levels is, in its way, as remarkable as a Bay of Fundy tide. In October, 1886, and in January, 1889, westerly gales of this kind occurred. The guard lock had been left open and the water was rammed into the long offshoot represented by the summit level (about 18 miles long), where it was piled up and kept there by the force of the wind, so that, during the gale of 1886, the surface rose about four feet at Port Colborne, seven feet at the aqueduct, and a small quantity of water is said to have passed over the coping of the guard gates at Thorold, the level of which is about nine feet over Lake Erie, mean surface! Had a break occurred at this point, the damage which must have ensued to the country below can scarcely be imagined.

In this connection it may be asked what would have been the result on the 11th October, 1888, when a heavy breach occurred in the Cornwall Canal, had there been no guard lock at its head? In other words, if the canal had been open to the river at the time of the accident? I venture to say that instead of only the serious interruption so loudly complained of by forwarders, the canal would have been closed to navigation for the remainder of the season.

The safety which a guard lock gives under such circumstances (or modification of them) is sufficiently obvious. With guard gates only, the canal would not be navigable until the gale had subsided. If left open they would be useless ; and if shut (as they should be), they could not be opened until the head against them disappeared. At the east end of Lake St. Francis the water will rise about 18 inches during a strong westerly gale. A guard lock is therefore indispensable at the head of the Soulanges Canal. With two pairs of gates, the passage of vessels need not cease during storms, and the canal below the lock (which is always liable to accidents) would be saved from the destruction which would ensue if it were left open to the lake, whilst a break occurred in the high banks, or at one of the culverts.

But I shall not trespass on your patience any longer. There are so many questions arising out of the study of this important subject that it would far exceed the time at my disposal to even touch upon the greater number of them.

In conclusion, I thank you for the honor you have done me by my election as President for 1895. I have endeavored during my term of office to absent myself as seldom as possible from the meetings; and I may now say that I do not mean, after leaving the chair, to take less interest than heretofore in the affairs of the society, knowing, as I do, full well, that no success can be achieved except by a long pull, a strong pull, and a pull all together.

## THE MINERAL RESOURCES OF CANADA.

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## (Concluded.)

Ores of silver and lead in nature usually occur together, and are found at a number of places in the Dominion. Only a few words, however, can be said concerning one district, which is at present especially prominent and promising, namely, the Kootenay district of British Columbia. This is bounded on north and west by the C.P.R., on the east by the interprovincial line, and on the south by the international boundary. Here within the past few years a great number of important metalliferous deposits, chiefly rich silver and lead ores, have been discovered.

Many of these deposits have been taken up and are being worked. Little towns and mining centres are springing up. Roads and trails have been made in all directions. Lines of railway have been and are being built, both from the north and south, and several smelters have been erected. In fact, so far as the mining development of British Columbia is concerned, the centre of interest has for the time being, at least, been shifted from the old placer districts to this Kootenay country. Gold and copper have also been found in this district, which is believed to be one of exceptional promise, and which will in the near future largely increase the mineral production of the Dominion.

There are also among the products of Canadian mines, in addition to coal, many non-metallic minerals, that is to say, minerals which are not worked for any metal, but which are of the highest importance, such as asbestos, mica, gypsum, apatite, petroleum, salt, etc.; in fact the value of the non-metallic minerals produced by the Dominion far exceeds that of the metallic ores. Among these non-metallic minerals one of the most important and interesting is asbestos, a name given to the fibrous form of certain minerals, our Canadian asbestos being a fibrous form of the mineral, serpentine. The mineral derives its name from the Greek word signifying incombustible, on account of the fact that although this asbestos looks like the fibre of wool or cotton, unlike these, it cannot be burned or destroyed by fire. It is found in thin irregular veins, varying in width from the thickness of a sheet of paper to six inches or more, which veins traverse the great masses of serpentine rock found in the eastern townships of the Province of Quebec, but especially in the townships of Thetford and Coloraine. When first broken from its enclosing rock its distinctive character is not very clearly shown. but when crushed by striking with a heavy hammer or by passing between powerful rollers, it falls into a mass of fine, soft, flexible fibre of so-called mineral cotton or asbestos. This fibre, although not possessing the strength of many vegetable fibres, can be spun and woven. String, rope, wall paper, or millboard, or even clothing of asbestos, can thus be made, and the material being incombustible, serves many purposes for which vegetable fibres are unfitted. It is especially useful in packing steam joints, etc., and in Paris and elsewhere firemen are clothed in suits of asbestos cloth. and thus protected to a certain extent from the dangers incident to their heroic calling. The asbestos industry is comparatively a new one in the Dominion, the first mining having been done in 1878, when 50 tons were taken out; last year 7,630 tons were raised, having a value of \$420,825.

"Phosphate" or Apatite was until the last year or two mined extensively in the Ottawa district. The discovery of the very extensive phosphate deposits of Florida, however, has so lowered the price of this mineral—a fall in price of about one-half having recently taken place—that the mineral cannot be profitably mined at present prices in Canada. With the phosphate a number of other minerals are found, and among these is mica, which occurs in large amount in the form of crystals, often of large size, and while the phosphate has so greatly declined in value, a corresponding demand for this mica has sprung up, and the Canadian " amber mica" is now largely exported, and has now a well

<sup>\*</sup> A "paper read before the Applied Science Graduates' Society of McGill University, and published exclusively in THE CAMADIAN ENGINEER.