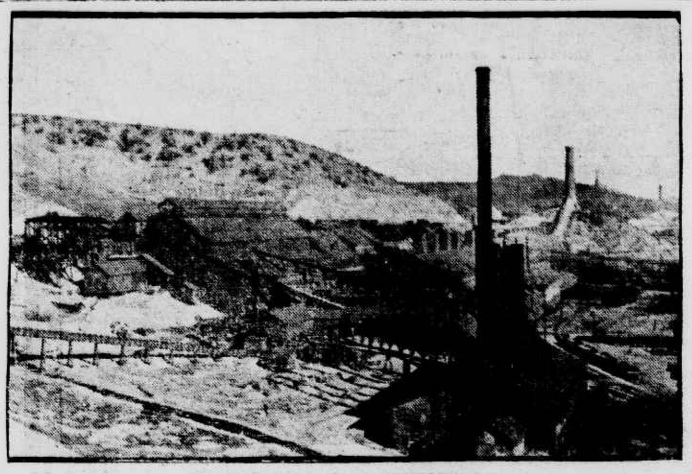
THE SMELTERS OF ANACONDA

Quarter of a century ago no one ever thought that the little valley near the mouth of Warm Springs creek canyon would be the home of thousands of industrious citizens; no one realized then that a city of great importance in the commercial world would be built here; no one ever dreamed that it would become famous because of its enormous smelting plants and win the distinction at the beginning of the twentieth century of being "The World's Greatest Copper Smelting City."



View of Upper Works (Old Works).

But the pages of history have so recorded, and it is a source of great pride to every resident of Anaconda and Deer Lodge county to point to the neighboring foothills, dotted with high stacks belching forth their volumes of smoke and fumes and say: "There is located the largest copper smelting plant on earth; there is produced a large percentage of the world's output of copper; there thousands of wage-workers find lucrative employment."

When Marcus Daly decided that the ores of the Anaconda mine should be smelted elsewhere than Butte, he was ever mindful of the fact that an abundance of water was the first matter of importance to be considered in the Daly he had not reached this work; he had in view. Many places were considered, but none of them seemed to meet all requirements quite so well as the one which he finally decided upon and from which the building of Anaconda resulted.

Warm Spring creek canyon furnished a supply sufficient for all needs for a time; but far up in the mountains were other streams and lakes which he had the forethought to secure title to, so that when the city he founded grew to large proportions, when the smelters he established became enlarged and improved, the waters of Warm Springs creek could be reinforced from a source inexhaustible.

There were Storm lake, Brains lake, Lake Hurst, Silver lake, all of which could be tapped and their waters diverted from their natural channels and conveyed into Warm Springs creek.

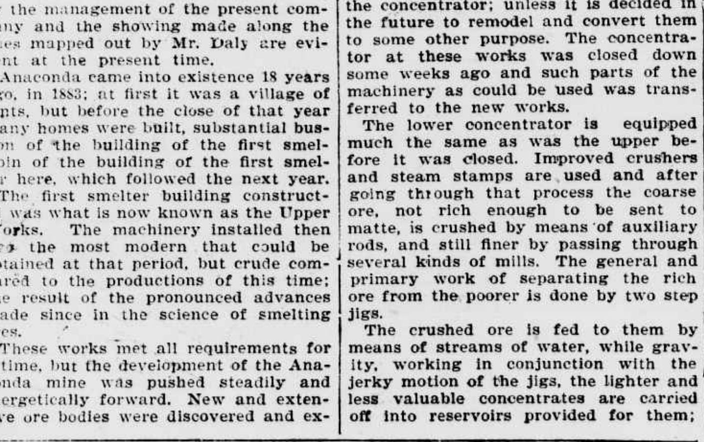
When the control of the Anaconda mine passed from the hands of Marcus Daly he had not reached this work, he had planned to do it, but while the management of the Anaconda Copper Mining company's affairs was in his hands it was not necessary to make the enormous outlay of money which the contemplated improvements meant.

