and in May following it was recorded that provision had been sent over "for building ships, as pitch, tar, oakum, tools, etc," and it was proposed to set apart a house for such stores, to make an inventory of them, and to give Molton the charge of the whole. Fishing vessels were to be built on shares. The first vessel ever built in Massachusetts—Plymouth being then a separate colony—was a bark launched at Mystic (now Medford) on the fourth of July, 1631, and named by Governor Winthrop, to whom she belonged, *The Blessing of the Bay*. In the course of the season this vessel made several coasting trips, and soon after visited Manhattan and Long Island. On this occasion, Mr. Winthrop says, the sailors were surprised at seeing, at Long Island, Indian canoes of great size. Some of these specimens of aboriginal boat building were capable of carrying eighty persons. The natives were no doubt equally amazed at the proportions and novel architecture of the largest vessel, probably, that had yet floated on the waters of the Sound. Another vessel of sixty tuns called the *Rebecca*, was built in 1633, at Medford, where Mr. Cradock, the first governor chosen by the Company, had a shipyard. A ship of one hundred and twenty tuns was built at Marblehead by the people of Salem in 1636.

CHILLED SHOT.

Mr. Fairbairn, in his treatise on iron ship building, which appeared so recently as the close of last year, records his opinion that cast and wrought iron were not materials calculated to make a serious impression upon armor plates, and that nothing had been found to answer the purpose better than hardened steel. The cast iron prepared by Dr. Price, and the case hardened shot prepared by Major Palliser, Mr. Fairbairn considered, might answer the purpose in some cases, but he questioned whether this material, however well prepared, could be made to hold together, and not break in pieces when the shot struck the plates. So he came to the conclusion that steel shot and shell were the only projectiles suited for attacking iron-plated vessels. Major Palliser, however, has recently succeeded in demonstrating most thoroughly and practically that, by his method of chilling the shot when cast, he obtains a metal possessing a hardness equal to that of steel and a toughness approaching very closely to that of wrought iron. He has thus solved one of the most important questions of modern gunnery—that of penetrating armor with shells which do not explode until they have passed through the plate and backing—or, in other words, completely through a ship's side. Major Palliser is by no means the first to accomplish this object; the credit of that is due to Mr. Whitworth, who effected his purpose with comparatively small projectiles and low charges of powder. Following the latter gentleman, others have done the same thing, but two serious drawbacks to success were always present. The shells for the most part exploded backward on contact, and being made of steel, were very expensive, their cost for large ordnance ranging from £7 to £20 each projectile. So, on the score of imperfection and of costliness, absolute success was not attained by any, nor until Major Palliser had perfected his chilled shot, which are both cheap and efficient, was it considered attainable. But the question was set at rest by a series of experiments which were carried out last week, at Shoeburyness, with various kinds of shell.

These experiments were instituted for the purpose of testing Major Palliser's chilled shells against those of the best steel projectiles, and in their results proved most valuable. The principle upon which Major Palliser manufactures these shells is worthy of notice as being something more than the old process of chilling. As the shells are required for a particular purpose, they must have something more than a mere chilled surface; a definite and carefully-determined hardness must be imparted throughout the metal. This condition is attained by a selection and combination of those brands of iron which have been found by experiment to chill to the exact extent required, a careful mean being observed between iron which it is difficult to chill and that which chills too hard. Added to the principle of manufacture is the principle of construction, which goes far toward the success of the projectile. The form given by Major Palliser is such as will convert the sudden shock of impact as much as possible into a uniformly increasing pressure. In other words, the projectile has an elongated-pointed head, which is as essential an element in it as is the perfect chilling of the metal. Upon the occasion in question the firing was from an ordinary 7-inch wrought-iron muzzle-loader, with full battering charges of 22 lbs. of powder and a range of 200 yards. The shells were directed against a "Warrior" target, which was built of the ordinary 4½-inch plate with 18 inches of teak backing and an inner iron skin, the whole well braced and strengthened. Half the target was bolted on Mr. Bascomb's plan of india-rubber pads, the other half of the bolts being secured by Mr. Paget's steel cup washers. At the conclusion of the experiments it was found that Mr. Bascomb's system had stood better than Mr. Paget's, but then it appears that the shots almost invariably struck that part of the target bolted on Mr. Paget's principle, while that portion fastened with Mr. Bascomb's washers was scarcely touched. The experiments were commenced by firing a steel shell on Major Alderson's plan, having a screwed base, and being charged with 3 lbs. of loose powder. The shell penetrated the 4½-inch plate, but did no more, except to explode backward from the face of the target. The next shell, which was of the best steel, of Mr. Firth's, passed through the plate and entered the wood backing, but it exploded outward as the first had done. The third shell struck on the edge of the hole made by the first, passing easily through and exploding in the teak backing, which it set on fire. Other shells were tried with similar results in some instances, in others they were even less satisfactory, some of Mr. Firth's shells bursting before they reached the target; a few exploded in the gun. Three of Sir William Armstrong's conical-headed shells, made on the Belgian pattern, with a sharp cone, were fired, and produced a similar effect to those previously fired. After all the steel shells had been tried, Major Palliser's chilled-iron shells were tested, and the first shot proved the superiority of the system over all the others. The shell struck an uninjured portion of the target and went through the plate and backing so quickly as not to explode until it had passed beyond. The backing where the shell had passed through was splintered into fragments, and had the object been the side of a ship instead of a target, the results would have been most damaging to a gun's crew at quarters. The charge of the second Palliser shell did not explode, but after passing through the target the projectile broke itself up into fragments, which were sent spinning about in all directions with a velocity nearly as dangerous as an explosion would have imparted to them.

