SCIENTIFIC RESEARCH IN
SOUTH WEST AFRICA (5TH SERIES)

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TSUMEB

A HISTORICAL SKETCH

(5 figures, 32 photographs)

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Cover design by Petro Smit. The alchemistic signs portray the main chemical elements of the Tsumeb ore deposit and symbolize from top to bottom: Copper, lead, zinc, silver, sulphur, arsenic.

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I. Early Times.

To the visitor going down Main Street in Tsumeb the half-hidden black headframe of De Wet Shaft, only fifty yards away, is not particularly impressive. Every two minutes a five-ton load of dirty, wet ore rumbles from the skip into the storage bin and the banksman mechanically signals for the next. On the gold mines of the Republic of South Africa the observer will have seen much bigger surface structures, indicative of considerably greater daily ore production. Can it be that the importance of Tsumeb has been generally overstressed just because it lies so far away in the African bush? Or just because it has given the initial impetus for the opening up and development of northern South West Africa sixty years ago? The truth is that in total metal production the Tsumeb mine has become one of the foremost on the African continent. Until June 30th, 1966 this bonanza has yielded 12.46 million short tons of ore containing 665,700 tons copper, 1,818,800 tons lead, 730,500 tons zinc and as by-products many million pounds of cadmium, silver and germanium. The gross income from the 3.2 million tons of metals actually sold over the period 1906—1966 (assuming 1 rand = 6 marks) totals 623 million rand. At the present metal prices the gross value would be higher by at least 50 percent. Taking into account the ore reserves already established, it follows that the metals produced from the Tsumeb ore-body will in the foreseeable future exceed the thousand-million-rand sales mark in terms of present currency rates. All this money will not, of course, flow through South West Africa, as a large part of the final earnings accrue to overseas smelters and refineries. The statistics do, however, reveal why the Tsumeb mine has attained world status as a base metal producer, besides becoming famous for the rich variety of beautifully crystallized minerals in the oxide ores.

The history of Tsumeb has no sudden beginning. Until the turn of the last century South West Africa had been a little known, relatively neglected territory, while the adjoining Republic of South Africa was already reaping vast economic benefits and also suffering political pains from its growing gold, diamond and coal mining industries. Although various hunters, traders and missionaries had advanced into the northeastern parts of South West Africa since 1850, the country had not changed its essentially primitive character. The discovery of the Tsumeb ore-body happened long before this time — some indefinite day when Bushmen of the Otavi Upland showed the outcrop of green malachite to a wandering Bergdama who knew how to smelt copper metal from the carbonate ore.

The history of the nomadic tribes of early South West Africa is known in only the broadest outline, for these people have left no written record of their wanderings. Our pioneer historian, Dr. H. Vedder, has endeavoured to trace the migrations of the Bushmen, Bergdama, Saan, Herero and Ovambo in the Territory since the sixteenth century, mainly by interpreting their folklore and

languages. New aspects of the trend of events have recently been outlined by Prof. J. P. van S. Bruwer, an authority on the ethnic groups of people now living in Southern Africa. When Jan van Riebeeck founded the Cape in 1652, the Ovambo had already migrated from the north into the Cunene-Okavango area, whereas the forefathers of the Herero, having trekked south from the lakes of Central Africa over a long period and then swung west, were settled in the Mossamedes Province of southern Angola and in the northern Kaokoveld. The first European adventurers exploring the land north of the Omuramba Omatako in 1851 found the Otavi Highland, stretching from Grootfontein westward beyond Outjo, inhabited by the Heikom (Saan) Bushmen and Bergdama tribes. That they had been occupying the country for untold centuries is suggested by the numerous place names between the Cunene and the Cape derived from their joint Nama-Bushman dialects. The Herero of the Kaokoveld, having spread out southward into the pastures along the Swakop River during the eighteenth century, had been involved since 1835 in several battles against Jonker Afrikaner fighting on behalf of the indigenous Nama tribe.

We shall never know precisely when copper ore was first broken from the colourful outcrop at Tsumeb for smelting. This account therefore conveniently begins with the primitive setting in which the place won its name, possibly more than two hundred years ago. If the Bushmen and Bergdama had a specific name for their mine it has been completely lost. The latter tribe possessed all the essential knowledge of elementary copper metallurgy and probably guarded their trade by refusing to reveal to strangers the names of the localities from which the ores were derived. "Tsumeb", according to Dr. Vedder, originated from the Herero tongue, the word "Otjisume" meaning the "Frog place", or, by analogy, "the place of the algae". The people, impressed by the green hill of oxidized copper-lead minerals, were reminded of the bright green algal scum on a shallow pond which, if thrown out on the rocks, would make them closely resemble the weathered ore. The name was adopted by the local Heikom and Bergdama tribes who dropped the prefix "Otji-", which means "the place", and added "b" at the end to put the name into masculine form in accordance with their Nama-Bushman language, giving "Sumeb". Thus we find in the first written reports of the South West Africa Company that the place was called "Soomep", which changed to Tsumeb a few years later.

When was the name "Otjisume" first used? The forefathers of the Herero, according to Vedder, had lived in the plains between the present Gobabis and the Omuramba Omatako until about 1550, when discontent induced them to migrate westward with their cattle herds, and settle in the Kaokoveld for some two hundred years. J. P. Bruwer rejects such postulated westward migration and believes that the Herero people originally entered South West Africa from the north, crossing the Cunene River since about 1700, and moving gradually southeast toward Bechuanaland where they became known as the Mbanderu. In either case their cattle were grazing in the lush Omuramba Omatako country during the latter part of the eighteenth century. These people possessed little metal and probably had no knowledge nor interest in the smelting of copper ore. H. Vedder writes that in various later clashes against the Ovambo the Herero, advancing east from the Kaokoveld, were armed only with kieries and wooden arrows, that could not match the iron assegais of the Ovambo. The

great hunter, Tjiponda, venturing northeast of Okahandja, also wielded bow and arrow when he was killed by the Saan at the Waterberg about 1700. A closer approach to Tsumeb was made by the leader, Nandavetu, who trekked to the large spring at Otavi and tried to oust the Bushmen from the mountain ranges. In this he failed, was killed in fight, and buried at Khorab. It is of interest to recall that he gave the name "Otavi" to the spring, the term "tava" referring to the nudging and pushing of a calf when it drinks from the mother cow. After Nandavetu another headman, Katauu, who had settled at Grootfontein, made an effort to reach the springs at Ghaub and Nosib. He was overwhelmed by a combined force of Bergdama and Ovambo and killed with most of his men. The Ovambo had been friendly with the Bushmen and Bergdama for a long time, trading salt and cattle for copper ore. Together they were determined not to tolerate any interference.

If the Herero were unable to conquer the traditional inhabitants of the Otavi Mountain Land, how should one account for the name "Otjisume"? Possibly during the migrations of Nandavetu and Katauu individual Herero reached the mining site and their word "Otjisume" eventually superseded any previous names. It is unlikely that their forefathers did so on their earlier trek from Bechuanaland to the Kaokoveld. Alternatively, some of the Bergdama and some of the Ovambo who had wandered south in search of trade, spoke the Herero language fluently, and as *they* were the people doing the mining in early times we may consider it most probable that "Otjisume", changed to "Sumeb", was a name given by themselves before any Herero appeared on the scene.

To trace from where the Bergdama acquired the technique of smelting copper ore we step back into archaeological time. The word "copper" derives from the name of the island Cyprus in the Mediterranean, whence the Romans received their "aes cyprium" or Cyprian metal; "cyprium" became corrupted to "cuprum" which became "copper" in English, "Kupfer" in German, "cuivre" in French. The copper deposits of Cyprus were worked probably as far back as 3,000 B.C., part of the production going to Egypt. Even older are copper objects discovered in Mesopotamia below the level of the clay deposit left behind by the Great Flood, dated 4,000 B.C. The art of metal working may have originated in Elam, a land east of Babylonia now forming part of Iran, in Sumerian times. The ores were probably obtained from the State of Oman in southeast Arabia, and from the Arghana deposits in Turkey. It may be assumed that the first reduction of ore to metallic copper occurred by chance round a camp fire. Experiments then led to the building of primitive furnaces with a small circular cavity in the hearth in which the molten metal collected. A charcoal or wood fire was made in the furnace and alternate layers of charcoal and ore were added. After cooling the metal lump was dragged out and broken on a stone. The small pieces thus obtained were resmelted for casting as required. The earliest furnaces relied solely on chance fanning by the wind, but in later times blowpipes with bellows were used to control the air supply.

The knowledge of working metals was introduced into central and southern Africa by immigrant peoples from the north, probably before 500 A.D. They were related to the Hamitic race, but had acquired Bushman blood through intermarriage. J. Desmond Clark (1957) writes that they were pastoralists and mixed farmers, who relied to a great extent on hunting for meat. Their copper

ware, made from ores mined in the Katanga and on the Copper Belt, followed trade routes to Angola, Southern Rhodesia and the East Coast. The mining was in the hands of certain families or clans who vigorously guarded their secrets. Excavation was done in the dry season when men, women and children assisted in mining the ore from shafts and trenches usually up to 40 feet in depth. The workings were abandoned when water was encountered or when they became too dangerous. The malachite ore was then carried to smelting sites usually chosen near a stream where water and anthill were available for the building of the furnaces. In places groups of up to 30 smelters were erected, each under the direction of a master smelter. The furnaces were essentially like those used in the Middle East, measuring about 28 inches high and 15 inches in diameter. Air was blown in by goat-skin bellows through pipes made by moulding clay round a wooden core. The smelting was accompanied by complicated ritual, dancing and singing by those present. After about an hour-and-a-half the performance was over, the furnace broken down, and a cake of some 15 lbs. of copper removed for refining.

We may not be far wrong in crediting the early Bergdama for introducing to South West Africa the secret of smelting copper ore long before the Herero and Ovambo had even moved into the territory. Their mixed Hamitic-Bushman descent is faintly suggested by the survival of a few words in their hybrid tongue that are related, according to Dr. B. Struck, to the Sudanese languages.* From what little evidence there remains on early smelting sites at Gross Otavi, Otjikoto and elsewhere, the style of operations as conducted by the Bergdama and their later friends, the Ovambo, was much like that described from Central Africa.

The first written record of mineral deposits in northern South West Africa appears to be contained in the diary of Sir Francis Galton who, accompanied by Charles J. Andersson and I. Allen on a journey to Ovamboland in 1851, camped at the Otjikoto Lake, twelve miles west of Tsumeb, on 26 May. There he met various groups of Bushmen and Ovambo transporting copper ore to Amboland. He makes no mention of the place where the ore was mined, but it appears from later records that carriers of copper ore from Gross Otavi were taking the circuitous route via Grootfontein and Otjikoto toward Ondongua. Further information was gathered on an expedition by the Rhenish missionaries, H. Hahn and J. Rath, accompanied by the hunter-trader F. Green, to meet the headmen in Ovamboland and assess the chances of mission work in their country. On June 17, 1857, while camping at the foot of the Otjitjika Mountain east of Grootfontein, they met Ovambo men bringing copper ore from the Otavi Valley. The ore was transported in neatly woven baskets made of palm leaves and provided with a sturdy handle. A full basket was found to weigh 90 pounds, in addition to which food and water also had to be carried over a route of more than 150 miles! With an average daily shift of fifteen to twenty miles the journey must have taken about ten days to complete. The porters formed groups of up to thirty who attended to their task with military discipline. How much the supply of copper ore was worth to the Ovambo is revealed by the unsuccessful attack of Chief Nangoro's men on the four oxwagons as Hahn's party

* H. Vedder, op. cit.

left Ondongua at the end of July after a week's sojourn. Nangoro wanted the wagons for transporting iron ore from Angola and copper ore from Otavi to his domain. The expedition returned to Otjikango (west of Okahandja) on September 11.

In 1866 Hahn made a second trip to Ondongua from 24 May until 24 September, travelling via Outjo, Naidaos and Namutoni. He learnt on the trip that the copper deposits of the Otavi ranges were in the hands of Bushmen under Chief Kangombe who kept the localities as secret as possible, and trusted only the Ovambo traders. Hahn inferred that the Ovambo porters carried anually some sixty tons of copper ore to Ondongua. He also wrote (Cape Monthly Magazine, 1873): "It can scarcely be doubted that they also (i.e. Bergdama) before they were enslaved worked in their rude way the different copper places in Great Namaqua and Hereroland. Numerous indications prove that such working was carried on in former centuries". C. J. Andersson had built a trading station at Ondongua the year before, and interest in hunting and in the ivory trade drew the attention of more and more adventurers.

Early in January, 1875, an American trader, Gerald McKiernan, trekked from Walvis Bay via Omaruru to Otavi ("Etabe") in the company of I. Hickey, C. C. Thomas and W. H. C. Willmer, all English traders; they built a house and started gardening alongside the "seven springs". They learnt from a hunter, Brooks, at Otavi that copper ore was being mined about twenty miles away and within a few days, on a hunting trip, McKiernan and Thomas found the site at Gross Otavi, describing their trip as follows:- "When the wagon came up, we slaughtered the game, and proceeding onward arrived at sunset at a place which answered the description of that given by Brooks as the vicinity of the coppermine. Old smelting places were plentiful. Calcined stones, charcoal and fragments of copper-ore in heaps. Lion-tracks were very plentiful and a close guard was kept on the bullocks. Soon after dark we heard lions roaring and growling at no great distance in the jungle at the foot of the mountain, but they did not come near the wagon. I had frequently seen tracks on the road in, but it was the first time that I heard them give tongue, and it was a novelty to me; but I was assured that there was no danger except to the oxen. The next morning we began a search for the mine, but were unsuccessful for nearly half the day; and when we finally did find it, it was not more than 200 yards from the wagon. Such is the nature of that part of the country, a dense jungle; and notwithstanding the frequent visits of the natives, no footpaths led to the mine."

"The mine seemed to be of great richness and pits were dug along the line of the lode for a considerable distance. There were masses of ore of many tons in weight exposed in many places, and seemed to have been left for want of proper tools for breaking it up into portable form. We had a large hammer, and I broke off about 300 lbs. of it for a sample. It was very hot work, the thermometer 106° in the shade, and we were excessively annoyed by a species of gnat which is common in parts of the country. The mine would be very valuable if nearer the sea, but it is too far to transport it by wagon, I do not think a railway feasible. In fact, between the mine and Walwich Bay there is not water enough to feed one engine a day. The distance is about 350 miles." Samples of the ore were sent for analysis to the firm Barry Nephew, Cape

Town, who recommended further exploration. A journey was made via the Awagobib Valley to find the "Griqua bastard Kruger" to negotiate for mining rights, but they failed to locate him and were guided back to Otavi by a group of Bushmen and Bergdama, thus remaining ignorant of the ore at Tsumeb. McKiernan and Willmer left Otavi for Omaruru on 20th January, 1876 when the Ovambo and Herero had turned hostile. In the report of W. Coates Palgrave, Special Commissioner of the Cape Government to the tribes north of the Orange River, of his mission to Damaraland and Great Namaqualand in 1876, he shows on a colour map that the Otavi-Ondera area was inhabited by Bushmen, which tribe was quarrying copper ore "out of enormous deposits, which exist there of surpassing richness. The reduction of this ore by the Ovambo is assisted by the use, as a flux, of the ash of a tree met with in the country." Palgrave was of the opinion that "metals and minerals are not of any greater account to the future welfare of the country, than the trade with the interior tribes, which must grow more and more important as the "Reserve" becomes occupied by a population in which the European element is certain to predominate."