His ideas were carried out, however, by the management of the present company and the showing made along the lines mapped out by Mr. Daly are evident at the present time.

Anaconda came into existence 18 years ago, in 1883; at first it was a village of tents, but before the close of that year many homes were built, substantial business of the building of the first smelting of the building of the first smelter here, which followed the next year.

The first smelter building constructed was what is now known as the Upper Works. The machinery installed then was the most modern that could be obtained at that period, but crude compared to the productions of this time; the result of the pronounced advances made since in the science of smelting ores.

These works met all requirements for a time, but the development of the Anaconda mine was pushed steadily and energetically forward. New and extensive ore bodies were discovered and explored, the producing capacity of the mines was steadily increased, Butte achieved more fame as a great mining camp and in due time the necessity came of enlarged facilities for reduction; this led to the building later of what is commonly known as the Lower Works.



Power House and Machine Shop.

More extensive than the upper and including the convertor building, in addition to many supplementary structures, all thoroughly equipped with everything necessary to the systematic and economical conduct of the function assigned to them.

As the works were enlarged, it was the policy of those in control to introduce every improved piece of machinery or device that would lessen the cost of extraction or better the facilities for handling the product of the mines. If any new system or advanced ideas of treating ore were sprung upon the mining world it was experimented with; mining world they were experimented with; if the method proved advantageous it was adopted.

So it was that the Anaconda company kept abreast with the times and established here the largest and most complete copper smelting plant on the earth. The buildings of the old works are erected along the north bank of Warm Springs creek for a distance of one and a half miles, and represent an investment of $11,000,000 or more. Their combined capacity has been equal to handling 6000 tons of ore daily and their daily output of refined copper has been estimated in excess of 200 tons per day. The general average of the ore treated has run about 5 per cent copper, but ores of a much higher grade is handled.

The output for the fiscal year ending December 1, 1901, is placed between $36,000,000 and $40,000,000; the proceeds about $12,000,000. These figures are based on estimates.

On account of the long service of the upper works, and the approaching competition of the new Washoe plant it has been decided to put them out of commission entirely, at least a part of them, the concentrator; unless it is decided in the future to remodel and convert them to some other purpose. The concentrator at these works was closed down some weeks ago and such parts of the machinery as could be used was transferred to the new works.

The lower concentrator is equipped much the same as was the upper before it was closed. Improved crushers and steam stamps are used and after going through that process the coarse ore, not rich enough to be sent to matte, is crushed by means of auxiliary rods, and still finer by passing through several kinds of mills. The general and primary work of separating the rich ore from the poorer is done by two step jigs.

The crushed ore is fed to them by means of streams of water, while gravity, working in conjunction with the jerky motion of the jigs, the lighter and less valuable concentrates are carried off into reservoirs provided for them; the richer and heavier concentrates fall below and by their sluices eventually find their way to the saving tanks.

The saving of the finer concentrates, one of the most important and difficult tasks of the process is done by means of several styles of tables. The product then is passed on through the other various departments of the smelter and finally ends up at the refinery, where the various metals are separated and made ready for the market.

The general office building of the company, a commodious two-story brick structure, is located near the upper works where the chief officials of the company have their offices and where they transact their business.

Large boarding houses and dormatories are located at the lower works; accommodations are there provided for several hundred men, but the major portion of the employes make their homes in the city and go to and from their work each day upon the electric street cars or by means of bicycles. In good weather a great many walk.

This is the story, briefly told, of the early history of the old works, their growth and workings up to the present time.

