## A VISIT TO A GUNPOWDER MILL.

On the front of an old-fashioned house in Lombard-street, London, are inscribed the ominous words "Gunpowder Office." Busy as the people are in that busy street, it is remarkable to observe with what apparent care the passers-by choose the opposite side of the way in preference to steering their barks close to so seemingly dangerous a fort. But they need have no fear, for scarcely more than a few ounces of powder, by way of samples for merchants, are ever there.

Gunpowder is the guard-chain and strong-bolt which keeps the barbarian thief from entering the precincts of the peaceful and industrious, and is, indirectly, the great peace-constable of the world. Prior to this clever chemical invention, the wars of sects, classes, or nations were vexatiously prolonged. Charlemagne spent a long reign n perpetual war. During the Roman empire war scarcely ceased, and so it had been with all the preceding inations. The history of the world is a history of shift ing wars. Prior to the invention of gunpowder, or more correctly speaking, prior to its application as a means of warfare, a prolonged peace, such a peace as the 40 years between the Napoleonic wars and the Crimean war, has scarcely been recorded. The fact is that when men discovered the terrible effects of this new engine for their destruction they began to think more seriously of war. The old battles, fought without gunpowder, were not half so much to be dreaded as a modern war. The battles of Ptolemy and Ramises, kings of Egypt, of Nebuchadnezzar, Babylon, and Xerxes, of Susa, were of a class that may be compared to a mighty host of robbers sacking a country with but little or no danger to themselves. What a contrast do such battles present to the terrific encounters at Inkermann and Sevastopol, at which thousands of men were killed after but a few days' contest. All men fear and respect gunpowder. Nations spend millions of money in building fortifications, and in endeavoring to make strongholds impregnable to the effects of this simple mixture, but all their efforts are without avail. No fortress that has ever been erected can hold together against bomb-shells, rockets, und balls flying through space with lightning speed, urged on by gunpowder. The *modus operandi* practiced in the manufacture of an article so destructive cannot fail to interest everybody, and so we ask the reader to accompany us on a visit to the great manufactory at Hounslow.

The tall chimney stacks now in sight are at the Gunpowder Mill; so keep them in view, and you will be sure to travel right. A little walk and you are within hearing of the engine's groans. Now you are fairly within "blowing-up" distance, so have a care; if smoking, put out your cigar. Within a tract of land two miles square is another about half-a-mile broad; and it is within the latter that the mills are at work, ceaselessly, from morning to night, from night to morning, Sunday and week-day without end—until the next terrible explosion gives a little rest, when fresh muscles and new headpieces are quickly again directing this grim work. The first thing that will attract a stranger's attention will be the enormous cords of wood—alder wood and dogwood—for a quarter of a mile: the ominous words "fire-engine," lettered on several, warns one to beware. Now you enter the niter-house, and here all appears harmless enough, boiling and steaming, filtering, cooling, and crystallizing. You will here be pleased enough to see how the dirty earthy saltpeter (niter) of India is washed and purified till it looks as fit to eat as a lemon ice. These large retorts are where the wood is distilled to convert it into charcoal. By this process not only is charcoal produced, but hundreds of gallons of tar, and also acid water. This acid water, in plain truth, is weak vinegar, and has only to be freed by a few strokes of chemical magic from the tarry particles now floating in it to become the white-wine vinegar so tastefully labeled at the great pickle-shops of Soho-square and Piccadilly.

Pass we on. Here the sulphur sold to us by King Bomba, and vomited out from the earth's stomach by the fire-belching mountain Vesuvius, is ground, sifted, and rendered fit to enter the warrior's mixture. The niter, the charcoal, and the sulphur are all pretty harmless in their primitive state, but "when rogues meet, then let honest men beware." So now to the first mill-house. The rumbling, the rattling, the clankling, the screeching, the heaving, the wincing of powerful machinery, overcoming obstacles, are now about as pleasant to hear as an Atlantic steamship fighting against the storm-waves, and you on board of it. An engine-house, boiler, furnace and chimney in the very center of a gunpowder mill! But so it is; one mighty axle passes from the engine-house to six grinding-houses—three on the left, and three on the right. We will enter one of them; it is about the size of a small cottage; on the floor is a monster chemist's mortar, and inside it, in lieu of pestle, there roll two mighty stone wheels, cased with iron tyres, weighing more than 2 tuns each. Forty pounds of mixture—sulphur, niter, and charcoal—are put into the mortar. Over and over this the wheels roll for eight hours before it is considered smooth and fine enough. Every two hours it is "liquored"—that is, a little water is sprinkled over it from the rose of a watering-pot. At the end of eight hours, black-looking demons will appear and carry off this 40 lbs. of meal (it is now called "meal") to the corning-house. Here the meal from all the said grinding-houses is brought together, and subjected to immense hydraulic pressure, so as to form "cakes." Each cake is then cut into slices, and each slice forced through a little sieve-like apparatus, which divides it into "grains." The newly-made grain powder is, however, still too damp for use, and must be dried. To do this the powder is spread out on trays that hold about 10 lbs. each, and is then placed in the drying-house, which is, in fact, another cottage of wood construction. By the side of this building there is a small furnace and boiler for generating steam. This steam passes through convoluted pipes within the drying-house, zig-zag between the racks that support the trays of gunpowder. Proper valves are arranged so as to preven the pipes becoming too hot. Finally the powder has to be made genteel and respectable, with a bright polish on its face, fit to appear into society. This is effected by passing first through the dusting-house. Here all the fair-formed "grains" are sifted away from the "dust;" and so very dangerous is this operation that a large wooden screen is erected all round the house, in order to keep cloud-like dust being wafted by the wind towards any o the boiler furnaces, for the slightest spark falling from the chimney stacks into the dusty cloud would explode the whole. It being thus necessary to keep the dust within a limited space, the men employed in the work are exposed to its noxious influence. Lastly, the powder is carried to the glazing-house. Here it is put into barrels of one hundred lbs. each, together with a few ounces of black lead. Each barrel is fixed on a kind of spit, and made to revolve on its axis until, by mutual abrasion, every grain has the black metallic luster familiar to all who use the "shooting iron." We have said the powder is carried from this house to the other house: now, all these "houses" are but cottages, or rather enclosed wooden sheds, of the lightest possible construction; so built, for obvious reasons, that should any accident occur the whole thing would blow away. The "houses" are separated from each other by many yards, even distant an eight of a mile. By thus separating the buildings there is, of course, less danger in case of fire.

