depot, composed of those who have not been enlisted for the first depot. The landstrum is also made up of two divisions, the first comprising those who have finished their term in the landwehr or the first depot, and the second all those who are not engaged in other service. The latest statistics of the Japanese army obtainable were given out in December, 1900, and placed the total active army at 8,046 officers and 158,214 men, and a grand total, including the various reserves, of 11,611 officers and 457,480 men. The active army was composed of the imperial guard comprising 14,110 officers and men, the twelve divisions comprising a total of 128,955, the Taiwan, Formosa, garrison comprising a total of 16,387, the gendarmerie comprising a total of 2,624, and the students and others comprising 1,978. There were 204,109 officers and men in the reserve, 98,722 in the landwehr, 51,966 in the first depot, and 109,581 in the second depot. Each of the 12 divisions of the army and the imperial guard as well comprises 2 brigades of infantry in 2 regiments of 3 battalions of 4 companies; 1 regiment of cavalry of 5 squadrons; 1 regiment of artillery formed of 2 campaign groups and 1 mountain group of 3 batteries of 6 guns; 1 battalion of pioneers of 3 companies; and 1 train battalion of 2 companies. There are besides, as troops not separated into divisions, 1 railway battalion and 1 battalion of telegraphers.

The number of artillery regiments is 13, each comprising 9 batteries—3 of them campaign and 2 mountain. The battery has an effective strength of 5 officers, 10 non-commissioned officers, 112 men, and 60 horses (37 for the mountain battery, 30 of which are draft animals). There is no heavy army field artillery. The officers of all classes are recruited at the special military school; those of the artillery afterward passing through the school of applied artillery and engineering. Before entering the special military school, the candidates admitted do a year's service in a regiment as simple soldiers; then they pursue the school course for two years and afterward spend six months in the regiment before being made officers.

The artillery establishments are: (1) The two powder mills of Itabaska (3.5 miles from Tokio) and Iwahaua in the province of Kozanke (72 miles to the north of Tokio); (2) the arsenal of Tokio, which comprises a manufactory of arms, a cartridge works, a repair shop, and a pyrotechnic laboratory; (3) the arsenal of Osaka, which comprises a gun foundry, a manufactory of gun carriages, a projectile foundry, and a pyrotechnic laboratory; (4) the arsenal of Taipe in the island of Formosa, to the west of Kilanny; and (5) the gun foundry of Kouse.

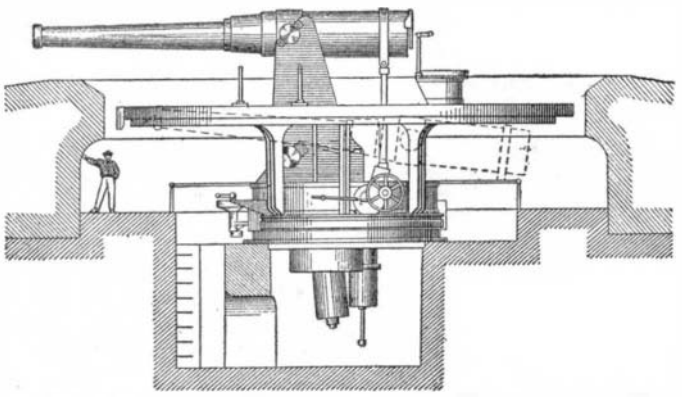
In Japan, the artillery is considered as the select branch of the service.

Coast Defense Guns.—It is probable that in the near future the Japanese will be independent of foreign makers in the provision of large guns for coast defense, just as they expect, with the increase of their naval gun-making establishments, to be eventually able to supply their new warships entirely with pieces of home manufacture.

The earlier coast-defense guns were made largely by the celebrated Schneider-Canet Company at Creusot, France. We present on the front page views of two types of guns for fortifications made at the French establishment for Japan. The one shown in the upper cut is a 10-inch gun upon a disappearing carriage and intended to be mounted in the manner shown by the accompanying line cut. The gun and mount are normally contained in a circular excavation. The gun is carried upon the upper ends of a pair of arms, which hold the gun trunnions. The lower ends of the arms are pivoted to a rotating carriage. The breech of the gun is supported by another pair of arms, and the mechanism is such that the gun can be lowered out of sight below the parapet for loading, the gun and crew during the operation being out of sight of the enemy, and sheltered from shell fragments by a horizontal circular overhead shield. The gun rises to battery through this shield, and recoils, on firing, back and down through a slot in the shield for reloading. The gun weighs 21¾ tons, the mount 61 1-3 tons, and the projectile 475 pounds. The initial velocity is 1,900 feet per second.