In his diary (see below) M. Rogers states that a representative of an English Company, Captain Ferrow, arrived about 1880 and sank the first shaft at Gross Otavi.

In the late seventies the thirstland trekkers from the Transvaal had settled for a few years in the northern Kaokoveld and in 1881 they moved to Humpata in southern Angola. They became well acquainted with the trader and elephant hunter, Will Worthington Jordan who had been roaming the country for several years. When a number of the trekkers failed to take root in the Portuguese Territory Jordan invited them to return to the Otavi-Grootfontein area. On 21st April, 1885, he concluded a favourable purchase contract with Chief Kambonde of Ondongua, who desired to keep the Herero out of the Otavi Mountains; Jordan acquired a large tract of land, about 50,000 square kilometres in area and including Tsumeb, Otavi and Grootfontein, south of the Etosha Pan for the sum of £300, 25 rifles, an immunized horse and a barrel of brandy. He induced some twenty trekkers to stop for a while at Otavi and afterwards finally settle at Grootfontein. The purchased land was named the Republic of Upingtonia, and farms were handed out to the newcomers. Jordan reserved for himself legal ownership of all ore deposits and the mineral rights on the farms.

These developments caused the Herero Paramount Chief, Maharero, great displeasure, and he called in the help of his confidante, Robert Lewis — trader, elephant hunter and adventurer in the country since 1858 — to influence the Ambo headmen to cancel their deed of sale. This led to the murder of Jordan in Ovamboland and the partial evacuation of Grootfontein, the farmers dispersing mainly to Angola and the Transvaal. For his services Lewis received from Maharero a written grant on 9 September, 1885, ceding the mineral and prospecting rights of that part of Damaraland under his jurisdiction for a period of twenty years. More specifically, he was given a lease over the "Otavi" mine and surrounding country within a 20-mile radius for thirty years, on condition that ownership remained that of a British subject. The annual fee in respect of this grant was £10 plus 2/6 per ton of ore exported. The mineral

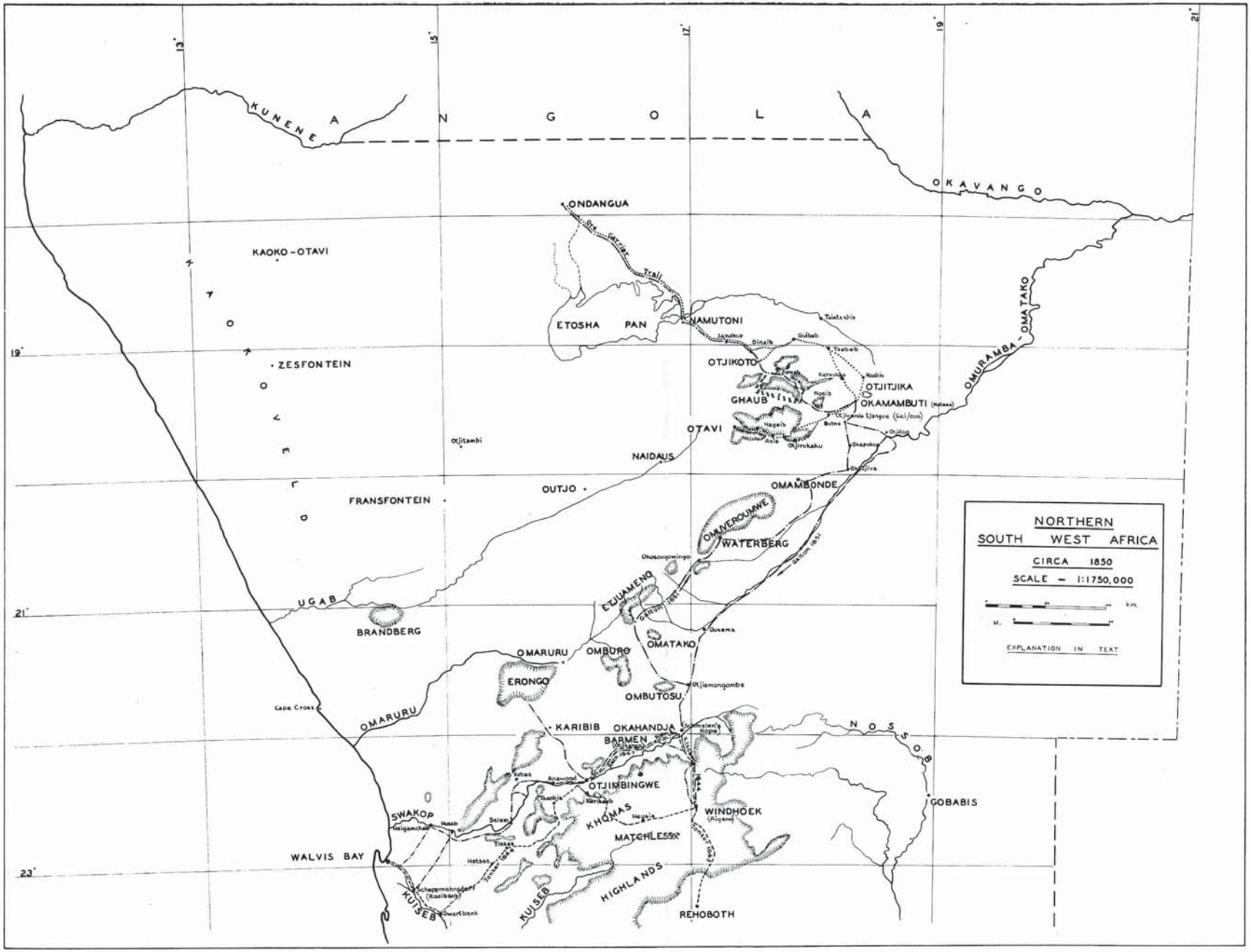
rights thus asserted by Maharero were open to challenge, as neither the Paramount Chief nor any of his subjects had lived at and operated the copper mines that were in the hands of Bushmen and Bergdama.

On 24 April, 1884, South West Africa was declared a Protectorate of the German Reich by the Chancellor, Otto von Bismarck. A year later Reichskommissar Dr. H. Göring founded the local administration at Otjimbingwe and signed a treaty with Maharero at Okahandja on 21 October, 1885, by which full responsibility was assumed to protect Maharero and his people, particularly against the Hendrik Witbooi tribe. By the end of 1886 the protectorate was extended to include the Republic of Upingtonia as well as most of central and southern South West Africa.

In August, 1887, Dr. Göring was summoned to report personally in Berlin on the discovery of gold by a prospector, Stevens, at Pot and Anawood in the valley of the Swakop River west of Otjimbingwe. This news stirred active interest in Berlin and Cologne where several syndicates were formed and four expeditions were sent out under Dr. Gürich (geologist), Mr. Scheidweiler (mining engineer), Dr. Fleck and Dr. Schwarz to explore mineral possibilities in this otherwise so unattractive country. This led to the promulgation of the first mining regulations by the Reichskommissar on 23rd May, 1888, and the appointment of Bergassessor Frielinghaus and Referendar Duft to enforce the law.

Robert Lewis, who had failed to get support from the German government for ratification of his concession (from Maharero) in 1886 and 1887, was in Kimberley when the news spread of the discovery of gold in S.W.A.; he hastily returned to Otjimbingwe in October, 1888, and influenced the Herero by crafty intrigue to revoke their concession to the German regime. At a historic meeting called by Maharero on 30th October at Okahandja the latter proposed the termination of the protectorate and declared the mineral rights granted to the Germans as valueless; he furthermore requested to negotiate for the establishment of a British protectorate. In reply Dr. Göring produced the declaration of 15 September, 1887, in which Maharero had declared all previously granted concessions null and void. Lewis' further efforts to get the government of the Cape of Good Hope interested remained unsuccessful. Reichskanzler Bismarck simply sent out a picked Schutztruppe under Hauptmann Curt von François in January, 1889, to eliminate further meddling and uncertainty. Robert Lewis had arranged interviews in England with Lord Salisbury and Lord Roseburg to obtain protection of his rights, but met with no success. He finally ceded certain privileges of his concession to several syndicates in South Africa and on 27th March, 1890, sold his remaining rights in Damaraland to a company in London called the Damaraland Company. On May 20th, 1890, the treaty between Maharero and Germany was reconfirmed, just before the transfer of Dr. Göring to Haiti.

FIG. 1: This map has been compiled from various sources of information, chief of which are H. Vedder (1934), F. Galton (1853) and C. J. Andersson (1856). The first wagon road was made by Jonker Afrikaner in 1843, from Aigams (Windhoek) to Rehoboth. The next year he built a rough road across the Khomas Highlands from Windhoek via Heusis, Kurikaub, Tsaobis, Tinkas and Hotsas to Swartbank, and thence along the Kuiseb River to Walvis Bay. The missionaries Hahn and Kleinschmidt made a road from Barmen (Otjikango) in 1844 via Okahandja (Schmelen's Hope) to Windhoek. Three years later the missionary Rath cleared a road westward from Barmen to Otjimbingwe and thence more or less along the Swakop River to Heigamchab and Walvis Bay. This is the route taken by Francis Galton in 1851 on his journey of discovery into the hinterland. From Otjimbingwe he made a side trip to the Erongo Mountain, and from Barmen he visited Jonker Afrikaner in Windhoek to force an armistice. Galton then proceeded north to the Omatako and Etjuameno Mountains, thence past Waterberg and Omambonde to Okamambuti (also called Nutsas) near Otjitjika Mountain. When he travelled on the back of an ox to Otjikoto the party passed a few miles south of the "Sumeb" ore outcrop, but no one told him so. At Otjikoto they met ore carriers coming from Okamambuti via Tsebeb, *"en route"* to Ondangua. The ore came mainly from the "mines" at Nageib (now Gross Otavi) and Asis (now Kombat). The tribes living in the Otavi Mountains would not allow the passage of porter caravans through their territory. When Galton returned from Ondangua he branched off south of Okamambuti to reach the Omuramba Omatako near Otjituo in order to have water for his oxen all the way back to Barmen.


KUNENE
ANGOLA
OKAVANGO
ONDANGUA
KAOKO-OTAVI
ETOSHA PAN
NAMUTONI
OMURAMBA-OMATAKO
OTJIKOTO
ZESFONTEIN
GHAUB
OKAMAMBUTI
OTJITJIKA
OTAVI
NAIDAUS
OUTJO
FRANSFONTEIN
OMAMBONDE
OMUVEROUMWE
WATERBERG
UGAB
BRANDBERG
ETJUAMENO
OMARURU
OMBURO
OMATAKO
ERONGO
OMBUTOSU
KARIBIB
OKAHANDJA
BARMEN
OTJIMBINGWE
NOSOB
GOBABIS
SWAKOP
KHOMAS
WINDHOEK
MATCHLESS
WALVIS BAY
KUISEB
HIGHLANDS
REHOBOTH
NORTHERN
SOUTH WEST AFRICA
CIRCA 1850
SCALE - 1:1750,000
EXPLANATION IN TEXT

II. Exploration and Construction: 1892—1906.

While affairs in S.W.A. appeared to be still unsettled, certain financial groups in Germany, supported by their government, developed an interest to explore the mineral occurrences of the territory through a capable mining company. The prime mover in this matter was Edmund Davis, a director of companies in London. On 3 August, 1892, the German government had finally drawn up the so-called Damaraland Concession and entrusted it to Dr. J. Scharlach, an attorney, and C. Wichmann, a business man in Hamburg, pending the formation of the proposed mining company. On 18 August, 1892, the South West Africa Company was incorporated in London to take over the rights of the Concession, and on 12 September, 1892, the Damaraland Concession was finally ratified and ceded to the South West Africa Company, under signature of Dr. Kayser of the Department of External Affairs. On November 14, 1892, an amending protocol was added to the Damaraland Concession. The initial capital of £300,000 of this Company was later increased to £2,000,000.

The concession granted the following rights to the South West Africa Company: The exclusive mineral rights over an area of 22,000 square miles that included the Otavi copper mines; absolute ownership rights over ground chosen by the Company and covering 13,000 square kilometres; plus an area 10 kilometres wide on each side of the railway that was to be built to the mines, and the exclusive right to build a harbour and railway to serve the territory. Within a span of four years the Company was to spend 600,000 marks on development and it was given ten years in which to build a railway to the north. In the addendum protocol it was stipulated that preference was to be given for a period of ten years to German settlers in Grootfontein and the surrounding area. The concessionaries were required to send an expedition to the area without delay. This was done promptly by the South West Africa Company, who organized an expedition consisting of two sections: one, under Mathew Rogers to investigate ore occurrences, the other under D. Angus to survey a rail route to the coast. This expedition reached Walvis Bay on 20 October, 1892, and set about to equip for the expedition inland.

Trouble with natives started when Manasse, Herero Chief at Omaruru, refused to let the expedition pass. The minutes of a conference with Manasse, held on 22 November, established that Maharero, the Paramount Chief, had granted the mineral rights to Robert Lewis, who had departed for overseas and lost contact. The native headmen were amicably disposed towards England and regretted that Palgrave and others had left the country, for they disliked the Germans. After negotiating for several days Manasse permitted the expedition to proceed. On 19 December, 1892, M. Rogers outspanned at the old house of C. C. Thomas at Otavifontein.*

* Information from the diary and correspondence of M. Rogers kindly supplied by Dr. J. W. Brandt, M.P. formerly Chief Geologist, S.W.A. Co. Ltd., Grootfontein.

On 20 December Rogers and a certain Eslich rode on horseback to the well known mines at Gross Otavi and Klein Otavi (Kombat), the diary stating: "The native workers have made a perfect network of holes in the limestone rock wherever the small veins of copper were seen intermixed. Made an examination of these holes, one of which, said to be sunk by Englishmen, is about 30 feet diagonally. There is either a large deposit of copper underneath, or they have nearly reached the end of it, which will take us from six to nine months to prove. Some very rich specimens of copper glance and other copper ores found." On 30 December Rogers recorded: "I am informed there are several places in these hills the Bushmen work for copper but on asking to be shown where they are am coolly told permission must first be obtained of the Bushman Chief and he lives at some considerable distance from this place."

On 12 January, 1893, Rogers visited Tsumeb and recorded his first impressions as follows:- "The outcrop of copper here is the finest mineral outcrop I have ever seen. It is associated with quartz, the first time I have seen this mineral with the copper in this country. The containing rock appears to be slate, but to definitely determine the soil must be removed." On 16 January Rogers held a conference with "John Creiger" (Johannes Kruger) and a certain Winn of Ghaub who claimed controlling rights over several of the copper deposits. According to H. Vedder this Kruger was the grandson of the Cape Baster Johannes Kruger who had settled at Waterberg and occasionally came to Ghaub to hunt. After extended negotiations they granted permission for development of the mines on condition that compensation was paid. The story goes that Kruger received an oxwaggon and a pair of riding breeches from Rogers.

