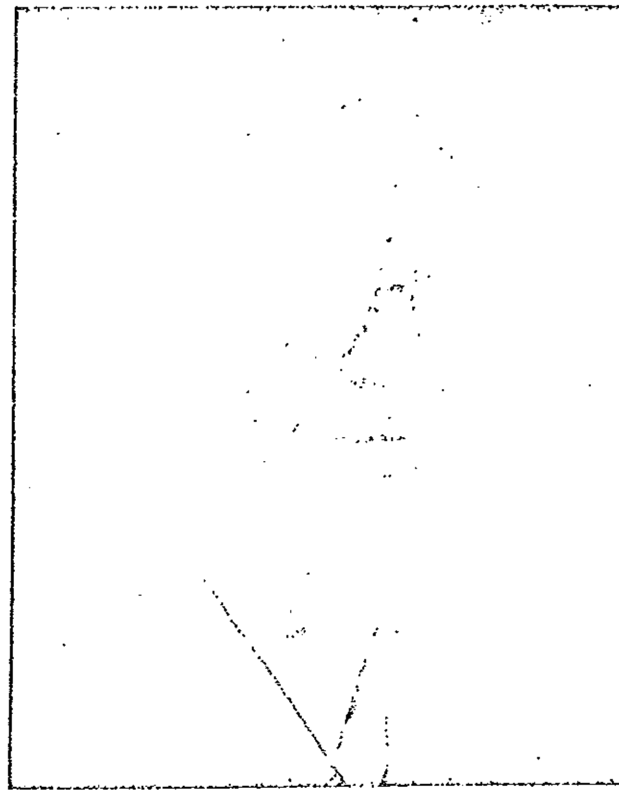
SALES LIVED AT
954 Caledonia
between
1910 and the
early 1920s



RENO H. SALES

An Interview By Henry C. Carlisle

Reno Sales' outstanding accomplishments and contributions have been made in two broad categories; first, in the field of applied geology to mining operations and, second, in the coordination of field and laboratory work directed towards better understanding and use of geological science in the search for ore.

Known as the Father of Mining Geology because he developed principles of observing and recording geology that have become standard in the mining industry, Sales conceived and perfected a system of precise geological field mapping during the early days at Butte, Montana. His emphasis on engineering accuracy in recording geological observations and his system of plotting geological notes produced a simple, uniform and concise method of graphically portraying geological relationships. In the same way that good English composition reflects clear thinking, Sales mapping inspires sound geological reasoning.

His second great achievement was initiated by establishing at Butte a research laboratory dedicated to the principle that the study of ore deposits is best accomplished by action in the field, supported by techniques available through modern laboratory facilities. His classic publications on Butte ore deposits have provided guideposts for future applications of integrated field and laboratory methods to problems of mining geology.

Sales' accomplishments as a leader and teacher have provided examples and inspiration for a new generation of mining geologists; thus, through his own work and through them, he has made and will continue to make major contributions to geological science.

V. D. Perry
Vice President
The Anaconda Co.

Carlisle: *Reno, let's start off by asking "When was the first day that you began working in your profession?"*

Sales: I began in Butte, Montana, on August 22, 1900 as an assistant engineer for the Boston & Montana Consolidated Copper and Silver Mining Co., and continued at that job for about a year. The general manager was C. S. Batterman, and the mines—Mountain View, Pennsylvania, Leonard, East Colusa, and one or two others—were part of Boston & Montana.

You started right in the middle of an impressive string of Butte's well-known mines.

Yes, but after a year I got into the geological department of the company through Walter Harvey Weed of the U.S. Geological Survey. Earlier Weed had hired me as a wrangler to do a little geological work and mapping in the Neihart District of Montana. When he came to Butte to continue his work on the Butte folio, he found me working as assistant engineer and asked the management to let me work part time for him doing mapping and other geological work. Batterman permitted the request, so I worked twenty days a month for Weed.

At that time, the Boston & Montana and some other companies were controlled by Amalgamated Copper Co. David Brunton, chief engineer of Amalgamated, and H. V. Winchell, a geologist, a program

of geological mapping was started. Winchell became chief geologist, and since he needed more men to do the geological work in the various mines, he hired me on Weed's suggestion. So in November 1901, I went from engineering into geological work as assistant geologist.