The results of these two shots were so conclusive that the charge of powder was reduced to 18 lbs., with which the third shell was fired. This shell missed the target and went away to sea; the next, however, which was fired without a bursting charge, went through the target, breaking up and scattering its fragments as before. The charge was then further reduced to 16 lbs. of powder, which was nearly equal to increasing the range from 200 yards to 1,000 yards, while the velocity of each shot on striking was less than 1,300 feet per second. But for all this, the next shell penetrated the plate and backing and was only stopped by coming in contact with one of the heavy struts which supported the target from behind, and which it broke. At this stage of proceedings the Ordnance Select Committee ordered the firing to cease, considering a continuation would only be a waste of time and powder. This will be the more apparent when we state that a few weeks since Major Palliser's projectiles were tried against the "Bellerophon" target, which has 6 inches of iron with 22 inches of teak, and an inch iron inner skin. The results, however, were precisely similar to those with the "Warrior" target, the shells passing through quite as easily. The results therefore constitute a victory for guns over armor plates, and this long pending question may be considered for the present as definitively settled. For the present we say, because, although the *Warrior's* strong sides afford but little more protection against Major Palliser's shells than would those of a wooden ship, it is possible that we may in time find some means of neutralizing the damaging effects of these projectiles. It always has been so; throughout the history of the question victory has always alternated between the guns and the plates. But unquestionably Major Palliser has gained such a victory as will not easily be reversed, and has inaugurated such a condition of things as will require a long time and a considerable amount of scientific and engineering skill to render obsolete. The gallant officer's labors in perfecting our artillery system and in economizing this branch of our national expenditure are worthy of every praise, while the success he has recently achieved in producing a projectile before which an enemy's armored broadside would be no longer impregnable, entitles him to special distinction.—*Mechanics' Magazine.*

Extracting the Metals from Auriferous Quartz.

The following, from the *Alta California*, details a process of extracting the precious metals from quartz rock, which posesses some novel features:

"The rock is dry crushed, and afterward submitted to the action of balls in a drum to insure full pulverization, it being desirable that the powder should approach as near wheat flour as possible. A charge of this powdered quartz is then placed in an air-tight cylinder, the interior of which is furnished with a worm of pipes to convey superheated steam therein. Added to the charge is a given quantity of quicksilver, which is first heated by the introduction of ordinary steam; the superheated steam is then turned on, or the whole seethed or boiled for an allotted period. On the top of this cylinder a water bath is placed, and as the mercurial vapors rise they become condensed. Thus the system of thoroughly impregnating the crushed rock with quicksilver is carried out with efficiency After thus cooking, the cylinder door is opened, and the whole mass discharged upon a novel shaking table, which is worked by the power of the steam employed in the previous operation. This table is built of copper, on a wooden frame, with rollers and riffles of peculiar construction, which, when it is in motion, give the water, amalgam, and dust the same action of the ocean surf—an undertow. As the mass descends, the amalgam, from its metallic weight, gradually clears itself from the quartz dust, and the result is that it is all collected in the troughs of the riffles, containing every particle of metal, be it precious or base, the quartz holds. The mode of applying superheated steam to the crushed rock desulphurizes it, freeing the metals, and all that is necessary is to retort the amalgam to obtain the result of the yield.

Monitors and Heavy Guns in Sweden.

The Swedish Government has lately built three iron-clad ships of the monitor pattern, two of which, the *Ericsson* and the *Thunder* are afloat. The third, still on the stocks at the Motala works in Norrköping, is 250 feet long, with great breadth of beam. The turret is of twelve thicknesses of inch-plate iron, beautifully fitted together, and inclosing two 15-inch guns. The main wheel for the turret is of cast iron, which must be acknowledged to be a signal defect in this important feature of the plan. The Swedes disapprove the system of coil twist for guns, and declare that the iron from Dannemora, of which the Armstrong guns are made, is not suitable for the more solid-made guns adopted by Sweden. Two of these are shown in the exhibitions at Stockholm; one is a rifled breech-loader, the other a smooth bore. The engines of the new monitor are also in the exhibition, and are wonderfully compact trunk engines of 150 horse-power, with the two cylinders end to end and across the keel.

At Motala also there is a very peculiar iron-clad gunboat, which is more like a canoe than anything else. The bow or "nose" is depressed, so that the water line, when on war service, will be almost at the summit of the arched deck. The single gun carried by this formidable craft is in a mailed gun house, fore and aft, in the center of the deck, and the gun cannot be separately trained, but the whole boat must be directed so as to point it. Thus the only aperture for hostile entry into the gunboat is that of a few inches for the shot to issue from the muzzle of the gun. The boat is about 100 feet long, and it looks like a great whale with a cannon on its back.