On 19 January, 1893, six Damara (i.e. Herero) from Omambonde arrived at Rogers' Camp at Gross Otavi. On 20 January still more arrived from "Otyozondjugo" with a letter from Samuel Maharero, written in Hollands. As nobody in camp was able to read it "John Creiger" was summoned to come to translate it. On Sunday, 22 January, after "Creiger's" arrival, Rogers notes: "He (Samuel Maharero) expects us to visit him immediately, as he wants to know by what authority we are here, and who gave us this authority. He having recently received £100 from Mr. Robert Lewis as rent for this property, he wishes to know whether we are sent from him or not." When Rogers had arrived in Walvis in October, 1892, there were two emissaries from Samuel Maharero to collect the semi-annual rent monies from the Damaraland Exploration Company for the Otavi mines. In the interest of peace Rogers went to the Waterberg to interview Samuel Maharero. When he arrived he found that Maharero had left for Okahandja.

In his letter of 21 January, 1893, addressed to the Board of Directors in London, and accompanied by a sketch of the field occurrence Rogers writes: "I have been holding places of trust for the past 24 years; have visited various countries of the world, inspecting mines, mineral outcrops, and prospecting for minerals; have been associated with the minerals gold, silver, tin, copper and lead; but in the whole of my experience, I have never seen such a sight as was presented before my view at Soomep, and I very much doubt if I shall ever see such another in any other locality... The outcrop is in a valley, formed by gradually sloping hills. As if the subterranean forces had made one sudden and special effort to force an entrance through the crust of the earth, a large rent is made. This rent has been filled in probably by aqueous solutions with

minerals, having as its chief matrix quartz. In this instance the minerals, as far as can be seen, are different ores of copper and lead. In process of time, either by subsidence, or erosion and denudation, the surrounding strata composing the containing rock have been removed, leaving the fissure vein standing in an inclined position corresponding to the lay of the strata — in some places being 40 feet in height — with the green and blue colours of chrysocolla conspicuously covering it. By various causes the hard quartz matrix has become shattered and rent, and the smaller fissures again refilled with the same minerals. The following sketches will, I trust, give some idea of the appearance. As nothing has been done on this outcrop, and as the soil and detritus cover the southern side, it is difficult to determine its real width... I will only say that on first seeing such a grand and prominent outcrop I could scarcely conceal my astonishment and delight... were this scheme only one of ordinary speculation I should have no hesitancy in recommending this field for immediate work, but being nearly 400 miles from the coast, that the facilities for working are far from the best, and that various essentials are lacking for cheap and effective mining, I am compelled to ask permission, when we have finished at Otavi, to transfer the camp to this place, and do some work below the surface before I say whether even this grand outcrop warrants the necessary outlay for mining on a large scale. I will, however, add that few mineral outcrops present such exceptional indications as this one." This is the first professional report on the ore deposit, one that eventually proved to be among the richest in the world.

It is worth noting how various people asserted ownership of the mineral rights. Thus on 5 March, 1893, a group of Dama turned up at the camp, one of whom reportedly was really the Chief of the Herero, but had ceded his position to Samuel. A ration of tobacco sufficed to induce him to give Rogers written permission to investigate all the mines in the district. On 16 March Rogers wrote as follows on the bad feeling aroused among the natives by the mining operations: "The Damaras that arrived here yesterday say, internal dissensions are existing in the country because of our being here. Each chief claims the place and consequently disagrees with his brother chiefs." On 8 April further hostility is reported: "Some Hottentot chiefs with a large following arrived at 7 p.m. and peremptorily ordered me to desist working along the valley and demanded the stones I had brought from the shaft, or they would take them by force. This party have been the most hostile we have as yet seen." A further incident of this kind occurred on a return journey from Tsumeb to the camp at Otavi when Rogers stayed overnight at Ghaub, and recorded on 16 June, 1893, as follows:- "Very cold night, a piece of ice seen on top of one of our barrels. After breakfast a raad held with the Damaras and Hottentots. They first ask the usual questions, where we come from, etc. They neither acknowledge Samuel nor Manasse as bearing any special right over this district: They have their own part where they rule, but Kambazembi was the first to settle here, then Bushmen and Bergdamaras, and ultimately the Red Men or Hottentots*. They accuse us at Otavi with not being sufficiently hospitable in

* This is obviously untrue, as the Otavi Mountain Land had been Bushman territory for centuries before Kambazembi emigrated from the Kaokoveld after the death of the Chief Tjamuaha in 1861 and settled in the Waterberg area.

giving them food, etc., when they visit us." On June 26 "John Creiger" brought letters from Samuel and Kambazembi in which they prohibit Rogers to work any mines other than those at Otavi.

On 19 July, 1893, Kambazembi, the Chief, called at the camp at Gross Otavi and compelled Rogers to cease operations. On 17 July Rogers had received a letter from Samuel Maharero instructing that work should not stop without the authorization of himself and "Kamabathembie". On 25 September Kambazembi called again and ordered that operations cease immediately, besides demanding £3 per month for his rights. Afterwards he apologized for intruding on operations and thereupon received the usual gratuities.

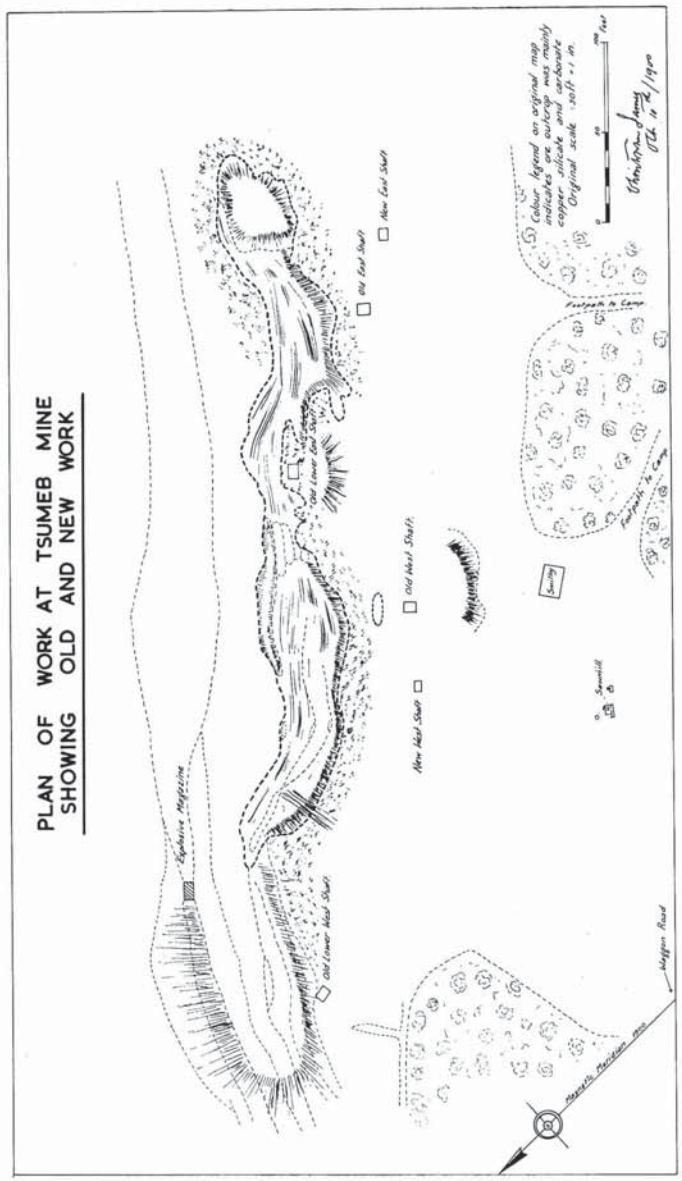
On 26 September Rogers obtained permission from Samuel to move camp from Gross Otavi to Guchab. During October Rogers decided to end work at the Otavi mines and transfer part of his labour force to Tsumeb while provisionally continuing with investigation and prospecting round Guchab. Rogers reiterates that the Tsumeb and Guchab outcrops are of the best he has ever seen, especially the former which brought him to ecstasy.

More trouble occurred when the native labourers went on strike in quick succession, and Rogers requested London to relieve him of his duties. This was granted in 1894, after the completion of two prospecting shafts to a depth of 20 metres each, and of several crosscuts into the ore-body at Tsumeb. The work had established that the ore was exceptionally rich in lead and copper, but the metal prices were so low that it appeared uneconomical to bring the mine into production, considering the cost of transport to the distant coast. Rogers not only pioneered systematic mining in the Otavi Mountain Land, but also compiled a map of the district by trigonometric surveys and recorded the first meteorological observations in this area.

In February, 1893, the South West Africa Company sent out their General Representative, Dr. G. Hartmann, whose first task was to reach finality in regard to the boundaries of the Damaraland Concession, in consultation with the German officials in Windhoek. He chose Grootfontein as headquarters for the Company. In 1894 another expedition under Dr. Hindorf was sent to investigate the possibilities of agriculture in the northern part of the concession.

In August, 1895, Landeshauptmann Major Leutwein journeyed with a Schutztruppe division of seventy from Windhoek to the north, accompanied by Samuel Maharero with fifty Herero horsemen. He met Dr. Hartmann at Grootfontein, where twenty-five Boer families had already settled. They visited Johannes Kruger at Ghaub in August and officially recognized him as chief of the people of that area. Finality was reached on the boundaries and recorded in the written documents of November, 1897.

FIG. 2: Plan showing four shafts alongside Tsumeb ore outcrop sunk by M. Rogers in 1893. Drawing done by C.James in 1900. (Tsumeb Corporation Ltd.)



At the Second Annual General Meeting of the S.W.A. Company held in September, 1895, the Directors reported: "Amongst other operations, considerable prospecting work has been done on the outcrop of copper ore at Soomep, about 20 miles from Otavi, to which reference was made in the last Report. A lode, the full extent of which is not yet explored, has been discovered, and large samples taken therefrom have assayed as follows:

Copper, 9.80 per cent.
Lead, 42.75 per cent.
Silver, 5 oz. 11 dwts. 0 grs. per ton of 20 cwt. of ore
Gold, traces.

Suitable railway communication is essential in order to turn to account the Company's mineral rights and landed property. The construction of a line from the coast to the interior, is, indeed, of vital importance not only to this Company but to the Protectorate generally, for the purpose both of the German Government and of all parties interested in the development of the country. This fact is becoming more and more recognized and the Directors are confident that it is merely a question of time when a line from the coast to the interior, say in the first place to Okahandja, will be constructed. Such a line would be convenient for extensions and branch lines North, East and South."

The Company had also acquired a major shareholding in the Hanseatic Land Mining and Trading Company as well as the Kaoko Land and Mining Company. In the same year the Rhenish missionary, Kremer, moved with his flock of followers from Tsumamas near Outjo to Ghaub, adding to his group the Bergdama from the mountains round Otavi.

In 1896 attention was diverted to these newly acquired concession areas and to the Kaokoveld coast for guano. Prospecting operations were delayed in 1897 as a result of the outbreak of rinderpest which brought wagon transport to a standstill. The Administration, realizing the need of rail transport, retook the rights of the Company in exchange for exploration rights in Ovamboland, and started to build a narrow-gauge railway from Swakopmund in September of the same year, completing the first ten kilometres as far as Nonidas. At the same time a two-foot-six-inch line was built by the Cape Government from Walvis Bay to Rooibank (11 miles) whence the merchandise was transported inland by oxwagon. In October, 1898, the South West Africa Company finally obtained an extension of land and mining rights into Ovamboland.

In 1899 S. J. Speak was sent to attend to the Otavi operations. On 12th April of the same year the De Beers Consolidated Mines acquired from the South West Africa Company against a cash payment of £5,000 the exclusive rights to all precious stones within its area of interest.

The preliminary work of exploring the Otavi Upland had consumed much capital, and still more was needed to exploit the ore deposits. The South West Africa Company therefore initiated the formation of a new company with the help of German banking groups. This was the Otavi Minen- und Eisenbahn-Gesellschaft founded in London on 6 April, 1900, with an authorized capital of £2,000,000 (or 40,000,000 Marks) divided into 400,000 Ordinary shares of M.100 each and 400,000 Founders' shares of no face value. The South West Africa Company was allotted 200,000 Founders' shares that would receive 25 per cent.

of the surplus profits of the O.M.E.G., after provision for reserve fund, Directors' remuneration and the payment of a dividend of 5 per cent. on the Ordinary share capital. The contract was made with the Disconto-Gesellschaft, of Berlin, and the Exploration Company, of London. Mineral rights over an area of 1,000 square miles would be transferred to the new company; also the option to take surface rights over one half of the same area, and certain other rights necessary for the construction of the railway.

A well-equipped expedition of 33 miners under Christopher James as chief engineer arrived at Swakopmund on 29th June, 1900, and trekked by oxwagon to the north to spend about £50,000 in proving the copper deposits at Tsumeb and in the Otavi Valley. The journey was a very rough one. "We have experienced the discomfort of remaining unwashed, for the space of 2, and even 3 days at a time." The personnel of this expedition included a medical doctor and also the school-going son of James.

On 13th August, 1900, the expedition arrived at Tsumeb. A search for the mine workings was immediately undertaken and soon these were found about five minutes' walk north of the road. James wrote to London: "It will be impossible to use the present shafts as, judging by the cursory glances I have been able to give them, the timbers are very rotten and useless. You are of course anxious to hear my opinion of the mine itself, but I do not feel justified in making any statement on what I have seen in these few hours, and beyond saying that I am favourably impressed with the outcrop, and have seen some very fine specimens of ore on the dumps, I must ask you to wait a month or so, when I hope to be able to give you some accurate information from the result of work actually done on the mine."

A road to the shafts was made without delay and an area cleared to unload freight and supplies. Rough log huts were built as bricks could not be made, due to the scarcity of water. James writes: "The remains of Roger's buildings are nearly erased, only one hut still bears a roof, which is decorated with a tired looking flag."

Otjikoto Lake was the nearest source of water, which had to be carted by oxwagon twelve miles over an impassable road to Tsumeb. At the lake itself the water stood 30 feet below the surface and had to be raised to the surface by means of buckets. The tanks in which the water was transported were too light and started leaking. Fortunately two extra tanks were obtained from the Government authorities.

James started sinking two new shafts 243 feet apart. "I anticipate very hard ground, as the whole of the new west shaft is in a compact body of ore; I have scarcely ever met with tighter ground. In No. 1 crosscut I encountered about a foot of pure copper glance, running through the galena and gradually merging or blending into the lead ore. The main long drive connecting the old west and east shafts, was run through barren ground, assaying 1½% Cu. This appears to me to be a horse running through the entire lode, it corresponds with the outcrop."

The first consignment of copper ore was dispatched on 28th December, 1900, by oxwagon to Swakopmund. This consignment consisted of 181 bags weighing 9 tons. To each bag was attached a metal disc with a number punched on it. The bags contained the following ores:

21 bags — Copper glance.
20 bags — Blending lead and copper ore.
20 bags — Galena.
40 bags — Average of Mr. Rogers' old West crosscut.
40 bags — Old East crosscut.
40 bags — Average copper glance from New West shaft.

