

gun is further strengthened by additional pieces called hoops, also shrunk on. Even the jacket, in turn, is reinforced by hoops or bands, which are interlocked in an ingenious manner. The gun forgings are made from open-hearth steel, cast in ingots, each being about twice as heavy as the finished piece. The ingot is forged down, rough-bored and turned nearly the finished dimension, and test specimens are taken from one or both ends after the forging has been annealed, oil-tempered and again annealed. If satisfactory, the ingots are then accepted by the government. The pieces are then sent to the gunshop, at Washington, which is shown in our issue for February 26, 1898. The gunshop work is principally turning and boring. The work has to be done with the utmost accuracy; for shrinkage it is done to $\frac{1}{16}$ of an inch. The tubes are bored as well as the jacket, and the hoops are also accurately turned inside. After the tube is finished, the jacket is shrunk on by heating in a furnace forty feet deep to a temperature of about 550° Fah. Twenty or thirty hours may be needed to bring it to the uniform temperature. The jacket is then lifted out of the furnace by the crane and is lowered over the tube, and if the jacket is properly heated it goes smoothly to its seat and the embryo gun is allowed to cool. Then the fore part of the tube is turned for the chase hoops, which are then put successively in place; then the jacket hoops are shrunk on in the same general way. The next operation is to finish boring the gun, and then the rear of the gun is bored out to an increased diameter to form a chamber for the powder. This is connected with the main bore by a conical portion of the bore, termed a compression slope. Back of the powder chamber is a short box of still larger diameter, termed the screw box, which has a screw thread cut on its inner surface. Then sections of this screw thread are slotted out, forming the interrupted screw for the breech plug. The exterior of the gun is now finished-turned and the bore is rifled. The gun is then ready to receive its breech mechanism. The 13-inch gun shown in our engraving has a new arrangement of the breech mechanism, which is superior to the one formerly used, which required three distinct operations: 1, turning the breech plug; 2, withdrawing the breech plug; 3, swinging the breech plug and tray away from the breech. On the shaft, below the worm wheel, is a wheel which first acts as a gear wheel on a rack fastened to the breech plug, to slide the breech plug into the screw box when the breech of the gun is to be closed, and then acts as a worm wheel on a worm rack at the end of the gear rack and at right angles to it, thus turning the breech plug and locking it in place by means of the interrupted screw. The usual gas check and firing mechanism common to all large rifles is used in this gun.

The gun is mounted in a sleeve, a key or bar is secured to the gun and fits a groove in the sleeve, which permits the gun to slide longitudinally. The recoil is taken up by four recoil cylinders, which are shown in our engraving. They are mounted in collars, the lower portion forming an integral part of the sleeve. The piston rods are attached to a ring located near the breech end of the gun, so of course they travel with the gun. In the recoil cylinders are nests of heavy springs, which take up a large part

of the recoil. The movement of the pistons is also regulated by a mixture of glycerine and water in the recoil cylinders. This fluid is allowed to escape slowly past the piston by grooves in the walls of the cylinder. At the point where the gun is to be brought to rest the groove ends, consequently the motion of the gun is arrested. The sleeve holding the gun is pivoted at its front end on two trunnions. Devices are provided for elevating and depressing the gun. This work may be

accomplished by hand power or by a motor. An arrangement is made for allowing the screw to yield at the moment of recoil. At the rear of the gun will be noticed the rammer, which, though only five feet long, may be extended to fourteen feet by means of tubes that telescope. Hand gear is also provided for the rammer. Our engraving, which was made from a photograph taken at the Indian Head proving ground, shows the gun on a turret mount. The gun and its mount turns with the turret, and the gun captain in the sighting hood directs the elevation and depression of the gun so as to get the proper range, sighting through a telescope secured to the sighting hood. By means of levers connected with the sleeve, the sighting telescope is always maintained in strict parallelism with the gun itself. The gun captain discharges the gun with a lanyard or by electricity.

The following data referring to the largest gun now made for the navy are of interest: Diameter of bore (caliber), 13 inches; length of gun (479.1 inches), 39 feet 9 1/4 inches; weight of gun, 136,000 pounds; weight of

full charge of powder, 520 to 560 pounds; weight of projectile, 1,100 pounds; velocity at muzzle, 2,100 feet per second; velocity at 2,500 yards, 1,805 feet per second; thickness of steel which shell will perforate at 1,000 yards distance, 24.54 inches.

