The lecturer having minutely described and exhibited the one pointed spears of different savage tribes, said that the South Sea Islanders occasionally poison their spears by thrusting them into a corpse, and leaving them while the flesh decays.

The spear is generall, and was probably originally thrown simply by the hand. Several races however, now possess an implement for the purpose, which is called a "throwing stick" or "spear caster." This throwing stick is a flat piece of hard wood, generally, but not always, broader in the middle, with a piece of bone or tooth at one end as a catch for the end of the spear, and a lump of gum at the other to keep the hand from slipping. The spear caster seems to be unknown in Asia, Africa and Europe, but it is used by the Esquimax, and by one of the Brazilian tribes.

The arrow follows naturally after the smaller spear or javelin—indeed, the only way in which it can be distinguished satisfactorily is by the presence at the hinder end of a notch for the spring; for, though generally feathered at the end, many are bare. The bow and arrow, though very generally distributed, are not universal. The Australians and New Zealanders were entirely ignorant of them, nor are they used by the Caffres. The neighboring Bushmen on the contrary, rely principally on their bows and arrows, which, though weak, are formidable, because poisoned. The form of the bow varies very much. In the south it is said to be much longer than in the north; among equestrian races it is natually much shorter than among those who go on foot. Among savages the arrows are very carefully made, because a bad shot often involves two or three days labor. Although the gun is gradually superseding the bow, still the latter possesses certain advantages, as it makes no noise, therefor does not frighten the game so much, and is lighter to carry. There is, moreover, a kind of arrow which is not used with a bow, but with a blow pipe, usually from six feet to sixteen feet long. These weapons occur in Sumatra and in the neigboring islands, also in South America, but not in Africa. In Western Europe it is represented by the pea-shooter.

The first traces of art with which we are acquainted began at a very early period, and have been found in a manner quite unexpected. Among the remains of a man discovered in the French caves, and belonging to the reindeer period—that is to say, at a time so early that the reindeer was abundant in the south of France, and when possibly—though on this point there is much doubt—even the mammoth had not entirely disappeared, simple carvings and etchings have been discovered giving unmistakable representations of animals. These works of art are sometimes sculptures, if one may so say, and sometimes drawings made on bone or horn with the point of a flint. They are of peculiar interest, being of far more ancient date than even the monuments of Assyria and Egypt. There are those who express surprise at the skill shown in the drawing of savages, but there is no reason why a savage living unknown ages ago should not draw as well as a child of to-day.

Sir John Lubbock then proceeded to describe at some length the skill in carving exhibited by many savage tribes. He also pointed out that some savages have no ideas of art, and cannot understand a picture when it is shown to them. He added that it is somewhat remarkable that while in the reindeer period we find very fair drawings of animals, in the latest part of the stone age, and throughout that of bronze, they are almost entirely wanting, and the ornamentation is confined to various combinations of straight and curved lines, and geometrical patterns. This he believed would be eventually found to imply a difference of race between the population of western Europe at these different periods.

MORE ABOUT SUBMARINE EXPLORATION.

Our description of the submarine apparatus now being used in the attempted recovery of treasure from the wreck of the frigate *Hussar*, has given rise to inquiry for further information upon the subject. We herewith give an account of the commencement of submarine exploration, and its progress up to the present time. As we said in our former article, diving without the use of apparatus was the beginning, and it dates back to a very early period. Homer, in the sixteenth book of the Iliad, describes Patroclus as taunting Hector's charioteer for falling from his horse when he was slain, as a diver goes into the sea tobring up oysters. Other references to diving are to be found in ancient works. Thucydides speaks of the employment of divers to saw off stockades driven into the bottom of a harbor to prevent Greek ships from entering. Livy gives an account of their employment for the recovery of treasure and merchandise. The story of Antony's fishing and bringing up a salt fish attached to his hook by a diver employed by Cleopatra, is a familiar one. The first attempts to aid divers in their descent, were confined to such rude devices as bladders placed over the mouth and weights to help them to descend and remain more easily. In Pliny's time divers used a long pipe with a floating funnel to enable them to breathe under water while engaged in the operations of ancient warfare. In 1252, Bacon, in his "Discoveries of the Miracles of Art, Nature, and Magic," says: "A man may make an engine whereby without any corporal danger, he may walk at the bottom of the sea or other waters." Like many other hints which were thrown out by Bacon and which have found their interpretation since, in the great inventions which have succeeded them, this was unaccompanied by any detailed description.

The real history of devices for submarine exploration dates from the sixteenth century. From that time to the present, there has been gradual improvement in this art. Not the least meritorious of the inventions which have been made belong to our own time and country, but of them anon.

