

1.—A 5 1/2-INCH GUN FROM THE "OQUENDO."

Shield penetrated by shell at Santiago. Saddle of 13-inch gun for the "Kearsarge" seen to the right.

first erected (see Figs. 6 and 7.) On the first platform the great rock-breaker was placed, which reduced the rock to about the size of a walnut. On the platform below was stored the sand and cement. The broken rock, after being washed, was dumped through a chute into a large iron drum holding six barrels or about twenty-two cubic feet. A car holding two barrels of sand and one barrel of cement was brought forward, and in this proportion the whole was dumped through a chute into a mixer placed on the platform below, water for the concrete being fed in proper quantities through a nozzle in the axle of the mixer.

Power for operations was supplied by three detached engines situated on the lowest platform. After the sand, rock, and cement were thoroughly mixed, the material was dropped into cars running upon a trestle and carried over the dam where the last block was being formed, each car load being dumped through a large pipe to a platform, and thence by wheelbarrow (see Plate 7) into the frame on the dam site where the block was to be stationed. This plan was followed successively until the dam was completed. The capacity of the concrete machines was 450 barrels, or about 10,000 cubic feet, daily. The amount of material consumed gives some indication of the great size of the work. It included 205,000 barrels of the best Portland cement, 410,000 barrels of sand, and 1,230,000 barrels of rock.

The front slope of the dam is 1 foot horizontal to 4 feet vertical; the rear slope commences 1 foot vertical to 1 foot horizontal, ending in the upper 60 feet with a slope 2 feet vertical to 1 foot horizontal, the two rear slopes being connected by a curve of about 300 feet radius. The convex side of the dam, which is upstream, is curved with a radius of 637 feet.

ENOS BROWN.

**GUNS RECOVERED FROM THE SPANISH CRUISERS.**

There has recently been brought up from Cuba, and unloaded at the Washington navy yard, a considerable amount of material which was recovered by the wrecking companies from the wrecks of Cervera's fleet. It is a miscellaneous collection, of guns, gun shields, projectiles, chains, ship stores, and general fittings.

The most conspicuous part of the salvage is the breech-loading rifles, from the secondary batteries of the Spanish cruisers, and the shields and mounts which accompany them.

Our illustrations are from photographs taken at the Washington navy yard, soon after the material had been unloaded from the United States collier "Leonidas," and it will be seen that the trophies carry upon them the unmistakable mark of the two agents, shell fire and conflagration, which

of the "Vizcaya," the 5 1/2-inch guns were of the rapid-fire type, we believe, but in the other two ships they were of the old slow-fire pattern.

The 5 1/2-inch guns are of what is known as the Honoria pattern, of the year 1883. They have a total length of about 17 feet, the length of the bore being 35 calibers. The total weight of the gun is 4.1 tons, and it fires an armor-piercing projectile weighing 86 pounds and a common shell weighing 75 pounds. For the armor-piercing projectile the firing charge is 44.1 pounds of powder, which gives the shell a muzzle velocity of 2,001 feet per second, equivalent to a muzzle energy of 2,386 foot-tons. At the muzzle the penetration would be about 14 inches of iron.

The mounting is seen very clearly in the illustration (Fig. 2), showing the breech and inside of the shield of one of these guns of the slow-fire pattern. The gun is trunnioned in a top carriage, which travels during the recoil upon the slides of the lower carriage. The trunnions are formed on the gun, as is usual in all slow-fire weapons, and they can be seen on any of the dismantled guns shown in our various engravings. The lower carriage rotates upon a circular bed of rollers, below which, encircling the foundation plate of the mount, is a circular vertical rack, the rollers and rack being protected from projectiles by a circular casing which is bolted to the carriage and rotates with it. The up-

brought about the speedy destruction of the Spanish fleet.