A DIAMOND in constant use for cutting cold glass lasts about three months, but if used to cut hot glass, it would only last for one day.

SOME AMERICAN FORTS.

BY C. F. HOLDER.

The forts of the great American seaboard present an interesting spectacle at the present time, being in a state of transition. Nearly all still retain the old form and outline, but many have been adapted to modern guns and provided with defenses which will make them effective against the most powerful foe.

An examination of the old forts which gave such accounts of themselves during the civil war tells a remarkable story of the progress of military science and shows that within a few years the old methods have been completely overturned.

So radical has been the change that the government has done almost nothing with many of the old forts, and for thirty years they have been dropping to pieces in the hot sun of the Southern border, a semblance of care being taken of them by a corporal's guard stationed there to see that the property was destroyed by nature, not by man.

Among the forts attracting attention at the present time is Fort McHenry, which constitutes the defense of Baltimore. It is situated on a picturesque point and, while of an obsolete type, has some powerful modern guns

which will prevent the advance of any Spanish warship in that direction.

Those who have not visited Old Point Comfort, Virginia, for several years would hardly recognize the old garrison at present. It is the center of army and navy activity. The Point is crowded with men, and has been of special importance, owing to the fact that it was the rendezvous of Commodore Schley's "Flying Squadron," before it was ordered southward.

Fort Monroe is perhaps the most important location on our entire coast line, so far as defenses are concerned, as it is supposed to command the approach to Washington, Baltimore, Richmond and many other cities of more or less importance.

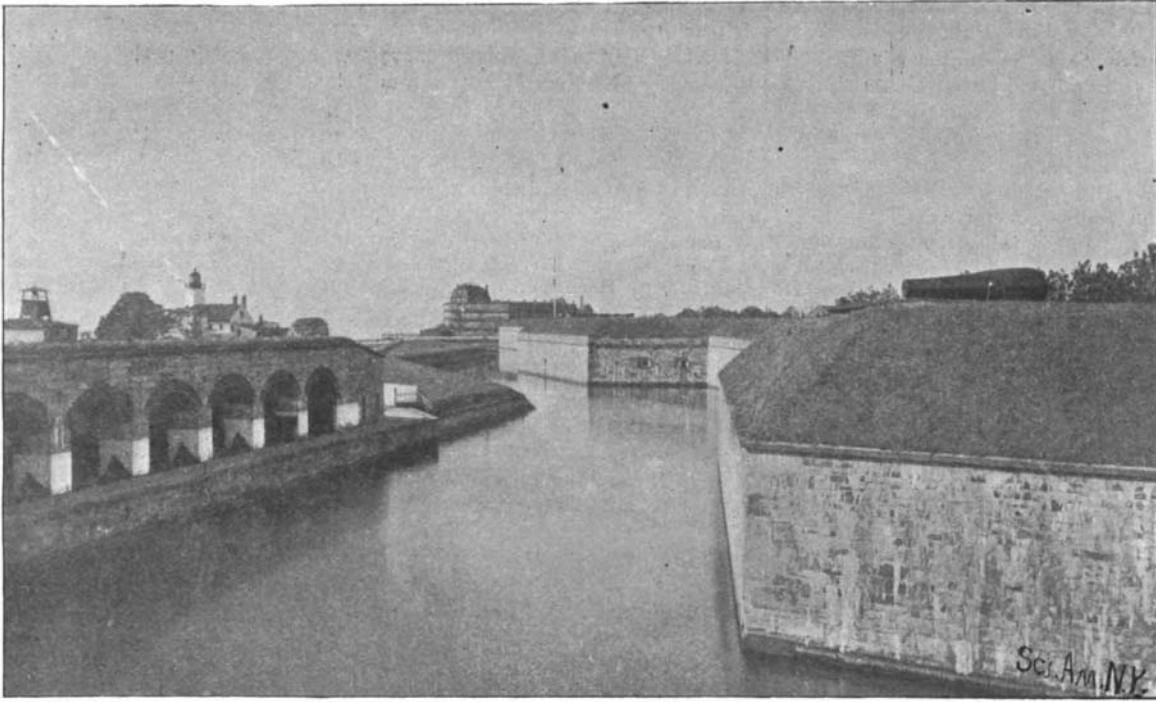
Fort Monroe is the largest fort in the United States, possibly in the world, and embraces thirty or forty acres or more in its interior. It has two tiers, a casemate and parapet, is surrounded by a deep moat, and is protected by a water battery and batteries of heavy guns along the sandy beach. There are two

entrances over bridges, and in the center is a fine parade ground, where are held the drills of the artillery schools. This famous school was established in 1868, and has become an important branch of the service, really a post-graduate West Point course, from which all the officers of the artillery branch of the service have graduated. It was here that the first experiments were made with 15-inch guns and sections of modern batteries and armor.