"With regard to the disposal of these samples of ore, I beg to advise, that each of the 6 descriptions be crushed separately and passed through a half inch sieve and thoroughly mixed. Then I would suggest that the half of each be sent to Messrs. Henry Bath and Sons, Swansea, and the other half retained in Hamburg. In this way the price from both markets can be tested."

In February, 1901, James reported that he had encountered carbonic acid gas in a big cavity in the West shaft. It took four hours to pump the gas out, after which sinking could continue.

On March 4th, 1901, James reported that in six months' time 1,269 feet of shaft had been sunk. "Mr. Jewell and six miners have started the cross-cutting, and reports that he has 6 in working order now... In this manner I hope to complete the 7 proposed crosscuts in about 2 months and shall then be able to give you a preliminary opinion of the possibilities of Tsumeb and also start the work at Groot Otavi." The crosscuts established the width of the ore-body on the first two levels at 60 feet and 160 feet respectively.

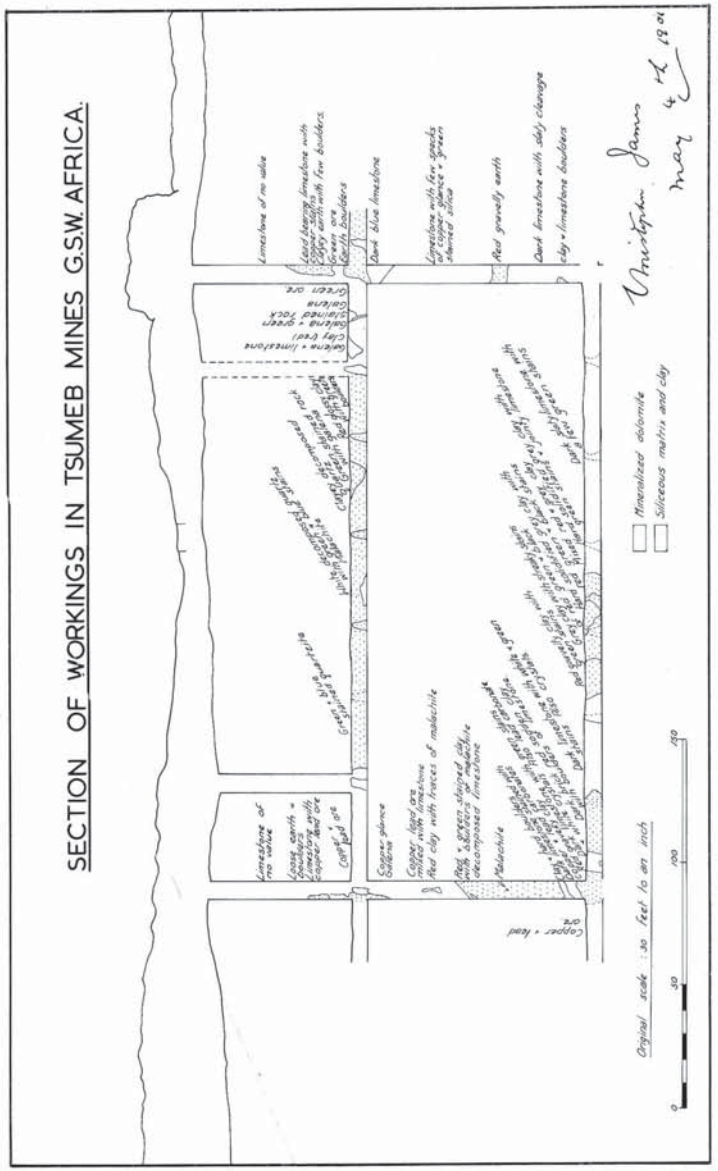
In the interim Mr. James moved his offices from Tsumeb to Guchab.

On 13th August, 1901, the work on the Tsumeb mine was stopped. James advised that he was in a position to submit a preliminary report on the mine. "By the plan and cross sections sent you herewith you will note that there are 239,330 tons of high grade ore developed in the mine between the surface and the No. 2 level, of an average value 12.61% Copper and 25.29% Lead and 190,519 tons of low grade ore of an average value of 2.91% Copper and 4.37% Lead."

"Assuming that all metallic contents are extracted the high grade ore will yield in metals 36,998 tons of Copper and 74,190 tons of Lead."

"In a country where fuel and water are available both the high and low grade ores could be concentrated to great advantage, but under existing conditions this method of treatment is impracticable as the cost of transport alone on the low grade ore to Otjikoto, a distance of 12 miles, would swallow up any profits likely to accrue from its treatment. I therefore propose to discard this low grade ore and leave it for some future time when the country shall be more developed and prosperous and permit of it being profitably worked. With regard to the high grade ore, in the absence of fuel, which if in abundance would afford the cheapest method of treatment as the mine would supply its

FIG. 3: Longitudinal section showing development workings of the Tsumeb ore-body and geological notes made in August, 1901, by C. James after completing his investigations. (Tsumeb Corporation Ltd.)



own fluxes, the only alternative is to send it direct to the smelters and this could only pay if the ore was transported at an exceedingly cheap rate to the coast, for it must be remembered that 15% Lead is required free by the smelters."

"Of the possibilities of the mine in depth I hold a very favourable opinion as regards quantities but I am inclined to believe that copper will be strongly superseded by Lead especially in the East ore body which from recent developments seems to prove that the Lead will entirely replace the Copper in depth . . ."

"In conclusion I regret to say that I cannot hold out any hopes that this mine will ever pay for the Railway to the coast."

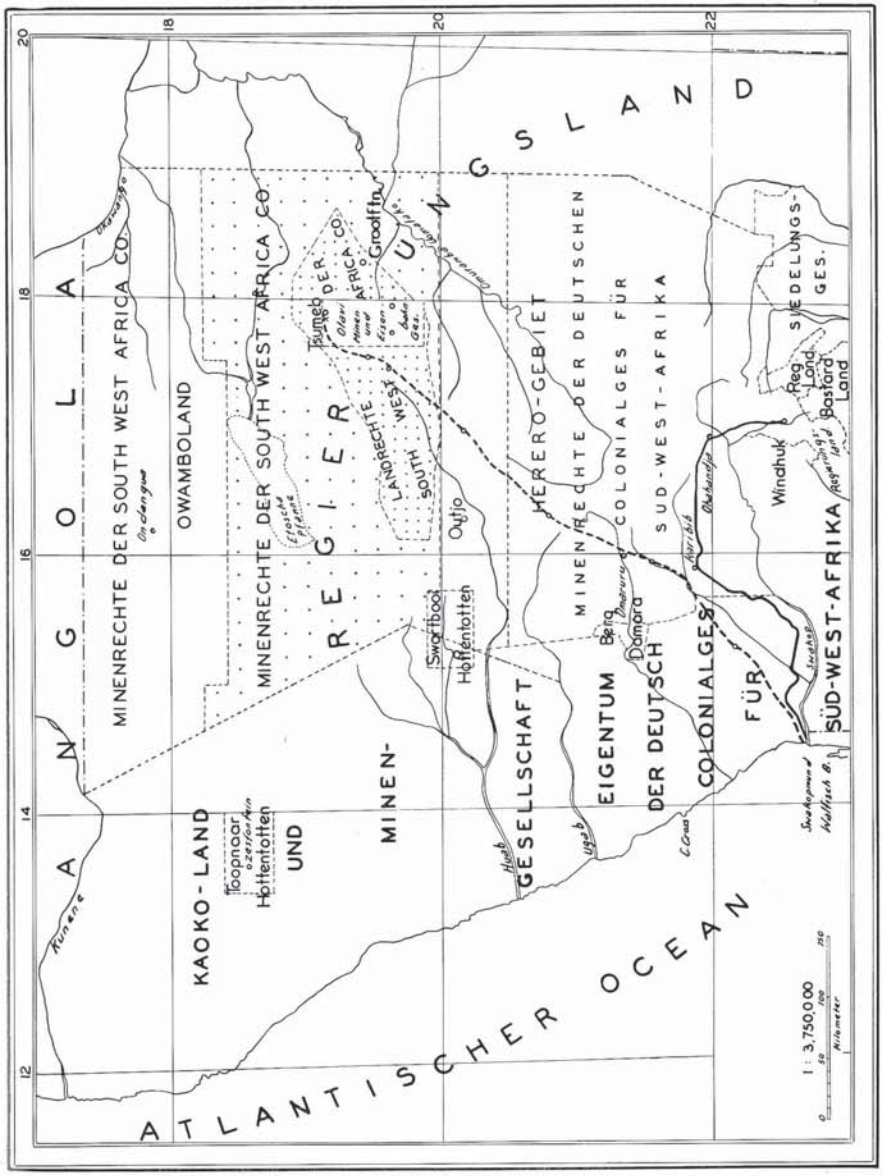
"At the rate of 61,600 tons of ore extracted per annum, the life of the mine on the present developments is 4.7 years. I think I can fairly assume that as much ore occurs again in depth and of a similar value, which would raise the life of the mine to 8½ years. This would mean, on the basis of my estimate a total net profit of £3,315,000 at the rate of £390,000 per annum. In conclusion I must say that whilst I believe you have a valuable mine at Tsumeb, I think you will be overtaxing it if you expect it to pay for a railway to the coast, but with expert management and economic methods of working, such as I have laid before you, this property will yield a handsome profit on the capital expended, and at the same time I consider the conditions are favourable towards proving a much more valuable property with future developments." The estimate was based on a price of £60 per ton for copper and £12 per ton for lead.

Notwithstanding the pessimistic tone of Mr. James' report O.M.E.G. signed a second agreement with the S.W.A. Company on 13th May, 1903. In terms of this agreement O.M.E.G. undertook the building of a narrow gauge line from Swakopmund to Tsumeb. The main reason for taking this step was to transport the ore from the Otavi area to the coast. The intention was to complete the line by the end of 1906.

Dr. Hartmann, who in previous years had already explored the Kaokofeld and was Director of the S.W.A. Company in Grootfontein in 1900, made a further trip to the west coast, accompanied by Oberleutnant Winckler of the Administration, to find a harbour suitable for large ships. A railway expedition was sent out under the Norwegian engineer, T. Toennesen, to explore the country north and south of the Cunene River to decide upon a harbour. In view of the poor possibilities along the Kaokofeld coast the Company negotiated with the Companhia de Mossamedes and the South African Company Ltd., taking over the entire capital of the latter and spending about two years on the examination of various projects.

Serious consideration was given to the building of a standard-gauge railway at a cost of £1,665,000 from Port Alexandre (Angola) to the Otavi area (730 km) as part of a trans-African line to connect with the Witwatersrand gold fields (2,200 km). The Anglo-Boer war had, however, caused such a set-

FIG. 4: Map showing concession areas in northern South West Africa and proposed railway from Swakopmund to Tsumeb, 1902. (Ann. Report, O.M.E.G., 1903)



back in the Transvaal, that this grandiose scheme was shelved, and it was manifestly uneconomical to build a line from Angola to Tsumeb primarily for transporting ore from only one productive mine with a life of less than ten years. The Portuguese Government was unwilling to pay for a large share of the cost of a line through Angola to the Cunene River on the northern border of South West Africa. They moreover insisted that it should have for a terminus in that territory the town of Humbe. A railway from Otavi District to Angra Fria on the Kaoko coast would be about 500 miles in length, and one to Khumibmund via Sessfontein about 430 miles. The alternative of building a branch line from Karibib to the north was impractical as the Staatsbahn to Windhoek (completed in 1902) had light rails (9 kg. per metre) whereas heavier rails (15 kg. per metre) were required for transporting ore concentrates.*

Meanwhile Herr Gathmann, Government Mining Engineer of Windhoek, also examined the ore deposits at Tsumeb, Guchab and Klein Otavi (Kombat) in September and October, 1902. He confirmed in particular James' estimate of the tonnage and grade of indicated ore at Tsumeb. This was considered sufficient to guarantee amortization of capital plus interest over a period of five years.

On 23rd May, 1903, the Deutsch-Südwestafrikanische Zeitung announced the telegraphic confirmation that the decision had been taken to build the line from Swakopmund to Tsumeb. An agreement had been signed on 12th May, whereby the South West Africa Company ceded to O.M.E.G.: (1) Mining rights (excluding precious stones) over an area of 1,000 square miles including the copper mines of Otavi, Klein Otavi, Anwap (Guchab) and Tsumeb; (2) Land occupation (ownership) rights within the 1,000 sq. mile area for purposes of settlement, mining, railway building, up to a maximum total of 500 square miles; (3) Water rights on such occupied land; (4) The right to build communications of whatever kind within the 1,000 square mile area; (5) The right to build a railway from Tsumeb to the coast; (6) Land, water and other relevant rights held by the South West Africa Company in Damaraland for operating the railway to the coast; (7) Ownership of land and water rights 10 kilometres on either side of the railway through Damaraland; (8) Mining rights (excepting precious stones) in 20 x 30 kilometre blocks, spaced 10 kilometres apart, along the entire length of the railway within the Concession. Further negotiation was underway with the Deutsche Kolonialgesellschaft for similar land rights along the railway from Km 1 to Km 140 and mining rights from Km 1 to Km 325.** In all, this gave to the O.M.E.G. about 2,700 square miles of mining rights and 500 square miles of freehold.

In July, 1903, the O.M.E.G. signed a contract with the firm Arthur Koppel to deliver all the construction material at a price of 14,725,000 Marks (= 25,840 Marks per kilometre) within a period of two-and-a-half years. Their Chief Engineer, Victor Solioz, started preliminary work at Swakopmund in September, 1903, and actual construction of the 60-centimetre gauge track began in November. The Deutsch-Südwestafrikanische Zeitung described the venture of building the 566 kilometre line as the longest narrow-gauge light railway in the world.

* The locomotives on this line had very limited tractive power, and the journey from Swakopmund to Windhoek included three overnight stops at Jakalswater, Karibib and Okahandja to service and refuel the engines.

**These are points measured in kilometres from the railway terminus at Swakopmund.

PHOTO 1: O.M.E.G. railway terminus in Swakopmund. On the far right Hotel Germania and Hotel Hohenzollern. (Collection: W. Schatz)

In November, 1903, Herr Gathmann was appointed Mining Engineer of O.M.E.G. and stationed at Otavi, after visiting Kimberley and O'okiep to study mine plant. At the outbreak of the Herero rebellion he had to flee to Grootfontein, and when this settlement became overcrowded by troops he moved to Omaruru for two years, where he designed the layout for the mine at Tsumeb.

