lime to remain in the vessel in which it is slacked, for at least twenty-four hours. The water should be placed in the vessel first, and the lime thrown into it, and after the contents are thoroughly slacked it should be frequently plunged or stirred to allow the oxygen generated by the slacking process to escape, or become modified, and thereby changing the caustic properties into what is chemically known as lime soap, the influence of which upon the hides is, to soften it, without distending the fibers so severely, as will fresh slaked lime.

Probably most practical tanners who have given the beam house much attention, have observed one fact, that when a pack of hides is taken from a new lime, they present a stiff, harsh appearance and feel, and the hair does not slip as freely, although longer going through the process, as when put through a lime liquor that has been used for several months, and which turns the hides out in a soft, pliable condition, and as a consequence yields up the hair much more readily. Some tanners only make entirely fresh or new limes, two or three times during the year, because their experience has instructed them, that a hide is more thoroughly and rapidly denuded of hair, through the medium of an old lime, than in a fresh one; because the former is less caustic, and operates more directly upon upon the earthly matter deposited around the roots of the hair, and perhaps this is the reason why acids have been adopted by some, as a substitute for lime, as they are known to act more immediately upon the roots of the hair which are impregnated and surrounded with a material that partakes largely of carbon, which is to a greater or less extent imparted to the hair, and renders it almost invulnerable to decomposition. This element has a strong affinity for acetic acid, and is readily disolved by being brought in contact with it. Submitting these facts for consideration of the trade, we will pass on to give our view upon other matters no less important to the leather interest.

EXPLOSIVE COMPOUNDS FOR ENGINEERING PURPOSES.

NO. IV.

The most powerful opponents with which gunpowder apparently has to contend, are nitro-glycerin and gun-cotton, and this on account of the extraordinary amount of power they possess; indeed, under certain conditions, they develop an almost irresistible force. But it is just this attribute of resistless violence, which has hitherto rendered them the most unsafe, the most dangerous compounds that can be applied to practical purposes. Man loses all control over these agents, inasmuch as an accidental blow or a slight concussion may—nay, must—produce a violent and perhaps most disastrous explosion. It is of no avail to possess a material which does several times the work of any other adapted for the same purpose, if life and property are in momentary danger of destruction. That this was one of the perilous conditions under which nitro-glycerin and gun-cotton were employed, is evidenced by numerous accidents which have occurred within the last few years in connection with their application to blasting purposes. But, both these dangerous agents have, within the last twelve months, been brought under control, and their action has been so modified that they may now be said to possess all the conditions necessary to constitute a safe and highly efficient material for blasting purposes.

Taking them in the order to which they are referred to above, let us first examine the merits and demerits of nitro-glycerin which is one of the most remarkable materials employed to replace gunpowder as a destructive agent. This substance was discovered by Sobrero, in 1847, and is produced by adding glycerin, in successive small quantities, to a mixture of one volume of nitric acid of sp. gr. 1·43, and two volumes of sulphuric acid of sp. gr. 1·83. The acid is cooled artificially during the addition of glycerin, and the mixture is afterward poured into water, when an amber-colored oily fluid separates, which is insoluble in water, and possesses no odor, but has a sweet, pungent flavor, and is very poisonous, a minute quantity placed upon the tongue producing violent headache, which lasts for several hours. The liquid has a specific gravity of 1·6. and solidifies at about 5° Cent. (40° Fah.); if flame is applied, nitro-glycerin simply burns; and if placed upon paper or metal, and held over a source of heat, it explodes feebly after a short time, burning with a smoky flame. If paper, moistened with it, be sharply struck, a somewhat violent detonation is produced.

In 1864, Mr. Alfred Nobel, a Swedish engineer, first attempted the application of nitro-glycerin as an explosive agent. Some experiments were, in the first instance, made with gunpowder, the grains of which had been saturated with nitro-glycerin. This powder burnt much as usual, but with a brighter flame, in open air. When confined in shells or blast-holes, greater effects were, however, produced with it than with ordinary gunpowder; its destructive action is described as having been from three to six times greater than that of powder. The liquid could not be employed as a blasting agent in the ordinary manner, as the application of flame to it from a common fuse would not cause it to explode. But Mr. Nobel has succeeded, by employing a special description of fuse, in applying the liquid alone as a very powerful destructive agent. The charge of nitro-glycerin having been introduced, in a suitable case, into the blast-hole, a fuse, to the extremity of which is attached a small charge of gunpowder, is fixed immediately over the liquid. The concussion produced by the exploding powder, upon ignition of the fuse, effects the explosion of the nitro-glycerin. The destructive action of this material is estimated to be about ten times that of an equal weight of gunpowder, so that if we take 32,000lbs. as the average of work done by 1lb. of gunpowder, as stated in the early part of this paper, we get 328,320lbs., or about 146½ tuns, as the work done by 1lb. of nitro-glycerin. Therefore, although its cost is about seven times that of blasting powder, its use is attended with great economy, more especially in hard rocks, a considerable saving being effected by its means in the labor of the miners, and in the time occcpied in performing a given amount of work, as much fewer and smaller blast-holes are required than when gunpowder is employed. The material appears to have received considerable application in some parts of Germany and in Sweden; but, in England, it has not progressed beyond the stage of experimental trials.