In the center of the channel stands old Fort Wool, now of little use except as a lighthouse base and a monu-

ment of past methods. The government has permitted the construction of a number of buildings on the reservation at Old Point Comfort, which might have to either come down, in case of attack, or be blown down. Such is the big hotel which rises on the beach in front of the fort to the south, almost in line with the guns on the parapet.

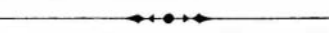
Passing on to Charleston, South Carolina, we have Sumter, Fort Moultrie, and many batteries, and the



VIEW OF MOAT AT FORT MONROE, VA.



FORT McHENRY, MARYLAND.



harbor has been well protected by torpedoes. Sullivan's Island has the remains of many old war time batteries, and if invasion was supposed to be possible, the spot would again be occupied. Battery Beauregard was particularly famous, and at what is known as the "Cove" the first ironclad was built; being a battery of palmetto logs protected by heavy iron plate. The guns of Sumter struck this ironclad one hundred and sixty-three times with little or no effect, while the battery with its novel armament hit the brick fort four hundred and ninety times.

Savannah, Georgia, is protected by Fort Pulaski; and at the mouth of the St. Mary's River there is another fort of the old type. It is about six miles from Fernandina and stands on the beach, covering the narrow and shallow channel.

Following the coast line, we come to Key West, where Fort Taylor stands, a type of the old regime; a two-tiered fortress built in the water and connected with the mainland by a drawbridge. In case of an attack, guns in shore batteries along the sandy beach would be sufficient to prevent an invasion.

On the Gulf coast of the mainland, Pensacola has in Fort Pickens the most elaborate fort of the old school. Its position is commanding, and during the late war it occupied an important position. Fort Pickens has two tiers, and is made of brick and filled in with sand and concrete. The walls are very thick, but would hardly stand before the projectiles of to-day.

The fort was built on the generous plan of the old days, with a large parade ground, each gun occupying a large casemate, the faces being flanked by bastions which gave the fort an attractive and castlelike appearance.

While many of these forts are useless, they could all be employed as the bases of new and modern forts, and, doubtless, one result of the existing war with Spain will be the evolution of a modern fort or battery which will place our long coast line among the best armed and equipped regions of the world.

Why America is not better prepared is due to the fact that the majority of Congressmen of the past twenty or thirty years have paid more attention to politics than to informing themselves of the demands and needs of the country. It was only after a fight of years that the navy was placed on any kind of war footing, and it is only just to American officers to say that the army has been almost completely neglected. Yet within a few weeks the government has been able to supply a well-equipped force which will well maintain the honor of the nation.

The Cost of an Indian Earthquake.

The official report from the secretary to the chief commissioner of Assam on the earthquake of June 12 last, which resulted in the loss of 1,542 lives and the destruction of an enormous quantity of property, has arrived. The cost of repairing damages in the public works department alone is estimated at more than thirty-five lacs of rupees, or, to put it moderately, over one-quarter of a million pounds sterling. These figures do not include the cost of damage to local communications chargeable to municipalities and local boards or departmental expenditure not borne by the public works department. In the circumstances, the chief commissioner is applying for a grant from imperial revenues to assist the administration to recover from the effects of the earthquake. "Here," says Prof. Milne, "we have a danger threatening life and capital which can only be avoided by the acceleration of engineering operations."

"With regard to the proposals that the various headquarters of the Assam administration shall be shifted to more favorable sites, the interference which such a step would cause to public and private interests makes it desirable that the effects of earthquakes in the future should be met, not by escape to localities where movements might be less, but by changes in the methods of construction. During late years Japan has suffered from earthquake movements probably more severely, in the ratio of nearly five to three, than that which in June last created so much destruction in Assam. . . . Profiting by experience and guided by experiment, Japanese engineers and their European colleagues have gradually departed from stereotyped methods of construction, with the result that structures of the new type, whether they are ordinary dwellings

or other works, have, so far, remained standing, while what is old is slowly disappearing.

