals with stationary engines. The second article on "Mechanical Stoking" treats of the Roney Mechanical Stoker. "The Oldest Library in the World" deals with the wonderful discoveries at Nippur, which are referred to elsewhere. "The Mycenæan House of the Double-Ax" is an interesting archæological article by Louis Dyer. "The Mission of Science in Education," by John M. Coulter, is concluded. "The Coal Trade of the United States and the World's Coal Supply and Trade" is illustrated by a graphic diagram.

Contents.

(Illustrated articles are marked with an asterisk.)