As all the devices for submarine navigation have hitherto met with little or no success, we shall pass them without remark, and confine ourselves to those devices which have had for their object the simple descent and continuance beneath the surface in safety and comfort. These devices have, comparatively speaking, only lately begun to assume a form approaching perfection. The earliest mention of a diving bell that we can find is in "Beekman's History of Inventions." He says that in the sixteenth century, in the presence of the Emperor Charles V., and several thousand spectators, two Greeks let themselves down under water in a large "*inverted kettle*" with a burning light and rose again "without being wet." In the latter part of the fifteenth century, some attempts were commenced to recover from the Spanish Armada, the treasure which was lost at the time of its disaster near the Island of Mull in the Hebrides, but without success only three guns being recovered. In this attempt a bell was used devised by the Marquis of Argyll, to whom the British Government pledged all the treasure he should succeed in recovering.

In 1680, William Phipps invented a square box of iron with windows and a seat for divers, with which the Spanish treasure was again sought. After having once failed he was assisted by the then Duke of Albemarle, and succeeded in finding and recovering treasures to the value of $1,000,000 in gold. For this feat he was knighted. In 1683, Sinclair, the mathematician, published a series of calculations relating to the size of a bell necessary to contain air for a given number of men for a given period, and the proper thickness and shape of its walls to withstand pressure; the depth to which bells of certain construction could safely descend, etc. These calculations were of the greatest value to the advancement of the art. In 1775, the celebrated Dr. Halley contrived a way for supplying air to a submerged bell, by sinking a number of barrels filled with air to the bottom, which was transferred to the bell by means of tubes and cocks, an escape-cock being placed at the top of the bell. With this apparatus, slightly improved, Mr. Spaulding and an assistant attempted to recover the cargo of a vessel wrecked on the coast of Ireland, but by some means they were unable to obtain a supply of air from the barrels and were suffocated. Smeaton was the first to supply air to bells by the use of forcing pumps, and since his time the air pump has been constantly used in similar attempts. We have not space to give in detail an account of the progress of improvement in diving bells in other countries since Smeaton's time. Some very efficient submarine armor has been devised, to which we referred in our former article, together with some difficulties which cannot probably be obviated in this class of devices.

These inventions have, notwithstanding, proved of great service in submarine engineering. In the early part of the present century by the use of a modification of Kleingert's armor, Tonkin recovered treasure from the Abergavenny, sunk near Weymouth, amounting to $300,000.

We are indebted to Dr. J. A. Weisse for the following particulars of the most recent improvements in diving bells.

"The *Nautilus* Diving Bell, exhibited at the Crystal Palace in New York, was an improvement on all previous diving bells, having within its walls a working chamber, an air chamber, and a ballast or water chamber. The able engineer, William Mont Storm, improved the *Nautilus*, whose patent expired some years ago.

The *Ryerson* Diving Bell, patented October 19th, 1858, had like the *Nautilus*, a working chamber, an air chamber, and a ballast or water chamber with some improvements. In this bell, Otto Sackersdorf, engineer of our Street Department for twenty years, blasted and removed 2,100 cubic yards of Diamond Reef and opened the channel between Governor's Island and Brooklyn.

In a written statement of October 6th, 1864, Mr. Sackersdorf speaks thus of the *Nautilus*, *Maillifert's* Bell, and of the *Ryerson* Bell: "The *Nautilus*, although a decided improvement, has not verified its promises. I have tried it at the Navy Yard in 1854. It does not work independently from the surface and uses too much air.

"*Maillifert's* Bell has some good features for stationary work, but it is immovable and very dangerous on account of its funnel or man-hole. Absolutely impracticable for any depth of water, say twenty-five or thirty feet or strong tide.

"The *Ryerson* Bell carried about four atmospheres of pressure in the chambers, and its lifting power was up to eight tuns. Heavy rocks were taken and dropped in deep water. The bell was independent of anything above water (signal-line excepted), and carrying the means of respiration and motive power in itself; remains any length of time below, or descends or ascends with any velocity you choose. Twenty seconds were more than enough to descend twenty-five or thirty feet. The old fashioned bell required on the same spot sixteen minutes, not mentioning the slow and dangerous mode of entering or leaving. Suffice it to say, that our bell had about nine feet of diameter inside. Five men had ample room to work in. They experienced no difficulty whatever and changed but once a day with the gang on board the vessel above. Any man of common sense can be easily instructed to work the apparatus, so simple is the arrangement therefor. A leak is at once indicated by the barometer, and by this means all danger of drowning made impossible."

William Mont Storm's "Improved Submarine Explorer," to which the Patent Office, May 1, 1866, granted eight new claims of improvement over all its predecessors, has been still further improved by Mr. Wm. R. Taylor.

A report of the principles involved in these bells and of the uses they may be applied to, by Wm. W. W. Wood, chief engineer of the United States Navy, may be found in the Navy Department, dated February 2, 1865. Admiral Farragut, looking at a drawing of the Improved Submarine Explorer, observed that naval warfare would soon be carried on as vigorously under as above water.

