POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The Association held its regular weekly meeting at its room at the Cooper Institute, on Thursday evening, October 30, 1862; Dr. Stevens in the chair.

CAST IRON FORTS.

Mr. REID—Mr. Chairman, I have here some models of cast-iron blocks which I have designed for the walls of forts. You see that the surface is cast with alternate depressions and projections, so that the blocks lock into each other; thus binding the whole wall together in such manner that, if one block is broken out, the wall will not fall down. Indeed, 100 feet of the wall may be undermined without bringing it down. Projectiles are now made of such weight and propelled with such velocity that, as we have repeatedly seen, granite walls are soon drilled an crumbled to pieces, and unless some better material is brought into use, the use of land fortifications will have to be abandoned. It has been proposed to face the walls of forts with wrought iron, but we all know that as wrought iron rusts on the surface, a scale of the oxide falls off, exposing another portion of the metal to the action of the air, and thus the sheet is rapidly worn away; while the scale of rust on cast iron adheres and forms a protecting coat which preserves the remainder of the mass from rust. These blocks may be built up in front of the walls of our present forts, and they may be made of whatever thickness is found necessary to resist the shot in use, and then if more powerful missiles should be introduced, the walls may be increased in thickness by raising an additional layer of blocks. Cast iron will resist a crushing pressure of 100,000 lbs. to the inch, granite about 11,000, and brick, 4,000 or 5,000.

Mr. FISHER—Can you tell us how much the velocity of projectiles has been increased within a few years?

Mr. REID—About thirty per cent.

Mr. STETSON—The range of rifled projectiles is greater than that of round balls, but the initial velocity is not as great. The greater range with a lower initial velocity is due to the greater momentum in proportion to the resistance of the air, owing to the elongated form of the projectile.

Mr. FISHER—If these blocks are cast of several tuns weight each, as proposed, the difficulty of breaking them will be very great. I recollect seeing the efforts in progress at the Novelty Works to break a mass of cast iron, which by some oversight or accident became chilled in the furnace. After trying several more rapid plans, such as dropping weights upon the mass from a great hight, some very slow process was resorted to—I do not know what.

Mr. STETSON—It was drilled in lines and split to pieces with chisels.

Mr. FISHER—It was a mass of about thirty tuns, but it did not look very large—some six feet in diameter, I should think.

Mr. STETSON—Five feet.

Mr. FISHER—Rather more than five feet I should judge.

Mr. STETSON—I measured it.

Mr. FISHER—A weight of 200 pounds was allowed to fall upon the mass a great number of times without producing any effect except making a dent. The hight from which the weight fell, I should think, was some fifty feet.

Mr. REID—Sixty feet.

ROCK OIL EXPLOSIONS.

G. TAGLIABUE—Mr. Chairman, it was proposed last week that I should bring one of my instruments here and exhibit the mode of its operation. [The speaker then proceeded to explain the operation of his instrument, as fully set forth and illustrated on page 184 of the current volume of the SCIENTIFIC AMERICAN. The claims of this invention will be found published in our regular list this week.]

Mr. BRACE—I manufactured coal-oil before the rock oils came into use, and on the discovery of petroleum, I removed my operations to the valley of the Kanawha. An old well had been sunk in that valley twenty years ago for salt, and a spring of oil was struck and thousands of barrels ran to waste. After the present excitement in relation to petroleum commenced, that old well was cleaned out, but the oil had ceased to flow. On the other hand, eighteen years ago, in boring for salt, a reservoir of gas was struck, when the drill and rods, weighing 2,400 lbs., were thrown out like a ramrod from a gun, and that gas has been blowing ever since. A gasometer has been erected and the gas is used for boiling the salt. The salt water and gas both come from the same hole, and 800 barrels of salt are made per day; the gas being sufficient to boil half of this amount.

Mr. PAGE—No fire has ever been occasioned in the country by refined petroleum. We have had fires from crude petroleum, but we shall not have these any more. The fires have been occasioned by the light oils, and now the oil is exposed at the wells in shallow tanks until these light oils are evaporated. I recently had an order for 500 barrels of light petroleum oils, and I was unable to fill the order in this city. This instrument of Mr. G. Tagliabue's was got up at the request of the heavy oil dealers to test the presence of volatile oils, and we are satisfied that it accomplishes the purpose. When the Common Council of Brooklyn had the matter under consideration of preparing an ordnance to obviate the great risk of keeping these oils, I proposed to the committee to prohibit the importation into the city of any oils under a specific gravity, but a few experiments showed that this was no indication of comparative safety. For a very heavy oil may have a small quantity of very volatile oil mingled with it, and its specific gravity will be high, and yet the volatile oil will evaporate at temperatures so low as to make the oil dangerous. The question is, at what temperature are the dangerous vapors given off; and that is shown by this instrument.

Mr. COHEN—As all of these oils give off vapors below their boiling points, only more slowly, will not these vapors accumulate when oils are stored in close cellars or rooms, and thus may we not have explosions from oils which will not appear to be dangerous when tested by this pyrometer?

Mr. CHURCHILL—That is really the objection, in a scientific point of view, to this instrument. Still, from experiments that I have made, I think the instrument will show very well the *comparative* safety of oils.

