11. That large calibers are insisted upon, and to be furnished immediately.

It is not intended, by what has been said, to dispense with the employment of floating defences for our coast at the different points where their use is advantageous.

THE WAY THE GOLD DEPOSITS OF CALIFORNIA WERE FORMED.

Lawson B. Patterson went to California early in 1849, and he has spent 12 years in mining, never having diverted his labor to other pursuits, and never having come down from the mountains until September last. Having become satisfied that the usual explanations given by geologists of the formation of the gold deposits are unsound, he has written a little book of 100 pages to publish his own ideas. Before proceeding to examine Mr. Patterson's positions, let us give as briefly as possible the usual explanations of the geologists.

If a grain of sand, equal in diameter to the thickness of four sheets of paper like this on which the SCIENTIFIC AMERICAN is printed, is laid upon a 16 inch globe, it will bear the same proportion in hight to the size of the globe that the Himilaya mountains bear to the size of the earth. The mountains and valleys, therefore, of the earth form very slight wrinkles in its surface. It is supposed that the interior of the earth is a molten mass: the solid crust of the surface not bearing so large a proportion to the whole, as an egg shell does to the whole egg. As the earth cools, it contracts in size, and the crust settles in upon the shrinking mass. This settling in is not uniform all over the globe, but large tracts go down; bending up the rocky crust around them sufficiently to form those slight wrinkles which constitute the mountain ranges and ocean valleys that seem so vast to us—the pigmy crawlers upon this whirling ball.

These changes in the surface of the earth are constantly going on, but very slowly. The coast of New Jersey has settled some four feet in the last 80 years; a portion of Sweden is rising at the rate of about one foot in a century, this movement having raised that country about 800 feet; while the bottom of the Pacific ocean is slowly going down.

Now there was a time, inconceivably remote as we count time, but comparatively recent in the vast periods of geology, when the rocks that now form the Sierra Nevada mountains and the rest of California were buried beneath the waves of the Pacific Ocean. These rocks were traversed then as now by veins of quartz, some of which contained gold. How the veins of quartz were formed, and why the gold should be collected in them, we do not propose now to consider, though it has been made the subject of profound inquiry by the ablest geological chemist in the world. The changes that have subsequently taken place are more than sufficient for a single article.

As the middle portion of the bed of the Pacific subsided, the rocks near the coast were heaved up, and thus California rose, like Venus, from the sea. Extensive, laborious and minute examinations of the surface of California, by geologists trained to the difficult art of observation, have shown that the country was raised by successive periods of upheaval: between which were long intervals of repose. In ascending the slope of the Sierra Nevada, terraces are found one above another which unquestionably formed, in successive and widely separated ages, the shore of the Pacific. As the rigid rocks were tilted up, they were cracked and broken; opening long channels, into which the water from the copious rains was collected, forming the rivers that flow down the slope of the mountain. At first these channels had rugged bottoms and sides, but the flow of water for centuries has worn them smooth. It has also worn them deeper, and the depth to which its ceaseless attrition has cut into the solid rock is one of the most impressive proofs that we have of the immense periods that have passed since rain first began to run in these ways.

Wherever a gold-bearing vein of quartz chanced to be broken by the upheaval or worn by the stream, a deposit of gold would be formed. Of course the formations of the several deposits would be influenced by an endless variety of circumstances. In some places the rocks would be worn by the rivers, in others by the beating of the sea. Basins would exist in which the water for thousands of years would tumble the debris of the mountains, shaking down the gold to the bottom. Then as these basins were lifted above the sea, they would become ponds to be slowly filled up by the growth of vegetation. The river channels and the basins are the "long toms" and "pans" in which nature carries on her mining operations; collecting the gold upon the ripple bars, and washing away the "tailings" to the sea.

Mr. Patterson cites in opposition to this theory two facts, one of which at first view seems to have a great deal of force, while the other seems to be in perfect accordance with the theory. He says that at Cement Hill the basin in which the gold occurs has a complete rocky boundary, so that no stream could have flowed through it. But no geologist supposes that streams ever did flow out of the bottoms of these basins. Mr. Blake, in a passage cited in Mr. Patterson's book, ranks Cement Hill among the lacustrine deposits, that is, deposits formed in lakes or ponds.

But the other objection of Mr. Patterson seems to have more weight; this is that the rocks of the river banks are not worn smooth as they would be had they been cut through by the action of water. We have no doubt, however, that a more extensive observation will convince our author of the unsoundness of this objection. If he examines a water cut channel, like that in the Niagara river below the falls, he will see that the rock is undermined and broken, so that a face once smooth becomes ragged, while he will discover that wherever the ledge on the sides of the California streams is protected by a layer of clay and gravel it bears unmistakable evidences of having been worn smooth by the action of water.

Mr. Patterson's book contains some excellent practical advice to miners, and will be found richly worth its cost to all California seekers of gold. It may be purchased by sending 50 cents to the author at Boston, Mass.

PATENT LAW REFORM IN NEW BRUNSWICK.