The new geology department at that time was very small. The only men in it when I arrived were a draftsman named Al Longley and an assistant geologist, Fred T. Green. Shortly afterward, the company added a few more to the staff. We went along that way for awhile, maybe adding one or two here and there. I was responsible for the geological work in the Butte & Boston and the Boston & Montana mines, a job I did up to the time I became chief geologist.

In the meantime, between 1898 and 1906, the famous Heinze difficulties took place. I got right in the thick of it when I began to map the geology of the Boston & Montana mines, where the troubles between F. Augustus Heinze and Boston & Montana were. I became a witness in a lot of court hearings concerned with litigation over extralateral rights claimed by Heinze. I have written a book entitled *Underground Warfare at Butte,* which details some of these troubles.

But when you tell me how few there were in the geological department and then tell me that these big suits started at the same time, you must have been an important part of these trials.

No. I wasn't a witness in these early trials, only the court hearings. At the trials, important men like Clarence King were brought from the outside as witnesses. Among such suits between Heinze and Boston & Montana were the early Michael Devitt and the Pennsylvania cases, both of which concerned ownership of veins dipping from one property into another.

Now, you became assistant geologist in 1901 and chief geologist in 1906. Is that jumping ahead too fast?

No. When Winchell resigned in late 1906 to join Great Northern Railway Co., I became chief geologist.

How did the Heinze difficulties concern you personally.

There were earlier law suits but trouble continued in the early 1900's over the ownership of ore between the Butte & Boston and the Boston & Montana companies and their antagonist, Heinze. There were apex difficulties, and our company was constantly being brought into court to be enjoined from working this or that orebody.

In most cases where there was an injunction, I was appointed by the court as the inspector to go underground to see whether the injunction was being obeyed. I would be the only one who had the right to go into the Heinze mines (the Rarus and the Minnie Healy were two of them) because I was doing it under court order. In a number of instances, I found that Heinze was surreptitiously mining orebodies in direct violation of local and federal court orders prohibiting such work.

There has never been anything like it anywhere in the annals of mining history. The events at the Michael Devitt and Pennsylvania mines are two good illustrations of what went on during this period. These two mines abutted against the mines of Heinze and often their workings were very close and in some cases connected. In the latter instances, padlocked iron doors and heavy bulkheads were erected between our workings and those of Heinze, who even stationed guards at some of these doors equipped with telephones to send warnings to the surface. Often Heinze's miners would break through the walls into our workings and attempt to take over the stopes. High pressure water lines and the strong odors of burning rubber, leather and trash were often used by these miners to drive out the "opposition." On one occasion I was with an investigating group when a homemade hand grenade sent fragments of rock flying in a stope already filled with the smoke of blasting powder. It was a miracle none of us were injured.

Despite court orders to the contrary, secret crosscuts were employed by Heinze's men to reach ore zones in contested claims, and they would extract as much ore as possible before discovery. In one case, two miners in the Pennsylvania mine were killed when blasting powder was set off to demolish a raise being driven by my company under a court order for the purpose of investigating a suspected Heinze looting operation. Those were certainly hectic days.

As assistant geologist and court inspector, you were right in the middle of things during this period as a witness and perhaps as an expert some time after that.

Well, since I served as the court inspector for the mines, it always devolved upon me to be a witness at these injunction hearings. As a matter of fact, these hearings were very important, similar to small size trials because we made preparations just like one would for a big law suit, using mine models, cross-sections, maps, etc. The unfortunate part of these hearings was that they were usually held before the famous Judge Clancy.

Judge Clancy just didn't listen—he certainly didn't listen to me when I took the witness stand. He'd be looking out the window stroking his whiskers while I was trying to point out the geology on various models. When the injunction hearing was over, he wouldn't have heard anything. Once in awhile, he would speak kind of gruffly about something and then go back to stroking his whiskers and looking out of the window, paying no attention to what we were saying. That was the kind of thing we were up against in presenting a case in court.

