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BIG GUNS FOR COAST DEFENSE.

The chief of the bureau of ordnance, Gen. S. V. Benet, in his recently submitted annual report, notes that a twelve inch breech-loading steel rifle is now nearing completion at the Watervliet Arsenal, and will probably be ready for trial in February. This is the largest size of modern gun we have yet attempted to manufacture, but the Watervliet plant is being put in shape by the government to turn out, also, sixteen inch steel guns. These guns will be fifty feet long and weigh 125 tons each, requiring a full firing charge of 1,000 pounds of powder of the description at present used, and throwing a projectile over a ton in weight. It is expected that these guns will have a maximum range of about fifteen miles, and a muzzle power equal to the penetration of three feet of iron. The plans of the fortifications board call for forty-four of these guns for the defense of ports of the first importance, with the idea of manning our future coast defenses with guns of heavier caliber than are now made for the largest ironclads, and which the highest authorities declare it is impracticable for them to carry and work. The proposed artificial island forts at the entrance to New York harbor, shown in our first page illustration, would afford admirable positions in which to place a few such guns, which, according to the plans of the ordnance department, are to be "mounted in pairs in turrets occupying low and exposed sites, and commanding the principal water approaches" to the port, where they will have "an offensive power commensurate with the importance of the position they will occupy." It is altogether probable, too, that before these guns are completed, or the forts in which they are to be placed will be ready for them, we shall have found and adopted a practicable smokeless powder, affording much greater penetrative force than the explosive agent at present employed, and giving the defense an immense superiority to any means of attack at present known.

PROGRESS OF ALUMINUM.

Since 1885 the efforts made to cheapen the cost of aluminum have been especially earnest among the metallurgists and chemists, both in this country and abroad. In this work Mr. H. Y. Castner, of New York, and Messrs. Cowles, of the Cowles Electric Smelting and Aluminum Company, of Cleveland, O., and Lockport, N. Y., have been especially active, a 500 horse power dynamo having been erected at the latter place for the aluminum manufacture in 1886. And yet so difficult has been its production that five years ago its price was quoted in troy ounces at from 75 cents to $1.25 per ounce, although within the past year or two it has been sold at $3 to $4 50 per pound. Now, however, Mr. Eugene H. Cowles claims to have discovered a new process for the cheap extraction of this metal from common clay. According to the New York *Times* he says:

"We now expect to offer a pure metal made by a new process that is radically different from anything yet known to metallurgists—a process that is ridiculously simple in operation and almost theoretically perfect. By reason of two chemical discoveries it is found that the pure metal can be extracted direct from the clay. This can be done without the use of electrical heat. When operated on as large a scale as that on which iron is produced, aluminum will be produced at a cost permitting it to sell at $200 per ton, a price less than the present price of copper. Alterations will be made immediately in our works at Lockport to make the metal on a large scale. Capitalists in New York are preparing to build immense new works of probably twenty times the capacity of the Lockport works. One of the large plants will undoubtedly be at Niagara Falls, where 10,000 to 12,000 horse power will be required to operate it."

It is to be hoped these expectations will be realized, and if so aluminum is likely soon to occupy a highly important position in the arts, some of which it probably will revolutionize.

The metal has a specific gravity of 2·58, a cubic foot of silver weighing four times as much, and a cubic foot of iron or steel three times as much as a cubic foot of aluminum. It is of sensibly the same color as silver, oxidizes but slightly in air, water has no action on it, nor is it attacked by nitric acid or dilute sulphuric acid or sulphureted hydrogen. From its extreme lightness, strength, and resistance to tarnish, it is used to a considerable extent in the manufacture of dental, surgical, optical, electrical and scientific instruments of various kinds. It is very malleable and ductile, and may be readily beaten and rolled into thin sheets or drawn into fine wire. It melts at a temperature higher than that of zinc and lower than that of silver, has a tensile strength of 25,000 to 30,000 pounds per square inch. Among its uses heretofore have been as an alloy of copper, making aluminum bronze, also in small percentages as an alloy of iron and steel, with remarkable advantages.

THE newest street-cleaning wagon works on the principle of a patent parlor broom—dustless, and gathers up the dirt as it goes.

