

## Literature.

## GUNPOWDER.

(From the Quarterly Review.)

At Waltham Abbey, not half an hour's walk from Enfield Lock, is situated the only establishment for the manufacture of powder which the Government possesses. Here dispersion, instead of concentration, is the order of the day. The necessity for complete isolation causes the factories to be distributed over a very large space of ground, and the visitor has to walk from workshop to workshop through groves and avenues of willow and alder, as though he were visiting dispersed farm buildings rather than the different departments of the same manufacturing process. There are not perhaps more than a dozen detached buildings in the whole establishment, yet these are scattered over upwards of 50 acres of ground. To such an extent do meadows and woods and meandering canals predominate, that the idea of being in a powder mill is entirely lost in the impression that you are walking in a Dutch landscape. The visitor who enters the great gates of the mill, impressed with a belief in the dangerous nature of the ground he is treading is somewhat startled on finding a steam-engine at work on the very threshold of the factory, and a tall chimney smoking its pipe in what he supposed to be the vicinity of hundreds of barrels of gunpowder; but in reality these boilers and furnaces are placed many hundred feet from the mixing houses. The English Government powder is composed of seventy-five parts of saltpetre, fifteen parts of charcoal, and ten of sulphur. The ingredients being thoroughly powdered, prepared, and purified, are submitted to the action of a machine which completely mixes them. The product is then conveyed by a covered boat very much like an aldermanic gondola in mourning, some hundred yards along the canal to the incorporating houses, where the most important process of the manufacture is carried on, and where the danger of an explosion first commences. The incorporating machine is nothing more than a couple of runners or huge wheels weighing 4½ tons each, which revolve one after another on their edges in a bed of metal supplied with a deep wooden rim which gives it much the appearance of a huge kitchen candlestick. Into this dish the black powder is placed, together with a little water which varies in quantity from four pints in winter when the atmosphere is charged with moisture to ten in the summer, when the desiccating quality of the air is very great. For four hours this pasty mass is crushed, ground, and mixed by the action of the runners. The precautions taken against explosion teach the visitor the dangerous nature of the ground: he is treading. Before he puts his feet across the threshold he must encase them in leathern boots, huge enough to fit Polyphemus, and guiltless of iron in any form whatever; even his umbrella or stick is snatched from him lest the ferrule should strike fire or accidentally drop among any part of the machinery whilst at work. The machinery is even protected against itself. In order to avoid the possibility of the linch pins which confine the cylinders to their axes falling down, and by the action of skidding the runner, producing so much friction as to cause an explosion, receptacles are formed to catch them in their fall. As small pieces of grit, the natural enemy of the powder maker, might prove dangerous if mixed with any of the charges, the axle sockets of nearly all the wheels are constructed to expand, so as to allow any hard foreign body to pass through just in the same manner in which the fine jaws of the larger serpents are loosely hinged to enable them to get over at one gulp suck a bulky morsel as a full-grown rabbit.

Accidents will happen, however, in the best regulated mills, and provision is made for rendering an explosion when it occurs as innocuous as possible. The new incorporating mills are constructed with three sides of solid brick work three feet thick; and the fourth side and roof of corrugated iron and glass lightly adjusted. As they are placed in a row contiguous to each other, the alternate ones only face the same way, so that the line of fire, or the direction the explosion would take through the weakest end, would not be likely to involve in destruction the neighbouring mill. It does occasionally happen, however, that the precautions are not sufficient to prevent danger spreading. In