"The fact that the Japanese government annually votes from £1,000 to £5,000 to assist a committee in investigations which may result in modifying earthquake effects, has a bureau controlling the seismic survey of its country, and has appointed a professor of seismology at its university (at which all students of engineering listen to some twenty or forty lectures on construction in earthquake countries, and by this time may have read the report of its trained seismologist, Dr. F. Omori, sent to Assam to note anything that might be of benefit to his own country), are strong testimonies that material benefits have already been obtained from the study of earthquakes.

"When we consider the British capital invested throughout the seismic regions of the world and the money from time to time expended in the restoration of consular and other buildings, we must surely feel that the sooner we turn attention, if only to that which has already been done to mitigate the effects of earthquakes, the sooner will the loss of life and property which accompany such disasters be reduced."—The Architect.

Russian Copyrights.

The copyright system in Russia is so imperfect and leads to so many abuses that an imperial commission for the revision of the code has been seriously considering the question. Russia has had no copyright convention with any other state since 1887. The Pall Mall Gazette says:

When speaking at a copyright conference recently held at St. Petersburg, Mr. Spassovitch, an eminent Russian jurist, pointed out that the 125,000,000 inhabit-

comes more apparent when it is remembered that few Russian authors command a sale sufficiently certain to enable them to produce their works otherwise than in the pages of these periodicals. And that is partly because the publishers must contend with a deluge of foreign pirated editions. Even Russian authors of the first rank find themselves seriously handicapped, while outside Russia they are defenseless. Count Tolstoi, who reserves no rights, has been compelled to declare publicly that, on account of their gross inaccuracy, he declines all responsibility for certain French translations of his works.

The imperial commission has suggested several steps in advance, among them that all works published in Russia, whether by Russian subjects or foreigners, should enjoy full protection, including control of translation, and that all works of Russian subjects, wheresoever published, should have the same rights. It also recommends provisions calculated to encourage the collection of Russia's vast treasures of folk-lore.

Klondike Packers' Troubles.

A dispatch from Dyea, March 24, via Seattle, March 30, says that the white packers at the summit, to the number of several hundred, have driven off the Indian packers, who have been packing goods here every summer. Chilkootee, one of the Indian packers, has appealed to Gov. Brady for protection from the white men. The Governor referred him to Deputy Marshal Cuddilgee first, and instructed him that if the marshal failed to give him the desired protection, he should then appeal to Col. Anderson. It is understood that Col. Anderson will not tolerate any such action by the white men, even if they are American citizens.

The price for packing from the scales to the summit is 2 cents per pound at present. There is a perfect stream of men going up with packs on their backs. Packers make from \$6 to \$15 per day. The Burns hoists are working, one by horse power and one by steam. The Dyea-Klondike Company has just got its aerial tramway in operation. Other proposed tramways are not yet completed. The Burns hoists only run from the scales to the summit, and the Dyea-Klondike Company from a short distance below the scales to the summit.

Threats appeared that if the tramway companies get to working too soon the packers will take measures to stop their work, as the successful operation of the tramways will throw practically all the packers out of employment.