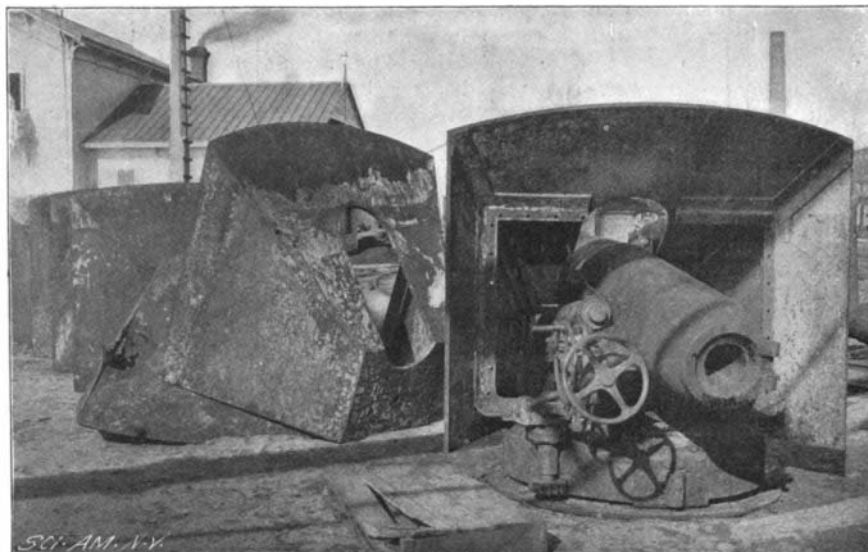
The guns shown in our illustrations have been recovered from one or other of the three sister ships, "Vizcaya," "Maria Teresa," and "Oquendo." These vessels carried as their main armament two 11-inch rifles and ten 5 1/2-inch breech-loading rifles. The 11-inch guns were in two turrets, one forward, one aft, while the 5 1/2-inch guns were arranged in broadside, amidships on the main deck. In the case

per and lower carriage, the turn-table, and the rack, without the casing, of one of these mounts, are shown in the lower right-hand corner of cut No. 1.

The gun is traversed to right or left by means of the hand wheel to the left of the breech, which, by means of a worm, worm-wheel, vertical shaft, and a pinion engaging the circular rack, rotates the carriage about the rack, the latter, of course, being bolted to the stationary foundation plate. The elevation and depression of the gun is accomplished through another hand wheel which acts on a pinion and a circular vertical rack attached to the gun.

Two of the circular racks are shown in Fig. 3, resting upon a dismantled Spanish gun.

All of the guns were provided with shields of comparatively light construction, the thickness, even at the vertical front end, not being over one inch. They are carried on the bottom carriage, to which they are attached by bolting at the front end, and by means of a square frame of angle-iron, which passes round the interior of the shield and extends inwardly to meet the carriage, to which it is bolted. These shields are of sufficient size and thickness to protect the gun crew from machine bullets at close quarters, and from one and six-pounders at long range; but, for protection against anything above a machine gun at close range, or above a six-pounder at any fighting range, these light shields are worse than useless. They cannot keep out the shells, and they merely serve to afford sufficient shock to burst a shell, which, but for the shield, might pass harmlessly by without striking any of the gun crew. In any case, it is not likely that more than one member of the detachment would be struck, whereas a shell that burst in passing through the shield, might kill every man at the gun.



2.—VIEW SHOWING BREECH AND MOUNTING OF A 5 1/2-INCH GUN.