Through the land on which the Gunpowder Mill is situated there flows a small river—the Colne—and from it are cut several canals, which by serpentine windings form wharves to several of the houses, so that when the powder is sent from one to another it is carried by boats, a means of transit attended with the least danger to those transporting so dangerous a material.

Advantage is taken of the abundance of water-power to do a great deal of the work at the mills; indeed, before the demand for powder became so great, the whole work was put into operation by the motor thus at hand.

Powders of various textures are here produced, which require grinding from six to eight hours for each charge of 40 lbs. Every charge then, as an average, occupies seven hours. The different qualities are known as sporting powder, military or government powder, mining or blasting powder, &c.: 40 lbs. of powder every seven hours is equal to 960 lbs. a week; this multiplied by 10, the number of grinding-houses at work, is equal to 9,600 lbs. a week, 85½ cwt., over (or say) 4¼ tuns weekly, that is 220 tuns annually—220 tuns of gunpowder made yearly at one manufactory.

The source of power in gunpowder lies in the saltpeter; this substance, termed nitrate of potash, consists of nitric acid and potash. Now, the nitric acid is, as it were, an immense volume of atmospheric air, condensed into a solid, ready on demand to assume the air form by the touch of a spark. When sulphur and charcoal are mixed with niter (saltpeter), and a spark is applied, the sulphur ignites, setting fire to the charcoal, and concentrated air is supplied to the substance by the decomposition of the niter. The air condensed therein instantly unites with the combustible, and the result is an intensely hot gaseous compound, two thousand times the bulk of the original solid.

The English government gunpowder is composed of 75 parts of niter, 15 charcoal, and 10 of sulphur. The Russian military powder contains 73¾ of niter, 13½ charcoal, and 12¾ sulphur.

[The above interesting article was sent to us for publication, by our valued contributor Mr. Piesse. On the 30th. of March last, these powder mills were blown up. The explosion occurred within 12 hours after he had left them.—Eds.

## AMERICAN HYDRAULIC CEMENTS.

Not many years ago all the Roman and hydraulic cements used for our public works were imported from England, but at present very little foreign cement is employed, as our engineers consider the American superior in quality for most purposes. One reason for this preference is the freshness of the home product; it can always be procured when newly ground, whereas foreign cement becomes somewhat impaired in its energy by its transport across the ocean, where the atmosphere is very humid. By exposure to a humid atmosphere, hydraulic cement absorbs carbonic acid and moisture, which injure its adhesive and *quick-setting* qualities. Messrs. Delafield & Baxter, Wall-street, this city, who manufacture the famous Rosendale hydraulic cement, inform us that it will keep for a year or more in tight barrels lined with paper, as they put it up, when protected from a moist atmosphere. They have also furnished us with information in preparing this cement for use, which we know will be useful to many of our readers. As it sets rapidly on exposure and under water, it should only be mixed in such quantities as are required for immediate use; a sufficient quantity of water is employed to make it into a paste of moderate thickness, care being exercised to wet it thoroughly. The sand most suitable for mixing with it should be free from organic and other impurities, and should consist of fine, sharp grains of silica. The use of sand in cement and mortar is to prevent rapid shrinkage, also exposure of the cement on a greater surface; its office is a mechanical, not a chemical one. Experienced engineers in charge of public works usually mix their cement in the proportion of one part of cement to one and a half or two of sand. Others sometimes mix three or four parts of sand to one of cement. All cements (mortars also) should, if possible, be prepared under cover, to prevent their drying too rapidly in warm weather. The stone or brick to be cemented should be free from dirt and well moistened, otherwise they will absorb the moisture from the cement, and prevent the adhesion of its particles during the process of crystallization.

Hydraulic cement is chiefly useful as a mortar for works under water, and for walls of buildings under ground. In making concrete foundations with it, one and a half parts of sand to one of cement should be made up to the consistency of good mortar, and one measure of it to three of broken stones or brick are about the proper proportions that should be used. The whole of the concrete should be laid as rapidly as possible, and finished in sections, well rammed, so as to have the whole work formed into one solid mass, and of an even surface, before it sets, when it should be left undisturbed until it hardens; and if it is exposed in a dry place, it should be moistened occasionally with a little water. Very cold weather is injurious to the energy of cement; in northern latitudes it loses energy during a low temperature, and remains inert until the return of warm weather. Inexperienced persons unacquainted with this fact have condemned the best cements by applying them in the wrong season.

Sounding Shells.—There are few persons who cannot remember the childish wonder with which they were filled, when a sea-shell was first placed to the ear; and the still greater wonder they experienced when told that the strange resonance which they heard was the roar of the sea; this being the common explanation given to children. There are, doubtless, many adults persons who do not know the phenomena of the sounding shell. It is caused by its hollow form and polished surface; these enable it to receive and return the beatings of all the sounds which tremble in the air that surrounds it.