

The Famous Pyramid of Cholula Near the Volcano.

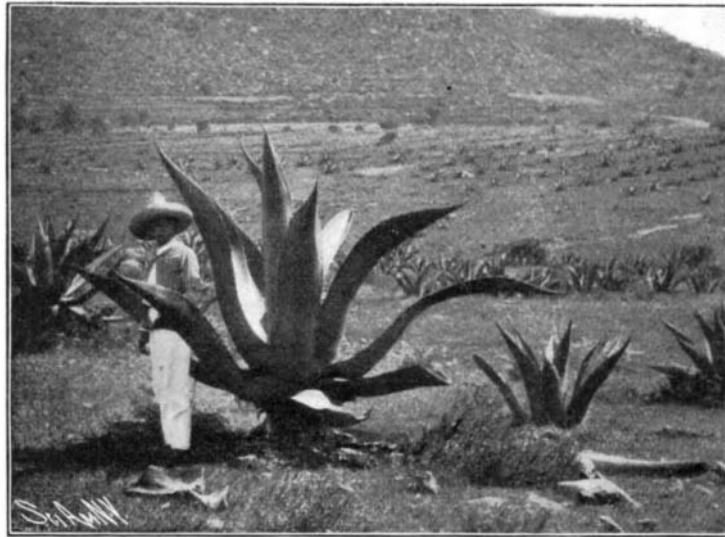


The Port of Vera Cruz, from Which the Sulphur is Exported.

**THE VESUVIUS OF AMERICA.**

BY DAY ALLEN WILLEY.

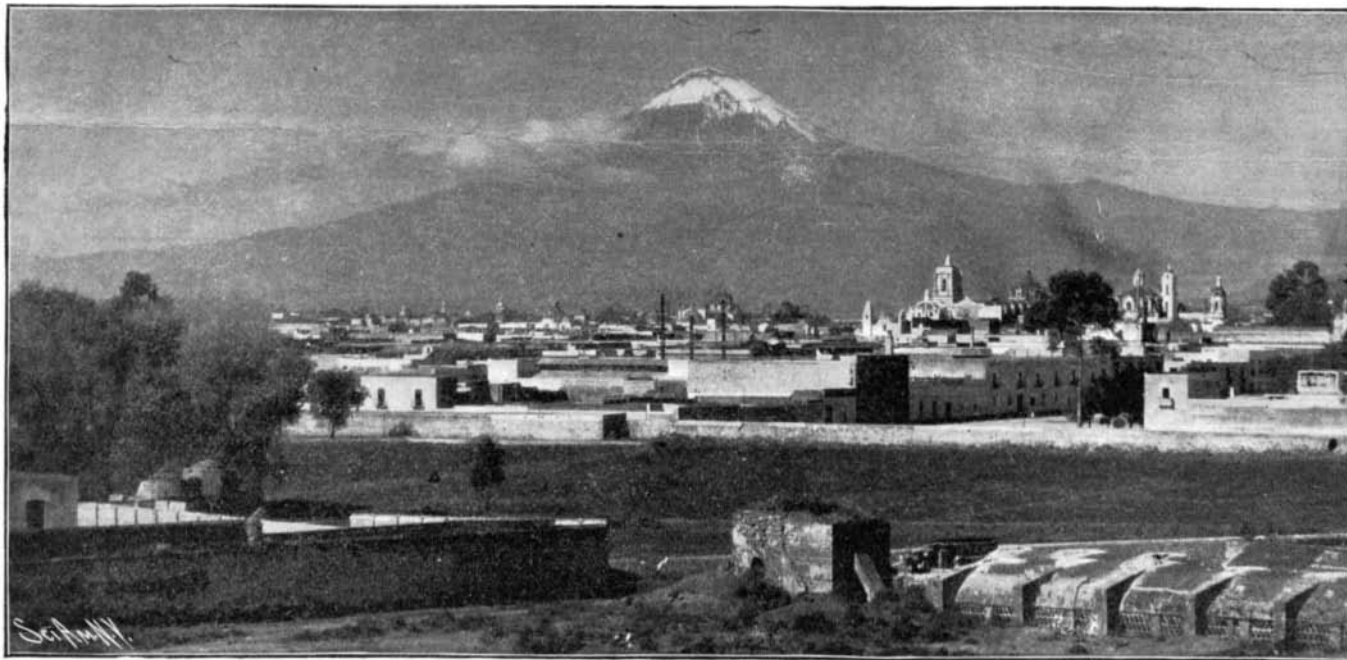
Every traveler through Old Mexico hears of one spot which is more attractive to tourists from abroad than any other. This is the volcano of Popocatepetl. Some have called it the "Vesuvius of America," owing to the frequent eruptions which have marked its history; but unlike Vesuvius, its crater has been entered by man, and, remarkable as it may seem, here has been for centuries the site of a great natural industry. Popocatepetl has been producing sulphur probably for ages, according to the opinion of geologists and other experts who have examined the interior of the crater as far as it has been possible to venture with safety. True, it is by no means an extinct volcano. By day clouds of steam and smoke arise from the summit of the mountain, and at times in the night the sky above is illuminated by the glow from the fiery mass whose existence is revealed through the occasional vent here and there in the temporary bottom of the crater. It is a strange sight to witness human beings toiling in this abyss day after day, extracting the sulphur ore, as it is called, with pick and shovel, and "packing" it on their backs to the edge of the crater where it is hoisted to the top. Some of the peons have labored in these depths 550 feet beneath the earth's surface for the greater part of their lives, since sulphur mining, as it is called, has been carried on in