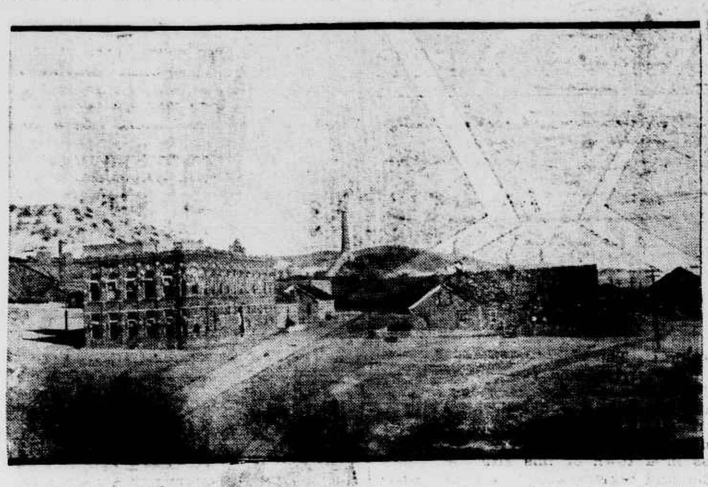
For 18 years these works were under the personal direction of Marcus Daly. His identity with the management of them and with the Anaconda mine only ceased when he disposed of a controling interest in the stock of the Anaconda Copper Mining company, and when the affairs of that corporation became vested in the present corporation.

The Washoe Copper Mining company was also a creation of Mr. Daly, but like the Anaconda company, it, too, became the property of the Amalgamated Copper company, which absorbed them both.

The new works located just east of Anaconda, a distance of less than three miles and upon which the finishing touches are rapidly being made, were originally planned as the property of the Washoe company; but since the amalgamation the affairs of the Anaconda company and the Washoe company have been and will continue to be operated under one head, with William Scallon of Butte as the present chief executive in Montana. The chosen subordinates who looked after the management of the older plant have their jurisdiction extended to the new.

It is difficult to describe the new smelter buildings as they are today, but some idea of their collosal dimensions can be formed through the medium of figures.

The structures which constitute the smelters proper are six in number, the convertor, concentrator and bins, blast furnace, reverbatory, power house and machine shop and roaster, besides many others of a supplementary character.



General Office of A. C. M. Co. and Officers' Residence at the Upper Works.

They are constructed for the most part of steel, brick and stone; wood, however, has been used extensively, but all of the buildings are considered to be practically proof against destruction by fire.

In the construction of these mammonth buildings 38,900 cubic yards of masonry forms the foundations of the various buildings and stacks. The brick used for building purposes number 12,500,000, of which 10,000,000 are common red building brick and the balance, 2,500,000, are fire brick.

The stone used in the foundations was brought here from various parts of the state where building stone is quarried. Structural steel has been used to the amount of about 12,000 tons, also 20,500,000, board meausre, of lumber.

In the concentrator bins, concentrate bins and concentrator 11,000,000 feet of lumber has been placed.

The tonnage of materials of all classes used in the building of the works is something enormous. Including the structural parts, machinery, stone, brick, etc., there was used approximately 12,000 carloads, averaging 20 tons each, or 240,000 tons. If all these cars had been coupled together they would have made up a single train of the length of 74 miles.

In dimensions the concentrator building is the larger of the group. This structure is 640 feet long and continues in six tiers or sections down the hill for a distance of 600 feet. Below this still are three sections of slum bins, which extend across the entire length of the building for 640 feet. In the concentrator building proper there has been used 4,175,000 pounds of structural steel. Additional to the concentrator are built some immense storage bins for ore and coal.

These bins are 640 feet long, 24 feet wide and 80 feet high, which required in their construction 3,992,000 pounds of structural material.

Since these bins were installed it was decided to build a trestle of the length of 288 feet on each end of the bins; they are now completed. They were constructed of steel and are so arranged that should necessity ever require it, they, too, could be converted into ore bins. In these trestles no less than 2,500,00 pounds of structural steel was used, making a grand total of nearly 11,000,000 pounds of structural steel in the concentrator building, ore bins and trestles—approximately a little over 5000 tons.

The next building in size is the reverbatory. It is put up in two sections, which in reality are separate buildings. Each section bears the dimensions of 175x250 feet which required the use of 2,620,000 pounds of steel.