Meanwhile, Heinze had been having great difficulty finding enough ore to keep himself in money. He finally got into bad financial shape and had to get out of Butte. In 1906 Heinze sold out to John D. Ryan and his associates. Soon thereafter, Winchell resigned, and I became chief geologist of the Amalgamated Copper Co. This landed me right in the

middle of all the other law suits—there were quite a number of them in various parts of the district.

Let's take another tack. First, when did mining at Butte start? I mean copper mining, not the earlier workings for silver or gold.

Copper mining started about 1871. By 1910 there were about 25 or 30 shafts but no new orebodies had been discovered for decades. They simply mined down on the same orebodies that had been discovered years earlier.

What would you say was the next landmark in the history of Butte after 1910?

The item of the greatest importance in Butte at that time—and for its future—was the consolidation of properties under the Anaconda Copper Mining Co. Plans had been made for the dissolution of Amalgamated and in 1910, Anaconda increased its capitalization to purchase the property and assets of other corporations that had been under Amalgamated's control. Into that firm were merged the Amalgamated Copper Co., the Boston & Montana, and all of those copper companies that had been associated with and friendly to Anaconda. Amalgamated was formally dissolved in 1915. Anaconda was thus composed of all the big properties except North Butte, the Senator Clark properties, the Davis Daley and the Pittsmont. Anaconda bought out the Original and the Stewart, two of the important Clark mining properties in 1910.

About 1914, the geological department took over the development work in the Butte district. Up until that time all I did—all any of us did—was to map the geology. We hadn't gotten to a point where we had anything to do with the direction of operation or the direction of the development work, even a cross-cut. But when we took over, no cross-cuts or drifts in the Anaconda mines were run without our permission.

When Anaconda grew through those mergers, you were its chief geologist, a position you held until 1948, when you became consulting geologist. How had the staff grown by 1910? You only had about two men when it started, besides yourself.

I would say that there were probably fifteen geologists, but when the engineering department was taken over by the geological department, the chief geologist was also the head of the engineering department and of the sampling department.

I've heard it said that the tremendous amount of litigation in Butte was the cause of the discovery of many orebodies.

No it wasn't. The litigation was over orebodies that were already known and being mined. I think I can safely say that the actual development work done for litigation purposes didn't find any more ore. It might have helped develop a vein, but not in the finding of new veins or new orebodies.

Didn't the careful geologic mapping that you did result in finding new orebodies over the years?

The training we got from such careful mapping—done for litigation work—did, of course, contribute to the work generally. The litigation was fine background because the geological work taken to court had to be done carefully. When you get on a witness stand you had to be sure that your geological notes were right, and correctly mapped.

Isn't it true that by 1912 much more ore had been found in Butte, something you and your company have been doing more or less every year since?

Yes, that's true on both counts. From year to year, especially in more modern times, much of the ore has come from orebodies unknown in earlier days.

That shows that the geology department was busy.

Well, we tried to earn our keep.

In this period, you started to take many interesting trips, one of which was to South America in 1916. What can you say in general about that visit?

It was to examine several properties. On the trip came our Anaconda president, B. B. Thayer, and L. D. Rickets (a well-known engineer), Will Braden, Ira Jorelemon, myself and Tom Hamilton, who had had charge of some of the field work down there. We looked at our different districts: one was at Corocoro, Bolivia, and the others were in Chile—Potrerillos, Los Bronces, Lo Aguirre and the Africana properties.

Did you go to Chuquicamata at that time?

We stopped at Chuqui just for one day and went over the surface. Mr. Bellinger, the mine manager, showed us a lot of mine cross-sections and then we went on. I certainly didn't think at that time that Anaconda would one day own it.

What was the result of that trip?

We turned down the Corocoro district, but as a result of our examinations we purchased Potrerillos, which later became the Andes Mining Co., and the El Salvador property.

What happened at Butte in the next few years—say from 1916?

At that time there were quite a number of properties operating besides Anaconda. There was the Davis Daly Copper Co., the Balaklava Copper Co., Alex Scott, Butte Superior, North Butte Co. and Pittsmont. In some cases we got into apex difficulties or controversies, particularly with the one called the Pilot Butte, and also with the Balaklava. In 1925, we got into an apex litigation suit with Senator Clark. However, the result of all of this was that from time to time Anaconda acquired these various properties in dispute, some of them very important—the Davis Daly, the Clark properties, and others.

