THE MANUFACTURE OF NITRO-GLYCERINE.

A NORTH ADAMS correspondent of the Boston *Herald* sends to that paper a description of the manufacture of nitro-glycerine at the Hoosac Tunnel. He says: About one hundred yards beyond the west shaft of the Hoosac Tunnel is to be seen a board fence, surrounding about ten acres of ground, with the announcement: "Nitro-glycerine works! Dangerous; no visitors admitted!" A drive leading between two rows of buildings brings the visitor to the acid house, a well-ventilated building, one hundred and fifty feet long. Here are eleven stills, each seven feet long and two feet in diameter. Under these a light, slow fire burns, which is carefully attended to, for the temperature must be kept moderate. In each of these stills is placed a charge of nitrate of soda and of sulphuric acid. A stoneware pipe conducts the gases, at a temperature of about 180° Fahrenheit, from each still into a stone receiver or condenser, or rather a series of four condensers, connected by stoneware pipes, ranged on a platform three feet above the ground. Into three of these sulphuric acid is poured and the fourth is empty. The nitrous vapor passes from a still to the first condenser, where a portion of it, forming, as it condenses, nitric acid, is taken up by the sulphuric acid; the remainder passes on to the second, third, and fourth condensers, though a very small portion is left to pass into the last, which only requires to be emptied once a month. It takes about twenty-four hours for the still to complete the conversion of its contents into nitric acid, at the end of which time the resultant mixture, about six hundred pounds, is run off into carboys, twelve of these being filled from three stills. About one hundred carboys are generally kept in stock, as the acid does not spoil when kept closed. These carboys are then emptied into a soapstone tank, having a capacity of eighteen carboys, and an empty pipe, connected with the main leading from the blowers in the engine house, is

INSERTED INTO THE ACID,

causing a current of air to agitate it, so as to remove the nitrous fumes, mix it thoroughly, and bring it all to uniform strength. Formerly this was effected by removing the acid into a glass vessel containing about forty gallons, and it required boiling for hours; the mode now practiced occupies only five minutes, and the risk of fracture of a glass vessel in a sand bath is avoided. The acid is then carried into a converting room, about one hundred feet long and well lighted, where it is divided among one hundred and sixteen stone pitchers, arranged in nine wooden troughs placed in the center and at the end of the room, and these troughs are now filled with ice-cold water, or ice and salt, so as rise within four inches of the top of the jar. On shelves above the troughs are arranged glass jars, one to each stone pitcher. Into each of these glass jars chemically pure glycerine is poured, and this, by means of a siphon, with a rubber tube attached, about two feet long, falls, drop by drop, into the corresponding pitcher of mixed sulphuric and nitric acids. Immediately below the shelf on which the glycerine jar stands is a two and one-fourth inch iron pipe, which brings a current of cold air from the receivers connected with the two blowers above mentioned. This current of air is distributed to each jar, while the acid and glycerine are mixed by a rubber pipe, to which is attached a glass tube sixteen inches long and with a one-fourth inch bore. During the hour and a half or two hours that the glycerine takes to run off into the pitchers the greatest care and closest attention is required. The three men whose duty it is to attend to the mixing process have each a row of pitchers to watch, walking the whole time up and down beside them, with thermometer in hand, and, as the nitrous fumes rise from the forming nitro-glycerine, they stir the mixture with the glass tube, before mentioned, in a pitcher that may be giving out too violent fumes. Sometimes this may be caused by the glycerine running a little freely, which fires the mixture, wastes the glycerine, forming oxalic acid, and

DEVELOPS UNPLEASANT VAPORS.