Over one hundred teams came in recently and joined

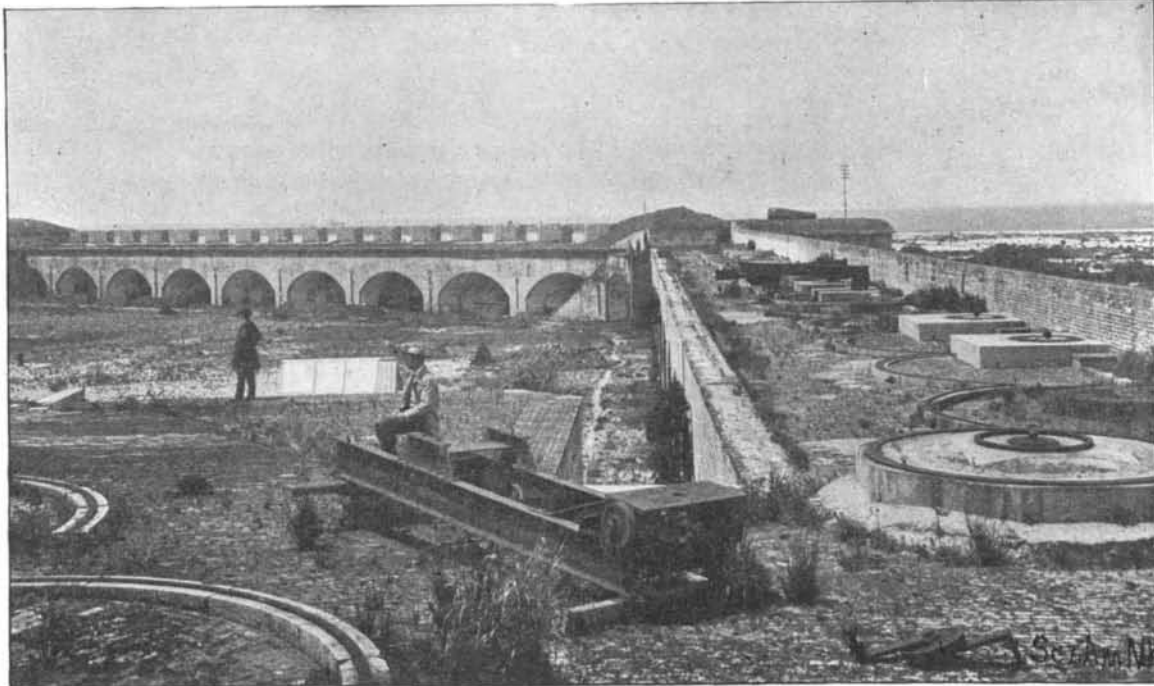
the crowd that has been employed on the scows and hauling freight to the sheep camp. The prices for hauling from Dyea to Sheep City during the week were from 3 to 2 cents per pound. It fluctuates according to the conditions of the roads and demand. Teams have been making from \$150 to \$200 per day for several weeks, and many tons are yet piled up ready for forwarding. The price for having freight taken from Dyea to Lake Bennett has been in the neighborhood of \$10.50 a pound. A large number of men have been taking their own outfits up the trail, either by their own muscle or by dogs, horses, oxen, or mules.

Every one is apprehensive that the road in the cañon will give out any day, when teaming with two-horse, and, in fact, with any sleds, will have to be abandoned in the cañon and the trail resorted to, says The New York Times. The price will then be advanced to 4 or 5 cents at least per pound. It is estimated that the ice in the cañon cannot last more than fourteen or fifteen days if the present mild weather continues.

Travel is proceeding regularly on the Skaguay trail. Goods are hauled through to Lake Bennett. Probably three-fourths of the people who have come here the last month have gone up by the Dyea route, but nine-tenths of those who have reached Bennett have gone over the Skaguay trail.

Many very large stocks of goods have gone by the White Pass, while the other trail has done more of the small business. When the bottom falls out of the other trails, the Skaguay wagon road and the Dyea tramways, if they are done by that time, will have their hands full of business.

CERTAIN butterflies have very transparent wings and these are thought by Haase to be even more effectual for protection than conspicuous "warning" stripes or other markings.



FORT PICKENS, FLORIDA.

ants of the Russian empire are made up of different races, several of which have national literatures of their own. As Russia protects no translations, great injustice is often done to the Czar's own subjects. For example, Poland possesses many novelists of high and some of European repute. The instant a work appears by Pruss or by Sienkiewicz it is seized by the translators, and appears in a number of Russian journals without one kopeck finding its way into the pocket of the author. But in Russia the author is not the only sufferer; the publisher shares his hardships. Of late piracy has been assuming gigantic proportions. Russian publishers denounce the pirated works introduced from Germany. In the shops of Poland, of the Baltic provinces and of South Russia, such books abound. During the last forty years one firm in Leipzig has published (in Russian) five hundred different works by the most popular Russian novelists. And this foreign production is now more active than ever. In 1895 a German agent was actually advertising in Russia cheap editions of Russian copyright works which could be supplied to Russian booksellers from German presses. The great extent of the empire facilitates the introduction of these pirated editions. The St. Petersburg publisher with difficulty detects the proceedings of some distant provincial dealer. It is true that redress is easy in case of detection. But as the law exacts only a fine proportionate to the number of pirated copies found, the culprit, who keeps his stock low and relies on weekly supplies from Germany, gets off easily, pays his fine and continues his practices.