PIGEONS AS DISPATCH CARRIERS.

The wonderful instinct which leads homing pigeons to return to their cotes, though liberated many miles away, has been taken advantage of by sportsmen and many persons, who enter with great zest into the work of breeding and training these birds and entering them for races. There is a federation of homing pigeon fanciers, consisting of upward of three hundred members. The secretary's office is at Philadelphia, and upon his books is entered a description of each bird belonging to a member of the federation participating in a contest. A piece of metal is attached to the leg of the bird taking part in a race, and upon this is inscribed a mark or number which serves to identify it, should it stray from its course or be driven by wind or storm. The organization of pigeon fanciers has also arranged a series of stations at various distances extending toward the south from New York, and birds when trained are sent by express to these stations, and are there released by a member or a representative of the federation. During the racing season many birds are constantly being started, and occasionally items like the following appear in the daily prints:

"On the last cruise of the New York pilot boat Edmund Blunt, when it was seventy miles southeast of Sandy Hook lightship, a carrier pigeon settled on the foremast rigging. The boat keeper climbed up and brought the almost exhausted bird to the deck, where it was fed and afterward revived. It had a metal band on its leg upon which was engraved 27-29 H."

"A carrier pigeon bearing a message written on some vessel by A. Ross to Mrs. A. Ross, Annapolis, Md., under date June 26, flew on board the schooner Fleur de Lis, Captain Duffy, at 4 P. M., July 11, when the vessel was twenty-seven miles off No Man's Land. The bird appeared to be nearly dead, but recovered."

Such excellent results were attained by the pigeon fanciers, so unerringly did the birds come back to their lofts—only a small proportion of failures occurring—it was not to be wondered at that their marvelous abilities as carriers of messages should have been turned to practical account. During the siege of Paris, 1870-71, pigeons were frequently made use of, and since that date the French government has put forth continuous efforts to develop their use in both the military and naval service. A series of experiments were initiated at Toulon, looking to the introduction of the birds into the naval service. They were conducted by Vice Admiral Bergasse du Petit Thouars and the Societe Forteresse. The first effort was directed toward domesticating the birds on board the St. Louis, the artillery practice ship. Considerable difficulty was experienced from the birds becoming frightened by the guns on board ship, but by rearing them near the guns they soon became accustomed to the sound, and when liberated from the various vessels during target exercise, would form groups above the smoke, sometimes mingling together, but never losing their own ship. France is the only country which has made careful experiments and adopted a system connecting the fleet and the shore. Germany, Austria, Russia, Italy, Spain, and Portugal each has a military pigeon service. Germany has the most complete military system in the world. Lieutenant Richard Wainwright, U. S. N., in speaking of it, says: "The whole of the northern coast is studded with pigeon stations, which are under the control of the minister of marine. Experiments have been made by the German naval authorities on homing pigeons on board men-of-war, so that messages may be sent to the ship from the shore. It is said that the birds experience no difficulty in recognizing their own ship among a number of others."

From 1855 until the laying of the Atlantic cable, homing pigeons were employed to take the news from transatlantic steamers to the Sandy Hook telegraph stations to be transmitted to New York. A bird liberated from the steamer Waesland at one o'clock in the afternoon, when three hundred and fifteen miles from Sandy Hook, was at its loft in the evening. Another let go from the Circassia at nine in the morning, when two hundred and fifty miles out, brought a message in the afternoon.

Canada has quite recently established an organized system of messenger pigeon stations throughout the dominion, extending from Halifax to Windsor and connecting her principal seaports with the interior. Gen. D. R. Cameron, director of the Messenger Pigeon Association, in speaking of the utility of the service, says: "I am of opinion that a most important branch of the pigeon service will be connected with the coast service. The evidence that these birds can be relied upon to cross 400 miles of the ocean is apparently thoroughly reliable." A report from Halifax states that it is proposed to put Sable Island in communication with the mainland by means of carrier pigeons. This locality has always been regarded as one of the most dangerous points on the coast, and wrecked mariners have sometimes been stranded on the island for weeks without being able to communicate with those who might rescue them.

Efforts are now being made to introduce a carrier pigeon service into the United States navy. Professor