Although nitro-glycerin appears to possess very important advantages over gunpowder as a blasting and destructive agent, the attempts to introduce it as a substitute for gunpowder, have been attended by most disastrous results, ascribable in part to some of its properties, and the evident instability of the commercial product. The explosion which occurred on board the West Indian Company's steamer *European*, will long be remembered by many. This distressing event happened on April 3, 1866, when the *European* was unloading her cargo alongside the railway company's wharf at Aspinwall. The force of the explosion was such as to tear away the upper parts of the ship, and to blow the plates off her sides. The wharf, too, which was some 400ft. in length, was literally torn to pieces, and about fifty persons killed, while many others were seriously injured. By the ship's bill of lading a number of cases of nitro-glycerin were proved to have been on board, and doubtless careless handling of these packages, by men who were ignorant of the dangerous nature of their contents, led to the catastrophe. As if to impress the public still more strongly with the peril attending even the mere transport of this destructive agent, another accident occurred on the 16th of the same month. Two oil-stained boxes, each measuring about 4 cubic feet, arrived at San Francisco by the Pacific mail steamer. They were removed from the ship into the city, in which they had no sooner been deposited than they exploded with a violence that shook the neighborhood like an earthquake, for a quarter of a mile around, and proved terribly fatal to human life. It was publicly stated that the boxes contained nitro-glycerin which was intended for sale to the mining companies in Nevada, Idaho, and Colorado. In Sydney, New South Wales, too, a tremendous explosion occurred on March 4, 1866, in the stores of Messrs. Molison & Black, in Bridge street, which were totally destroyed. The noise of the explosion is said to have very much resembled the discharge of artillery, while a column of the *debris* was thrown to a hight of about 150ft. A great amount of damage was done to the surrounding buildings, and property to a serious extent was destroyed. This explosion was traced to two packages of nitro-glycerin.

There is yet another danger attending the substitution of nitro-glycerin for gunpowder in mining, and this relates to its manipulation when being prepared for firing a shot. Although the oil may have been safely transported to its destination, there is no guarantee that its destructive energy will not be developed before it is placed in the hole which is intended for it. Indeed, there are instances on record which show how slight a circumstance serves to spread death and destruction around, even in the handling of this material. It should be observed that among other disadvantages, nitro-glycerin freezes at a somewhat high temperature, in which condition mere friction will explode it. A sad illustration of this fact occurred in 1867 at Hirschberg, in Silesia, where nitro-glycerin was being used in the boring of a railway tunnel. The oil was one day found to be frozen, and in this state was delicately handled, and fragments were detached by means of a piece of wood. In the bore holes the frozen nitro-glycerin exploded quite as well as the fluid. One day an overseer attempted to break up a lump of the frozen material with a pick. The result was a violent explosion of the whole mass, which caused the death of the incautious miner. Several accidents have also occurred in our own country since the introduction of nitro-glycerin, and many of those who were the first to experiment with it, have already given up its use. This material, therefore, was only worthy of utter condemnation for its fearfully dangerous and uncertain character, even under the most favorable circumstances. Its resistless energy is fully admitted, and its great value in this respect for mining operations duly recognized; but, inasmuch as it does not appear that there are any conditions under which it can be handled with safety, its use ought certainly to be everywhere prohibited.

AMBERGRIS.

This singular substance is one among those derived from animal sources that are employed in the perfumer's art, and although its origin would seem to preclude its use by the fastidious, the same objection would equally apply to musk, the product of the civet cat or musk deer, which if not an excretion is a secretion intended probably, as is the offensive liquid ejected by the skunk, as a means of defense. Ambergris, or "gray amber" as its name denotes, is simply and only a portion of the excreta of the sperm whale, *Physeter macrocephalus*, resulting from disease. It is considered generally to be a result of a morbid secretion of the whale's liver, and is probably produced also by other oceanic mammalia. It is usually found floating on the surface of the sea in those parts of the ocean most frequented by the spermaceti whale; a small barren island off the coast of Yucatan, having received its name of Ambergris from the quantity of that substance found on its shores.

Whale fishers look for it in the intestines of the whale, and its value is so great that whalemen pursue with eagerness the sickly cetaceæ although they promise a scant return of oil. It is amorphous, or in roundish pieces, frequently formed in layers, of a grayish color—whence its name—with streaks of whitish yellow, brown, or black. It has a waxy texture and when warmed emits a pungent odor. It is for this quality it is so highly esteemed. It has been sold for its weight in gold. It is very scarce and seldom appears except as "essence of amber" or "extrait d'ambre," forms of perfumery having this material for their base and bearing a very high price.