Scene in the Vicinity of Popocatepetl.

the bowels of Popocatepetl for four centuries; yet no one knows when an eruption may occur which would destroy every living thing for miles around.

From where they toil, the workmen can clearly discern the fissures whence the escaping sulphur fumes and smoke prove that beneath them there is a furnace of nature; but were it not for the crevices the accumulation of the sulphur deposit would cease, for they form a portion of the great natural laboratory in which this material is compounded. The history of Mexico proves the age of this industry, for Cortez obtained sulphur, probably from the summit of the volcano, to use in manufacturing gunpowder for his soldiers. Since that time, the substance has been obtained by the natives when the volcano was not in such a state of activity as to keep them from approaching it. For several years recently a considerable quantity has been secured, although by a very crude method. As already stated, the beds are



General View of the Volcano from the City of Puebla.

were worked by hand labor, the sulphur being placed in bags containing 25 pounds each. They are placed on the backs of human packers who carry them to the foot of the crater and attach them to a rope suspended from the top. Then each is hoisted singly by means of a windlass. At the top the bags are given to other peons who seat themselves on straw mats and slide over the snow which covers the outer portion of the mountain to the timber line. At this



Peons Carrying Sulphur to Timber Line by Sliding Over the Snow.



View of the Crater Which Forms the Greatest Sulphur Mine in the World.

point the sulphur is placed on mules to be transported to the railway station about nine miles distant.

Various estimates have been made of the quantity of sulphur which at present exists in the crater, some figures placing it at fully 100,000,000 tons. Von Humboldt, who made an exhaustive study of the interior of the volcano, gave the opinion that the bed is the largest in the world. A commission of experts appointed by the Mexican government, however, made a careful study of the crater and confirm the statements that the quantity of sulphur is undoubtedly enormous. These reports have led to such an interest being taken in Popocatepetl that it has actually become American property and the flag of the United States is probably ere this floating above its summit, for a company of capitalists from the States have actually purchased this great factory of nature and intend mining the sulphur on an extensive scale.

Consequently the famous mountain has become a subject of more than usual interest. As is well known, it is one of the highest peaks on the American continent, reaching to a point 17,520 feet above sea level. The crater itself is somewhat unique, since its present form resembles a bell rather than a cone, to which most craters bear a similarity. The opening is 2,700 feet at its greatest diameter, which is from east to west, while the greatest diameter at right angles to this line is 1,200 feet. The rim of the crater is considerably lower on the side toward the city of Puebla, which is situated within sight of it. At this point the hoisting windlass has been erected. From the hoisting platform to the floor of the interior, as already stated, is no less than 550 feet, of which 225 feet comprises a wall, which is practically vertical. Fortunately the walls are formed of the trachytic and porphyritic rock, covered at the summit by a lava which has been thrown out in past eruptions. The lava rock has assumed such a curious shape that the rim near the hoisting side is popularly known as the "Devil's Spine"—a very proper term. That the sulphur is continually being formed is shown by an examination of the bottom of the crater near the fissures. Here the rocks have been found covered with a layer of powdered sulphur recently deposited. From time to time openings have been made in the mass of debris which has accumulated in the crater as the result of eruptions. These pits have revealed masses of sulphur ranging from 6 to 10 feet in depth. The commission of Mexican experts has traced the deposits, covering spaces which represent nearly half a mile in area, while borings indicate a depth ranging over a thousand feet. The quantity of sulphur secured during the last thirty years, however, gives possibly the best conception of the extent of this curious industry, for it amounts to 10,000 tons, although every pound was taken from the deposits and carried away from the mountain by men and animals.