An analysis of the contents of fourteen leading Russian reviews and magazines revealed that 43 per cent of their contents were translations of foreign works. In one magazine the translations were 98 per cent of the whole. The serious import of these figures be-

INDIAN KETTLES.
BY EYLER REYNOLDS.

Summer visitors who have found health-giving recreation along the shores of America's fairest sheet of water, Lake George, can not have failed to notice at different localities certain strange and wonderful holes in the rocks, having a diameter of a foot or more and with a perfectly smooth interior, as carefully made as though a stone carver had worked them out of the solid bedrock.

Seek information of a resident or a tourist wanted to the locality who is familiar with the sight of them, and the reply will come, "Oh, those are simply Indian kettles." When pressed further for an explanation, the fanciful answer is made that Indians who hunted in the Adirondack region, then known as the Great Northern Wilderness, hollowed out these holes in the rocks along the shores wherever they pitched their camp, and therein cooked their liquid food. But how did they heat so peculiar an oven, one without a bottom or sides, one naturally asks. A seemingly good explanation is given that the liquid was placed in the hole, a large stone, or many of them, heated and dropped in until the temperature was raised to the boiling point. In this way large quantities of soup, enough for all the camp followers, could be made. Such is the traditional or rather the mythical explanation of the "kettles" to be found in plenty along the shores of Lake George, but such is far from the true way in which these peculiar holes were constructed.

The "kettles" are the handiwork of nature, and beautifully constructed are they. There is a more common name for them, generally bestowed in regions where Indians are forgotten, and it is that of "pot-holes."

They were made by the action of water many years ago, but to be more definite, the state geologist will tell you that they were made something over 30,000 years ago, or more than 24,000 years before the period fixed by the Bible as the time of the creation of this planet. As these holes are found far above water, it is of interest to explain how they were formed by the water.

About 50,000 years ago, almost the entire State of New York was covered by ice. The Hudson River was a frozen mass from the high ridge of hills on the one side to the other, as is shown today by corresponding erosions of the rocks caused by moving ice, on both sides. Lake George bore the same appearance. From hilltop to hilltop was a single mass. Every valley was filled. Then there came a change. There was a breaking up of this immense field, and glaciers were formed. Invariably all the glaciers of North America passed southward although the water of Lake George now flows northerly. There is a valley now from Baldwin, at the northern end of the lake, continuing southward, which is filled with water,

forming the lake. Rogers Rock, an immense elevation rising abruptly with a precipitous face toward the water, is about five miles south of the town of Baldwin and on the west side of the lake. It is one of the features of this beautiful region. To the west of this elevation is another valley, now dry. When the ice broke up, one body moved southward by way of the valley,

now Lake George, the other passed to the left of Rogers Rock. The two immense bodies met at the promontory just north of the hamlet of Hague, N. Y. Eddies were formed. The larger eddies were nearest the confluence of the two streams, and smaller eddies, diminishing in size, were strung along in the general course. Boulders carried down by the fierce current

covered with floating moss and to which there is no outlet below the surface because it is a bowl in the rock. Excavating disclosed the remains of a mastodon fifty feet below the surface. Evidently in prehistoric times the huge beast had fallen into the hole in the ground, for this one is thirty feet in diameter, and could not extricate himself because of his unwieldy form, or else his remains had been washed down with the glacier and had lodged there.

The bones of this big fellow are now on exhibition in the New York State Geological rooms. It is proposed to continue the work of cleaning out these pot-holes, in order to gain information of the animal kingdom of centuries ago. In Scandinavia the pot-holes are called "Thor's kettles," and a quantity of remains of extinct animals have there been found.

