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(Illustrated articles are marked with an asterisk.)

HOW LONG SHALL NITRO-GLYCERIN CONTINUE ITS WORK OF DESTRUCTION?---THE FAIRPORT EXPLOSION.

We have been taught from early infancy that human life is of all earthly things most sacred and valuable. The Scriptures tell us the greatest evidence of love a man can manifest is to give his life for that of his friend. Yet in these latter days we seem to have adopted a new gospel, by which the pecuniary interests of corporations and unscrupulous and avaricious men, are set higher in the scale of value than the lives of innocent, industrious people, and the happiness of families.

Since the first introduction as an explosive agent of that most terrible compound, nitro-glycerin, its history has been one of disaster and destruction. The calamities, of which it has been the cause, are too horrible to dwell upon, even in the recollection. It is our painful duty to now record still another, and we copy the following brief account of it from the Painesville (Ohio) *Telegraph*. The explosion took place at Fairport, Ohio, on Tuesday the 1st inst.

"At about 5 o'clock the people of Painesville were startled by a sudden concussion of the doors and windows, and jarring of buildings, as though some heavy body had been hurled against them, with a force almost sufficient to crush them in. This was followed by a dull heavy reverberation, similar, yet still unlike, the firing of heavy guns at a distance. Buildings were jarred, and trembled as though shaken by an earthquake. The reverberation and rolling sound as of distant thunder were perceptible at least from three to five minues after the first concussion was felt. An immense cloud of blood-red smoke was seen to arise in the direction of Fairport, and then to change its color to a lighter hue, and spread itself out in the heavens. This terrible phenomenon at once seemed to explain the cause of the great commotion. All at once understood that it was either the explosion of the nitro-glycerin manufactory or their magazines. Teams were immediately brought into requisition, and a number of our citizens started for the scene. It would be impossible to describe the scene which the town presented. The whole place seemed at first a complete mass of ruins. The buildings were shattered, the doors blown off their hinges, the windows all smashed in, plastering off, crockery, lamps, and looking-glasses demolished, chimneys torn down, stoves overturned, and everything in the houses in utter chaos. But if the scene was terrible within, it was still more so without. The whole population nearly were in the street, wild and crazed. The crash had come so suddenly, and the concussion had been so great, that many of them for the time were perfectly insane. Some of the men were for a few moments attacking each other, and women were insanely struggling, while all were loudly weeping and wailing. Children were running wildly about, screaming in terror, as if seeking protection, while others were struggling and screaming in the arms of their mothers, who were rushing hither and thither, not knowing what to do or where to go.

"Both the magazines of the Glycerin Company, situated on the west side of the river, had exploded, and four men who were at work in or near them were blown to atoms. The immediate cause of the explosion is not and never will be known. It is supposed that Mr. Malone, one of the four men, was digging a pit for a new magazine, and that one of the men was engaged in putting glycerin into cans from the jars in the magazine ready for shipping, while the other two were in some way assisting, by carrying glycerin backward and forward between the magazines and the manufactory. The explosion of the two magazines, which were near each other, was simultaneous, so far as the people in the vicinity could judge, they hearing but a single report. The men were blown to atoms. So far as we have heard only one piece of flesh has been found, not larger than a man's hand, and a bone, apparently part of a rib.

"The effect upon the magazines was wonderful. Of the frame structures only a handful of splinters was anywhere to be seen. It seems as if the wood must have been consumed, or the pieces blown so far that no one has yet found them. The force of the explosion penetrated deep into the earth, heaving out immense quantities of sand, and below this huge masses of blue clay. The holes, which must have been blown out to the depth of fifty or sixty feet, soon filled with water up to the level of the lake. They are forty or fifty feet in diameter at the top, and seem like the craters of extinct volcanoes. Two or three sycamore trees, which stood near the magazines, were scathed and rent, limbs were wrenched off, and all covered with sand and blackened, as if swept by a fiery tornado.

"The explosion was felt even in Buffalo, a distance of 160 miles. Soon after it occurred, a dispatch was sent over the wires from that city to Cleveland, and other points on the lake shore, asking if they had been again visited by an earthquake.

In Painsville, the shock was very severe, especially in the south part of the town, where the clay or hard pan comes very near the surface. In one small house we have heard of, things were thrown from the shelves, and a bedstead moved near two feet. It is supposed that the explosion must have reached the clay or hard pan, some thirty feet below the magazine, with such force, that houses built on that strata, though some miles distant, were more affected than those on the sand much nearer."

In addition to the above particulars, we have received, through private sources, others, some of which show in a most startling manner the appalling force of nitro-glycerin.

We are told that a physician riding at a distance of not less than twelve miles from the scene of the disaster was stunned by the shock, and his horse brought to a stand-still. Upon looking at his watch he found that the concussion had stopped it.

Another man sick with typhoid fever, lying two miles from the magazine, was instantly killed by the shock.

There is something intensely awful in the contemplation of a force like this, which, held by a slender and feeble thread, will, when let loose, rend the air like an earthquake and scatter destruction for miles around.

Since the introduction of nitro-glycerin to this country we have more than once raised our voice in denunciation of it as a far too dangerous substance to be allowed to exist in larger quantities than a chemical professor would venture to exhibit to his class. Experience has shown that it may, and will explode under the most ordinary circumstances which attend its storage and transport, and that it cannot with safety be intrusted to the handling of such men as must use it, if used at all, for purposes of ordinary blasting. The damage done by it has far exceeded any good derived from its use, and it is time, and more than time, that its record of death should be terminated by stringent laws prohibiting its general use.