Of late years, however, the Japanese have abandoned the disappearing gun in favor of guns mounted "en barbette," the gun appearing permanently above the parapet. One of their guns of this type, built like the others at Creusot, is shown in the lower front-page engraving. It is carried on a gravity-return barbette carriage. The gun, by its trunnions, rests in the bearings of a massive cast slide, each half of which carries half a dozen steel rollers on which the gun moves in its recoil up the inclined paths of the lower rotating carriage. The usual recoil checks are provided and the gun returns to battery by its own gravity aided by the action of coil springs. The whole gun carriage is carried upon a circle of steel rollers, and the gun is elevated and traversed to right or left by the crank arms operated as shown in the engraving. The Japanese fortifications are armed with this type of heavy gun in various sizes.

Field Guns.—The present period of the transformation of the artillery finds Japan in possession of a 3-inch hardened bronze gun manufactured at the Osaka arsenal. This gun is provided with a screw fermature and ordinary pointing devices. It throws an 8.8-pound belted copper shell with an initial velocity of 1,380 feet. It is drawn by small horses of the pony type,



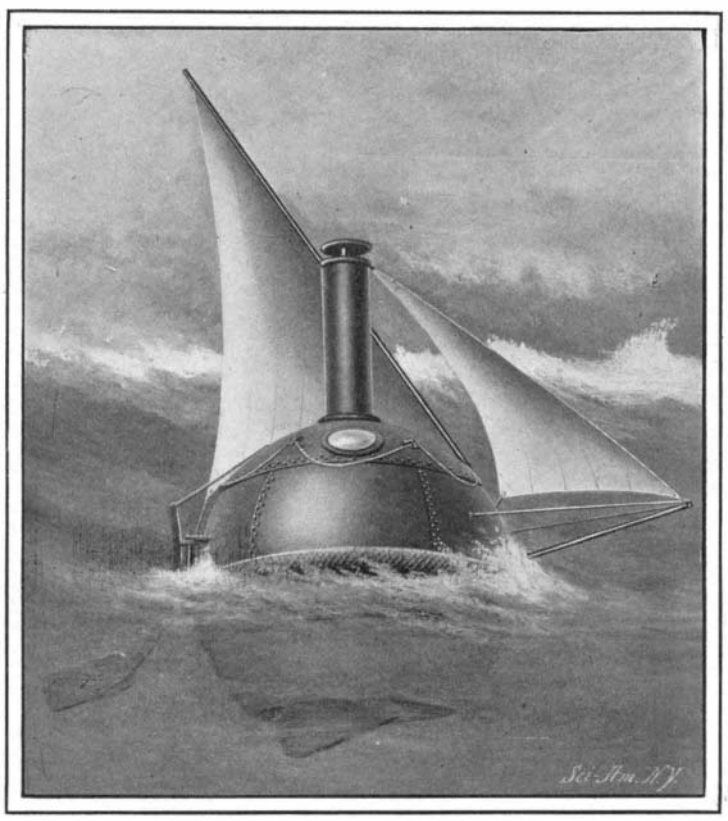
EMPLACEMENT OF A 10-INCH JAPANESE DISAPPEARING COAST DEFENSE GUN.

the rations of which consist of 11 pounds of hay and 9 quarts of barley.

The mountain gun is of the same caliber and throws the same projectile with the same initial velocity.

Awake to the progress of Europe, Japan has submitted the question of the rapid-fire gun to deep study; and although she has, indeed, made an appeal to European industry for aid in this matter, she has rather preferred to rely upon her own resources and has adopted a gun devised by Col. Arisaka. Although the full particulars of this gun are not definitely known, it is fairly certain that it possesses in full those elements of rapid fire that distinguish the latest rapid-fire artillery of European nations. That it is a most effective piece is proved by the crushing fire which it delivered against the Russian entrenchments at the battle of the Yalu, when the enemy were so thoroughly shaken up that they could not withstand the subsequent infantry attack.

Machine Guns.—Japan, in 1902, organized two batteries of machine guns and assigned them to the two first divisions. One of them is provided with 6 Maxim guns and the other with 6 Gatlings. Experience will decide as to the selection to be made between these two systems. Each battery comprises 3 officers and 52 men. The instruction as to the use of the guns makes it incumbent upon the division commander, in time of war, to assign a section to each of the brigades of infantry and to the regiment of infantry of his division.