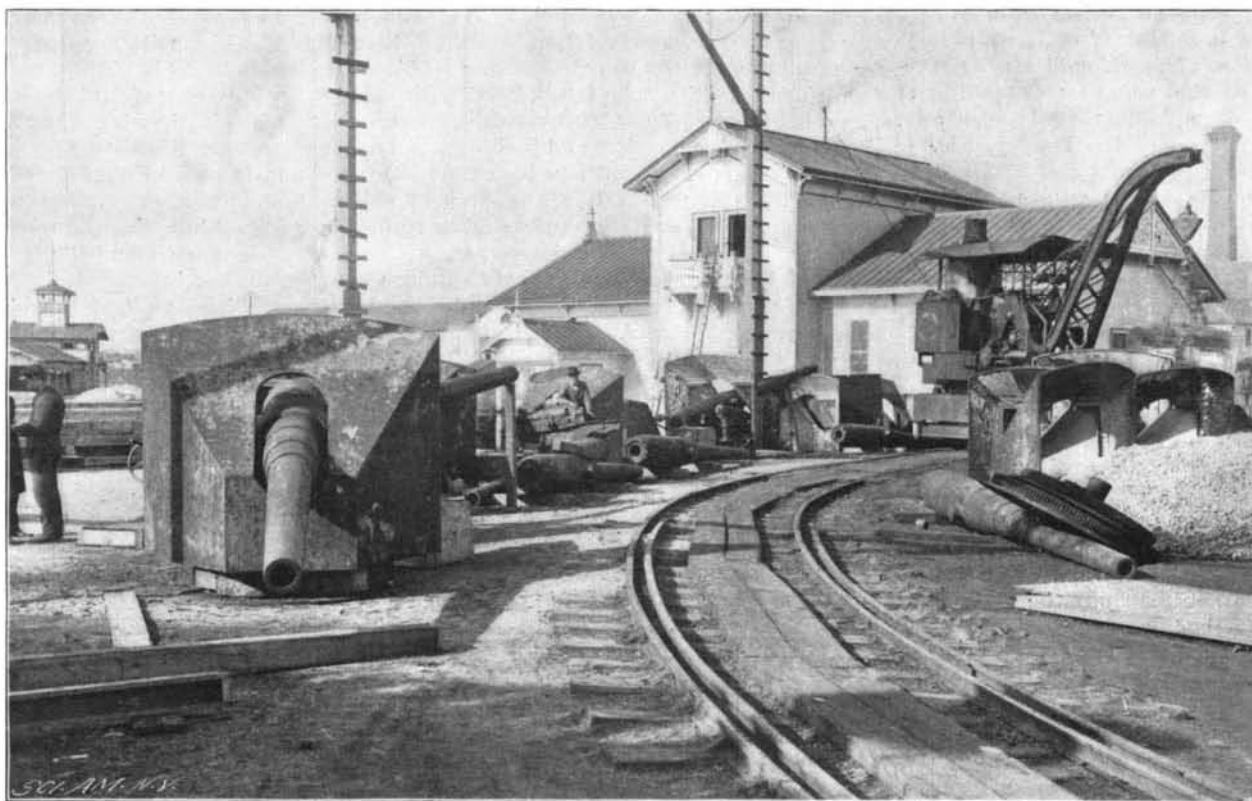
The third shield (from the "Vizcaya") shows effect of shell passing through from the inside.

All the guns bear evidence of the attempt of the Spaniards to render the guns valueless before they fell into the enemy's hands. It will be noticed that the breech-blocks are all missing. They were unhinged and thrown into the sea before the surrender. If our government wished to use the guns, however, it would be easy to replace the blocks, as the Navy Department

has drawings of them on file.

It is not likely that any of these guns will be put to active use, for it would entail the introduction of another size of ammunition into the navy, where there is a natural desire to keep down the number of different patterns of guns to the lowest practicable limit. It is not unlikely that the guns will be mounted as trophies at the Naval Academy, and in various public places throughout the country.

A BROKEN-WIND-ED horse is rarely seen in Norway. A bucket of water is always placed within his reach when feeding, and the animal alternately takes a mouthful of hay and a sip of water.



3.—SPANISH GUNS, WITH THEIR MOUNTS AND SHIELDS, AT THE WASHINGTON NAVY YARD, TAKEN FROM THE SPANISH WRECKS AT SANTIAGO.

## Science Notes.

Bright red spectacles accompanied by internal doses of calomel form a new German specific against seasickness. It is deduced from Epstein's investigations on the influence of color on the blood vessels in the brain. Seasickness is due to lack of blood in the brain, while red sends blood to the brain with a rush. By looking at one point for some time through the red glasses, the patient is cured radically.

The number of bacteria in London crude sewage is 3,899,000 per cubic centimeter, at the Barking outfall, and 3,527,000 at the Crossness outfalls, according to the average of a number of recent counts by Dr. A. C. Houston, made early this year, under the direction of Dr. Frank Clowes, Chemist of the London County Council. The range at Barking was from 7,260,000 on May 3 to 513,000 on April 15; and at Crossness, from 5,290,000 on March 2 to 2,410,000 on April 20.