When the plans of the new owners are carried into execution, the crater will become the site of a most interesting series of operations. Arrangements have been made to install pneumatic machinery which will cut away all of the rock formation which can be reached. It is then believed that the sulphur can be obtained merely by the use of the pick and shovel, since it exists in such a loose formation. A tramway will be built along the floor of the crater with tracks reaching the principal workings. As the sulphur is mined it will be loaded into cars and hauled to the foot of a cableway consisting of a series of huge buckets, traveling along an endless wire rope. As fast as the buckets are filled with sulphur, they will be hoisted to the edge of the crater, thence carried down the mountain to a refinery which is to be built at the foot. Here the impurities will be separated from the sulphur and it will be transported by another cable system to the Interoceanic Railway, whence it will be shipped to the city of Vera Cruz, the nearest seaport.

#### DISAPPEARING COAST-DEFENSE GUNS.

(Continued from page 320.)

the breech. The action of the carriage is as follows: Upon firing the piece the central pivot of the levers moves horizontally to the rear, carrying the top carriage with it. The lower end moves vertically upward, being constrained by the crosshead guides. The gun moves downward and to the rear in the arc of an ellipse. The energy of recoil is absorbed partly by raising the counterweight and partly by the resistance of the hydraulic cylinders. After loading, the pawls are tripped, and the greater moment of the counterweight enables it to raise the piece into battery. The return to battery is softened by the hydraulic counter-recoil buffers in the cylinders, forming a sort of dash-pot.

An attacking fleet would be practically at the mercy of such a battery of disappearing guns. At the outset it would be ignorant of the location of the fort; and the use of smokeless powder would render the detection of the guns, during the few seconds that they showed above the parapet, a difficult matter. The

only possible chance to place a shell inside the fort would be by making use of high angle fire; and this is impracticable in the modern warship as at present constructed, for two reasons: first, that the existing gun carriages will not allow the breech to be sufficiently depressed to admit of such fire; and, secondly, that the existing decks are not strong enough to withstand the heavy vertical strain of the recoil. The aiming of the gun is all done under shelter. By means of a "range finder" and the "converter board" the gunner can lay the piece with perfect accuracy while it is yet below the level of the parapet. Gun for gun, such a battery has an enormous advantage over the floating fortress, for it would have in its favor: 1. Invisibility. 2. Absolute protection from gun fire. 3. Absolutely steady platform. 4. Absolute determination of the range and bearing of the enemy. To this must be added the moral effect upon the courage and endurance of the gun crews, resulting from their superior protection.

#### The Current Supplement.

The events which are now occurring in the Far East lend a peculiar interest to the launching of the new first-class battleship "Kashima." Harold J. Shepstone describes the ship in the opening article of the current SUPPLEMENT, No. 1529. A demand exists for posts that are strong, convenient, durable, and cheap, particularly in those parts of the country where timber is difficult to obtain. C. L. Catherman believes that cement posts admirably answer all requirements, and presents convincing arguments to uphold his view in an instructive article. Dr. O. N. Witt presents another one of his instructive papers on Patina, giving explanations that are wonderfully simple. "Friction Clutches" is the title of a most exhaustive discussion by George A. F. Pover. The so-called main spring of a watch finds manifold application as the cheapest and simplest means for mechanically driving simple apparatus. Emil Riedel tells how the motor spring is to be calculated. A highly suggestive lecture was recently delivered before the Royal Institution by Prof. J. J. Thomson on the Structure of the Atom. An abstract of the lecture is published in the current SUPPLEMENT. For several years American engineers have bent their energies to the designing of a simple and safe single-phase alternating-current railway. Mr. A. Frederick Collins describes the first successful American road of this type. Jeanette Macdonald presents a vivid picture of a California Hop Garden. Prof. Charles Fisher publishes a description of the objects belonging to the later Greek period, showing their marked differences from the Babylonian type, and contrasting them with the objects of the first Greek or Mycenaean period. The first of three papers by the late Alfred J. Hipkins is presented, the installment describing stringed or musical instruments without keyboards.

#### Population of the Philippines.

The total population of the Philippine archipelago as returned from 342 independent islands is 7,635,426. Of this number almost seven million are more or less civilized. The wild tribes form about 9 per cent of the entire population. The civilized tribes are practically all adherents of the Catholic Church. The Moros are Mohammedans, and the other wild peoples have no recognized religious beliefs.

The total population, according to the most reliable authorities, is a little more than four times as great as it was one hundred years ago. During the same period that of the United States multiplied almost fifteen times. The excess of birth rate over death rate in the Philippines has been large, in spite of sudden and great losses as a result of epidemics of various diseases.

While it is true that the enumeration of the wild tribes, according to the methods employed among civilized peoples, was not practicable, very careful and painstaking estimates were made, and the returns are probably within 10 per cent of the true number. The total number of non-Christian peoples is stated to be 647,740.

