gredients have been intimately mixed, and thoroughly incorporated by stirring and kneading, the powder is then ready for use, and may be packed in bulk in boxes, or compressed into cartridge cases made of paper, of such convenient sizes as may be most in demand for blasting purposes. "In using this improved explosive compound for blasting, it

may be inserted into cartridge cases, as above stated, or without any inclosure or wrapping as may be preferred. For the best effect it should be pressed firmly down so as to fill the bottom of the bore hole, always using a wooden rod for the charging of the hole. (Every miner is aware of the importance of having his charge of powder firmly set in the bottom of the hole.) It is easily and efficiently exploded by means of an ordinary fuse inserted in the open end of a percussion cap, the metallic edges of the cap being compressed or crimped tightly and firmly around the fuse, in close contact with the fulminate in the percussion cap. The carped end of the fuse is then inserted into the explosive powder, which is pressed closely around it in the bore hole, and a tamping of sand or other suitable material may be placed above the charge of powder and pressed down upon it. The fuse thus applied is fired in the ordinary manner ; and when the fire reaches the percussion cap, it explodes, which effects the immediate explosion of the charge of explosive compound." Nobel's invention consists, therefore : "In the combination

Nobel's invention consists, therefore : "In the combination of nitro-glycerine with infusorial earth or other equivalent absorbent substances."

Kieselguhr or guhr is found in Hanover, Germany. It is a soluble variety of silicious earth, is a white, mealy substance, composed of the silicious armors of a species of shells (*Diatomeen*) that form a multitude of small cells which possess considerable hardness and, looked at through a microscope, show their perfect state of preservation. This guhr possesses, as has been shown above, an immense absorbing capacity, and owing to the peculiar form of these infinitesimal small shells, every small particle of nitro-glycerine is, so to say, surrounded by it, and lies (is stored away) in a small cavity of this porous material in such a manner that these particles of guhr prevent the propogation of the vibration caused by a comparatively strong concussion. It can be said that each particle of nitro-glycerine is packed away separately in each particle of guhr in which it is retained by capillary attraction, and consequently the great objection against the liquid is in this way obviated.

At first the new blasting agent made but slow progress, owing in a great measure to the strong prejudice existing against its chief ingredient. But gradually it has grown into favor and numerous dynamite factories have sprung up all over Europe and America, and not less than a dozen were under the inventor's control, and what is more are on a paying basis.

It was not long after its introduction to the practical and scientific world, that it was universally adopted in both hemispheres, as it became an absolute necessity to the engineer and uniner. During the last two decades, which are so eminently marked for the great advancement in railroad building, this material has been an immense aid in cutting the path for the great reformer of our modern age—the iron horse. And certainly the greatest credit is due to the inventor who has furnished us the means of accomplished results, which might have been delayed for years had it not been for the excellent material which he has put into our hands.

The great success of dynamite has given rise to numerous other nitro-glycerine compounds, of which the most known are the Lithofacteur, Dualine, Hercules, Vulcan, Warren, Excelsior powders, which have entered into successful competition with Nobel's dynamite. The remark will be made here, that the ob-Ject of these articles is not to say which is the best nitro-glycerine compound, but to impart to the reader the knowledge of what they are, as the miners on this coast are two intelligent a class of men to be told which is and which is not the best of these powders. Let everyone use his own judgment on that subject. It is self-evident that that compound which holds absorbed the greatest amount of nitro-glycerine in a pure and neutralized condition, will make the strongest, and consequently, the best powder. In some cases, where the absorbents used do not possess the great absorbing capacity of kiesel-guhr, the admixture of meal powder is resorted to, to add to the strength of the compound, besides acting also as a vehicle to carry the nitro-glycerine.

The strength of dynamite, No. 1, is set down for equal weights to be as one to five, as compared with black powder, although in practice, some authorities set it lower, and some higher.

Dynamite forms a fine grain, somewhat pasty and fatty substance of gray brown color, which has, under the ordinary pres-

sure employed to form it into cartridges, a specific gravity equal to liquid nitro-glycerine.

Against fluids and solutions it comparts itself in the same manner as nitro-glycerine, only it must not be permeated by water, because it separates the oil from the guhr. Against heat it bears the same relation as nitro-glycerine. Dynamite burns in an open flame or on live coal with a quiet development of gases, but it must not be confined, and only when wrapped up in paper or other light substances, like wood; but in that case even there is danger of its being heated to the exploding temperature. Especially in storing large quantities, like in magazines, it can happen that during a fire an explosion can take place, as the mass may become heated to 380° before the same is burnt up. Such an accident happened in the dynamite factory at Hamburg on the 12th July, 1866.

Against moderate strokes and concussion, such as may happen during transport, like the running together of the heavy box cars or railroad trains, jolting of freight wagons, dropping of case, the material is insensible, and although an instance is on record where during a collision a box car containing dynamite was all broken up, the boxes smashed and the powder spilt without explosion, it must be recommended to always handle this material with due precaution.

Some experiments as to its safety in regard to percussion are of interest :

A strong wooden keg containing 10 lbs. of dynamite put up in cartridges, was thrown from a height of 100 lt. against a rock, and the keg and contents remained intact.

To a flat stone weighing 200 lbs., a cartridge of dynamite was tied and then the stone dropped from a height of 20 ft. The cartridge was all smashed to pieces, but it did not explode. In spite of these reassuring results, which show the insensibility of the material against heavy percussion, we have on record some very distressing accidents, which have for causes the reckless handling of the same; and therefore let it be again repeated that although dynamite is a very safe substance when handled with ordinary care, it must not be forgotten that it is the highest explosive known, and that it ought to be treated accordingly

In its frozen condition it is hard to explode, but even then it is to be recommended not to employ any pointed instrument for breaking it up, and in thawing it out to follow the ordinary rules which are known to every miner. It is very hard to explode frozen dynamite, consequently accidental explosions with the frozen stuff ought certainly be easily avoided.

It is hardly to be presumed that we will reach such a point in the manufacture or handling of explosive substances, be it dynamite, be it gun cotton, or be it gun powder, where claim can be laid to an absolute safety, as some accidental combination of circumstances will lead to explosions, and it is therefore the question, that under ordinary circumstances these accidental combinations should be avoided, which can be done by the exercise of care, prudence and precaution, and also by a perfect knowledge of the properties of the material, by the parties who handle it.

Dynamite has been in use in this country some 13 years; it has been shipped and transported over thousands of m les, been distributed in thousands of parcels in different parts of our Territories, under different atmospheric and climatic conditions, and, so far, spontaneous explosions of magazines are not on record as yet. Numerous distressing accidents have occurred, but from different causes, and consequently we presume the theory of scientific men, that dynamite does not explode spontaneously, to be correct, as the particles of nitro-glycerine are finely distributed through the kieselguhr, and if, during a storage of long duration, the nitro-glycerine decomposes the decomposition takes place slowly and gradually and does not lead to disasters.

I adopt the theory of scientific men that dynamite does not explode spontaneously, not because scientific men say so, but hecause practice has proven it up to this date, and it is to be hoped that future experience will bear out this theory.

As yet, I cannot consider the different dynamites as the perfect ideals of modern blasting agents, as they possess some disadvantages, which, no doubt, science will overcome in time.

1. The easy separation of the nitro-glycerine from the absorbents through water, which necessitates that it has to be put in water-tight cartridges when used under water for any length of time.

2. It gets hard at a comparatively high temperature; it freezes.

3. A more complete neutralization of its fumes, so as to make them less obnoxious.