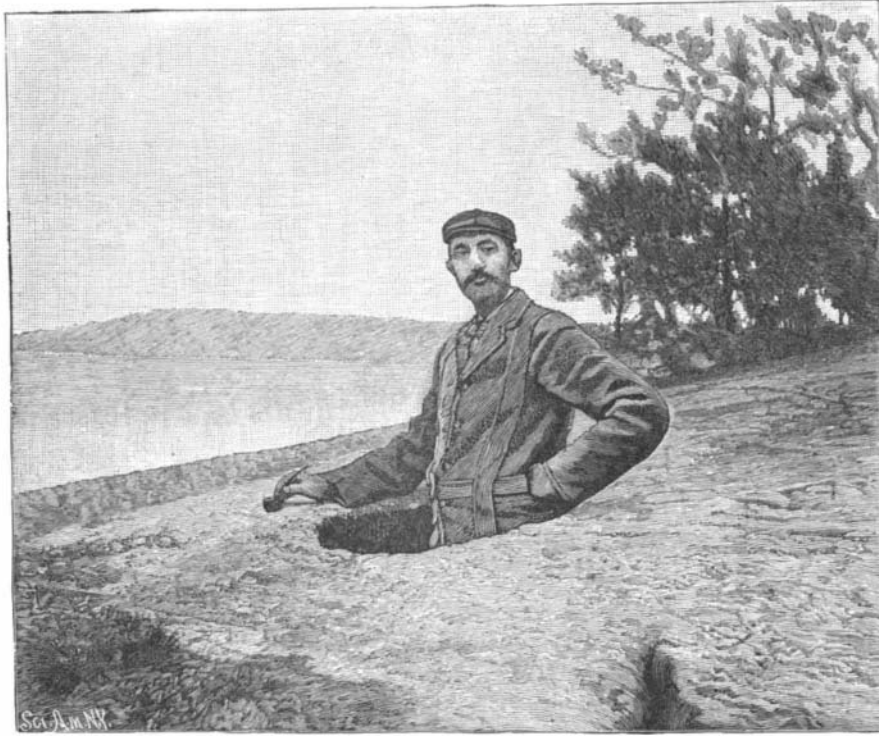
In the Canajoharie limestone many "kettles" are to be found, in fact the name of that city is the Indian term for Hole-in-the-Rock. Near the town of Naples, Ontario County, N. Y., where there is a valley containing four lakes, the result of a glacial wash, and where the ice was stopped by the dirt washed down with the torrent, there are a number of them of great interest. Here the rock is sandstone. Near Lucerne, Switzerland, the glaciers have formed some beautiful eccentricities in the form of pot-holes of a variety of shapes and sizes. Visitors always spend some time at the spot, and so beautiful is the place that it is called the Glacial Garden. The Hon. Verplanck Colvin, head of the Adirondack Survey, states that he has recently discovered a pot-hole located 2,000 feet above sea-level, and several hundred feet deep, but he is not prepared to make his wonderful find public.

As they vary much in size, so do they also differ considerably in appearance. Some have a cone at the bottom, while some are flat, the surface along the sides of some is smooth as though sandpapered, while others present spiral grooves. While some are double at the top and end in a single chamber, others run down to a fine point, as though prepared for a blast of powder. All point directly downward, and a majority are large enough to admit a person's body. A man standing in a Lake George "kettle" gives an idea of their shape and size, and how these curious creations of nature look is shown in the picture. Perhaps the Lake George villagers are not far from the right when they style these pot-holes Indian kettles; for though they were not made by Indians, still they might have been put to some practical use by them, and thus the name may not be a misnomer after all.

THE Evening Post reports that the great painter, Mr. G. F. Watts, is an associate of the Society for the Protection of Birds, and feels strongly about the fashion of using the plumage of birds for millinery purposes. He is now painting a picture representing an angel with bowed head and despairing figure bending over a