On 11th January, 1904, the Herero rebellion broke out after only 9 kilometres of railway had been completed. Most of the native labourers quit work and Italian labour was recruited to continue construction. Transport of material from Germany was severely delayed as the Woermann Line was obliged to ship military personnel and equipment instead. The O.M.E.G. made an agreement with the Government to expedite building the railway as far as Omaruru and connecting this line from Onguati to Karibib, for which they would earn some bonus and be given armed protection along the line and also a military post at Tsumeb. In April, 1904, a labour force of 260 Italians arrived in Swakopmund, and in September of the same year 750 more. Some 250 Ovambo were also available for construction work, plus about 1000 others. These measures hardly relieved the situation, as most of the Italians proved inefficient and disliked the country as much as the job; many broke contract and sailed for home at their own expense. As a result the total labour force during the fiscal year 1904 fluctuated between 900 and 1,200. In the same year O.M.E.G. bought the farm Usakos for its abundant supply of water in the Khan River and for erecting railway repair shops.

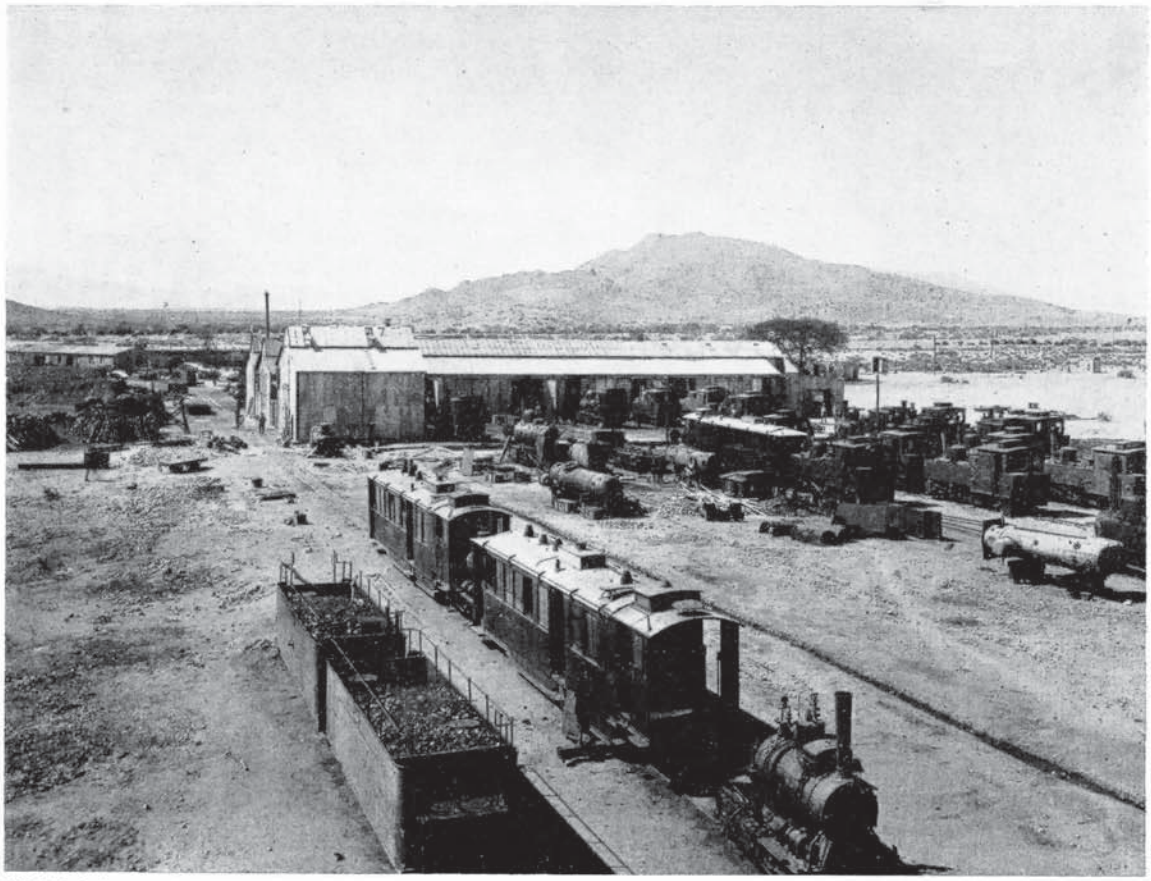


PHOTO 2: Locomotive repair shop, Usakos, 1905. Note two steam-wagons in left foreground. (Collection: W. Schatz)

PHOTO 3: Labour gang on railroad construction between Otjiwarongo and Tsumeb, 1905. Note native women carrying steel sleepers on their heads. (Collection: W. Schatz)

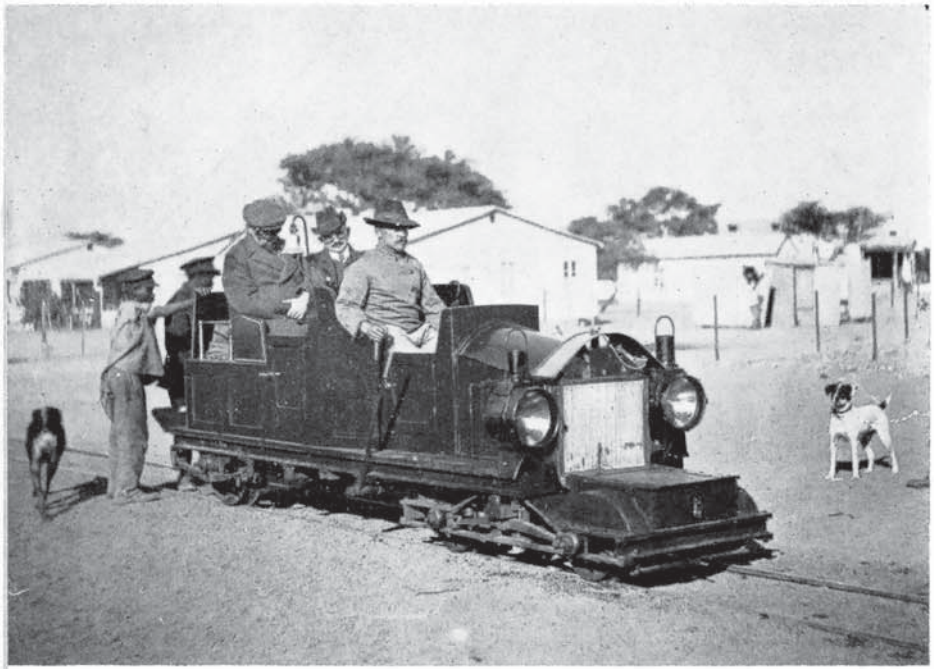


PHOTO 4: The "Pay-corps" in their motor railcar. Paymaster (with black moustache) Mr. H. Grueber. Note bell to summon employees at stopping places. (Collection: W. Schatz).

The Otavi Railway, operated by the construction firm Arthur Koppel, performed valuable service during the period of hostilities in transporting troops and equipment from Swakopmund to Usakos. The line reached Karibib on 18th May, 1905, and was opened to traffic as far as Omaruru on 24th August the same year. By late 1905 the number of native workers (mainly Ovambo) had shrunk to such an extent that the O.M.E.G. offered a bonus of 877,500 Marks for completion of the railway before 31st December, 1906. To meet the situation the Government arranged that Herero prisoners-of-war could work on rail construction and thereby also rehabilitate themselves. As a result native labour during 1905 increased from 970 to 2,140.

Until November, 1905, the following construction cargo had arrived in Swakopmund:- 24,200 tons rail (enough for 474 kilometres of line), 23 locomotives, 6 tenders, 276 trucks of various kinds, 106 bridge frames, 69 station buildings, store sheds, loco sheds, houses for railway foremen and station masters, telephone equipment for a 450 kilometre line, corrugated iron pipes for

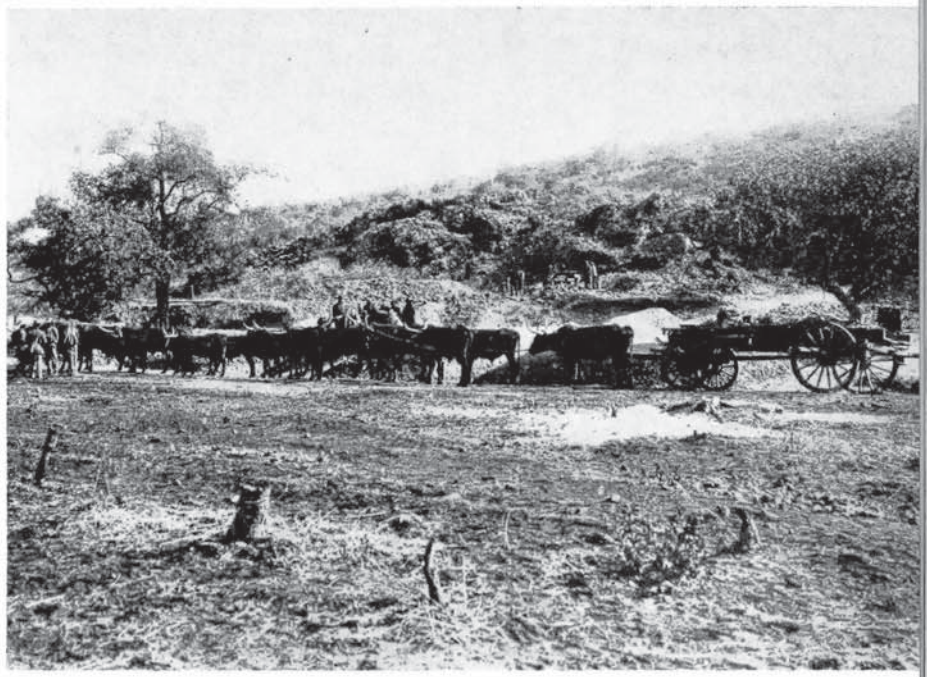


PHOTO 5: Oxwagon at the foot of the "Green hill", the outcrop of the Tsumeb orebody. Old West Shaft with winch in foreground. Photo taken about 1905 when James' workings were rehabilitated just before the railroad reached Tsumeb. (Archives of Swakopmund Museum)

culverts, pumping equipment for water supply, and machinery for the repair shops in Usakos. The landing of all this cargo in addition to troops, arms and materials, horses and slaughter stock caused hopeless congestion alongside the wharf, and plans to deepen the harbour by sand dredge did not materialize. The Government therefore decided to build a 275-metre timber landing bridge 600 metres south of the jetty, which, though uncompleted, was taken into service in April, 1905, for offloading lighters. The O.M.E.G. thereupon built its own railway station on a plot south of the jetty and the landing bridge.

Meanwhile preparations were resumed for mining at Tsumeb. In September, 1905, the Engineer-in-Charge, Mr. Gathmann, was transferred from Omaruru to Otavifontein. After a few provisional buildings had been erected at Tsumeb, work started in November, 1905, to make the old shafts accessible and re-timber the drifts and crosscuts. A tender had been accepted for supplying 20 kilometres of pressure pipe and for machinery to pump water from Otjikoto to Tsumeb. Plans were drawn up for cutting an incline from the surface to hoist 400 tons

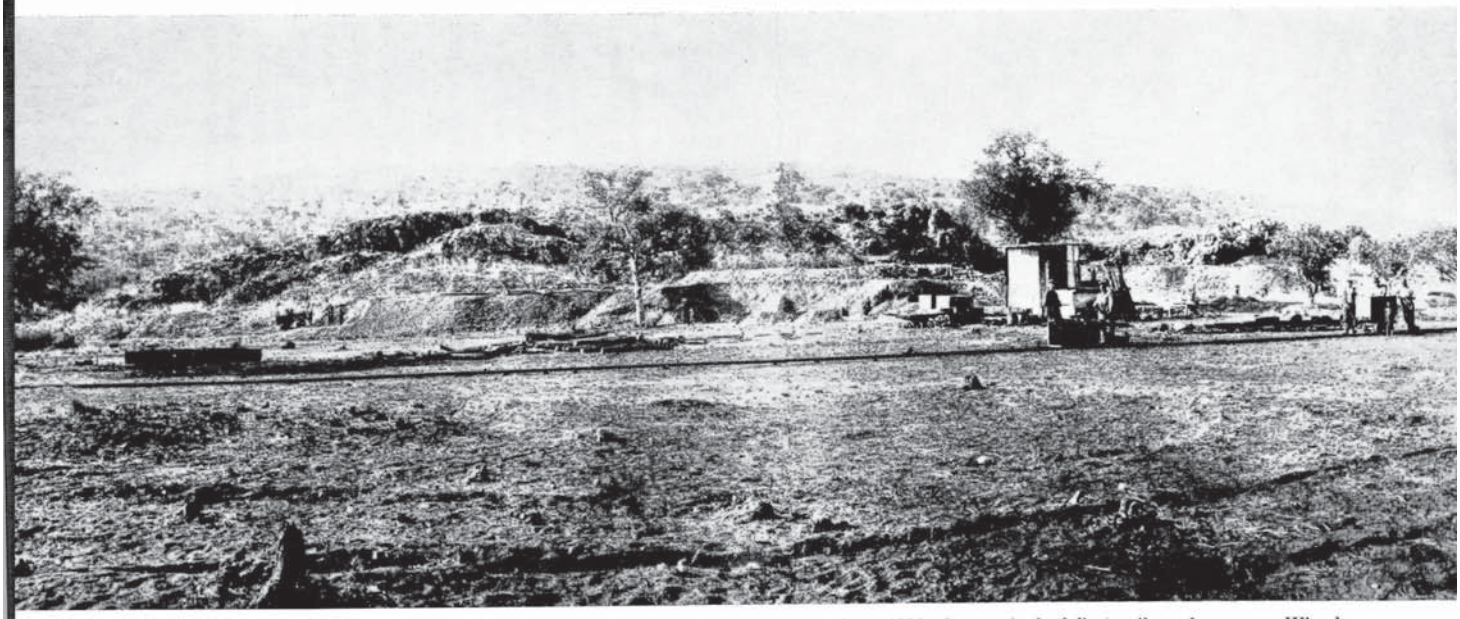


PHOTO 6: Panorama of the whole "green hill" of ore at Tsumeb, taken about 1906 after arrival of first rails and ore cars. Wheelbarrows loaded with ore by mortar and pestle. Old Lower West Shaft located to the left of the men loading ore into rail car. Old East Shaft behind small ore car on the right. Old Lower East Shaft hidden at foot of ore outcrop just to the right of corrugated iron shack. (Collection: W. Schatz)

PHOTO 7: Hoisting ore at the West Shaft, 1906. Note the rough surface of the leached outcrop of the ore ridge. View looking west. (Collection: W. Schatz)

of ore per day from the proposed opencast. A new two-compartment shaft was to be sunk with a capacity of 300 tons of ore per day on the down-dip side of the outcrop.

Plans were likewise made for a smelter with lead- and copper-furnaces, with the necessary steam plant to treat 120 tons of concentrates per day. Governor F. von Lindequist, travelling on horseback from Windhoek, inspected development at Tsumeb in June, 1906.

