

pressure, a great part of this water at 330° will instantly flash into steam carrying the rest with it at about the velocity of a cannon ball. So far we know. The theory is that this flying body of inelastic water-particles operates like so many projectiles—like a broadside of grape—tearing into pieces everything within reach."

We alluded to the statements of this writer on page 137 of our present volume, and would not now refer to them but for the purpose of further exposing their erroneous character occasioned by a recalcitrant article in the *New York Times* of the 25th ult. In the above extract the impression is conveyed that Mr. Clark has indorsed Colburn's theory and amplified it in the *Encyclopædia Britannica*. This is not so, for Mr. Clark has repudiated the steam percussive theory of Mr. Colburn in two letters to the *Mechanics' Magazine* of May 3 and 10, 1861.

The experiment of Mr. Stevens is of no consequence for or against these theories. The statement above, that water will fly with the velocity of a cannon shot, is so unscientific that no person acquainted with mechanical philosophy, upon reflection, would have made it. The velocity of water flowing into a vacuum under a pressure of 100 pounds on the inch is but 116.72 feet per second, whereas the initial velocity of a spherical cannon shot is over 1,700 feet per second. The heated water that evaporates into steam in a boiler relieved of pressure by the escape of steam through a rupture is necessarily of low pressure and not very destructive. This is according to a well known law.

At the period of the explosion on the *Great Eastern* the correspondents of the *New York Times* and the *Engineer* were on board, but for want of a proper consideration of the case they mystified it amazingly. The most profound of living engineers has cleared up the subject in a very few lines. In Fairbairn's "Information for Engineer's," pages 305 and 306, he says: "In the disastrous accident which attended the first trial trip of the *Great Eastern* the funnel of the boiler, which was surrounded by a water jacket, gave way by a collapse at what was probably low pressure. This might easily have been prevented had the maker been aware of the extreme weakness of such flues when of large diameter and great length. The funnel, six feet in diameter, is in this case (which he illustrates with a diagram) exposed to the pressure of steam together with that of a column of water nearly forty feet in depth, and these two forces were quite sufficient to collapse the funnel and cause the frightful explosion which occurred."

Mr. Fairbairn believes that explosions are due simply to an overpressure of steam in boilers, in proportion to their strength, and no man living has made so many accurate experiments with steam boilers. In the report of May 7, 1862, of Mr. L. E. Fletcher, Chief Engineer of the Manchester Association for the Prevention of Boiler Explosions, he presents similar views respecting the cause of explosions. He says, in alluding to several cases, "It will be seen that all the above explosions occurred from the most simple causes, and that no mystery can be attached to any one of them. By suitable construction of the boilers in the first place, and due attention to their state of repair in the second, these explosions could in every case be prevented. * * * I find by far the most frequent cause of explosion is the insufficiency of the boiler for its working pressure, either on account of its original construction or want of repair." These remarks of Mr. Fletcher should "be written in letters of gold." They are of the greatest importance to every person who makes or uses a steam boiler.

A FRENCH SAVANT ON THE MANUFACTURE OF STEEL.

At the regular meeting of the French Academy of Sciences, held in Paris on the 18th of August last, M. Fremy, who is well known among scientific men for his researches into the nature of steel, read another memoir on the subject. He gave it as his opinion that steel would yet take the place of other metals in the manufacture of guns, and that it would yet supplant heavy wrought-iron plating in armor ships. "Those nations" he said, "which do not strive to keep up with the march of science, will very soon be left in a position of inferiority." The English method of making steel he held to be excellent, but as it is made in crucibles not holding

over 44 lbs. it could not be obtained in very large masses. This method of making steel is also very costly, as it requires the use of the best malleable iron, and about seven times the weight of the iron, for fuel, during the process. France could not compete with England in making steel by such an expensive system. M. Fremy has therefore made experiments, and investigations to make good steel by another method. When he commenced operations, it was generally thought necessary to get Swedish or Russian iron to obtain a proper quality of steel, because it was believed that only a peculiar quality of iron ore possessed "a steeling propensity." He desired to clear up this metallurgical mystery, and he asserts that he has succeeded. When in England he had an opportunity of witnessing Bessemer's process in operation, and although much impressed with the magnificence of the system it left serious doubts in his mind respecting the quality of the steel. He left England with the impression that the cast iron of France, reduced by coke, contained too much sulphur and phosphorus, to be converted into steel; but experiments made by him at the works of St. Seurin have dissipated his fears. The Bessemer process converts French pig iron in about twenty minutes into a kind of burnt azotized malleable iron which is very "red short," but when to this is added some cast iron of the specular quality in the proportion of 1 ounce to 40 lbs. good steel is produced. Experiments were made on a large scale, and it was found that good steel could be obtained from any pig iron which could be refined. English workmen have examined the specimens of steel there obtained, and they pronounce it equal to English steel. It has been made into chisels, knives, gravers and other cutting tools. M. Fremy believes that a great revolution is about to take place in the metallurgy of iron. We judge from his experiments, that good cast steel may be manufactured in America from most of our pig iron. Several tons of steel have been made by M. Fremy, from pig iron which he had supposed was totally incapable of being employed in the manufacture of steel.

MISCELLANEOUS SUMMARY.