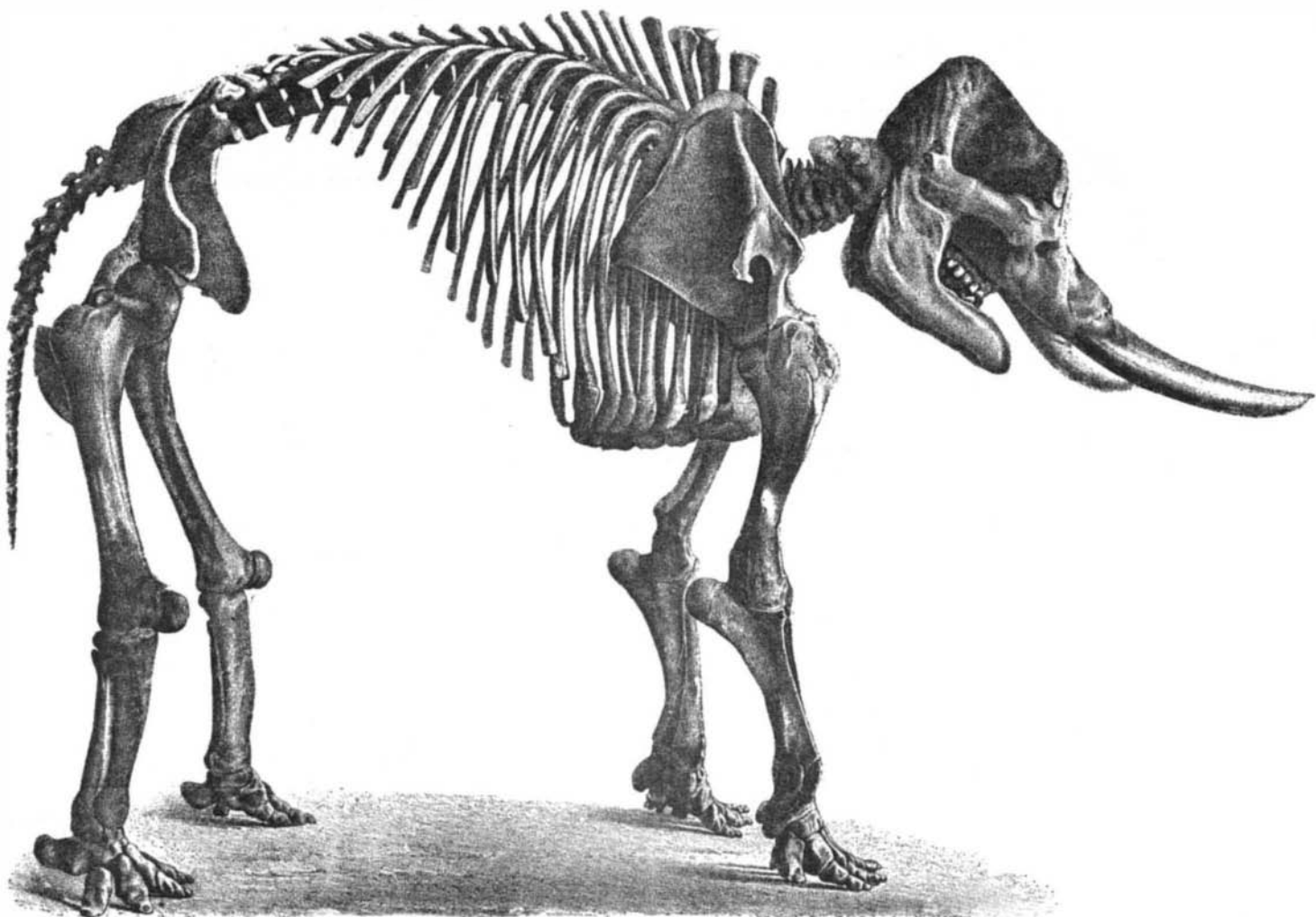
marble tomb covered with birds' wings, while a spirit of evil grins below.

RUSSIA has ordered a 10,000 horse power ice breaker of the Armstrongs, to cost \$800,000. It will be ready in October, and will be used to keep open navigation to St. Petersburg throughout the winter.



AN "INDIAN KETTLE" OR POT-HOLE.

were held in these eddies and passed around and around in the one spot. Knocking against the bedrock, which at this locality is crystalline limestone, they wore a hole. Gradually it increased in depth and diameter until after many years there was formed a hole of considerable size. Some of these pot-holes—and there are twenty-two of them on the one promontory of one-fourth of an acre in extent—measure 40 inches in diameter and range from 6 inches to 14 feet in depth. They occur as close together as 4 feet, and if in a virgin state are filled with muck formed of dry leaves and the water which collects there after a rain, for none has an outlet naturally. Frequently one finds in the holes the stone or a number of small stones which bored the hole. They are generally worn round, and seldom weigh more than a few pounds.



SKELETON OF MASTODON FOUND IN A POT-HOLE NEAR COHOES, N. Y.

Although the Lake George kettles are perhaps the most interesting in the country and have been seen by the greatest number of persons, they are to be found in other parts of the State of New York. In 1866, when clearing a place to establish the Harmony Knitting Mills, at Cohoes, N. Y., a large pot-hole was found. It appeared as a bog, like many a mountain pond