According to The Druggists' Circular and Chemical Gazette, the expensiveness and want of durability in the ordinary rubber bottles and ice bags which have been so essential in the sick chamber have long been a perplexing problem. Experiment with rice paper, covered inside and out with a coating of Japanese lacquer, led Prof. Jacobsohn to recommend this material to the Berlin Society of Internal Medicine as far superior to rubber. In strength, flexibility, imperviousness, lightness, and durability it is said that this bottle leaves little to be desired.

The increasing use of acetylene as an illuminating gas and the objection made to it in some quarters on the score of hygienic considerations lend particular interest to a number of experiments recently made on animals, says The Pharmaceutical Era. Dogs were kept for some time in an atmosphere containing 20 per cent of acetylene without deleterious effect, and it would appear that living beings are not injured by breathing an atmosphere so contaminated. A dog kept in an atmosphere containing 40 per cent of acetylene, however, succumbed after breathing 110 liters of the mixture. The danger from acetylene is smaller than from ordinary illuminating gas, and its intense odor makes it readily noticed when escaping into the air. There is no risk of explosion until the air contains one-twelfth of its volume of acetylene. It is particularly adapted to illumination, because of the slight heating effect as compared with its illuminating power, and the removal of but little oxygen from the atmosphere. The heat of combustion with an acetylene flame does not rise above 900° C., while the heat from an ordinary gas flame may reach 1,300° C.

It chanced that the birth-rate began to decline in France sooner than in other great countries of Europe, and that the decline has been more rapid. But, as the figures of the Registrar-General show, the same tendency is now very strongly marked in England, and is plainly visible in nearly every European country. It is quite conceivable that a couple of generations hence Frenchmen may find that their birth-rate is no longer the lowest in Europe. The truth is that the present rapid growth in European populations is a phenomenon which is almost entirely confined to the last 150 years. Through some of the grandest periods of our history the population of England was almost stationary, and the same statement applies to France. If this decrease is due to non-natural causes, it is not a matter for congratulation; but if it means that European peoples are ceasing to contract reckless and improvident marriages and are showing more care and discrimination in the begetting of children, it is a healthy sign of the times. Large families are not necessarily an evil, but if the members composing them are diseased and degenerate, they become a standing danger to the welfare of the body politic.—The Humanitarian.

In a recent paper on "The Accepted Altitude of the Aurora Borealis," read by Prof. Cleveland Abbe before the American Philosophical Society, he stated that some observers have seen the light in such positions between themselves and neighboring objects as to demonstrate that the aurora, like the lightning, may be entirely confined to the lowest stratum. Others have seen it so located among the clouds that its origin must be placed at or below their level, and therefore within a few thousand feet of the earth's surface. On the other hand, those who have calculated the altitudes of specific beams by trigonometrical or equivalent methods have deduced heights of twenty to a hundred miles; Dr. Boller has even quoted an altitude of 1243 miles. Prof. Abbe remarks that, after reviewing the literature of the subject since the time of Halley, he finds that all methods agree in one fundamental assumption that the observed beams and arches have an individual existence and a definite locus. But this assumption is negatived by the equal frequency of negative and positive parallaxes wherever the parallax method is applied. The only conclusion possible is that the observers do not see the same object, partly because the aurora is too low down, and partly because there are optical illusions due to alignment.

## Miscellaneous Notes and Receipts.

**Perfumed Ammonia Scouring Water.**—Perfumed ammonia scouring water is prepared by mixing:

|   |            |
|---|------------|
| Spirit of sal ammoniac.....                             | 160 parts. |
| Finely scraped soap.....                                | 30 "       |
| Borax.....  | 10 "       |
| Cologne water.....                                      | 15 "       |
| Distilled water, enough to make up 460 parts of liquid. |            |

—Neueste Erfindungen und Erfahrungen.

**Improving the Air in Work Rooms, etc.**—For one liter bottle of well water, take a spoonful of oil of turpentine, shake the liquid diligently until it becomes dim or white and distribute in the room, by means of an atomizer. One may also mix a few drops of acetic ether with the oil of turpentine. The refreshing effect of the quickly spreading, pleasant odor is astonishing.—Kraft und Licht.