We have advices from an attorney residing in St. Johns, New Brunswick, that at the last session of the Provincial legislature, which was prorogued a few days since, an act was passed amending the patent laws so as to allow citizens of the United States to obtain patents in that province. The law, previous to the act referred to, discriminated against all non-residents, hence our law of March 2, 1861, discriminated against residents of New Brunswick. We are happy to chronicle this excellent change in the spirit and letter of the law. It is in entire consonance with the spirit of progress which should mark the history of all nations. The benefits conferred upon mankind by inventions in the arts and sciences are universal, and their authors deserve universal recognition. The people of New Brunswick are among the most vigorous, enterprising and intelligent in all the British Colonies. A large number of ships are annually built in New Brunswick. Population about 200,000. This is an excellent opening for our inventors. For particulars about the practice under the law parties can apply at this office.

Successful Opening of the Great Exhibition---Defective Building.

The London *Engineer*, of May 2d, says:

The successful opening of the International Exhibition is a subject for gratulation. An undertaking which has aroused so much interest and no little anxiety deserves success, and nothing could be more auspicious than the opening ceremony yesterday. Whatever may be the comparisons made between the present exhibition and that of 1851, the public are manifestly preparing to come in millions, and they will certainly not be disappointed in the materials for valuable observation, whatever they may think of the general effect of the whole.

We think every engineer who has examined the structure of the building must now feel that one critical test of its strength is well over. The building is not over and above strong. It was planned by a gentleman who has exhibited the most intrepid defiance of some of the first principles of construction, his neglect to provide, in his original plans, for the outward thrust of the arches, being one example in point. Before the contractors, acting upon the ready suggestions of Mr. R. M. Ordish, had supplied extra diagonal tension rods, the main columns of the nave had gone out of plumb, and in the western annexe the visitor can still see the results of the same contempt of abutments, the wooden posts being from 12 to 16 inches out of plumb in a hight of 28 feet, the whole being held up by props in the Prince-Albert road. So, too, the breaking weight of the gallery girders is given as only 88 tuns, while it is possible to accumulate upward of 35 tuns of moving load upon them. The assigned breaking weight is, we take it for granted, the distributed breaking weight, which is twice that required as a central breaking weight. We have less fear of failure by actual overloading, however, than by buckling, or the settling of one or more of the detached brickwork piers, or the fracture of one or more of the weak lugs to which the diagonal tension rods are secured. For those who care to go through the details of the construction of the exhibition building, we may refer to the *Engineer*, Vol. XII., page 354, or to still more complete information in the current number of the *Practical Mechanics' Journal*. Few, however, we apprehend, care to spend much time in studying a notoriously imperfect model, as the building in question is—imperfect in construction as well as in architectural design. We allude to its defects chiefly for the purpose of expressing the hope that those having charge of the building will exercise every care to guard against a catastrophe, by frequently testing the truth of the columns, and watching the deflection of the gallery girders. With this we may dismiss the building, merely remarking that no curiosity on the part of a stranger to see it on the spot is likely to be rewarded by a single emotion when he arrives at South Kensington. But the contents of the building will quite atone for other defects, and to many objects the visitor will feel he can hardly return too often. In engineering and mechanical interests, especially, the display far surpasses anything of the kind ever attempted before. The machinery department, too, is the most advanced of any in the exhibition, and this fact, all who have looked into the annexe will say, reflects great credit upon Mr. D. K. Clark, the untiring superintendent of classes 5, 7, 8 and 10. Mr. Clark first assumed the duties of this post in June last, and since October he has given his whole time to it, with a success to which every visitor will bear testimony.

The western annexe is likely to be intolerably hot. With nearly two acres of glass roof, at a low elevation, and more especially with upward of a mile in length of steam and exhaust pipes ranging from 8 inches to 18 inches in diameter, and lying but a short distance beneath the floor, the temperature after St. Swithin's may be conjectured. Almost the only danger from fire, in this portion of the exhibition, would be, one would suppose, from spontaneous combustion, and we do not doubt that ample precautions will be taken to prevent any outbreak from this cause. The value of all the goods in the whole exhibition has been roughly estimated at £4,000,000, of which a large portion must be included in the annexes, almost too fragile to hold themselves upright. There must be, at least, £100,000 worth of marine engines in the building, and hardly less than £50,000 worth of locomotives. Mr. Clark has, in all, about 700 exhibitors in the classes under his superintendence, and we should suppose the average value exhibited by each was quite £1,000.

THE London *Engineer* says, the floating battery *Trusty*, fitted some time ago with Captain Coles's cupola shield for experimental purposes, has been refitted at Woolwich with the plates, seven in number, which were uninjured in the subsequent trial at Shoeburyness. The shield is again ready for the second trial, and will be fired at from Sir William Armstrong's heavy ordnance. The damaged plates, five in number, have not been replaced, but their vacancies have been filled with oak planks, and the interior of the cupola has been shored up with solid balks of timber, to render the shield as irresistible a target as 4½-inch slabs of wrought iron over a breastwork of oak can possibly supply. In the forthcoming experiments the shield is not intended to revolve, but will be fired at on one side only.

A DAILY direct train service commenced, on the 6th of May, between Berlin and St. Petersburg. A through train is also about to be established daily between Paris and St. Petersburg!