from $17 to $20 per ton is, as a rule, too expensive against the price of pyrites containing 50% sulphur at $4.50 to $6.50 per ton and is used when not too far from source of supply. In this country it is largely used in the manufacture of the sulphite wood pulp process. Strong efforts have been made to find additional native sulphur deposits besides those now well known, but so far no new large deposits have been brought into the markets and the price of native sulphur has not been reduced much in late years. The deposits in some of the West Indian Islands, and also some of the Alaskan group of Islands, are not yet figuring in the market to any extent.

So far, in the States, the importation is nearly double the home production.* In Canada comparatively small amounts of pyrites are mined, something over 35,000 tons being the total production for 1902. This comes largely from the mines at Eustis and Capelton in the Eastern Townships of the Province of Quebec. As yet no iron pyrites mines have been discovered that are of any extent, although the whole country, especially in the Lower Provinces, is heavily impregnated with pyrites in small particles, seams, or pockets, in practically all classes of rock. New locations in Lower Canada have been examined, but so far without direct economic success.

Newfoundland has produced some large deposits, some of which have already stood the test of time. Others, however, are still in the development stage, and later I will describe some of the deposits in the Labrador Districts which give promise of being large producers after being properly developed. The Pilley Island deposits in Notre Dame Bay, Newfoundland, are again producers, after having been idle for a number of years. At one time it was a well known deposit, having produced over 400,000 tons before being shut down. It, like nearly all Newfoundland pyrites, is very pure as far arsenic is concerned, and usually high in sulphur.

Physically, these Newfoundland ores are largely hard and fairly compact, some exceedingly so, as for instance the Labrador varieties, and with care the amount of fines is not excessive.

Copper pyrites are worked on a paying basis in several locations in Newfoundland, and such mines as Tilt Cove and York Harbour are, and promise to be, steady producers. York Harbour in the Bay of Islands, particularly, promises to be a large and steady producer. Along the Labrador Coast pyrites deposits have been reported, of which the Rowsell's Harbour deposit is, so far, the only one that has been carefully investigated. This is the one that I will describe fully later.

From this preliminary sketch on the sources of supply, we will now turn to the manufacture of sulphuric acid at the Dominion & Steel Company's Acid Plant, in Sydney, Nova Scotia, as described by Mr. C. Carter, Superintendent of the Plant.

The manufacture of sulphuric acid, as at present carried out by means of what is known as the chamber process, is the result of many years of study and observation, combined with the application and adaptation of materials and methods to the circumstances existing from time to time. Whilst other processes for the manufacture of acid have been brought out and developed, the chamber process remains to this day the most important of them all.

The object to be attained in this and other processes is to be bring about the combustion of sulphur dioxide gas (SO_2) derived from the combustion of sulphur with the elements of water (H_2O) and an additional atom of oxygen (O) to form sulphuric acid (H_2SO_4)

$$SO_2 + H_2O + O = H_2SO_4$$

As a chemical equatation, this reaction appears to be of the simplest kind, but as a matter of fact and practice, the combination does not occur in quite such an easy manner, for, whilst the first part of the reaction, viz, the combination of the sulphur dioxide with the water, is readily brought about with the formation of sulphurous acid (H_2SO_3), the greatest difficulty is experienced in getting this sulphurous acid (H_2SO_3) to combine with the extra atom of oxygen to form sulphuric acid (H_2SO_4).

The principal sources of supply of sulphur for the manufacture of acid are (1) brimstone, (2) iron and copper pyrites, and (3) spent oxide from the purifiers of gas works. Of these the pyrites are by far the most important sources, most of the acid at the present day being made from these substances.

It may here be convenient to give a brief outline of the process, returning afterward to discuss more closely each stage of the process in detail. Broadly speaking, the pyrites are burnt in suitable kilns or burners, and sulphur dioxide gas given off. This gas passes along through a flue into the nitre oven where a mixture of nitrate of soda and sulphuric acid is decomposed by the heat of the burner gas, and nitric acid vapours given off which travel on with the burner gas into what is known as the Glover tower, the object and working of which will be described later. The gas rises through this tower and passes from the top through a flue into a series of leaden chambers, where it comes into contact with water vapour in the form of steam introduced through the sides or tops of the chambers. In these chambers the reaction between the gases and steam takes place, resulting in the formation of sulphuric acid which falls to the bottom of the chambers as a fine mist, where it accumulates as a liquid known as chamber acid. From the last of the series of chambers, the residual gas passes through another flue into the bottom of the Gay-Lussac tower, up which it rises, and in which the greater part of the nitrogen acid gases derived from the nitrate of soda are recovered and made available for being used over again. From the top of the Gay-Lussac tower the remaining portion of gas, which consists almost entirely of air, passes out into the surrounding atmosphere.

Having given this very brief sketch of the process, it may now be convenient to discuss each step more in detail.

The kilns, or burners, in which the pyrites are burnt are usually built in sets, back to back, of 12 to 24, or more, burners, and are constructed of brick lined inside with firebrick. The internal dimensions are about 8 feet high, by 4 ft. 6 ins. wide, by 5 ft. to 6 ft. deep. About 2 feet from the ground is placed a set of grate bars. each bar being free to move around its axis, so as to allow the burnt cinders from the pyrites to pass through. The front of the burner consists of a cast iron plate fitted with three tiers of doors, the lower one being placed convenient for removing cinders from below the grate bars; the next higher on a level with the grate bars so as to enable the men in charge to get at and turn around from time to time. The upper door is placed about three feet higher, and through this the charging is done. It is fitted with a small sliding door to enable the interior of the burner to be observed without having to open the larger door. In the roof of the burner is a square hole about 12 inches square communicating with a flue passing along the whole length of the set of burners, and into which every separate burner discharges the gas from its pyrites.

In starting up a set of such burners, a layer of cinders is placed on the grates about 18 inches in depth, on which the pyrites is ignited by suitable means, the charge of ore being about 700 lbs. for every twenty-four hours. Each burner in a set receives attention in rotation every twenty-four hours, the cinders being shaken down into the ash pits, and a fresh charge being put in on top, the new charge being ignited by the heat of the previous charge. In the ash pit door are some small doors capable of being regulated, through which the air required for combustion of the sulphur is allowed to enter.

The heated gas from these burners, which consists essentially of a

*See Mineral Industry.