In such a case, by pushing back a little wooden peg in the glass jar, the flow of glycerine is lessened, and by stirring with the glass tube the nitrous vapors dispelled. Should the engine stop working by any unforeseen circumstance, the current of air will, of course, be stopped, when the mixture will take fire. In this case it is necessary to stir the mixture and at once stop the flow of glycerine. When the glycerine and acid are all mixed and the nitrous fumes cease to appear, the nitro-glycerine from each pitcher is dumped into a large tank of water, at a temperature of 70°, about four hundred and fifty pounds of nitro-glycerine being the amount of each batch manufactured. The nitro-glycerine sinks to the bottom and is covered by about six feet of water. Here it remains for fifteen minutes, to be subsequently washed free from any impurities. This tank projects through the floor into a basement chamber, its bottom being on a slight incline, so that the nitro-glycerine may run out easily. The water is first drawn off from the top of the nitro-glycerine, and then the latter is run into a wooden swinging tub, in shape somewhat like an old-fashioned butter churn, but a good deal larger in diameter. In this it is washed five times, three times with plain water and twice with soda, a current of air working it at the same time. The water from this tub is run off into a wooden trough, which conveys it to a barrel buried in the earth, in the side of which a hole carries it to another barrel a little lower down the hill, and this into another barrel, whence it finds its way to the dump of rocks which were removed from the tunnel; any nitro-glycerine that may have escaped in the washing process being collected and retained in one or other of these three barrels. The nitro-glycerine is by this time thoroughly washed and ready to store in the magazine, three hundred feet distant, to which it is carried in a couple of pails. In the magazine the nitro-glycerine is

POURED INTO "CROCKS,"

as they are called, earthenware jars, holding sixty pounds. These crocks are then placed in a wooden tank two and a half feet deep, which holds twenty of them, and immersed to within six inches from the top of the jars in water warmed by a small pipe from the boiler to raise the temperature to 70°, at which temperature it is kept all the time, as nearly as possible. They remain in this water about seventy-two hours, during which time any impurities still remaining rise to the surface as scum and are skimmed off with a spoon. The nitro-glycerine is then chemically pure, transparent as water, refracts light powerfully, and is ready for packing. The tin cans, lined with paraffine, and containing fifty-six pounds each, are placed in a shallow wooden trough, and the nitro-glycerine, being poured from the crocks into copper cans, is again poured into the tins through a gutter-percha funnel, the bottom of the trough being covered with

a thick layer of plaster of Paris, which absorbs and renders harmless any drops of nitro-glycerine that may be spilled. The tins are then placed in a wooden trough containing iced water or ice and salt, where the nitro-glycerine is slowly crystallized or congealed. In this condition it is stowed away in small magazines, three hundred feet distant, in amounts of thirty or forty cans each, until required for use. When the nitro-glycerine is to be conveyed to any point by teams the tins are packed in open wooden boxes, with two inches of sponge at the bottom and four rubber tubes underneath; these are long enough to allow the ends to come one inch over the top of the tin on opposite sides, thus interposing two elastic tubes between the outside of the tin and the inside of the wooden box, rendering it perfectly safe to carry. Each tin is cellular, *i. e.*, from the top of each tin to the bottom a tube passes, about ten inches deep and one and a half inches in diameter, for the purpose of throwing the congealed nitro-glycerine when the blaster is ready to use it, liquefaction being effected with water of 70° to 90°. The tins, being closed with a cork wrapped in bladder, are put into a sleigh or wagon, covered in summer with a layer of ice and blankets, and may thus be carried any distance in this purified crystalline state as safely as so many tubs of butter.

Perfect system pervades this factory, and it is necessary to insure safety. The steadiest men possible are selected for the work; three are employed in the acid house, working in three shifts of eight hours each, but they do not actually work more than seven hours. Every movement is like clockwork; every man has his place and special duty, which he is expected to perform at the proper time. In the morning, at 7 or 7:30, ten men dump the carboys of acid into the soapstone tanks and mix them, while a third is filling the glass jars with glycerine. This operation takes about an hour. One draws the acid, another weighs it, and a third carries it to the troughs. After an interval, during which the acids cool, three men attend closely to the converting of the glycerine into tri-nitro-glycerine. After the nitro-glycerine is dumped into the water tank two men are employed in washing it, while two wash the stone pitchers with water. The floors are kept scrupulously clean and perfectly free from atoms of nitro-glycerine, which, stepped upon while the men are at work, might send them to eternity and the building to smithereens. The room is then prepared for next day's operations, and by about 1 or 2 o'clock, after six, or, at most, seven hours' work, the day's work is done. Notwithstanding the extreme care used to avoid accidents, the Mowbray Works have been blown up three times, and of the nine competent superintendents that have been in charge, eight have been killed outright and their bodies blown to fragments, while the ninth is yet living, totally blind. The highest wages are paid, and, in order to render transportation easier and safer, Prof. Mowbray, within the past two years, has built a car expressly for the purpose.

NITRO-GLYCERINE.