CAPT. DOENVIG'S LIFE-SAVING GLOBE.

The iron industry of Alabama is represented at the World's Fair by a colossal iron statue of Vulcan, fifty feet high and weighing 150,000 pounds. It was made in Birmingham, to portray the importance of that city as a manufacturing point. The base of the statue is made of coal and coke. This cast-iron Vulcan occupies a place in the Palace of Mines and Metallurgy.

CAPT. DOENVIG'S LIFE-SAVING GLOBE.

It is now about a year ago since the first trials were made with Capt. Doenvig's new invention, the life-saving globe. These were all preliminary, however, and it is the practical tests, now just finished, that beyond all doubt have established the reputation of the new invention.

These recent trials were conducted on the coast of Jutland in very stormy weather, under the supervision of Norwegian naval officers and other maritime authorities. Two life-saving globes were used for the experiment. They were both set out from the Norwegian man-of-war "Heimdal." The first one had no human beings on board, but sand ballast corresponding to the weight of sixteen men. It was launched without trouble, and made a successful landing.

This fact ascertained by signals from shore to the "Heimdal," the second globe was set out. On board this one were Capt. Doenvig, Marine Lieutenant Engelstad, and three sailors. This also cleared away from the ships in good shape, and a few minutes after its being dropped into the sea, one of the trapdoors was opened, the men crawled out, swinging the Norwegian flag, set up sails, and sheered through the breakers toward land. It made a successful trip, and half an hour later it landed. At the time it was blowing hard from northeast, and the sea broke on four feet of water. The globe landed about fifty yards from the mainland. The men got out and waded ashore. By experts it was considered that an ordinary lifeboat would have been of no use under the circumstances.

The globe is made of sheet iron 5-16 inch thick at the bottom, 3-16 inch at the sides, and ⅛ inch at the top. It is 8 feet in diameter and 6½ feet high, and has a double bottom. It draws 2½ feet of water when loaded. The globe may be entered through three water-tight trapdoors. Under the deck, which is located about one foot below the waterline, are placed four galvanized-iron tanks, with capacity for holding 150 gallons of fresh water. Along the sides runs a low seat or bench, and the space underneath the same is filled with canned goods. In the center of the inner room is a funnel, that can be shoved up, thus letting fresh air into the globe.

There are three small windows in the top, for the double purpose of letting in light and providing openings through which rockets can be sent up. The globe has a movable keel, which can be let down from the inside, and also a rudder that may be applied in the same manner. Some small oars are also kept inside. A cork belt runs around the globe on the outside, on which the men can stand and row. There is also an anchor with 100 feet of steel rope attached, and a set of small sails, the funnel serving as mast.

There is no need for launching the globe; when the ship sinks, it will simply float. Its weight is about two tons, or the same as that of a large ordinary lifeboat. It cost about $500, and has accommodation for twenty men. It requires less deck space than an ordinary lifeboat.

An interesting statement bearing on the future of great cities was embodied in an address recently made by Prof. H. B. Smith, of the Worcester Polytechnic Institute, speaking of electrical transmission of power. He said that in San Francisco a few years ago the cost of electric current for power and light was 15 cents for one horse-power per hour, while to-day the published price is almost exactly one-seventh of this amount, and it is possible to deliver at the factory on the coast, from the melting snows and glaciers of the Rockies, power for the machinery at a smaller cost than that at which it is possible to produce that power by steam, even though the fuel were to be delivered at the factory boiler without cost to the power producer. It has been estimated that the quantity of carbonic acid annually exhaled by the population of New York city is about 450,000 tons, and that this amount is less than three per cent of that produced by the fuel combustion of that city; so we may expect that, with the removal of this great source of contamination of the atmosphere, even the air of our greater cities will be practically as pure as that of the country.

The chief use for acetylene in Canada is as an illuminant in dwellings. On the river St. Lawrence the buoys are lighted with acetylene gas, the gas being compressed into the buoys under ten or more atmospheres. The gas passes from the reservoir to the burner through a reducing regulator. The buoys are sufficiently large to supply gas to the burner for from three to six months without recharging. The buoys can be recharged without being removed from their positions, a steamer with a specially-constructed generating apparatus and a pump for compressing the gas being employed for this purpose.