**To Render Fine Fissures in Tools, etc., Visible.**—In order to make the extent of fine cracks in tools, etc., visible, it is recommended to moisten the surface of the cracked article with petroleum, to rub off clean and to wipe off the surface with chalk. The petroleum which has entered the fine cracks sweats out and the rent is visible in its whole extent.—Oesterr. Zeitschrift fuer Berg- und Huettengewesen.

**Lustrous shoe grease** is obtained as follows, according to Technische Berichte: Alcohol, 126 parts; camphor, 11 parts; Venetian turpentine, 16 parts; shellac, 36 parts; dyestuff, 32 parts. The latter may either be aniline blue, of which it is best to use 15 parts, or Bismarck brown (phenyl brown), likewise 15 parts; both coloring substances are dissolved in 800 parts alcohol. This polish is best suited for walking boots and shoes, since it possesses a fine, silky (not a lacquered or mirror-like) appearance.

**Technical Value of Acacia Wood.**—The fact that the locust tree attains in twenty-five to thirty years the same thickness as the pine in fifty and the oak in one hundred years caused L. Kausch to conduct experiments with this variety of wood. The author gained the conviction that acacia wood has an important future, especially as regards its use for mining purposes. Acacia timber excels by great firmness and durability, and is, therefore, also well suited for many other purposes, such as wheels, bungs, ladder steps, etc. The locust tree thrives in the poorest soil, even in the rubbish of sandstone quarries and in slaty declivities. All that is necessary is to make a little hole in the latter, to fill it with mother soil, and to plant the young tree therein. In wet soil the locust tree does not thrive.—Glück Auf.

**New Painting Ground.**—Since notable connoisseurs ascribe the subsequent darkening and defective luminosity of many paintings to the composition of the grounding with which the canvas is prepared, J. L. Schudt, in the Polytechnisches Zentralblatt, proposes in place of the mixture now employed, consisting of chalk, glue, and oil, a new composition, which he prepares as follows: Slake burnt lime with a little water, add to the mixture, while still hot, beeswax and linseed oil, and grind the whole in a paint mill with  $1\frac{1}{4}$  to  $1\frac{1}{2}$  times its weight of white cheese. The mass is applied on the canvas saturated with milk and smoothed. Another advantage claimed for this new painting foundation is that it does not allow cracks and fissures to form as readily as with the one heretofore in use.

**Water Lacquers.**—The group of the water lacquers embraces only a few, little used lacquers. Below are some receipts.

1. Shellac Water Lacquer.—Boil 28.5 grammes of shellac and 42.75 grammes of borax in 0.564 liter of water until the shellac has dissolved. If bleached shellac is used, a white color is obtained, with orange shellac a light brown one. This varnish gives a good binding agent for water colors and is also a useful paper varnish. It dries with a handsome luster and hard surface which is water proof. By the addition of aniline colors soluble in water, the lacquer can be tinted as desired.

2. Enamel Lacquer.—Mix 0.564 liter of albumen with 0.564 liter of water. For preservation, add a little carbolic acid or salicylic acid. Instead of the albumen, dried albumen may be employed, of which 28.5 grammes are dissolved in 0.564 liter of water, but the color is less clear. This varnish dries with good gloss. By drying in hot air it becomes more resistive to water.

3. Glue Lacquer.—Dissolve 1 pound of good pale glue in 9 liters of water, the color being entirely dependent on the quality of the glue. Good white gelatine gives a white color, while brown glue yields a yellow one. Solution accomplished, add (but only directly before use) 28.5 grammes of potassium bichromate, which renders the surface watertight. As said, the potassium should only be added closely before use, else the solution will be converted into a gelatinous, stiff mass. This mixture constitutes the basis of many leather varnishes. For preservation the addition of a little thymol or borax is commendable.

4. Crystal Water Lacquer.—Dissolve 450 grammes of good white gum arabic and 450 grammes of glucose in 1,629 liters of water. This solution dries hard and glossy.—Färben Zeitung.

## PATRICK COUNTY, VA., AND ITS CURIOUS "FAIRY STONES."

BY POWHATAN BOULDIN.