It might be said that the lawsuits did the company good rather than harm.

In a way, that's true. Some of those didn't do any harm, and did help to clear up the district by getting the mines under one control, which was so important. The difficulty in the Butte district was that the veins dipped down from one property into another. Some of these veins, in fact, did not appear except at very deep levels. Thus the apex of the vein might be on one property, but its actual discovery would take place under another property. It was impossible to operate them because it became impossible to decide which company should mine the ore. Trying to demonstrate in court who owned one vein or another became absolutely impossible. Anyway, nobody would know who'd win since it was impossible to forecast the court's decision. Those were the problems that made it necessary for the Anaconda Co. to consolidate the properties in 1910 and later.

I understand that you went to Poland about 1925, and that the company took over a large operation there. What are the details on this?

There were two phases. I went over to report on the mine and Fred Laist went over to report on the smelting operation. We spent three weeks there. This was mainly a zinc mine but with some lead. The orebody had been in controversy, and at the end of World War I, the politicians put the German-Polish borderline right through the middle of the orebody, giving part of it to Germany and part to Poland. There's no question but that the politicians knew what they were doing.

Incidentally, the German owners of the mine had great faith in German geologists, and once when I couldn't find any literature about the deposit, I requested a German geologist to help me out in determining the geology. Three geologists came down but I soon found out that all three were syngeneticists. They were no help at all.

After we took over the operation in Poland I made three trips back there, my last one in 1937.

In 1929, I believe, didn't you make another trip to Chuqui?

Yes, Anaconda had acquired the property in 1922, but in 1929 I found out that there had been no geological work done at all on Chuqui except brief reports by Waldmar Lindgren, which I believe he made for the company. It was decided that I should go down there and make a detailed study and geological map of the pit and orebody, which I did in 1930. That was one occasion, incidentally, where some drill holes were very fortunate because the geology was apparently not understood by anybody. I concluded that the western area of the so-called mine had great possibilities, so I had some drill holes put down there. The result of that was to add, as I recall, about 200,000,000 tons of sulfide ore assaying 2.75% Cu to the known reserve.

Up to that time, didn't they have a relatively large sulfide reserve?

No, and what they had was not too well drilled out. You see, there was only one deep drill hole there when I arrived—the others were all shallow, going down through the oxidized ore to the sulfides at a very limited depth. At this time, we set up the first real geology department at Chuqui, and I brought Walter March in as the geologist.

I know that when you were there in 1930, no sulfide ore was being mined. Now, 30 years later, they're mining more and more all the time. When did the sulfide operation really start?

The plant was completed about 1954, and since that time sulfide production has been much larger than that of oxide ore.

Can you name any important events or features of the Butte operations which were really landmarks?

I think I can. As the Butte mines grew deeper, it became extremely difficult to operate in the deep zones where the temperatures were great. The development of electric power in Montana made possible the supply of air necessary to work in these deep areas. Another important event was the consolidation of all these properties into one company, eliminating the continual ownership and apex difficulties caused by many separate companies.

Well, don't you think it's fair to say that there was still another factor of great importance—the development of the geology department of Anaconda?

Of course that might be presumptious, but I know there are others besides myself that felt the geological work was another very important factor to the maintenance of Butte's operations. I probably should point out here that the geology department at Butte —more precisely, the Geological Research Laboratory, founded during my years as chief geologist— also played other important roles in the fortunes of Anaconda. To cite but one, this laboratory has concentrated greatly on the study of the nature of rocks outcropping over orebodies, and this information proved vital in the discovery of El Salvador in Chile.

I know something else about you, Reno, which you have not mentioned. You received the Penrose Gold Medal from the Society of Economic Geologists; you received the Eggleston Medal from Columbia School of Mines, and the D. C. Jackling Award from AIME.

We haven't said anything here about your earlier years but you were born in Storm Lake, Iowa, and brought up in Gallatin County, Montana. You graduated from the Montana State College in 1898 and then went to the Columbia School of Mines in New York, where two years later you were awarded the E. M. degree. Then on August 22, 1900, you took your first job.

Reno, I thank you. I think that you've done a job of putting Butte on the map.