The railway to Tsumeb was completed on 24th August, 1906. Water for personnel and locomotives at Tsumeb was hauled from Khorab, forty kilometres away. On 12th November the stretch from Omaruru to Tsumeb was put into scheduled operation, starting with an official opening trip. The train, carrying 16 passengers, departed from Swakopmund at 6 a.m., consisting of 3 passenger coaches and 2 covered goods trucks, one equipped with kitchen, the other loaded with victuals. There was a long stop in the afternoon at Usakos to inspect the railway workshops, and at Onguati junction the Windhoek contingent including the Deputy Governor, Dr. O. Hintrager, was coupled on; this portion of the train included goods trucks fitted with beds, as well as a dining saloon. Supper was enjoyed by the light of tar-flares in Omaruru. The train reached Otjiwarongo at 7 a.m. the next morning, Otavi at 2.30 p.m., and travelled through an impressive lightning storm at dusk across the mountains at Bobos, to reach Tsumeb in time for supper by bright lamp-light. At the celebration dinner held at the station at 2 p.m. on 14th November Dr. Hintrager delivered a speech on behalf of the Government. The train departed at 5.30 p.m. and arrived back in Swakopmund at 7 a.m. on 16th November.

A representative of the Deutsch-Südwestafrikanische Zeitung, who was included in the entourage on this trip, gave the following sketch of the mining camp in the 21st November issue of the paper:- "Tsumeb consists of a number of small houses, tents, corrugated iron buildings including the "Glücks Hotel". The old prospecting dumps at the mine are being sorted — "In ununterbrochener doppelter Kette ziehen eingeborene Weiber kleine hölzerne Mulden auf den Köpfen tragend, schwatzend und lachend zwischen dem Erzhaufen und der Sortierungstelle hin und wieder." (In an unbroken double chain the native women, carrying small woden basins on their heads, move back and forth, gossipping and laughing on their way between ore dump and sorting place). The visitors saw one new shaft being sunk, while from another ore from the First level was being hoisted by hand-winch in a bucket. An inclined haulage was under construction to serve the open pit. Development was underway on 2 and 3 levels, and had just started on 4 level where the temperature was noticeably warmer.

This picture of the beginning of the mining operation marks the end of the early period of discovery and exploration. Everything was now poised for rapid expansion.

III. Productive Era of the Otavi Minen- und Eisenbahn-Gesellschaft: 1906—1946.

Tsumeb Mine.

In June, 1906, the O.M.E.G. head-office in Berlin requested the despatch of two 50-ton samples of freshly broken ore from underground. The sorted material that was sent away assayed approximately 13 per cent. copper and 40 per cent. lead; another lot of 100 tons was despatched before the end of the year. In two new crosscuts on 3 Level sampling showed an average metal content of 9 per cent. copper, 13 per cent. lead, and 14 per cent. copper, 24 per cent. lead, respectively; disappointment at these "poor" values was expressed in a letter from Berlin signed by the directors A. Gaedertz and G. Duft.

To meet the water requirements for mine and smelter as well as domestic supply, a high-pressure pipe-line was laid from Otjiokto to Tsumeb, and completed in February, 1907. Hydrants were provided at intervals of 2 kilometres for the purpose of irrigating land suitable for pasture or agriculture. In the same year an electric lighting plant was installed to serve the entire mining operation.

The first full fiscal year of production from April, 1907, to March, 1908, showed extremely satisfactory results. Despite a drop in the price of copper from £100 to £60 per ton a net mining profit of 1,298,731.01 Marks was made from 25,700 tons of treated ore delivered at a cost of 10.4 Marks per ton. Handsorting gave the following six products:- 28—35 per cent. copper ore, 18—25 per cent. copper ore, smelting ore, galena concentrates, siliceous rock, waste rock. The high-grade export ore was shipped to Germany, Wales and America in jute bags used at the rate of 40,000 per month.

In the mine the first important flow of water (900 gallons per hour) was struck in October, 1907, in a winze two metres below 3 Level; carbon dioxide gas was also encountered in fissures on the same level 35 metres east of the main shaft. Fifteen months later more water was opened in another winze between 3 and 4 Levels, so that larger capacity pumps had to be installed.

The mining method in the West ore-body was to cut sub-levels at 7-metre vertical spacing below 1 Level; drives and crosscuts were 4 metres high, leaving a horizontal crown resting on pillars. Thus neither fill nor timber support was required, and eventually the crown pillar would be recovered by opencast mining, preparation for which was already under way by stripping waste round the outcrop. The next year 29,450 tons of ore were hoisted from the opencast, to which the underground operations added 14,800 tons. The latter came from the East ore-body by cut-and-fill mining on an advancing brow 2 metres high, extending the whole width (13—15 metres) of the ore-body, wherever possible within reasonable safety.

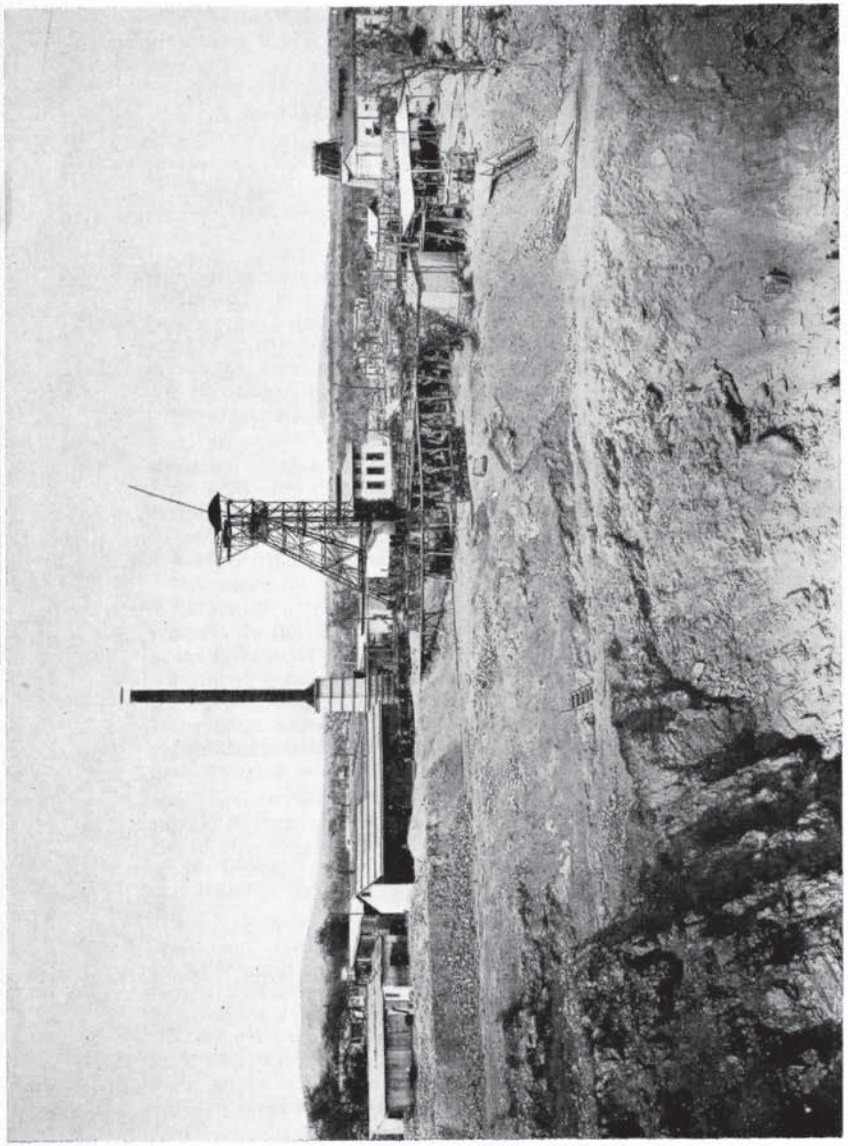


PHOTO 8: Old Main Shaft and steam hoist circa 1910. Power station at far right. This shaft collapsed with the widening of the opencast and was replaced by No. 1 shaft. (Photo: Lange; Collection: Fritz Jaeger; Archives S.W.A. Scientific Society)

Sinking of a new shaft with two compartments for ore and one for personnel and supplies was started on the south side of the opencast. The first reported fatal accident occurred on 3 Level in January, 1909, when the hanging wall collapsed, killing a fourteen-year old Ovambo. In 1910 continued mining in broken ground dictated changing to a mining system of narrow transverse stopes that were filled as mining advanced. The production cost immediately rose to 23 Marks per ton of sorted ore. A large part of the footwall ore and aplite body in Stope I on 2 Level caved in that year, the movement occurring along a clay fissure, but fortunately held to a minimum by the supporting fill. The Ovambos were not only afraid to go underground, but habitually skipped one or two shifts per week to relax and sleep in the bush. The heat from the steam pumps and bad air often caused personnel to fall asleep in the mine.

At first all blast holes were drilled with handsteel by candle light, up to twenty drill crews being engaged on such work. In 1909 the position improved under the new Manager, Dr. Heimann, when six jackhammers were taken into service. In the same year a hand-operated diamond drill with 200 metres of rods was purchased to explore for ore below the already developed levels. The first hole was collared in the West ore-body on 2 Level and reached a depth down dip of only 14 metres, i.e. not even to 3 level. This effort regrettably cost 1,000 Marks plus the loss of three diamonds! The next four holes fared no better, as the rods stuck repeatedly and caused the loss of corebarrel and bits. In the East ore-body, however, good values were proved to a depth of 15 metres below 3 Level. By 1911 the diamond drill had established ore continuity to a depth of 24 metres below 4 Level. Export ore at that time derived mainly from the East body, averaging over 16 per cent. copper, while most of the smelting ore was taken from the West body. A new incline with double rail track was cut down the north wall of the opencast to hoist all ore remaining above 2 level. This incline was popularly called the "Himmelsleiter", as the tracks seemed to lead from the dark depths of the mine directly up to heaven. As from August, 1911, the West and East opencasts were joined to form one big excavation as the intervening low-grade ore was so intensively fissured as to render further separate mining unsafe.

In the three years preceding the outbreak of World War I very good progress was made in respect of increased ore reserves and installation of additional plant and equipment. The new shaft reached 6 Level, cutting a hitherto unknown ore vein, 4 metres wide, in the hanging wall of the main ore-body, which was then traced laterally and upwards to the surface. On 4 Level exploration also led to the discovery of a chalcocite vein, 3 metres wide and persisting on strike for 18 metres west of the main ore-body. From 5 Level down to below 6 Level various boreholes, drifts and crosscuts established sulphide ore as well as oxide ore of high grade. In 1912 the production expanded sharply in response to higher copper and lead prices; 8,000 tons of dump rejects could be exported economically. Peak production was reached the following year (75,000 short tons). A second boiler and compressor were installed in 1910, followed by construction of a new electric power station with two diesel engines (930 h.p.). The cost of power as from July, 1913, was thereby lowered from 0.30 Mark to 0.18 Mark per KW. The air compressor and main shaft hoist were, however, still steam-driven. In January, 1913, a large flow of water was struck

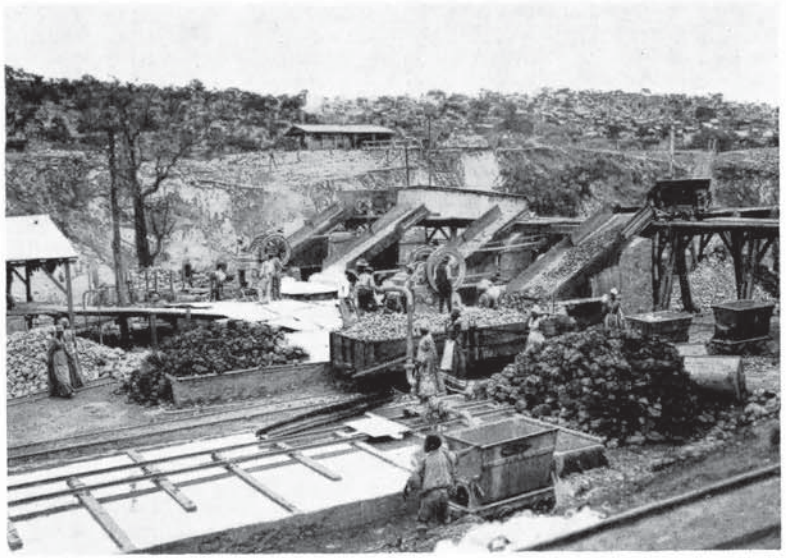


PHOTO 9: Primary crushers on west side of opencast, showing men and women sorting ore. Date about 1912. (Collection: W. Schatz)

at the south contact of the "aplite" body in a crosscut, causing temporary flooding of the mine up to 4 Level.

World War I brought production to a virtual standstill with general mobilization for the army. After the military occupation following the capitulation of German troops at Khorab on 9th July, 1915, permission was granted by the South African Government to resume mining, but because of marketing difficulties, lack of shipping and shortage of personnel Tsumeb remained dormant, except for methodical development in the mine. On the geological possibility that copper ore might be found south of the main ore-body in the main oolite beds and in the overlying "microgranite" (Mulden quartzite) a crosscut on 5 Level was driven in that direction in 1919, but had to be given up when a fissure was opened yielding 10,000 gallons of water per day. It is of interest to record that oil lamps and candles were still in use underground at that time, although the recommendation had been submitted to order 500 carbide lamps. The ore reserves in the mine increased from 548,000 tons to 1,003,000 tons, of which 254,000 tons were hoisted during 1919 and 1920, but only 87,614 tons could be exported. The ore blocked out on 6 Level and partially indicated on 7 to 8 Levels was mainly sulphidic and in part zinc-rich. As the main shaft would enter the main ore-body on 8 level it was decided to do no further sinking, and a recommendation was submitted already in 1917 that a new shaft be sunk on the west side of it.

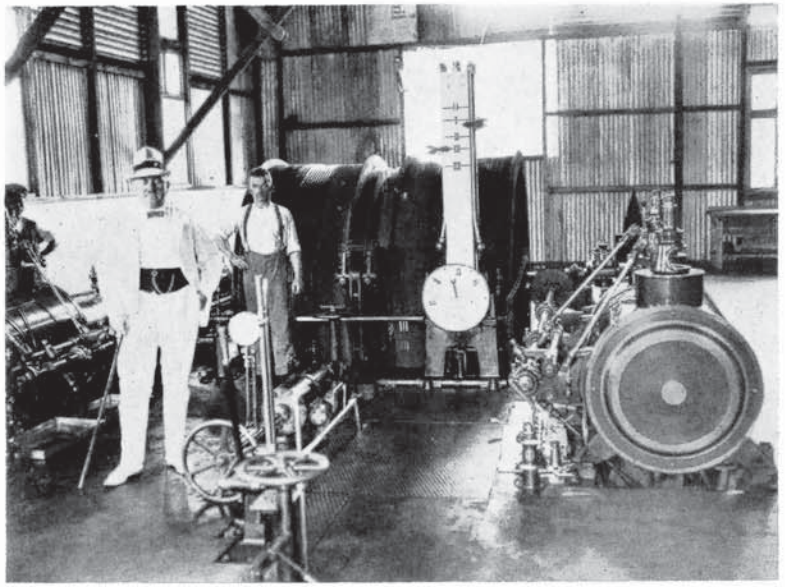


PHOTO 10: Steam hoist of Main shaft, about 1912. The personage in immaculate white suit is Direktor Thometzek. (Collection: W. Schatz)

An event that caused considerable concern was the fire in the mine, discovered on Sunday, 6th July, 1919, which lasted until the end of the month. Smoke was first reported from an old winze that used to serve 1 Level in the West opencast, and the fire spread to 2 level within two days, advancing through the mixture of timber and waste rock in the old stopes. To shut off air all surface fissures were closed up, the winze and the 2 Level drive were blasted so as to collapse, and water sprayed over the area for five days. Apparently the fire had died out, but on 18th July smoke reappeared farther east. For the next ten days the area was drenched using a flow of 25,000 gallons of water per hour, which finally extinguished the fire. A miner and three boys were gassed during these operations, but recovered. As a result of the fire slag had formed locally, and the mine workings down to 3 Level were in danger of collapse. The subsequent court inquiry established that the near-debacle had been started unintentionally by a native guard passing by the winze and throwing a cigarette down the hole.