The Blue Ridge and the Alleghany Mountains unite a little north of the county of Patrick, Virginia, and hence in that county they constitute only one mountain.

Stuart, a pretty little town seventy-five miles west of Danville, is the county seat of Patrick and the terminus of the Danville and Western Railroad. The distance from Stuart to the top of the mountain is ten miles, over an admirably constructed turnpike, and the scenery all along the road is exceedingly picturesque. When the traveler reaches the summit of the mountain, 3,000 feet above the level of the sea, he naturally expects to descend on the other side; but, greatly to his surprise, he finds himself in a comparatively level country, the soil of which is well adapted to the cultivation of grain, grass, and vegetables.

That portion of this remarkable plateau which lies in the county of Patrick is called the Meadows of Dan. In the meadows are innumerable springs of pure water, the temperature of which is 50 degrees in summer. In less than fifteen miles the traveler crosses twelve different streams, all rising on the top of the mountain, and all flowing through these beautiful tablelands. One of these streams (the river Dan) joins the Staunton and forms the Roanoke, which empties into Albemarle Sound. Another (the Ararat) flows into the Yadkin, which joins the Great Pee Dee, in South Carolina, and with this runs into the Atlantic Ocean. The waters of another empty into New River and finally reach the Gulf of Mexico.

So it appears that these streams, which rise so near together, are wide apart before they reach the ocean.

The Dan, making its way down the mountain, is a very great natural curiosity. After flowing about ten miles through meadows, it reaches the declivity of the mountain and begins to descend, making innumerable picturesque waterfalls in its downward course. One of these is known as the Big Falls. There the water flows between two high mountains and falls in a beautiful, smooth sheet over a huge rock 40 feet high. At the base of the falls is a basin of water, clear as crystal and extending 25 feet under the rock over which the water falls. This basin is nearly round and is 60 feet in diameter. The beauty of the falls, together with the wildness of the scenery, make it a very romantic place. But the most remarkable thing about the passage of the Dan down the mountain is the marvelous zigzag course which the river takes in making its descent. The distance in a straight line is only five miles, but, following the river, as it winds round the deep gorges, hemmed in on all sides by high mountains, it is at least twenty miles.

One mile below the Big Falls are the Pinnacles—two immense natural pyramids in the shape of a sugar loaf, rising to a level with the surrounding mountains. The summit of the highest one is about 20 feet square, and from it a view may be obtained which will amply repay the visitor for the labor of climbing, although that labor is very great.

The Dan runs entirely round the Pinnacles, taking one at a time. The distance straight across is only half a mile; but, following the river, it is at least two miles. When the river reaches the foot of the mountain the scene is suddenly changed, the waters becoming calm and placid, and the visitor, who has seen the mad rush and heard the mighty roar, has the inexpressible feeling of quiet which is experienced by one who has passed through a terrible storm.

The Pinnacles are frequently visited; but, owing to the difficulty in getting to the river and following it, few have ever visited the falls of the Dan.

Smith's River is one of the streams which rise in the meadows. Unlike the Dan, in descending the mountain it runs in almost a straight line, and following it is an arduous, though by no means an impracticable, undertaking. Many pretty cascades are to be seen, one in particular being especially attractive. This is down deep in a mountain gorge, where the river flows over a large rock, at the base of which is a little level spot, large enough for about a dozen persons to stand and admire the scene. As the rock is not perpendicular, the water does not make such a loud noise as at the Big Falls of the Dan, but instead a low, murmuring, melancholy sound, which is as soothing to the soul as the softest, sweetest strains of music. Such a retreat is not only attractive to the romantic youth, but it is refreshing to men of mature years who may be in need of rest from the cares and responsibilities of business.

In the meadows, near the head waters of Smith's River, rock crystal is found, out of which the Indians manufactured their prettiest arrow heads. The writer has one made of that material which is so perfectly transparent that the smallest print may be read through it. The writer has seen many arrow heads which were made of white flint, but this is the only one he ever saw which was made of rock crystal.

In the same vicinity there is a quarry of very fine soapstone. Near it was recently found a large bowl, which some Indian sculptor had made of that material;