WRECKS OF BRITISH VESSELS.—From the statistics, recently published, of disasters that occurred on the coasts of Great Britain in 1861, we learn that there were 1,494 wrecks, embracing a registered tonnage of 253,238 tons. The number of persons employed upon them was 11,040. Respecting the classes of vessels lost, there were 487 engaged in carrying coal. These vessels make numerous and short voyages; they run close along shore and are not provided with modern improvements for shortening sail and braving heavy gales. Of the total number lost, only 42 were steamers. The number of lives lost was 884.

THE PREPARATION OF FLAX.—A correspondent of the *Montreal Herald* mentions a discovery in the mode of preparing flax, which seems equally applicable to the Northern and elevated portions of the United States and Canada. He observes:—It has been discovered that in Lower Canada we can prepare our flax for the mill with very little trouble or expense, by a mode which answers as well as steeping, and that is, to spread the flax on a meadow in December, and allow it to remain on the ground till April. The winter snow rots it effectually, and when the snow goes off in April, you will find your flax clean and dry, ready for carting to the scutch mill, without any expense worth mentioning.

AMMUNITION.—Some idea of the amount of ammunition required to supply an army, such as Gen. McClellan's, during a heavy fight like that of the battle of Antietam, may be gained from the fact that thirty-eight tons of ammunition were forwarded to Gen. McClellan from Washington, via Baltimore, Harrisburg and Hagerstown. An eye witness of the battle states that he counted, at four different times during the day, the number of discharges from the Union artillery, and found that they were made at the rate of seventy-eight to the minute.

The Philadelphia steam fire engine *Hibernia* has been taken to Washington, accompanied by ten skillful firemen. It is in the quartermaster's department, and has been secured as a measure of safety from fire, for the enormous quantity of Government stores in the city.

THE VITALITY OF THE NORTH.—The population of the loyal States is about 23,000,000, or 5,000,000 more than that of Great Britain and Ireland in 1813, and about 5,000,000 less than that of France in 1813. Our wealth and natural resources are superior to either of these nations in 1813, and, instead of being twenty years at war, this is only the fifteenth month of our war; whereas France and Great Britain, in 1813, were both exhausted by twenty years of war, when they placed the vast armies of a million men in the field, armed and equipped.

A BALLOON for scientific purposes has been built in England by Mr. Coxwell. It is fifty-five feet in diameter and sixty-nine feet in length. The builder proposes to ascend five miles, for the purpose of making observations on the temperature and humidity of the air at different heights. He will use Professor Thomson's electrometer for electrical experiments. Trigonometrical observations are also to be made.

PETROLEUM FOR EUROPE.—The *Portland Price Current* says, the large whale ship *Omega* is about to load petroleum at that city for Europe. There has been exported from that port since January 1st, to the 20th of September, 87,200 gallons of petroleum, and from the United States during the same time, 6,242,912 gallons.

It is a common notion with many people that the morning air is the purest, most healthful and bracing; but the contrary is the fact. The air is then more full of dampness, fog and miasm at about sunrise which the heat of the sun gradually dissipates. Before engaging in anything like work or exercise out-doors it is conducive to take a cup of warm coffee and milk if breakfast cannot be prepared beforehand.

A NICE FLOWER FOR A BUTTON MOLE.—There is a plant in the island of Sumatra, the circumference of whose fully expanded flower is nine feet; its nectarium is calculated to hold nine pints; the pistils are as large as cow horns, and the whole weight of the blossom is computed to be fifteen pounds.

HOW TO GET AHEAD OF TIME.—The *Alta California*, of August 24, has this paragraph:—"The telegraph worked bravely last night. Our latest dispatches are dated Washington and New York, twelve o'clock, midnight. They reached us at ten P. M., two hours before they were transmitted."

BAKED QUINCES.—This fruit may be baked like apples, adding sirup, or sugar and water, while baking. Certainly every one who likes a sour baked apple will relish a baked quince. They are very good simply baked, and eaten with powdered sugar.

Heroism of an Engineer.

The express train from the West, on the Central road, due at Albany at half-past three P. M., Oct. 6th, ran off the track four miles west of Little Falls, through the displacement of a switch, throwing the locomotive, baggage, smoking and five passenger cars off the track. The accident occurred on a part of the track where the embankment on one side was six feet deep. When the engineer, whose name is Wemple, saw the danger, he applied the patent brake, communicating from the locomotive to all the cars, and, resolving to save the passengers, stuck to the engine till it was pitched down the embankment, and a total wreck. The brave fellow miraculously escaped with slight injuries. The fireman was seriously injured. The baggage car was also thrown down the embankment. Owing to the application of the brake the speed of the cars was so far checked that although five cars went off the track not a single passenger was injured in any degree. Sanford E. Church and family, State Engineer Taylor and Secretary of State Ballard, were on the train. The escape is wonderful, as the train was going at full speed.

Proportion of Males and Females in the United States.

According to the United States census of 1860 there were at that time about 730,000 more males than females in the United States, a fact unprecedented in the census of any other civilized nation. In most of the older States there is an excess of females; in Massachusetts 37,600 more females than males, while in Illinois there is an excess of 92,000 males; in Michigan 40,000 excess of males; in Texas 37,000; in Wisconsin 43,000; in California 67,000; and in Colorado there are twenty males to one female.