With this bell, as we stated in our former article, an engineer and four men with provisions, lights, and working tools of every kind, can descend to certain depths of fresh or salt water, work at wrecks, blast rocks, remove harbor obstructions, lay foundations for wharves, piers, docks, lighthouses, bridges, sea walls, fortifications, and repair the same with almost as much facility as on *terra-firma*. Thus millions of wrecked treasure and merchandise might be raised, and all the Scylla and Charybdis, Hell Gates, and Cliffs, so much dreaded by mariners, might be widened, deepened, and cleared all over the world.

Weight of the Air.

The air is composed of two ingredients, not in combination, but as a mixture, like wine and water. These ingredients are oxygen and nitrogen. They exist in the proportion of 23 of oxygen to 77 of nitrogen in 100 parts. Besides these, the air contains of carbonic acid about 3 parts in 10,000. Our atmosphere is estimated to contain about 1,954,578 cubic miles of oxygen. The respiration of man and animals, together with the combustion of fuel, consumes annually about 2½ cubic miles; consequently 250 cubic miles in 100 years, or only a 10,000th part in this time. The above paragraph reveals even more wonderful facts; a single perusal of it is sufficient to suggest questions of a most startling character.

Thus it appears, that in the course of ages, say 1,000,000 the supply of oxygen would be exhausted, and its beneficial place taken by carbonic acid, generated by respiration and other forms of combustion. But such was not to be. Let us for an instant consider the revelations of geology. It tells us that ages before the creation of man, the atmosphere contained a larger proportion of carbonic acid than it does at the present day. The question then arises, what has become of it? Let us dig into the earth till we discover coal; we then find our answer. The excessive carbonic acid of the early atmosphere has been converted into coal—coal, the remains of trees, which, in their lifetime, possessed the power common to all living plants, that of decomposing carbonic acid; depositing within their cells the carbon, and returning to the air its oxygen, for carbonic acid is only composed of carbon and oxygen.

What does the air weigh? Nothing, many will answer. But this is a great mistake, for every 100 cubic inches of air weigh slightly more than 31 grains. A cubic yard of oxygen weighs 2 lb. 4 oz. 7 dr. Such being the case, a cubic mile of oxygen weighs nearly 5,543,623 tons 10 cwt. By another multiplication sum it is easy to show that the whole of the oxygen in the atmosphere weighs 10,835,444,533,383; and, since the oxygen and nitrogen of the air exist in the proportion of 23 of the former to 77 of the latter, as before stated, the total weight of nitrogen of the air is the amazing amount of 36,275,183,872,630 tuns, while the total weight of the air, which is the result of the addition of these two quantities, yields the astonishing quantity of 47,110,628,406,013 tuns.—*C. H. Piesse.*

Mock Sun and Mirage.

About this time, last year, a mock sun was visible from Dover. This is a very rare phenomenon, and results from a reflection from clouds in the eastern horizon of the setting sun in the west, there apparently being two suns in the heavens at the same time. The atmosphere of the straits of Dover seems to produce these strange appearances in the sky, for a mirage was lately strikingly conspicuous at Dover. The dome of the cathedral and Napoleon's Pillar at Boulogne were to be seen from the Crescent Walk by the naked eye; but with a telescope of ordinary power the entrance of the port, its lighthouse, its shipping, and the surrounding houses, the valley of the hillside of Capecure, and the little fishing village of Portel were distinctly visible; while on the eastern side the principal features of the country, the lighthouse of Cape Grinez, the adjacent windmill, numerous farms and villages, with their windows illuminated by the setting sun, stood out with extraordinary clearness. While these were under observation, a locomotive was seen to leave Boulogne and travel some miles in the Calais direction, by its puffs and wreaths of white steam. Shortly after sunset the mirage subsided.—*C. H. Piesse.*

Movements of the Sensitive Plant.

M. Bert and M. de Blondeau have published in the *Comptes Rendus* some extremely interesting observations on this subject. M. Bert shows that the natural and regular movements of the leaves, which take place in the sensitive plant, are produced by a different cause from that to which the sudden, contraction is due when the plant is touched by the fingers. M. de Blondeau's observations are exceedingly curious and well worth further examination. He submitted three plants to the influence of an electric current from a Ruhmkorff coil. The first he acted on for five minutes; when left to itself, the plant seemed prostrated, but after a quarter of an hour the leaves opened and it seemed to recover itself. The second specimen was acted on for ten minutes. The plant was prostrate for an hour, after which it slowly recovered, The third specimen was galvanized for twenty-five minutes. but it never recovered; and in twenty-four hours it had the appearance of a plant struck with lightning. A fourth plant was etherized and then exposed to the current. Strange to say, the latter had not any effect: the leaves remained straight and open; thus proving, says M. de Blondeau, that the mode of the contraction of the leaves of the sensitive plants is in some way allied to the muscular contraction of animals.