On November 17, 1920, the Administration issued a proclamation by which O.M.E.G. mining rights were fully reinstated. The following year operations were in full swing once again, the mine attaining a production of 85,000 tons. The new shaft (now called No. 1) was collared in March, 1922, reaching just below 8 Level at the beginning of 1925 and beginning to hoist ore in April that

PHOTO 11: Water gushing from cavity in Tsumeb mine, January, 1924. Director F. W. Kegel (left) and Mine Foreman W. Klein (right). (O.M.E.G. collection of photographs)

year. It was named Friedrich Wilhelm Shaft in honour of the Mine Manager, Mr. F. W. Kegel. The capacity was calculated to be 200,000 tons per annum, hoisting ore from a depth of 520 metres. Because development on 9 and 10 Levels had shown a constriction of the ore-body it became imperative to establish its behaviour deeper down. A winze was therefore sunk on the north (footwall) side from 8 Level to 12 Level, while another from 12 Level to 16 Level was completed in 1926. At the same time No. 1 Shaft was also deepened to 16 Level and development in the ore-body completed on 11 and 12 Levels. The need for more power was met by installing two 420 h.p. Wolf-Locomobiles, a new boiler with water-softener, compressor, cooling tower and ash-treatment unit; in 1925 the power station output was raised by a further 600 h.p. Mining in 1927 and 1928 proceeded mainly between 13 Level and 16 Level and the following year the winze (now called No. 4 Shaft) from 16 Level to 20 Level was started in order to augment the ore reserves to match climbing production. The peak was reached in 1930 with an output of 236,000 short tons ore and adequate reserves established on 17, 18 and 19 Levels. But the price of copper had already dropped to £53 in 1930, and lead to £16, so that no dividend could be paid in that year.

In 1931 the world depression strangled the industry. Mining was confined to the upper levels to cut pumping costs and operations showed a nett loss of £94,434. The position grew steadily worse so that the mine had to cease operations on 1st August, 1932, the personnel attending only to general maintenance and overhauling of all the machinery. At this time Direktor F. W. Kegel returned to Germany and the management of the mine was provisionally entrusted to Dr. C. Hensen, until then Smelter Engineer. Rock bottom was reached in 1934 when the price of copper sank to £19½ per ton and lead £6½! After the world copper producers had agreed to cut production, a gradual improvement came about and in 1937, with the price of the metal ranging from £44 to £70, the Tsumeb mine was dewatered and produced 46,500 tons of ore. Normal tempo was regained in 1938 and extensive development carried out on 20 Level, including the cutting of a haulage drift to No. 1 Shaft position which was to be reached in September, 1939. Deepening of the shaft from 16 Level was resumed as from January, 1939. A footwall winze to 24 Level was begun in the same year, but had reached only 22 Level when all mining had to be abandoned on 25th September, 1940, a year after the outbreak of World War II. The assets of O.M.E.G. passed into the hands of the Custodian of Enemy Property and substantial shipments of high-grade ore from surface dumps were made by authority of the Government of the Union of South Africa in the early years of the war. Complete dormancy then set in, lasting until 1946.

Under O.M.E.G. control the Tsumeb mine produced 2,550,000 short tons of ore containing 210,400 tons copper, 451,230 tons lead and 215,470 tons zinc metal. Of this 1,023,000 tons constituted high-grade sorted ore for direct export, the remainder going through the concentrator and smelter to yield 140,300 tons copper-lead matte and 48,500 tons lead bullion. The total of the sales of export ore, copper matte and lead bullion as reflected in the annual reports was 226,347,225 Marks, or roughly £12,000,000.

Ore Concentration and Smelting.

From the beginning of O.M.E.G. mining activity it was realized that a substantial part of the ore was not of sufficiently high grade to render direct export profitable. Early in 1907 a smelter plant was therefore erected, consisting of two lead-copper blast furnaces (with iron water-jackets) that started operating in September, 1907. At the time there was no beneficiation of the ore other than by hand-sorting, but a mechanical concentrating plant was set up in 1908 to improve ore separation. Continued test work in Germany proved that the comparatively low-grade "aplitic ore" thus far left in the mine could be successfully crushed and concentrated by wet-mechanical procedure. A new dressing, separation and sorting plant was therefore built in the period 1913—1914, beginning its trial runs in October, 1915, after the cessation of hostilities in South West Africa. Full service was not achieved until 1921 when the plant treated 55,500 tons of ore to give 33,600 tons of concentrates suitable for smelting. The results were not too successful and operation was suspended in later years. About 1937 the Krupp organization sent out their engineer, Dr. Schranz, to design a suitable mill and flotation plant for more efficient separation and concentration of the ore constituents. His recommendations were forestalled by the outbreak of hostilities.

Before the smelter could be started up a request for 100 tons of slag and 7 tons of lead was submitted to head-office in Berlin; the prompt reply (10th April, 1907) came suggesting that slag could be obtained from the Ovambo smelters and the necessary lead be made in a local furnace! In November, 1907,

the smelter was reported to be working well, using at first iron ore flux imported from Germany and thereafter ore from Messrs. Kreft, Sabatta and Wolf of the farm Okawakuatjivi; they were owners of a mining area covering the iron deposit now known as Kalkfeld. Mining rights on this ground were granted to O.M.E.G. in 1908 and reconfirmed in 1921. Pyrite concentrates used as sulphur flux were obtained from Norway. Further correspondence reveals that the smelting operations presented many problems that caused numerous shutdowns.

At first high-priced Westphalian coke was used in charging the furnaces. Then charcoal was made from hardwood obtained from the neighbourhood of Tsumeb. Finally, during and since World War I, coke was obtained from Natal.

By 1909 the plant, after varied trials and tribulations, operated at a slight profit. The roasting section was enlarged in 1910 by the addition of two settling ovens and ten launders. From 14th July, 1914, until some time in 1921, the smelter was out of commission. After restarting it functioned so well that a third furnace was added in 1923 and an old one enlarged in 1924. A Cotrell precipitator was installed in 1925 which made possible the recovery of cadmium plus approximately 1,000 tons of lead per annum from the flue gas. In 1928 the third furnace was also replaced by one with bigger diameter, and a small round furnace as well as liquation unit with oil firing was built to smelt all the lead-bearing waste. A rotary furnace was added in 1930 to roast the cadmium-bearing flue-dust.

The furnace products, together with the slag, flowed into the clay forehearth, where copper black and lead settled while the slag was tapped off. As soon as the forehearth was full the copper black was removed. The raw lead gathered in a jar from which it was taken with a ladle and poured into moulds of 50 kilogram capacity. The copper black was run on to steel plates and broken up, ready for export. Peak operation was attained in 1928 when the smelter produced 14,727 tons of copper black and 5,004 tons of lead. With the onset of the world depression smelter operations were first restricted to treatment of lead residues and cadmium dust, and finally ceased in 1933. The plant was recommissioned in June, 1937, but once again brought to a stop in 1940.

Railway and Communications.

In July, 1907, construction started on the branch line from Otavi to Grootfontein, and on 3rd March, 1908, this 90-kilometre stretch was put officially into operation. The South West Africa Company was responsible for the building of this line, but signed an agreement with the O.M.E.G. on 7th January, 1909, that the latter would lease and run it. From Otjiwarongo a branch line to Outjo was completed in 1914, this being the start of the Amboland railway. It had been the intention of the Reichstag to build this line over 265 kilometres as far as Okahakana at a cost of £650,000, but the outbreak of hostilities brought this venture to a halt. An equally ambitious plan was receiving serious consideration, viz. to build a branch line from Richthofen station (25 kilometres from Swakopmund) to Goanikontes in the Swakop River, thence to Haigamchab and finally to the Ida copper mine, a total distance of 35 kilometres. This (fortunately) remained a pipe-dream. In the south the government railway from Seeheim to Kalkfontein (Karasburg) was completed in July, 1909.

PHOTO 12: Conveyance used by mine officials from Tsumeb on pay day to visit Otavi Valley mines and O.M.E.G. farms in early twenties. (O.M.E.G. collection of photographs)

The O.M.E.G. in 1907 ran three mixed trains per week from Swakopmund to Tsumeb and back, besides many goods trains according to the daily needs. The first full fiscal year of operation turned out a net profit of 2,077,170.5 Marks. As a result all tariffs were lowered by roughly 25 per cent. as from 1st November, 1908. The railway town of Usakos expanded rapidly. Two large dormitories were built in 1907, along with two bakeries, a fruit-wine cellar and soda-water factory. The Rhenish Mission erected a house and school, and also started a garden in the bed of the Khan River. In 1908 shower baths (!) were installed near the station for personnel and passengers; travelling comfort was furthermore ensured by the acquisition of a dining saloon and 42-seat passenger coaches. In this year 3,139 trains covered a distance of 566,605 kilometres, carrying 19,706 passengers and 62,019 tons freight. Clear profit for the year was 2,337,335.53 Marks, as against the profit of the Tsumeb mine at 1,824,693.93 Marks! The long-distance haulage tariff was therefore again reduced, this time from 0.12 to 0.07 Mark per ton-kilometre.

Negotiations began with the Colonial Department to take over the railway at a price of 22,000,000 Marks for operation by the government. The deal was concluded on 1st April, 1910, the line then being leased by O.M.E.G. *in toto* for ten years at 5.51% of the purchase price, with the option to renew the lease

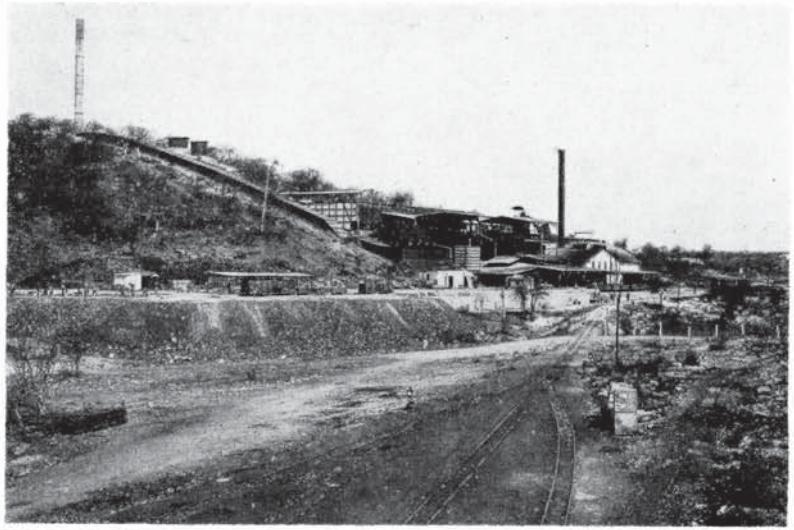


PHOTO 13: O.M.E.G. smelter circa 1910. (Collection: W. Schatz)

for a further twenty years. One of the conditions of the agreement was that the State railway from Swakopmund to Karibib would cease to operate. Through this deal the O.M.E.G. was able to repay 80 Marks per share (i.e. 80 per cent of the basic capital) to its shareholders. At Usakos a new workshop was erected, a hospital built for the natives, also a school for white children and a club with library and skittle alley provided. The O.M.E.G. benefited from freight delivered for the construction of the standard-gauge (three-foot six inches) State railway from Karibib via Windhoek to Kub, which was completed in 1911. An essential improvement resulted from the cutting away of some 50,000 tons of rock to ease the grade of the line through the Bobos Mountains near Tsumeb. In 1912 heavier locomotives were introduced that proved highly successful. Trans-shipping was done at Karibib, at that time the terminus of the standard-gauge State line.

During World War I the narrow-gauge railway was run by the occupation forces after the capitulation at Khorab. A standard-gauge line was also built to connect Walvis Bay with Swakopmund, and thence to Karibib, in effect replacing the narrow-gauge State railway. When the mining rights of O.M.E.G. were reinstated in 1920 the government retained full control of the Otavi railway.

Mention must also be made of the fact that postal and telegraphic communication was at first the responsibility of the O.M.E.G. On 28th November, 1906, a postal agency with telephone line was opened at Tsumeb. Four years later a morse-telegraph line was laid alongside the telephone line so that telegrams could be sent directly to Windhoek or Swakopmund. At the outbreak of World War I it was feared that the radio signalling station in Swakopmund

PHOTO 14: Official visit by Gen. J. C. Smuts (front row left) to Tsumeb after World War I. (Collection: W. Schatz)

might be destroyed by attack from the sea. Because of its adequate electric power supply Tsumeb was chosen for erecting an alternative radio station in November—December, 1914, the main steel tower near the present Police Office reaching to a height of 85 metres (280 feet). A subsidiary tower was built alongside the Jordan bridge north of the present Tsumeb Corporation Head-office. The antenna from the Police Station to the smelter stack had a total length of 1300 metres. The German forces, however, capitulated before the installation could be brought into use. The story is told that a German flag was flying at the top of the high tower one fine day after the armistice had been signed at Khorab. A troop of S.A. Riflemen tried in vain to shoot down the offending emblem and finally rewarded a Coloured boy with five pounds for removing the flag. Lo and behold, the next morning at the same elevation an article of white laundry was fluttering gaily in the breeze!

The Tsumeb Way of Life.

During the first years of organized mining at Tsumeb living conditions were primitive and amenities at a minimum. Visitors and immigrants were, however, impressed by the attractive tree-covered ranges and valleys. Thus Director A. Gaedertz wrote in 1907: "Das Land ist im mittleren Teile, vor allem aber im Norden ganz wunderbar schön. Die Zufahrt nach Tsumeb und die dortige Umgebung erinnert auffallend an die schönsten Teile Thüringens. In den Otavibergen, die ich auf fast unbekannten Pfaden nach den verschiedensten Richtungen durchfahren und durchschritten habe, kommen Erinnerungen an den Schwarzwald herauf. Schließlich rufen die herrlichen Sonnenuntergänge und das unsagbar schöne Glühen auf den Felsenschroffen Bilder aus den Alpen und Tirol wach". Those who stayed held other views. Eighteen months after development had begun in the mine the General Manager, Mr. Gathmann still resided in Otavi and commuted to Tsumeb by rail to inspect progress from time to time. It was only after a strongly worded letter from the Berlin head-office in March, 1907, that he condescended a few months later to move to Tsumeb where a house was still being built for him. Other items under construction at that time were the assay laboratory, three water reservoirs, two hospitals for whites and non-whites, a doctor's house, corrugated iron dormitories, two messrooms and twelve houses for staff. In 1909 many of the personnel were still housed in little 2 x 3 metre timber shacks called "Koppel-Bude" which were inherited from the railway construction crews employed by the firm Arthur Koppel. The corrugated iron dormitories accommodated ten people each, of various cultures and nationalities, some of whom were manifestly less concerned with hygiene than others. Beds procurable at a price of 20 Marks each had plank board for a mattress. In the heat of summer it was impossible to keep out vermin and one can imagine how many hours of sleep were lost on midnight hunting amid snoring and cursing of nine others. In addition malaria was prevalent during the rainy season, partly because many native labourers refused to take quinine as a prophylactic. An epidemic of influenza in 1907 temporarily reduced the labour complement to 100 whites and 393 natives.

