

conditions. Dynamite will stand treatment at one time which at another will result in explosion. An expert on explosives says that the most dangerous means of thawing cartridges are ingeniously devised by ignorant laborers; baking, boiling and toasting being favorite methods, while at a stone quarry, in one instance, an apparatus was arranged for steaming cartridges over a pot of boiling water. In this latter case the nitro-glycerine leaked through the canvas cover and settled on the bottom of the pot, with the result that an explosion occurred, the water acting as a tamping to the charge. The fact that small quantities of explosives containing nitro-glycerine will burn quietly and without explosion if ignited by direct contact with a flame, has led to the dangerously mistaken reasoning that merely heating the explosive can produce no ill effect. If a dynamite cartridge is ignited or placed in a fire it will probably burn harmlessly away, but if placed on a stove or in an oven, and gradually heated to its exploding temperature of 350 to 400 F., a violent explosion is almost certain to result, while before that point is reached the dynamite will become extremely sensitive to shock. In England alone, from the beginning of 1872 to the beginning of 1890, there were reported 63 accidents due to improper thawing of dynamite, by which 50 lives were lost and 76 persons injured. Reference may here be made to the explosion of dynamite, December 28th, 1892, in a thawing apparatus at the works for commencing the Brooklyn end of the proposed New York and Brooklyn tunnel, by which 4 persons were killed and about 20 injured. According to report, the thawing was done by placing the cartridges on shelves in a chamber six feet square and eight feet high, heated by a coil of steam pipes.

An unfreezable dynamite invented by Liebert, a German, has been used to some extent in Europe, and has been favorably reported upon by chemists and experts in explosives, and it would appear most advisable to test its practical efficiency in this country. The dynamite is made in the usual way, but its composition includes a chemical (isoamyl nitrate,) by which its freezing point is lowered from 40° above to 50° below F., while the explosive power is slightly increased and the sensitiveness to concussion slightly decreased. The dynamite, it is claimed, is not affected by damp; it may be kept for considerable time without deteriorating or losing its special properties, and its cost is little, if at all, in excess of that of ordinary dynamite. It is patented in the United States. It certainly seems that if there is a reliable dynamite, unfreezable at very low temperatures, and procurable at reasonable cost, it should find a field for introduction in the United States and Canada, and that steps should be taken to insure its introduction, in the interests of life and property.

In the discussion several methods of thawing dynamite cartridges were referred to, but it was shown that they do not provide for carelessness on the part of the laborers who use them. Mr. J. T. Jones described an apparatus for thawing cartridges, consisting of a tin box with tubes, like a tubular boiler; the box is filled with water and heated by an ordinary lamp, and the cartridges are placed within the tubes. Mr. M. Phenale had utilized the exhaust steam of an engine for heating a chamber in which the cartridges were placed. Mr. W. B. Phillips did not believe that there was ground for believing that that seepage of the nitro-glycerine would occur in cartridges, and he had opened and ground up a number of cartridges without finding any evidence of such seepage. With Rack-a-Rock the oil and the cartridges are kept separate in winter until the latter are to be used.

Dr. R. W. Raymond said that rackarock has a strong odor which affects the men, and he had had to give up using it. He thought there was no doubt that seepage of the nitro-glycerine frequently occurs, and is a great source of danger in the use of dynamite. As this occurs largely when the cartridges are being thawed, an unfreezable dynamite would greatly reduce the danger. As to thawing apparatus, while many safe arrangements may be devised, there is no guarantee that they will be carefully or properly used as a careless laborer in a hurry to thaw out some cartridges may disregard all precautions. Prof. W. P. Blake stated that in a case of his own experience the cartridges were placed on racks in a cabin, where they were thawed but that an explosion occurred owing, it was supposed, to some of the boys sent to fetch cartridges finding them not ready for use and lighting a fire to hasten the thawing. Mr. Woodworth said that in a dynamite storage room one box was left standing on end, and the glycerine seeped out from the cartridges and saturated the wood. Mr. Tratman referred to the use of a double box, with manure packed in the surrounding space, for storing dynamite in cold weather, as used in the Croton Aqueduct. At the works of the Londonderry Iron Co (Nova Scotia) a double box with mineral wool packing is used to store the thawed cartridges. Mr. J. F. Torrence said he had used the ordinary warming apparatus consisting of two tin boxes, one within the other, with hot water in the space between them, the cartridges being placed in the inner box, but he had found an oily film settle on the bottom of the box, being seepage from the cartridges. He thought many accidents were due to imperfect combination of the nitro-glycerine with the dope.

Dr. H. J. Fixott, St. Peter's says: "Have proscribed Puttner's Emulsion, and judging by results, heartily recommend it."

THE CRAWFORD MILL AND MECHANICAL GOLD EXTRACTOR.

By CAPT. GEO. A. MACDUFF, WAVERLEY, N. S.

Read before the Mining Society of Nova Scotia.