THIS agent was discovered by Sobrero, in 1847. Its chemical properties have been fully investigated by Mueller, Dupré, Railton, and others. It is commonly prepared by what is known as Liebe's process. Half an ounce of dehydrated glycerine being poured with constant stirring into a mixture of two ounces oil of vitriol and one ounce fuming nitric acid of the specific gravity of 1.52—the temperature of the mixture being kept below 77° F. by external cooling with ice; and as soon as oily drops begin to appear on the surface, the mass is poured with constant stirring into fifty ounces of cold water. Nitro-glycerine then separates, and may be purified by washing and drying in small quantities in a vapor bath. It then appears as a sweet, opaque, milky looking, oily fluid, but on careful drying by exposure to heat in a warm room, or in flat dishes containing thin layers, it becomes dehydrated and forms a transparent, colorless, oily fluid. It is slightly soluble in water, and freely in alcohol and ether, as it is also in fats and oils. It is, although slightly volatile, inodorous, and has a sweet, pungent, aromatic taste.

This agent, until recently, has been known only in the arts, being principally employed as an explosive in mining and blasting operations, and forming the basis of the compounds known as dynamite, glyoxylon, dualin, etc. Something over twenty years ago some observations were made, having the possible therapeutic properties of the article in view. These were made by Mr. Field, of Brighton, England, but this gentleman having commenced with too large a dose experienced sensations which discouraged him from a further trial. Latterly, the article has been revived as a medicinal agent, by Dr. Murrell, of London, and it is principally through the reported results of this gentleman's experience that the article has assumed the importance which is now attached to it. Dr. Murrell's observations were made both on himself and friends and patients. His first experience with it was on applying the moistened cork of a bottle containing a one per cent. solution to his tongue. In a few minutes he experienced a violent pulsation in the head, which rapidly increased and soon became so severe that each beat of the heart seemed to shake the whole body. Subsequent observations on himself revealed this as one of the physiological effects of the drug. The acceleration of the pulse was found to be very constant, sometimes, however, not amounting to more than ten beats in a minute. The temperature remained unaffected.

The chief interest, of course, attached to the drug is connected with its practical application in the treatment of disease. For some time past it has been used as a remedy for neuralgia, but owing, probably, to the disagreeable effects liable to follow an overdose, it has not been submitted to that thorough trial in the disease which its properties would seem to merit. It is, undoubtedly, an anti-neuralgic of great value, and should have a thorough trial, especially in those cases, which are but too numerous, in which the usual remedies, quinine, phosphorus, strychnia, chloral, etc., have proved unavailing. Nitro-glycerine, however, is now chiefly remarkable for its decided properties in the relief of angina pectoris. It is largely employed in the London hospitals as a remedy against this most terrible of diseases, and certainly the results attending its use establish it as an article of great merit. A number of cases are reported in which a perfect cure has resulted from its employment. This is, probably, more than can be said of any other remedy. The article may be given either in solution or in the form of pills. The latter form has the advantage of assuring a greater uniformity in the dose, and is much more convenient for prescribing. The danger which might be supposed to result from the known terrible explosive property of nitro-glycerine is practically absent from the article in the form in which it is administered as a medicine. The pill mass may be thrown into the fire or beaten on an anvil with perfect impunity. The valuable properties which the drug has

developed within the past year particularly, will result in fixing it as one of the standard remedies in the class of diseases in which it has thus far been recommended. Doubtless it will develop other properties with a more extended trial, and indeed, it has already been spoken of as an efficient diuretic.—*Therapeutic Gazette.*

DETECTION OF COTTON-SEED OIL IN OLIVE OIL.

By BENJAMIN NICKELS, F.C.S., F.I.C.

A CONTINENTAL firm (consumers of oils) consulted with me on a recent occasion as to the simplest method of detecting admixtures of "cotton-seed oil" with "Lucca or Gallipoli," making a strong point of the want of such a test among customers. Without entering upon the admitted difficulty of the case as regards the chemical aspect of the question, it has occurred to the writer that something might be done in the direction indicated by spectroscopic examination.

Pure "olive or Gallipoli," as examined by a Browning "direct vision" or pocket instrument, presents a deep shadowing or cutting-out of the blue and violet ray, with a fine, almost indistinct, line in the green, and a strong deep band in the red.

Refined cotton-seed oil similarly examined presents exactly the same appearance, but as regards the blue and violet ray only, the green and red being continuous.