#### A "Bureau of Authenticity."

Owing to the prevalence of spurious but often deceptive imitations of old and of contemporary masters, the Society of Friends of the Luxembourg Museum, under the patronage of M. Dujardin-Beaumetz, Under-Secretary of State for Fine Arts, is about to organize a "bureau of authenticity" for works of art. A number of experts are to be attached to the bureau, duly provided by the Prefect of Police with the full authority of police magistrates. There is to be a thorough search, high and low, for falsified pictures and statuary. The idea is new in France, and its application will meet with almost insurmountable difficulties, but M. Dujardin-Beaumetz is confident that with patience and indefatigable perseverance these will in due time be surmounted. —New York Tribune.

## Correspondence.

### About the Moving Stone Ball.

To the Editor of the SCIENTIFIC AMERICAN:

Noticing the article in your paper this week regarding the stone ball on the monument moving spontaneously, I make free to express an opinion on it.

I think the theory that the ball becomes more heated than the base is wrong, as the ball is polished, whereas the base is finished with a rough surface; it would therefore look to me that the base becomes more heated, and expanding somewhat, "bites" the ball slightly on the south side, and in contracting when cooling again, draws the ball down a little to the south.

JOHN GOODSMTIH.

Washington, D. C., April 13, 1905.

### The Projections on the Old Chinese Temple Bells.

To the Editor of the SCIENTIFIC AMERICAN:

In the issue of April 8, article "Some Remarkable Old Chinese Bronzes," the writer speaks of the thumb-like projections on the temple bells as being for the purpose of adjusting the sound. Many Chinese and Japanese bells have similar projections, but in every one of them these are above the sound bow of the bell. This would not be the case if the above theory were correct. An educated Japanese gave me another reason, to wit: Once upon a time Buddha was so engrossed in his meditations that he did not observe the sun's beating down on his bare head. The snails, seeing his plight, covered his scalp with their slimy bodies and prevented his having a sunstroke. Since then Buddhist bells that were cast had these twisted protuberances, while those of beaten metal have been covered with small convex bosses.

Washington, April 10, 1905. E. H. HAWLEY.

### Death of Col. Nicolas Pike.

Col. Nicolas Pike, soldier, author, and naturalist, descendant of a line of scientific men, and a relative of Capt. Zebulon R. Pike, for whom Pike's Peak is named, died on April 11.

The Pike family were Puritans, landing in New England in 1635. Col. Pike was born in Newburyport, Mass., eighty-seven years ago. In early manhood he settled in Brooklyn, where he first identified mastodon bones and teeth exhumed near Jamaica. Through Daniel Webster he obtained the appointment as United States consul in the island of Mauritius, in the Indian Ocean, where he made a great collection of birds, fishes, algæ, and shells. He presented to Cambridge University more than 800 drawings of the fish of the Indian Ocean, and received letters of thanks from Prof. Agassiz. His work, "Sub-Tropical Rambles in the Land of the Aphanapteryx," dealt with Mauritius. Upon returning to this country, his home in Clinton Street, Brooklyn, became a Mecca for students of natural history.

In the civil war he organized an engineer regiment and did notable work in adapting photography to the needs of the army. Among the curiosities he leaves is a three-sheet autograph letter from Washington to his uncle, Nicholas Pike, commending him as the author of the first arithmetic published in the United States. He also possessed the camp chest presented to Dr. David Livingstone by Sir Moses Montefiore.

Col. Pike was a very well-known figure in the office of the SCIENTIFIC AMERICAN. For years he contributed articles on various subjects of natural history to its columns. It was always a pleasure to see this rugged old gentleman enter the editorial sanctum, bringing with him a light heart, a sparkling eye, and the vivacity of youth.

He was a magnificent specimen of humanity, with his deep chest and active physique. Even after the age of eighty he would frequently appear at the office after having had a six or eight-mile walk, but with his cheeks flushed with the glow of health.

Those who were accustomed to his visits will for a long time miss the influence of his buoyant nature and always cheering presence.

### Opening of the Simplon Tunnel.

The Simplon tunnel was opened on April 2, when from the Swiss and Italian sides the first trains passed through, meeting at the center. Herr Brandau, the engineer who had directed the work on the tunnel, conducted the Italian train, which was lighted part of the way by miners with lanterns. The train from the Italian end was the first to reach the iron door at the center, but a little later the train from the Swiss end was heard on the other side. There was a brief time spent in communicating by means of hammering, and then the door was knocked down amid frantic applause and cries of "Long live Switzerland" and "Long live Italy." Bands played the Italian royal march and the Swiss anthem, and the two parties embraced and kissed each other. Herr Brandau shook hands with Herr Rosemund, the director of the work on the Swiss side, and an Italian Bishop Novara embraced the Swiss Bishop Sion. The latter bishop preached a short sermon, and blessed the tunnel.