

valley and lake. On this broad end the chief mining is being done in terraces. The ore is generally believed to be an igneous sheet. Many who have seen it consider it the largest single mass of iron ore yet discovered. It is, moreover, very rich in iron, although also high in phosphorus.

The development of this ore body is chiefly due to one man, Mr. Hjalmar Lundbohm, formerly a member of the Swedish Geological Survey, and for many years a good friend of not a few of us here in America. Mr. Lundbohm is now the chief official in the company, which in good years ships four or five millions of tons of ore. For several years he had saved the very peak of the orebody to be blown down when the Geological Congress should be his guest. And one evening about nine o'clock, but in daylight as bright as noon, while we were having coffee on the lawn before his house, perhaps half a mile from the peak, President Van Hise of the University of Wisconsin pushed the electrical button and caused twenty or thirty thousand tons of ore to fall with a crash.

At noon, however, we had lunched on this very summit and for a little while I had sat down somewhat apart from the rest and had studied over the bleak expanse of lake and bog and low glaciated hills which stretched away from the foot of the ridge. Under ordinary conditions only Laplanders with their herds of reindeer could eke out subsistence in the land, and yet below me was a little city of eight or ten thousand souls. There were a thousand children in the schools. The long night of winter had to be overcome with light. The polar cold had to be fought with fuel, and the nearest coal is in England, or in Spitzbergen, where lately Mr. Scott Turner, one of your own graduates, has been developing it. I looked over Kiruna and thought of the manifold responsibilities which centre in Mr. Lundbohm, and how in other places the manager, or as you say on the Point, the agent of a mine, is the head of a little state. I could not help feeling that there are other sides to the profession than ore and rocks, sinking, stoping and concentrating, oil flotation and smelting. There is the care of men, women and children, and the oversight of their manifold needs and general good. Yet what I saw at Kiruna, Lapland, impressive because so far in the frozen north, could in earlier years be duplicated right here on the Point and in the iron ranges, and doubtless can be yet. In the little settlements of the West there are many cases where a mine supports an entire community, and as for Mexico and South America, any one of us of wide acquaintance can cite graduates of our mining schools who bear the same relations to their villages and towns that Hjalmar Lundbohm bore to Kiruna. He had established at Kiruna, with a singularly generous spirit, schools of the very best character, with cheery pictures on the walls and with the best of desks and apparatus. Comfortable homes were provided for the miners and their families and much kindly attention was given to matters of welfare.

Yet with all these provisions for material and intellectual welfare, there is one other side which we cannot overlook, and that is—amusement for idle hours. We never trouble our minds about a man when he is busily at work, but we are justly concerned about him when his day or night shift is over. For miners who are underground during their working hours in dark and often wet stopes and drifts it is of more importance than for other workers to have some sort of wholesome recreation available whereby to pass an

enjoyable evening. If, as we all have seen in little remote settlements, there are only the boarding house and the bunks, we will find the miner storing up his craving for a change until the end of the week or month, and concentrating in a short, wild period what should have been taken in diluted and harmless instalments over days and weeks. The Young Men's Christian Association is taking up the matter vigorously and agitating the establishment of club houses which will supply social centres, often in charge of a specially qualified worker. In the American Institute of Mining Engineers we have during the past year been lending a very sympathetic ear to one of our officers, Fred Rindge by name, and an engineer by training, who is specially looking after the work in the mining communities. You will find in the papers of the last annual meeting a contribution by J. Parke Channing strongly favoring the movement.

And yet we must undertake these welfare movements prepared to be misunderstood and to find our best intentions regarded at times with suspicion and disfavor. Experience leads us to expect it, but we must be strong enough, and far-sighted enough, and persistent and unselfish enough to work discreetly and wisely for the good of a community despite the rebuffs.

I have endeavored to draw, and I hope you will feel with some justification, the parallel between the mining engineer and the physician. But there are other features of a mining engineer's work which we must not overlook. He is a sort of combination of overalls and dress suit and he has to be equally at home in either. He must put on the former if he is to know both what lies underground and what goes on underground. Several years ago I was out in Butte one summer with H. V. Winchell, one of your old-time Lake Superior men, and J. W. Finch, of Denver. We were looking over the geology of the Steward mine with great care. Now in the fault veins at Butte, through which, as channels, have certainly coursed great flows of hot waters, a soft clay gouge is very abundant. In old and wet workings it makes an emulsion or a thin syrup of fine particles that is first cousin to paint. We three had crawled through the old drifts of this character all day and had come up about four-thirty in the afternoon, so as to step off the cage just as the "Seeing Butte" car had deposited its load of eastern schoolmarmes and various other kinds of tenderfeet, all in charge of an orator with a megaphone. The Steward was the mine to which they were customarily taken. "Ladies and gentlemen," said the orator, "this is the Steward mine where many of the wretched miners work far underground, whose little cabins I showed you out on the flat. It is wet and dirty underground and—" catching sight of us, "there's three of 'em now." We certainly looked the part and tried to keep straight faces until we could slip into the change house.

What we had seen, however, embraced three sets of remarkable faults, which had developed one after the other. We had seen the oldest vein displaced by the next, and it shifted off one side by the last. We had been so keen in the study of this geological structure that I do not believe it had occurred to one of us that our surroundings were wet or dirty. As my colleague in mechanical engineering at home once said in my hearing, "When we are working over an engine in our overalls and in the grease and heat, we never think of either of them. It's the idea that fills our minds. The design or plan that makes the engine go excludes all else." And so it is with us amid the discomforts of