Then comes the roaster building, 375 feet long and 160 feet wide, which contains 48 of the latest pattern MacDougall furnaces. The structural material in this building weighed before being set up 2,230,000 pounds. It will be interesting to note also that the shells for the roaster furnaces set up in this building have a weight of 3,000,000 pounds and the castings and shaftings as much again, making a total weight of structural steel, castings and furnace shells of 8,230,000 pounds, or 4,115 tons.

The converter building is 174x462 feet in dimensions. In it 2,215,000 pounds of structural steel was employed.

The blast furnace, 82x280 feet, cannot be overlooked. In it 575,000 pounds of structural steel was required.

In the construction of the power house and machine shops, from which the machinery of all the buildings except the concentrator will be operated, 2,000,000 pounds of structural steel was set up.

In other jobs about the premises, such as in the construction of slag bins and miscellaneous buildings, 2,500,000 pounds of structural steel was put in place.

According to the following figures, as previously stated, nearly 12,000 tons of structural steel has been used in the various buildings of the Washoe smelter and does not include any machinery; the tonnage is on the buildings exclusively.

Concentrator, pounds	4,175,000
Concentrator bins, pounds	3,992,000
Concentrator trestles or additional bins, pounds	2,500,000
Reverbatory, pounds	2,620,000
Roaster, pounds	2,230,000
Concentrator, pounds	2,215,000
Blast furnace, pounds	575,000
Power house and machine shops, pounds	2,000,000
Miscellaneous, pounds	2,500,000
Total of structural steel, pounds	22,807,000
Total number of tons steel	11,403

It took more than 500 cars to bring these structural parts from the factories of the East. Besides these, were 30 carloads of corrugated iron used as coverings.

It is estimated that the tonnage of the machinery used in the new smelters amounts to about three times that of the buildings themselves, or about 35,000 tons, or 70,000,000 pounds.

Nothing has yet been said about the great stacks which will carry the smoke and fumes off into space. There are five large ones all told. None are less than 200 feet high; some are more, and have a diameter of 24 feet inside the steel walls. There are two smaller stacks, which stand only 186 feet above the ground. There is also a small one at the briquetting plant, hereafter described, which has an interior diameter of 6 feet and is 125 feet tall.

With the exception of the latter, each stack was built where it stands; each section was put in place piece by piece and securely fastened by rivets battered down by the employment of compressed air hammers.

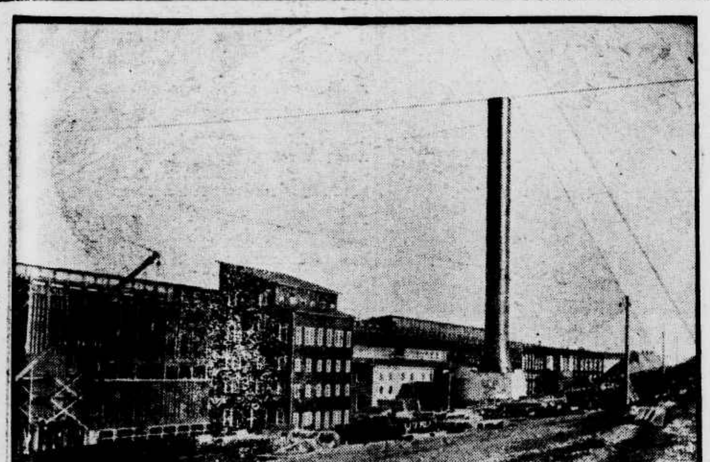
It took weeks to build them and was one of the most difficult pieces of construction found about the works; it was a dangerous task for the men who contributed their labor to the building of them, but happily, accidents of a serious nature were comparatively few.

The stack at the briquetting plant was built on the ground and was then raised to its position by means of derricks. In the linings of the larger stacks 400,000 bricks were used in each.

It would require much space to describe scientifically the treatment the ore receives from the time it is unloaded from the cars in the crude until the metals it contains come out in a refined state.