the great explosion which took place in 1852 a second house was fired at a couple of hundred yards distance from the spot where the original explosion took place. There is now a further security against the houses going one after another, like houses of cards. Over each mill a copper tank, containing about forty gallons of water, is so suspended that on the lifting of a lever it instantly discharges its contents and floods the mill. This shower or dutch bath is made self-acting; inasmuch as the explosion itself pulls the string, the force of the expanding gas lifting up a hinged shutter which acts like a trigger to let down the water. But it may be said, as the water does not fall until the explosion has taken place, this contrivance is very like locking the stable door when the steed is stolen! But this is the case with respect to the mill where the original mischief took place; but the lever first acted upon discharges the shower bath over the heads of all the others also, and by these means the evil is limited to the place where it originated. From the incorporating mills the kneaded powder, or mill cake, as it is termed, is taken by another funeral-looking gondola to small expense magazines, where it is allowed to remain for twelve hours before being taken to the breaking-down house. Here the hard lumps of mill cake are ground into fine powder by the action of fine-toothed rollers made of gun-metal, which revolve towards each other and crush the cake which falls between them to dust. The broken-down mill cake once more travels between pleasant meadows fringed with willow until it reaches the press house, where the meal is subjected to hydraulic pressure between plates of gun-metal, and is thereby reduced to dense plates about half an inch thick. These plates are allowed to remain intact for a couple of days, by which time they become as hard as a piece of fine pottery. Very many advantages are gained by this pressure. The density of the powder is increased, which enables it to be conveyed without working into fine duct; its keeping qualities are improved, as it absorbs less moisture than if it were more porous; and lastly, a greater volume of inflammable gas is produced from a given bulk. The pressed cake is now transferred to the maw of one of the most extraordinary machines we have yet witnessed. The granulating house, where the important process of dividing the powder into fine grains takes place, is removed very far away from the other buildings. The danger of the operation carried on within is implied by the strong traverse 15 feet thick at the bottom, which is intended to act as a shield to the workmen in case of an accident. It was here an explosion took place in 1843, which eight workmen lost their lives—in what manner no one knows, as all the evidence was swept away. To render the recurrence of such lamentable accidents as rare as possible, the machine is made self-acting. At certain times of the day it is supplied with food in the shape of fifteen hundred weight of pressed cake. This is stuffed into a large hopper or pouch, and the moment the monster is ready the men retire beyond the strong traverse and allow it slowly to masticate its meal, which it does with a deliberation worthy of its ponderosity and strength, emptying its pouch by degrees, and by a triturating process performed by two or three sets of fine rollers, dividing it into different sized grains. These grains it passes through a series of wire sieves, separating the larger ones fitted for cannon powder from the finer kind required for rifles, and depositing them in their appropriate boxes, which when full its removed from its own dangerous proximity, and takes up empty ones in their place. All the larger undigested pieces it returns again, like a ruminating animal, to its masticating process until its supply is exhausted. Then, and not till then, like Mademoiselle Jack, the famous elephant, it rings a bell for some fresh cake. The workmen allow it about five minutes grace to thoroughly assimilate the supply already in its maw, when the machine stops, and they enter with another meal. The doors of all the different houses are covered with leather neatly fastened down with copper nails, and the brush is never out of the hands of the workman: even while you are talking to him, he sweeps away in the gravest manner in order to remove any particles of powder or grit that may be on the floor, this he does mechanically, when not a particle of anything in it to be seen, just as a sailor in a crack ship always holystones the deck, clean or dirty, the moment he has any spare time.

The powder thus separated into grains is still damp and full of dust. To get rid of this it is taken by water to the dusting house, where it is bolted in a reel like so much flour. It has now to be glazed, a very important operation, performed by placing it in large barrels, which revolve with their load thirty-two times a minute for three hours together. By the mere friction of the grains against each other and the sides of the barrel, a fine polish is imparted to the surface of the grain which enables it to withstand the action of the atmosphere much better than when it is left unglazed. It is now stored for 16 hours in a drying-room heated by steam pipes to a heat of 130 degrees Fahrenheit, and is then finally dusted and proved. There are many methods of proving, but the simplest and most efficacious is to fire the powder from the weapon it is intended to serve. Thus cannon powder is proved by firing a 68-pound solid shot with a charge of 2 ounces of powder—a charge which should give a range of from 270 to 300 feet. If the powder passes the test, which it generally does, it is packed in barrels holding 100 lbs. each, marked L. G. (Large Grain,) and F. G. (Fine Grain,) as the case may be, and carried to the provisional magazine. When 500 barrels have accumulated they are despatched in a barge to the Government magazine at Purfleet, near the mouth of the Thames, the Lea forming connecting link of water between the canals of the works and that river.

The produce of this establishment, which had fallen so low as 5004 barrels per annum in 1843, is now so increased by improved machinery that 20,000 barrels a year can be manufactured, and of the very best quality. Even this supply is far below the consumption during a time of war, and contractors have, and always will have, to furnish a portion of the required supplies; but it seems that a model mill is useful for the double purpose of keeping up a due standard of quality, and of keeping down price. On the uniform strength of the powder depends the accuracy of artillery fire, hence the necessity of having some known standard of quality from which contractors should not be allowed to depart. The improvements which have taken place in the manufacture are very marked. About the year 1790, when powder was supplied to Government wholly by contract, the regulation weight of charge for a cannon was half the weight of the ball, it is now less than one-third, therefore two barrels are now used instead of three, a reduction of bulk which economizes stowage on board ship as well as in the field. Formerly powder had a range of 190 feet only; the range is now increased to 268 feet! This vast improvement is simply the consequence of the care with which the powder is worked and the attention bestowed on every detail of the mills since their direction fell into the hands of Colonel Tulloh, Colonel Dickson, and Colonel Askwith, the present Superintendent.