ROADS AND ROAD-MAKING.

Of primary importance to the civil as well as military power of any country are good public thoroughfares. Rapidity and cheapness in transportation are vital necessities to commercial prosperity, and in time of war the safety of a nation may depend upon the state of her roads. These facts have long been recognized, and hence the perfection of roads has been a problem to which engineers have in all ages assiduously applied themselves. The importance of even a slight advance in improvement has kept alive interest in this department of engineering, and century after century has elapsed without the perfect ideal being considered as yet reached.

That this is true is proved by a very brief review of the Patent Office records, in which patents for various compositions for road surfaces, and for methods of road-building, constitute every year a notable number of the patents applied for and issued.

Probably the most remarkable success ever yet achieved by any one system was that which attended and still attends the macadam road. Notwithstanding its expensive character, it to-day covers more surface in Europe than any other. In America, except in the vicinity of large towns, this road is not much employed, the comparative sparseness of the population and the small amount of travel in rural districts not warranting the cost of its construction and maintenance.

There are few circumstances under which this road is not admirably adapted to town and country thoroughfares. It has a smooth surface, after it has been a little used, and affords an admirable foothold for horses. It is expeditiously laid, and perhaps demands as little expense for care and maintenance as any other capable of equal endurance and service.

It is now fifty years or thereabouts since Macadam introduced this celebrated system, and it is quite doubtful whether the next fifty years will give the world anything better for all purposes. But, as we have already said, this system is not at the present, nor is it probable that it soon will be, available for the greater part of American thoroughfares.

Roads in this country must, from the nature of the case, be constructed of such materials as are available immediately along their lines, and must necessarily be more or less imperfect.

In this as in other countries the great enemy of roads is frost, and the only way to even partially prevent its ravages is to construct roads high enough to allow thorough drainage. The flat surfaces permitted on most roads in this country is their most radical defect. The result is rivers of mud in spring and autumn, and frozen ruts of indescribable ugliness and discomfort in winter until such time as the snow covers and fills them.

A few days' labor devoted to thorough ditching along the sides of roads and elevating the centers where they have settled below the proper grade would greatly mitigate the evils complained of. This is generally done, when done at all, by throwing back on the road the soil excavated from the ditches, a very erroneous method and almost a sheer waste of labor. Such soil is generally composed of comminuted and pulverized material washed off from the road, and will only temporarily pack. As soon as it becomes very dry in summer it grinds up into a dust heap, and is blown off by winds, and washed off again by rains.

All soil used to raise the level of roads should be new soil, not the washings of the roads, which latter should be carted away. Where roads are much traveled these washings are a valuable manure, and it would pay well to cart them into the lands lying along such roads, from which soil of inferior fertility might be taken to form the roadways.

Wherever practicable, a deep hard bed of stone or timber should be laid below the reach of frost, upon which the surface material should be distributed. Gravel stands unrivaled for road surfaces, but it is not available in many localities. Broken stone, however, is obtainable oftentimes where gravel cannot be got, and answers the purpose very well.

We have seen a road laid through a swamp made with a bed of rough logs, well sunk down, and covered with a mixture of blue clay and broken stone, which was excellent in all respects, having almost as good and permanent a surface as macadam.

It is usual to work country roads early in the summer, to repair the defects caused by spring upheavals. This done, they are generally left till the ensuing season, when the same operation is repeated. But a little labor late in the fall would pay well on most roads. This labor should be expended in securing proper drainage. All sluices should be opened if stopped, the roads raised where the summer wear and tear have depressed them, and their surfaces made smooth, so that the water may run off with the utmost facility Neglect in these particulars is always dearly paid for in the miring of teams and wagons, and in wear and tear of both animals and vehicles.

THE MOTIVE POWER OF EXPANDING GASES.

The power of expanding gases to perform work has only been successfully applied in the use of steam or water-gas, and atmospheric air. In the use of these gases they are allowed to escape after having expended a portion of their heat in the performance of work, and escaping to carry with them a portion of the heat imparted to them. In condensing steam engines, a portion of this heat is recovered and sent back to the boiler in the feed water, but a considerable loss is nevertheless experienced.

The general belief has been that fluids capable of being changed into gases by the action of heat, are more applicable to motive purposes than permanent gases. And we have yet to be convinced that this belief is not scientifically correct. It is true that the heat expended in converting water into steam at 212° is, and cannot be otherwise than lost in working steam under ordinary atmospheric pressure, in non-condensing engines; but this loss is so far compensated for by the conveniences attending its use, as contrasted with that of permanent gases, that it still maintains, and seems likely to maintain its supremacy.

Notwithstanding this, numerous attempts have been made and are still making by able engineers, to substitute permanent gases for steam in the working of engines. For the most part, air is the material employed, and it is with this material that the greatest success has been acheived. It has been used both separately and in combination with steam In the latter method, no very remarkable and permanent success has been reached, though some attempts in this direction have seemed to promise something.

With air used singly, there are now several engines, popularly known as "Caloric engines," which are efficient, safe, and economical within certain limits of power; but all attempts to develop great power with a single motor have failed up to the present time. With this brief review of the past and present history of invention in this field, we may proceed to notice an attempt recently made by Mr. A. W Bickerton, F. C. S. associate of the Royal School of Mines, who, in a paper presented to the British Association recently, gave an account of his invention.

Without admitting that the claims for economy made by him are probable or even possible, we think the statement made in his paper will interest our readers, and, therefore, will