the figures current in the local market. On the other hand, if given to the smelter, the buyer from the mine would be able to give a better price because of the bounty. The cutting in upon our supplies would be thus prevented in either case. Besides, by doing this there would be created a stable set of conditions. A smelter would be able to go ahead, and as long as the mine-owners knew that a reduction works was willing to take ores regularly they would go into the business of producing. Now there is neither certainty as to price, as that can be set arbitrarily, to a great extent, by the United States smelters, nor as to market, for the United States concerns cannot be said to be regular buyers and in fact only do buy either when they are short or when they might wish to hamper possible Canadian competition.

"And that brings us back to the other set of conditions, the preying upon the Canadian spelter market," concluded Mr. Jones. "Unless there is a duty as well as a bounty we cannot keep that market. With the duty we can hold the Canadian market; with the bounty we can successfully compete with the United States in the Orient and share in that market, thus obtaining assured conditions both for mining and smelting. Those assured conditions are today entirely lacking, and so long as they continue to be we shall suffer from lack of capital and skilled labour to place the zinc industry upon a permanent footing."

## THE COPPER MINES OF ALASKA.

ALASKA'S COPPER MINES are as yet comparatively undeveloped. There are known to occur in different parts of that extensive but little-explored country showings of copper ore that give promise of production, after adequate development, to an important extent. The following information, though not up to date, is of interest, being official. It is from Bulletin No. 285 of the United States Geological Survey, "Contributions to Economic Geology, 1905," by S. F. Emmons and E. C. Eckel, geologists in charge. This bulletin is one of a series prepared primarily with a view to securing as prompt publication as is practicable of the economic results of investigations made by the Survey, and "designed to meet the wants of the busy man, being so condensed that he will be able to obtain results and conclusions with a minimum expenditure of time and energy." The particular reference to Alaska's copper mines is as under:

The first commercial shipments of copper from Alaska were made in 1903, forming, it is hoped, the beginning of a great industry. At the present time the known mines of Alaska do not warrant definite estimates of future production.

On Prince of Wales Island two properties have been brought to a producing stage and are now reducing their own ores. The first is the Mamie mine at Hadley, operated by the Alaska Smelting and Refining Co. The ore is chalcopyrite, with pyrite, a very small amount of calcite, and much amphibole. The ore occurs in lenticular masses surrounded by black slickensided surfaces. It is understood that an arrangement has been made by which the company exchanges ore with the Britannia Co., near Vancouver, British Columbia, sending it the basic ore and receiving in exchange the highly siliceous ores of the Britannia mine. The Coppermount smelter was also in operation in the latter part of 1905 and promises to be a steady producer in the future.

One mine on Prince William Sound was a steady producer during 1904, shipping ore to the Puget Sound smelter.

The Nikolai greenstone forms a remarkable body of igneous rock, extending along the Alaska Range for nearly 300 miles, lifted and upturned with the Carboniferous limestone about its borders, but not breaking through the rock or sending out dykes or arms into it. This great body of rocks, which consists mainly of intrusive masses, but in part contains amygdaloidal surface lavas, is cupriferous over a very extensive area, and in places, as at Bonanza Creek (Copper River) carries disseminated bornite and veins of glance in what appears to be fresh rock, together with associated magnetite and pyrrhotite.* According to Schrader and Spencer the Nikolai greenstone consists of volcanic flows varying laterally and vertically and constituting a unit compared with adjacent rocks. It is composed of green to red feldspar, with augite, a less amount of chlorite, a little serpentine, and some accessory magnetite. The rocks are mainly altered basalts. Locally they contain metallic copper, which is secondary. Both the greenstone and the adjacent sedimentaries are fractured and the fissures become veins. The copper occurs in the fissures in the greenstone or in the sedimentaries only near the contact with the greenstone.

The best-known mines of the Prince William Sound or Copper River district are in the Bonanza Creek basin, which lies across the range from the coast and is reached by a two weeks' journey with saddle and pack mules. The ore occurs in a vein which crosses at 90 deg. the contact between the Nikolai greenstone and Carboniferous limestones upturned about it. The vein shows a paystreak of 4 ft. of 40 to 50 per cent ore, consisting of bornite and glance, the vein itself being about 11 ft. wide, if the parallel fissuring is included. The fracture is distinctly traceable into the limestone, where, however, it is barren and filled with limestone fragments cemented by calcite. The vein was traced by H. V. Winchell for over half a mile into the limestone and, being above timber line, it is well exposed, particularly where it crosses a 70-ft. cliff. Although carefully examined and sampled it does not show even a trace of copper throughout this extent in the limestone. The ore occurs only where the vein is incased in the greenstone, and a 40-ft. shaft sunk in the greenstone shows this ore to be a surface enrichment.

*For a description of the Nikolai greenstone see Schrader, F.C., and Spencer, A.C., Geology and mineral resources of a portion of the Copper River district, Alaska: House Doc. No. 546, 56th Cong., 2d sess., 1901.