The whole evening was spent in the discussion of these absorbing topics, and the regular subject, "Paper and its Uses" was not reached. This subject was accordingly appointed for the next meeting, which is to be held a fortnight from this one, and the Association adjourned.

IRON-CLAD SHIPS VERSUS BATTERIES.

It is a little curious, in the history of new and great inventions and discoveries, to notice the changes which are constantly taking place in opinions as well as in the inventions themselves. England has been a long time ahead of us, and was perhaps the first nation of the world to construct an iron-clad frigate, but whether the honor is to be conferred upon them or upon the Emperor of France remains an open question. It is certain that this country did not so readily embrace the propositions submitted to the Government for the equipment of such vessels; and, if we are correctly informed, Mr. Ericsson's plan of revolving turret batteries was the source of much discussion and argument among our naval authorities before it was adopted. Be this, however, as it may, it is very certain that we have at present only one vessel which properly comes under the head of an armored frigate, namely, the *Ironsides*. Recent discussions in English papers show that the conclusions arrived at, from the results of the experiments at Shoeburyness, are anything but favorable to the iron-clad frigates; the targets, representing perfect fac-similes of their sides, were either smashed to atoms, or else pierced like paper; huge plates of 4½-inch thickness, backed by heavy teak 18 inches thick, were, or could have been, as the tests proved, riddled by Whitworth's guns; and this not by any means with steel-pointed, punch-headed bolts, or other mechanical devices of the sort, but simply flat-headed shells. These, upon bursting, so shattered the target, in part, that it was found impossible to use it afterward. Various other experiments, some with the heavy 13-inch gun of Horstall, resulted in practical proof that those plates, at all events, could not withstand the impact of heavy shot.

Respecting the *Warrior*, the London *Engineer* says:

"Let the *Warrior* exert her full indicated power of 6,000 horses continuously for even three days, and she makes away with about 900 tuns of coal—all she is really intended to carry; her armor then adds about two feet to her draft, or more than 100 square feet of immersed midship section, and thus diminishes her speed by two knots an hour or more. Let us think for a moment what the *Warrior* would do if she were able to steam off 14 or 15 knots an hour; would she not be more formidable than she is now? She cannot do this, however, on account of her armor; and what protection does this afford her? None whatever. A representative target has already been pierced with various projectiles fired from guns of which thousands can be made and shipped if necessary. We must not forget, in considering the question of cost, that the *Warrior's* armor cost nearly £40,000. What if a vessel without armor, but carrying thirty-six 25-tun guns, should overhaul her; might we not count upon the destruction of the great prototype of our plated ships of war?"

The same journal concludes its article by saying: "If plates cannot effectually exclude shot and shell they had better be left off altogether." So far as this relates to frigates the arguments against armor are perhaps correct enough; but do they apply to floating batteries, where the question is resolved into the impregnability of turrets, cupolas, acutely-inclined sides or other devices of a like nature? Mr. Edwin A. Stevens, of Hoboken, the designer of the battery bearing his name, says, "the object is not so much to stop the enemy's shot, as to change its direction." A frigate's side does not do this except the projectile be received either in retreat or in pursuit; it being a well established fact that we have artillery which have sent their shot through plates of five inches' thickness, backed up with wood; and instances are recorded of even greater penetration. The argument, then, resolves itself into this form, whether the limit of resistance can be arrived at sooner than the acmé of aggression. We think not, and are supported in this assertion by the results of the experiments lately tried, and which have already been published in this journal. Improvements are going forward every day in artillery, which are sufficiently demonstrative to prove to every unbiased mind that the science of ordnance which was deemed almost perfect, is, as yet, in its infancy; the mind refuses to fix any limit to the possible size, range and penetrative power of ordnance; already we have in place, and pointing seaward, guns whose immense calibers excite speculation of the most lively and entertaining nature, and we are informed that some yet larger than fifteen inches are in contemplation.

Assuming the limit of resistance to have been practically reached in the case of frigates, we may ask, not unreasonably, if such is the case with batteries? for to this form of marine or at least harbor defence we shall eventually be confined; their favorable features are so numerous, and the objections so few, that with the present experience to guide us, their pre-eminence for defence and attack, over iron-clad frigates, seems established. Whether the hull be submerged, or only partially so, the fact of their not being required to make long voyages, allows the necessary room, which would otherwise be required for coals and miscellaneous stores, to be used for plating, or like defences, which shall make them invulnerable. We confess that reflection leads us to regard the revolving turreted batteries as especially adapted to the end required, namely, impregnability. The objections which were prominent in the experimental one—the *Monitor*—as to ventilation and some other matters, have been remedied in the new ships, and they promise to be all that could be desired: the thickness of the turrets has been augmented, the guns are greatly superior, and the whole arrangement of them commends itself, viewed in the light of experience, as entirely practicable. Human foresight does not extend far at the best. Time may bring about a combination of events which shall cause us to abandon these opinions. At present we think that batteries, compared with frigates, as the best means of defence and attack, have an overwhelming advantage.

THE Pembroke (Maine) Iron Works employs 360 hands, and are in full and successful operation. The ore is brought from the New York shore of Lake Champlain. There are made annually about 6,000 tuns of bar iron, 500 tuns of rivets, and 100 casks of nails per day. They are now making rivets for Government gunboats.