Only a person thoroughly posted on smelting matters could do the matter justice and even then the average reader would be but little the wiser. The technical terms used would not be understood, their meaning vague, so it is thought best to follow only the general course of the ore as it passes from one place to another on its journey toward the refinery.

The ore fed to the concentrator is of a lower grade than that which goes to the blast furnace. On being brought from the mines of Butte over the Butte, Anaconda & Pacic railway, the ore-laden cars are landed on the top of the ore bins, 80 feet from the ground; there the contents are dumped into the bins provided for them.



South Side View of Concentrator Building.

On being let out of the bins the ore then passes through the crushers and when pulverized to a required fineness reaches the two step jigs, the concentration tables and on through all the processes until the metallic particles, or cencentrates, are finally landed in the slum bins at the lower end of the concentrator building.

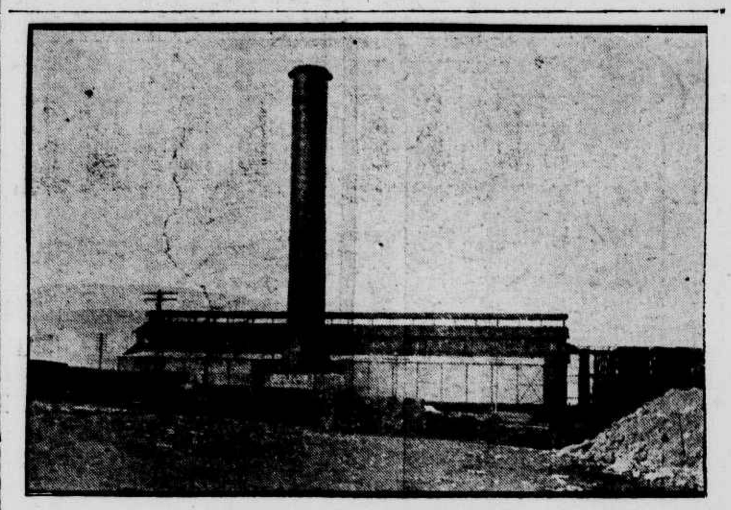
From this point, the concentrates are removed by means of miniature cars, pulled by compressed air locomotives and delivered to the roaster building, where the product is unloaded and passed through the MacDougal furnaces, here it becomes converted into calcine and is again loaded into the little steel cars and rapidly transferred to the reverbatory where it is reduced to matte; this done, its next destination is the converter, to which it is transferred without cooling, where the metals are run into molds and formed into bullion or annodes.

When this process is finished its next destination is the refinery; there the metals are separated whereupon they become a commercial commodity.

To the blast furnace the very rich ores, which do not require concentration, are put through an entirely different process and pass directly from there to the refinery. Near the blast furnace have been constructed four sections of wooden bins, into which the higher grade ores are dumped from the cars upon which they journey from the mines. Each of these bins has the dimensions of 350 feet in length and 25 feet in width. The ore is taken from the bins as it is needed in the blast furnace.

In smelting plants of the past it has been a difficult matter to save all the values; in fact, the losses in metals which escape in one way or another are heavy. If they did not get away in the smoke and fumes they did in some other manner. But when the new Washoe plant was designed it was the aim of the builders to let nothing of value escape. The science of smelting has advanced so materially in the past few years they were enabled to do so.

Only men of great competence and a high quality of worth in the smelting world were chosen by the management of the Amalgamated company to conduct this great undertaking. They, in turn, had only master builders in their employ, and through the exercise of their mechanical skill every portion of the big plant is so complete in every detail that it is almost impossible for any particle of the metals contained in the ores to get away; if any do escape, it is by the merest chance; anyway, the percentage of losses is a mere nothing.



Roaster Building From the South.

In the converter, roaster and blast furnace buildings are constructed large dust chambers, the purpose of which is to catch the metals carried towards the stacks in smoke. The dust chambers are so arranged that their contents can be automatically loaded into the little steel cars which perform various functions about the premises and conveyed to the "briquetting plant," located just to the east of the power house and south of the blast furnace, where the substances caught in the dust chambers are put through especially provided machinery; then undergoing various processes.