The history of the Crawford Mill is interesting, considering the brief period since the patents were taken out, showing as it does a patient and intelligent effort to accomplish a result long desired and of grave importance to the gold producers of the world.

Quietly and unostentatiously it has been developed and as we believe proved its ability to extract at one operation and at small cost a large proportion of all the gold contained in the ore, whether the same be classed as free or refractory, and to dispense with the cumbersome, complicated and extensive apparatus now in use, whether of a chemical or mechanical character, and thus removing the absolute prohibition which at present exists to the successful working of many mines where a large amount of concentrates are produced which have to depend upon more expensive methods in order to recover the gold they contain.

The gentlemen who have secured the rights of the patentee for the United States and Canada, and are now introducing the Mill for general use, are men of affairs, thoroughly conservative, and in no sense speculators, inventors or promoters, but are gentlemen who estimate from a purely business point of view the care, time and expense necessary to establish solely upon its merits, a revolutionary process of this kind.

While fully recognizing the general attachment of certificated mining engineers to the use of stamps as a safe and sure means of recovering a considerable percentage of gold from its containing ore, and also recognizing the high intelligence which has developed the various chemical processes and introduced them for the same purpose, the Gold Extractor Company have avoided as much as possible all antagonism or benefit to be derived from advertisements or florid statements with regard to the mill and its power to extract the gold from raw ore or its products, but have patiently and steadily conducted such critical and exhaustive experiments as in their judgment was necessary to determine the merit of the mill as a gold extractor, and its endurance as a machine, before offering it generally for sale.

For this purpose they have established and conducted steadily for months experimental metallurgical works in the City of New York, where they have received large and small quantities of ore from most of the gold producing States of the U. S., Canada and Mexico, and they are now operating experimental mills on refractory ores in Virginia, North Carolina, Canada, Montana and New Mexico, and will speedily have works in operations in Arizona and Oregon.

The information thus gained from these different tests and experiments is briefly set forth in the circular now offered for your inspection, which we think establishes the claim that by the use of the Crawford Mill, from 80 per cent. to 99 per cent. of the gold contained in the different ores can be extracted and saved in one operation, at less expense, both of time and money, than can be accomplished by any other process now in use.

Briefly stated, one 12 inch Crawford Mill, properly erected, supplied automatically with ore reduced to 10 mesh, and fed with clear water, will treat from 10 to 12 tons every 24 hours, and save the average of gold as mentioned above, which the ore contains, at a cost not exceeding \$1.50 per ton, and will run continuously with very slight wear and tear. If five mills are operated, the entire cost of milling, including wear and tear, will not exceed \$1.00, the cost according to U. S. wages.

The per cent saved naturally varies with the character of the ore treated, whether the same be hard or soft, and also with the constituent elements of the ore; thus a larger amount of ordinary free milling ore can be treated in a given time than of a sulphuretted ore, with a relatively varied per cent of gold saved. The amount and character of these savings depending upon the speed with which the mill is driven and the adjustment of the water supply. This, together with the accurate setting of the mill upon a firm and absolutely level foundation, constitute essentially all the points for which an expert is required. When these points have been carefully considered, and adjusted, the mill may be classed as automatic and only requiring the attendance of one person.

It has been found by experiment that the use of hot water in the mill is very advantageous, as by its use the ore is more perfectly disintegrated, the action of the quicksilver when heated is more pronounced, and hastens the amalgamation of the gold. Different modes for accomplishing this result may be used, varying with the surrounding conditions and the power employed to drive the machinery, whether it be water, steam or electricity. The engineer or superintendent in charge will readily determine the best mode by which the application of heat to the water can be made.

It is also proper to state that five mills, or a product from 50 tons every 24 hours, can be had as cheaply, so far as the cost of operating the mills is concerned, as from one mill, with the exception of the extra power required to drive the greater number of mills. After the mills are adjusted and the speed and water pressure regulated, one man can properly wait upon five mills. An ordinary travelling derrick or crane when in place will open the mills easily and quickly, if from any cause the wearing parts require examination or renewal.

The quicksilver bath can be renewed at any time when necessary without opening the mill or disturbing its operations, except for a very brief period. The position which this bath of mercury occupies, and its method of operating upon the gold, constitutes an important factor in the economy of the mill. It is an essential element that pure water only should be brought in contact with the mercury, and this is provided for in the structure of mill. Again, the mercury is not in any way ground up with the material, or brought in contact with deleterious elements which the ore may contain, that would be calculated to sicken the mercury; it thus exercises its full power for amalgamation and can be recovered with barely a trace of loss. My experience is that no loss of mercury occurs if the mill is properly run as regards water and feed.

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DR. WOOD'S NORWAY PINE SYRUP.

DR. WOOD'S NORWAY PINE SYRUP cures coughs, colds, asthma, bronchitis, hoarseness, croup and all diseases of the throat and lungs. Price 25c. and 50c. at all druggists.