

A TUNGSTEN DEPOSIT NEAR FAIRBANKS, ALASKA.

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Industrial conditions imposed by the war have created a greater demand for tungsten than at any time since the metal first became of commercial importance. Its profitable occurrences are few, and the size of the deposits small, otherwise its value would not be as great as it is, and deposits that could not be worked before the war are being more or less vigorously exploited today. Our knowledge of the occurrence of tungsten may still be termed meager, and any additional information is at present of value, even though it is purely descriptive.

Tungsten minerals have been found for a long time in the sluice boxes of the gold placer workings of the Fairbanks district, but only recently have lode deposits been discovered. The following is a brief description of a tungsten occurrence near Fairbanks, Alaska.

GENERAL.

The property has been known as the Stepovitch tungsten property and is located in the Fairbanks mining district, about eighteen miles east of the town of Fairbanks, Alaska. It lies on the divide between the headwaters of Gilmour and Fish creeks at an elevation of about 2,450 feet and is six miles distant from a railway and automobile road. The property is as yet a prospect, although one shipment of 265 tons of ore has been made. It has been worked intermittently in a haphazard manner. The workings consist of an inclined shaft to a vertical depth of fifty feet and one cross-cut, twenty-five feet in length. The ore shipped was removed from a small stope, halfway down the shaft.

The climatic conditions at the property are similar to those of the Fairbanks district in general, with fairly long warm summers, but extremely cold winters. The precipitation is less than twelve inches a year, so that the small run-off is a serious handi-

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cap in mining operations. The snowfall is not sufficient to inconvenience transportation of supplies or ore.

PHYSICAL FEATURES.

Topographically the Fairbanks district seems out of place in the northern latitudes. To reach it one traverses hundreds of miles of country exhibiting the most accentuated forms of glacial topography, but the Fairbanks district itself is in sharp contrast, for it exhibits no glacial forms and never has been glaciated. It is a lowland country of moderate relief with flat or slightly rounded ridges, rising to elevations mostly less than 2,500 feet above sea level. These ridges are monotonously repeated throughout the region, but are relieved here and there by broad dome-shaped masses such as Ester Dome and Pedro Dome. The main streams flow in flat valleys which terminate fairly abruptly against hillsides of moderate grade. Innumerable tributary creeks dissect the country and flow in steep narrow valleys about 1,000 feet beneath the hill tops. The valleys are filled with alluvium and well timbered. The hills are mostly mantled by a covering of soil derived from the decay of the immediately underlying rocks. The hill slopes and ridges are covered by small timber up to an elevation of about 2,400 feet. Rock outcrops are not numerous.

Most of the Fairbanks district is underlain by the Birch Creek schists, a much metamorphosed series, chiefly of sedimentary origin¹ consisting of quartzites, quartz schists, mica schists, hornblende schists, crystalline limestone and other varieties of metamorphic rocks. In places the bedding is readily discernible. These rocks are intruded by masses and dikes of quartz diorite and granite porphyry.

The Stepovitch tungsten property occurs in the Birch Creek schists in the immediate vicinity of an intrusion of porphyritic granite. In the hand specimen the granite is seen to consist of phenocrysts of feldspar embedded in a ground-mass of quartz, feldspar, and biotite. The microscope shows the rock to be made up of microcline, orthoclase, soda-lime feldspar, quartz, biotite, muscovite, hornblende, zircon, and titanite.

¹ Prindle, L. M., and Katz, F. J., Bull. U. S. Geol. Surv. No. 525, p. 59, 1913.

ORE DEPOSIT.

The ore is valuable for its tungsten content, which is entirely in the form of scheelite. No metallic minerals whatever could be observed in the ore with a hand lens; panning tests yield a concentrate of almost pure scheelite and show that no other high specific gravity minerals are present. The gangue is the enclosing rock.

The deposit occurs within the Birch Creek schists, which, in this locality, consist of crystalline limestone and mica schists with well-pronounced bedding dipping at an angle of 35 degrees. The crystalline limestone at a distance of about 100 feet from the deposit is a grayish, sugary marble, and appears to be fairly pure. The mica schist is made up chiefly of quartz, biotite, sericite, feldspar, and chlorite.

The ore appears to be a replacement and impregnation of the limestone along its contact with the mica schist. The crystalline limestone is highly altered, surrounding the ore, and is changed to a mass of lime silicates admixed with bunches of impure calcium carbonate. Where unaltered by surface agencies quartz, gray pyroxenes, and light-green amphibole appear to make up most of the rock. Some of it is extremely tough and resistant to fracturing. Where affected by surface agencies it is a crumbly granular sand of gray color. The ore-bearing part of the limestone can always be told by the alteration.

The scheelite is a gray-colored variety and most of it is so intimately admixed with the gangue in such small particles that they cannot be seen, and it is difficult to tell which is ore and which is not. Only by panning or assaying can the valuable portion of the ore be outlined. In a few places the scheelite may be seen with the naked eye in round grains the size of a pea, but if the rock is decomposed even these cannot be discerned, and it is only by experience of considerable panning tests that the scheelite-bearing material can be picked out. The part containing scheelite yields upon surface alteration a more sandy material than the non-scheelite-bearing material. There is an absence of veinlets, lenses, or drusy-filled cavities, of scheelite, and it is almost impos-

sible to obtain a hand specimen in which the mineral can readily be seen or examined without the use of a lens. This finely disseminated character of the scheelite will necessitate fine crushing for its extraction and consequent losses due to sliming, but the absence of other high specific gravity minerals should give a pure concentrate.

The ore appears to be in the form of small shoots or lenses within the limestone bed, which dip with the bedding at an angle of about 35° . Two such shoots are encountered in the shaft, but their size and extent could not be determined because of insufficient workings. The part of the upper shoot, as exposed, varies in width from 4 inches to 5 feet and is exposed along its dip for about 60 feet. It is said that the ore stopped from this shoot had a width of 4 feet. The average width of all the ore would probably be about 2 feet. The lower shoot has been exposed for a length of about 20 feet and in this distance varies from 1 to 6 feet. All of the ore within the shoots is the altered variety described above, but beyond the limits of the shoots it is a dirty gray crystalline limestone.

Sampling shows that the scheelite is irregularly distributed throughout the shoots and that small pockets and layers contain much more of the mineral than the adjacent layers. These, however, could not be separated in mining.

ORIGIN.

The scanty exposures of the deposit afford only a suggestion of the nature of its origin. It may be clearly seen, however, that it is not a typical contact-metamorphic deposit. The character of the alteration of the crystalline limestone and the nature of the minerals making up the deposit suggest that it has been formed as a replacement of the crystalline limestone by means of hydrothermal solutions. The pyroxenes, amphiboles, and other minerals noted in the ore suggest that the solutions were of high temperature. They probably were derived from the porphyritic granite intrusion near by. There is, however, as yet no evidence of direct connection between the two.