The product is finally formed into small bricks, in which shape they are resmelted, and their precious contents saved. The "bricquetting plant" is one of the most important parts of the works, and it is claimed that the savings made by it goes a long ways towards paying operating expenses.

In the building of the great Washoe plant compressed air has been an important factor. It was used as the propelling power for almost every mechanical device known to modern builders, and by its application in all departments of construction, a work which otherwise would have taken a term of years to accomplish, perhaps never undertaken, has been done within a comparative few months.

The employment of compressed air was most noticeable to visitors, perhaps most wondered at by them, when they heard the rapid "pity-pats" as the great steel beams constituting the skeletons of the buildings were raised into position. The frame work as it was raised piece by piece was securely fastened one to the other by means of rivets, the heads of which were battered down securely and permanently by the automatic hammers, having the force of compressed air behind them. In the future operation of the plant this element of power will continue to exercise most important functions.

At the old works electric motors are operated extensively to pull the calcine cars, slag cars and the diminutive trains here and there about the works. At the Washoe plant compressed air will do this important work.

It must not be understood from this that the use of electric power is to be curtailed. On the contrary, electricity will be employed in many ways where it is not in the older smelters across the valley. Electric cranes will be operated for doing heavy lifting wherever required.

At the concentrator power house some of the largest dynamos in the West are installed, and from this central point the electric fluid will be generated and distributed to the arteries of the street railway and electric lighting systems of Anaconda. The power for the electric railway will all come from the concentrator building dynamos, and the old water power plant located west of the city will be abandoned or retained as an auxilliary or emergency plant.

Likewise all the electric lights furnished to the citizens of the city will have the same source of supply and the service greatly and materially improved.

The Norberg engines used in the concentrator building are gigantic in size; it is doubtful if any as large can be found in the Rocky mountain regions; they are beyond question the largest in Montana and believed to be the largest anywhere in the West.

There are three of them, each having a capacity of 8,000 horse-power. One of them was on exhibition at the Chicago World's Fair. The machinery of the concentrator building is the only part of the entire plant that will derive its power from these enormous engines.

The machinery of the various other buildings will derive its power from the power house and machine shop building. This building contains the huge blowers, a necessary thing around smelting works.

It was on June 18, 1900, that the first ground was broken for the gigantic Washoe works. Only a few were present on the occasion and thousands of people who made ther homes in the city up the valley could not realize then what an important epoch in Anaconda's history that really was.

Even today there are people in the Smelter City who do not comprehend what the importance of the enterprise means in contributing to the permanent prosperity of this place.

The first sod turned and the first twig of sage brush uprooted for the new structures was on the spot where the roaster building now stands. In the following August the first structural iron was raised under the direction of John R. Keers, local representative of the Brown-Ketcham Iron works, which was awarded the contract for the erection of all the larger buildings save one.

Mr. Keers has had charge of this structural work devoting his personal attention to it from the start, and has received many words of praise from his employers, also from officials of the Anaconda company, for efficiency shown in every detail.

The general supervision of the entire works of construction, covering all departments, has been in the hands of Charles H. Repath chief engineer, and F. H. Collins assistant chief engineer, aided by a competent staff who have faithfully carried out their orders.

The Washoe plant was in contemplation for several years prior to the first breaking of ground, but the drawing of the plans, accepted later, was not undertaken until April, 1900, when W. S. Sample of the Brown-Ketcham company began on those of the buildings. He completed his labors in September of that year.

Another View of Concentrator Building.

On the premises about the new smelter buildings is a net work of railway tracks. The B., A. & P. lines are in evidence everywhere, also those upon which the trains operated by compressed air will run; many of the tracks are built on high trestles, and into the various buildings; some are laid along the surface of the ground and others in tunnels under the surface.

All the way from 1000 to 1500 men have been kept constantly employed at the