Now if we take as a standard a given stratum of pure olive or Gallipoli, say in a test-tube $\frac{5}{8}$ or $\frac{3}{4}$ in. in diameter, and a similar stratum or thickness of the standard oil in admixture with cotton-seed, there is no discernible difference as regards the shadowing in the blue and violet ray, but an almost entire fading out of the delicate line in the green, and a considerable diminution in the depth and intensity of the strong band in the red, consequent upon "dilution" or "thinning down." With 50 per cent. in admixture the loss in intensity is considerable; with 25 per cent. the variation is marked and discernible.

A suspected sample compared with and differing thus from the standard, and in the absence of any direct chemical evidence as to the nature of the oil in admixture, might fairly fall within the range of strong presumptive evidence pointing towards "cotton-seed" oil as the probable dilutant.—*Chemical News.*

ARTIFICIAL PRODUCTION OF FELSPARS CONTAINING BARIUM, STRONTIUM, AND LEAD.

By F. FOUQUÉ and A. M. LEVY.

By heating mixtures of silica, alumina, sodium carbonate, and strontia, baryta, or lead oxide, in the requisite proportions to a temperature just below their fusing points for forty-eight hours, crystalline masses are obtained which correspond in composition to oligoclase, labradorite, and anorthite, but contain baryta, strontia, and lead oxide in the place of lime. These crystals resemble felspathic micro-liths in their behavior with polarized light, and one of the axes of elasticity coincides with the direction of elongation. The anorthite of baryta is probably orthorhombic, the labradorite of lead is decidedly triclinic, but the determination of the crystalline forms of the other compounds could not be made with certainty. The macles of albite, characteristic of triclinic felspars, was not observed on the artificial products. They all scratch glass, and with the exception of the oligoclases of baryta, strontia, and lead, and the labradorite of strontia, are attacked by acids. Their specific gravities are given in the following table:

	Strontia.	Baryta.	Lead.
Oligoclase.....	2.619	2.906	3.196
Labradorite...	2.862	3.333	3.609
Anorthite.....	3.043	3.573	4.093

None of these artificial products corresponds with the natural triclinic barytic felspar recently described by Descloizeaux (*Bull. Soc. Min.*).—*Compt. Rend.*

DOMESTIC REMEDY FOR FELONS.

By T. C. BRANNON, M.D.

I HAVE been afflicted with nearly forty felons during my life, and suffered very much with the first ones, being able to get no reliable treatment from medical authorities. In my desperation I resorted to the many treatments kindly suggested by old ladies, and finally succeeded in learning how to abort the inflammation. Felons are generally, if not always, caused from bruises, and originate under the periosteum.

How to diagnose a felon.—When the palmar surface of the finger, thumb, or any part of the hand feels as if a fine, sharp, short thorn had entered the cuticle, and the outer end had become embedded beneath it, and when, on "picking" for it, it seems to be pressed into the periosteum, endways, and you fail to find the thorn, and know no other cause for redness, swelling, and pain, you may rest assured that you have a felon coming. But if you wish to further satisfy yourself whether or not it is a felon, take your pocketknife and rub the edge over the small, red spot, inclining the back of the blade forward. Notice if, when you are passing over the diseased spot, the red corpuscles are all caused to pass on through the blood vessels, leaving the inflamed part whitened for a short time after the knife passes over it. If not, it is apt to prove to be a felon.

I give rules for diagnosing the disease in its forming stage, when it is easily aborted by my treatment; but if neglected longer, it only succeeds in part, according to the deposit under the periosteum:

Treatment.—I have used the following simple treatment for twenty-three years, since which I have always succeeded in aborting this painful disease, or modifying the great pain, and not unfrequently preventing the loss of one joint of the finger: Take of soft lye soap and flaxseed meal a sufficient quantity, stirring the meal in slowly with spatula, or case-knife, manipulating thoroughly, so as to form a salve or poultice. Cornmeal is a good substitute for the flaxseed. Envelop the finger in this, applying snugly, and occasionally pressing it to bring it more completely in apposition. Renew the poultice every twelve to twenty-four hours. Don't try every prescription you may hear of. Depend on this, and this alone. It will, if applied in time, abort the disease; if adopted later, it will bring it to a small "head" (if too far advanced to be "scattered"), when it may be picked almost painlessly.

The escharotic properties of the soap soon destroy the thick skin over the region of the disease, which accounts partly from the quick relief from pain. Besides, I think it is partially absorbed, and thus affects, more or less, the diseased process.—*Therapeutic Gazette.*