Its discovery is not at all new. It is pretty certain it was known as a rare perfume in the fifteenth century, for Sinbad, the sailor, being wrecked somewhere in the Indian Ocean says:

"Here is also a fountain of pitch and bitumen that runs into the sea, which the fishes swallow, and then vomit up again, turned into ambergris."

Piesse in his "Art of Perfumery" does not rank the perfuming value of this substance highly; for he says: "A modern compiler, speaking of ambergris, says 'it smells like dried cow dung.' Never having smelled this substance we cannot say whether the simile be correct; but we certainly consider that its perfume is most incredibly overrated; nor can we forget that Homberg found that a vessel, in which he had made a long digestion of the human fæces, had acquired a very strong and perfect smell of ambergris, insomuch that anyone would have thought that a great quantity of essence of ambergris had been made in it. The odor was so strong that the vessel was obliged to be moved out of the laboratory."

We cannot agree with Homberg, for when first, some twenty years ago (and recollections of scents are among the most tenacious), we tested some fragments just brought in by a whaling ship, we very much admired the aroma, but—we are also partial to musk.

It is generally found in small quantities of only a few pounds or perhaps ounces in weight, but large masses have been discovered, one weighing 174 lbs. having been purchased in the East Indies by the Dutch, and a mass of 237 lbs. being obtained by the French East India Company. Lately, however we read that Captain Timothy C. Spaulding, of the bark *Elizabeth* of New Bedford, while coming southwest of Madagascar, struck a very large sperm whale. On opening the whale they had the good luck to discover 285 pounds of ambergris—worth on the spot $20,000.

Another New Bedford whale ship, the *Herald*, lately brought home 71 lbs. of this substance that sold for $97 per lb.

Floor Coverings.

A covering for floors is now made in England, by gluing together a number of pieces of wood of different colors, and from this block thin veneers or slices are cut, which are then fixed by cement or glue to a woven cloth, or any other such material as may be preferred. Each veneer will have on it a pattern resulting from the arrangement of the pieces in the block from which it is cut, and by assembling a number of them together a complicated pattern is obtained; or when it is desired to have a simple pattern, the slices or veneers may each be cut from a single block; and it may be formed by arranging these pieces together. Various kinds of wood can be employed in this arrangement. A floor-cloth or covering thus prepared may be glued down to the floor which it is wished to cover, or, for temporary purposes, may be secured by nails. Also, this invention includes the use of veneer patterns nailed to any ordinary floor; such veneers of hard wood are reduced in thickness at their edges or corners, and are nailed to the floor beneath, the nails being covered by thin pieces of veneer, thinner than the others, and cut to a desired form, so that the whole makes an ornamental pattern. These pieces are, moreover, glued into their places, and the whole forms a flush and smooth surface.

Copying Copper-plate Engravings on Stone.

Lieutenant Hall of the Coast Survey states that copperplate engravings may be copied on stone; specimens are to appear in the forthcoming report. To quote his description: "A copperplate being duly engraved, it is inked, and an impression taken on transfer-paper. A good paper, which wetting does not expand, is needed, and a fatty coating is used in the process. The transfer-paper impression is laid on the smooth stone, and run through a press. It is then wetted, heated, and stripped off from the stone, leaving the ink and fat on its face. The heated fat is softly brushed away, leaving only the ink-lines. From this reversed impression on the stone, the printing is performed just as in ordinary lithography. A good transfer produces from 3,000 to 5,000 copies. Thus prints from a single copperplate can be infinitely multiplied, the printing being, moreover, much cheaper than copperplates.

Laminated Wooden Pipes.

We have lately examined at Mr. C. Lenzmann's office, No. 18 Dey street, New York, some specimens of Mayo's patent wooden pipes, having interior diameters of six inches and two feet. These pipes are composed of veneers, or thin sheets of wood, wound upon each other, cemented with bitumen, and lined with hydraulic cement. The samples we examined were about an inch in thickness, and, we were informed, had been tested by hydraulic pressure up to 310 lbs. per square inch without sign of fracture.

The improvement appears to be one of much value. The method of laying up the sheets in bitumen is calculated to render the material imperishable; and as the tubes can be made of any size, and furnished at much less rates than metal pipes, we see no reason why the invention should not come into extensive use for aqueducts, sewers, and other purposes.

MESSRS. WALSH & WATKINS, have laid a 11-inch plate iron water-pipe, from a point on a mountain side in Tuolumne county, California, down the mountain, under a creek and up the ascent on the other side, in all 8,800 feet in length, and under a perpendicular pressure at the lowest point of 684 feet.