## ENCOURAGEMENT TO HOME MANUFACTURES?

## Report of the Toronto Sub-Committee on the Tariff.

Having taken the subject into careful consideration, your Committee beg respectfully to recommend the following classification of articles for duty, as being in their opinion the best adapted to advance the interests of the country.

Your Committee have to observe that, upon a large class of Goods which enter into competition with Canadian Industry, they have recommended an increased duty; while they have placed on the free list many articles which enter largely into general consumption, or are used for manufacturing purposes. It is therefore believed that the classification will be satisfactory to the great body of consumers, without reference to the large amount of incidental protection and encouragement afforded to our struggling manufactures.

Your Committee have been strongly urged to place cotton and woollen goods under the fourth class; but in view of the large consumption of these articles of foreign manufacture, they believed that a duty of 30 per cent, would be likely to cause a reaction, and destroy that confidence in the continuance of the duty, so necessary to insure the investment of capital in such manufactures.

With regard to Boots and Shoes, the at-

ention of your Committee has been called to the fact, that under the *ad valorem* system of levying duties, they are in many instances entered under value, to the injury of the revenue as well as of the honest importer and Canadian manufacturer. It has been urged that a specific duty, which could easily be imposed by a single classification, would be every way preferable to the present system.

In view of the present depressed condition of trade in this Province, and looking at the beneficial effects which have always followed the introduction of a high tariff on manufactures in the United States, your Committee would strongly urge upon the Government and the Legislature the necessity of immediate legislation on this important question.

All which is respectfully submitted.

## CLASS I.—FREE.

Free Goods List as at present and not here after excepted in the other classes, with the following additions:

Alum,  
Argols,  
Binnacle Lamps,  
Bleaching Powders,  
Boiler-plate unwrought,  
Bolting Cloth,  
Books not in course of publication in Canada,  
Borax,  
Brass and Copper Tubes, drawn,  
Burr Stones, unwrought,  
Catechu,  
Canada and Russia plates,  
Charcoal,  
Copperas,  
Cork wood,  
Cream of Tartar in Crystals,  
Earth and Clays,  
Fire Brick  
Felt for Silk Hats only, and Hat Trimmings,  
Gums in their crude state,  
Iron in Bars, Tin plate, Tin foil.  
Manilla Grass,  
Nail plates and rods,  
Nitre,  
Ochres unground,  
Railway Bars,  
Sal Soda, Soda Ash,  
Sal Ammoniac,  
Shellac,  
Spirits of Turpentine,  
Steel,  
Sulphur, unground,  
Sulphuric Acid, and Packages containing same,  
Tea, Coffee, Molasses and Raw Sugar,  
Wire of all kinds,

## CLASS II.—NOT TO EXCEED 10 PER CENT.

Acids other than specified,  
Anchors,  
Boiler plate, prepared or partially so,  
Brass and Copper Tubes, soldered,  
Brackets and Frames for Engines, in the rough,  
Bunting,  
Burr stones wrought,  
Candle wick,  
Chain Cables,  
Cotton Yarn and Warp,  
Drugs in their crude state,  
Felt Sheeting,  
Files,  
Fur Skins dressed,  
Grind Stones wrought,  
Hinges, Handles and Locks,  
Hair cloth,  
Locomotive and car wheel tyres in the rough,  
Mohair and Silk Twist, Galloons, and Carpet Web, for Shoemakers's use.  
Nets and Semes,  
Plate Glass,  
Pistons, Shafts, and Connecting Rods for Engines in the rough,  
Plush and Lace for Carriage trimmings,  
Prunella or lastings for Boots and Shoes,  
Refined Sugar,  
Ship's Blocks,  
Ship's Bolts,  
Veneers,  
Wrought Axles and Wheels for Locomotives and Railway Carriages, in the rough,

## CLASS III.—NOT TO EXCEED 20 PER CENT.

Books and Periodicals in course of publication in Canada,  
Crockery and China Ware,  
Cutlery of all kinds,  
Drugs and Spices, ground or prepared besides specific duty,