In those early years canned goods and beer were imported from Germany, butter from Australia, and potatoes from Las Palmas. Yet one could have all meals at the hotel for as little as 120 Marks per month.

Labour presented a problem for many years. Mr. Gathmann in 1907 expressed the hope that more Herero could be employed as they understood German and were more intelligent than natives of other tribes. The Ovambo, moreover, returned to their homeland every year to plough and harvest. Mr. Gathmann resigned at the end of 1908 and was succeeded by Dr. Heimann. After the discovery of diamonds in the Lüderitz area large numbers of natives quit work as they could earn better wages in the south, and in 1909 it became necessary to recruit 250 Cape Coloured boys on one-year contract. When these returned to the Cape Colony in 1910 consideration was given to importing Chinese labour from Schantung, but the Administration refused permission. The complement of German miners was therefore increased, bringing the total permanent European personnel to 120. As the Herero and Ovambo were found generally unwilling to work underground the labour supply remained tight and negotiations were started in 1911 with the government of India to import Coolies, a scheme that had been approved by the local government. Meanwhile the attractive conditions of work, good food and hospital facilities brought about a steady increase in Ovambo contract labour, and it was hoped that the projected Amboland railroad would further improve the position. The interruption of World War I postponed the problem for six years. In a report of the O.M.E.G. directorate it is stated that even during the period of active hostilities the non-white employees of all tribes working on the narrow-gauge railway had shown responsibility in their jobs and appreciation for the fair treatment received under O.M.E.G.

At the end of the war the personnel at the mine had shrunk to 328 all told, made up as follows: the mine foreman, 4 shiftbosses, 35 miners, 2 office clerks, 21 fitters, onsetters, smiths, carpenters, and 265 natives. These were severely decimated during the influenza epidemic in November, 1918, when 5 Europeans and 120 natives died, causing mining operations to be suspended for one month. But all was not heavy going while the O.M.E.G. was marking time after the capitulation at Khorab. In September, 1917, the mine foreman, W. Klein, reported: "auf dem Platze vor der Minen-Schlosserei (wurde gestern) von einer sich in Reparatur befindlichen Schiebkarre das Untergestell mit Rad gestohlen oder aus Schikane versteckt. Ebenfalls wurden die Schrauben einer dort stehenden Wettertür faustdick mit Stauffenfett beschmiert." (In the yard adjoining the fitters' workshop the undercarriage and wheel of a wheelbarrow under repair were stolen yesterday or hidden for sheer foolery. Also, the bolts of a ventilation door that was standing there were found smeared with grease several inches thick.)

When mining resumed in 1921 the skeleton personnel was soon augmented to meet requirements. There were 82 Europeans and 1,283 non-whites in April, 1922, increasing to 300 and 2,400 respectively within the next two years. The new General Manager was Mr. F. W. Kegel. A large hospital for the natives was built in 1925, followed by a modern compound the following year. During the depression (1932—1936) when the mine and smelter ceased to operate, personnel shrunk once again to a bare minimum. After resumption of activities the non-white labour force grew to 3,000 and the white to 300. These severe fluctuations handicapped the growth and improvement of Tsumeb town. One of the most important achievements during these years was the erection of the 700 sq.metre gymnastic hall (Turnhalle) under private initiative; the steel

frames were manufactured in Berlin, assembled in Tsumeb and the walls then bricked up by the 181 members of the Turnverein. In 1931 the seventh "Gauturnfest" was held at Tsumeb when athletes from the whole territory staged a grand meeting over the Easter weekend.

The humdrum daily toil at the mine and smelter provided a fertile environment for doing things out of the ordinary. An orchestra was founded about 1910, with Karl Simon, a tinsmith, as leader and first trumpeter. On Sunday mornings this player would climb up the slope of Hüttenberg, overlooking Tsumeb, and pour out choral melodies played to perfection. The violinist and pianist was August Hirsch, a fitter. When the great Landesausstellung was held in Windhoek in 1914 the Tsumeb band was officially requested to perform at the celebrations and also assist the military band. Like most great artists some of the members of the Tsumeb orchestra were highly strung. During a practice in one of the rooms at the Minen Hotel the tuba-player lost his temper when the B-trumpeter repeatedly sqeaked out the wrong notes; with one great swing he sank the tuba deep over his colleague's head. The manoevre was so well executed that the instrument could not be lifted without breaking the trumpeter's nose, and a tinsmith had to be called to cut open the giant brass horn. It is said that all damages were squared off the same evening by lavish rounds of beer. The less musically gifted employees spent much of their free time in the bowling alley — a long corrugated iron building at the back of the Minen Hotel.

What happened on Sundays? In the early years of mining hunting was extremely popular during the cooler months, as game, especially eland and kudu, abounded in the bush round the growing town. When it became hot, however, the riflemen conserved their energy by practising on the Schützenplatz (shooting range) located on open ground at the edge of town just north of the present Afrikaans Primary School. Some of the residents passed the time collecting botanical specimen or curious insects. Horse riding always was a favourite sport and over the weekends people often rode out to the neighbouring farms. Many Sundays permission was granted to use a locomotive and several flatcars for a picnic ride to the "Holzschlag" northeast of Tsumeb where timber was being cut to supply fuel for the power station and hardwood props for the mine. Sometimes the party included the brass band, well supplied with appropriate refreshments. One can imagine the upset caused among the peaceful eland and kudu in the African bush when the band suddenly burst forth with Prussian fervor. In later years recreation was also provided by a football field and tennis courts located near the Turnhalle (now No. 3 Store of the Tsumeb Corporation), while swimming was permitted in the settling ponds alongside the concentrator. A third tennis court was subsequently built next to the office of the Native Commissioner, that later became the Post Office block.

The vile-tasting water from the Tsumeb mine was considered by many to be poisonous (lead salts, bacteria), and when the supply from Otjikoto was cut off about 1910 because the mine was pumping enough, there was genuine interest on the part of the public to find something better than mine water for human consumption. It was a joyful day when one of the explorers discovered a spring at Klipfontein, about nine miles outside town close to the road to Otjikoto. On Sundays the population would go out by horse or cart to collect casks-

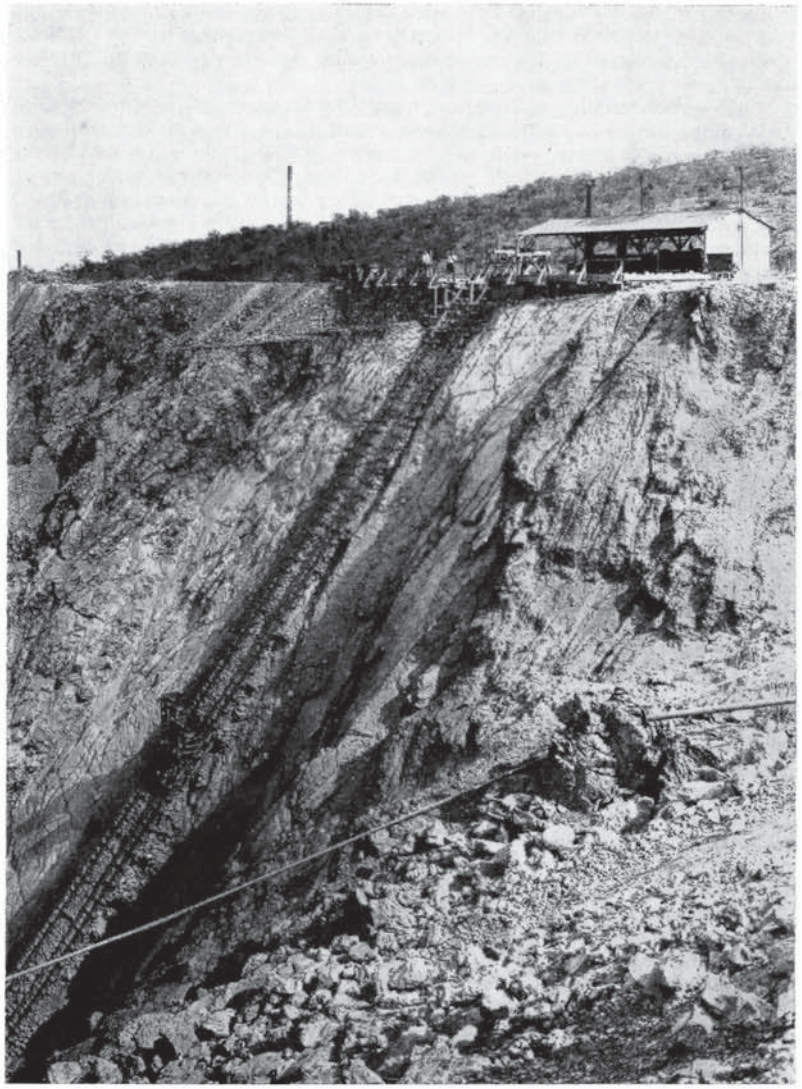


PHOTO 15: Inclined haulage on north bank of opencast, popularly named "Die Himmelsleiter" (Jacob's ladder). (Collection: W. Schatz)

full of health-giving clear water and incidentally also cool a quota of health-giving bottled beer. Unfortunately the O.M.E.G. felt obliged to investigate and their engineer reported that the spring originated from a leak in the Otjikoto-pipeline which was then leading excess Tsumeb mine water back to Otjikoto lake.

Once every month the Director inspected the mines in the Otavi Valley, accompanied by the pay-office clerk and a load of items requested for the distant personnel. The cart was drawn by a team of four lively mules held barely in check by several able-bodied servants until the Director was safely seated. In a cloud of dust the party would depart at six in the morning, stop at Nosib farm for a change of mules, and reach Asis via the Ghaub-Tigerschlucht road by eleven. After lunch another mule-cart would take them to Gross Otavi and return by nightfall. Starting again at six the next morning, a second side trip was made to the Guchab mine, nine miles to the east, to be back just in time for lunch at Asis. The afternoon was spent examining the Asis mine as well as the cattle on the farm. On the third day the expedition was headed again for Tsumeb, with a longer stop at Nosib to assess farming progress on this ranch. On their return to head-office in Tsumeb the Direktor would ask the paymaster whether there had been any complaints, and he would faithfully reply that the monies were received by every employee with enthusiastic gratitude. This contrasted somewhat with the more familiar version of the word O.M.E.G.: Oh, Mein Elendes Gehalt! (Oh, my miserable wages!) Though the old Asis mine proved unprofitable, the Direktor without doubt enjoyed the monthly outings. By 1925 Direktor F. Kegel no longer did the journey by mule-cart, but travelled in a comfortable Buick touring car.

At the outbreak of the First World War there were reportedly only three Mercedes automobiles in South West Africa, owned respectively by the Governor, the Polizei and the firm Woermann Brock. These were confiscated by the Union troops after the armistice of Khorab, and one was subsequently sold to the O.M.E.G. More automobiles came into the Territory after 1920, Tsumeb in due course boasting four of the speed monsters, the new ones owned by the more opulent storekeepers. One Sunday three of them undertook a race to Otjikoto. The roar of the first one faded out near the railway station when he skidded into the Jordan River. The second left the road a mile beyond the station, landing in the limestone quarry, and the victorious third, driven by the smelter engineer Dr. Miksch, gave up at Klipfontein six miles out, though managing to puff its way back to Tsumeb without help. For many years afterward the engine of the O.M.E.G. Mercedes ran a pump delivering water from the Guinas sinkhole for farming purposes.

Tsumeb became a very quiet place during the Second World War. From May, 1940, many white employees were taken away to internment camps in the Republic of South Africa, leaving at the end of the year only 116 men, 153 women and 159 children. Life became dull when all radio sets and photographic apparatus had to be handed over to the Police in 1941. With the mine out of action it became necessary to charge house rent and levies for water, lights and sanitation. Severe restriction of movement was imposed shortly after the arrival of Captain Kimbers with a detachment of soldiers in November, 1941. Barricades were set up across the street at the railway station and police headquarters, while livestock was no longer permitted to graze in town. This Siegfried line was nevertheless ignored by a wild lion that ambled through Tsumeb on the night of 25th October, 1943; three years before an elephant was found in broad daylight drinking water at a trough just below the railway station!

Medical services were greatly curtailed when mining came to a standstill. The hospital became the private practice of Dr. Jansens in October, 1940, and was taken over by Dr. Fourie, a military medical officer, a year later. In February, 1944, not even a medical orderly was left, and Tsumeb became dependent on Grootfontein for treatment of serious illness. There were many deaths resulting from malaria and pneumonia, while meningitis claimed a heavy toll among the natives.

The military occupation of Tsumeb ended in February, 1944.

Town, School and Sundry.

In January, 1909, the German Colonial Office in Berlin passed the "Selbstverwaltungs-Verordnung" for South West Africa, in terms of which the Governor was empowered to institute local bodies (Gemeindeverbände) for the administration of local affairs. Windhoek gave instructions to the Distriktschef of Grootfontein in 1910 to have the town of Tsumeb surveyed; this was carried out by the land surveyor Beykirch in September of the same year.

Two months later the Distriktschef reported that the residents of Tsumeb were completely disinterested in having a local „Gemeindeverband" as they felt obliged to do as instructed by the Management of the O.M.E.G. — ore else face discharge from their work or transfer to Guchab or Asis! They also submitted that sanitation, lighting and street maintenance were being attended to by the Company to reasonable satisfaction and any levies raised would only flow back into the O.M.E.G. money-box without necessarily bringing about further improvements. The Governor consequently decided to postpone the institution of local administration for an indefinite period, and no further steps were taken until after the Second World War.

The first school lessons were given in 1912 by the missionary, Ferdinand Lang, in the large bowling alley shed at the back of the Minen Hotel. When his pastoral duties no longer permitted teaching, the classes were continued by a Mrs. Brettschneider. In these years too, Dr. H. Vedder, who was then Rhenish missionary at Ghaub, was fetched by mule-cart on Fridays to give lectures in the corrugated iron shed — this being called the "University of Tsumeb".

In November, 1913, the School Inspector, Mr. B. Voigt, recommended the erection of suitable premises as there already were 18 children and it was expected that this number would soon increase to 50 when the families of the miners would arrive in due course. The O.M.E.G. was prepared to give a building site plus a cash donation of 3,000 Marks. In June, 1914, the Distriktschef of Grootfontein was informed that provision had been made in the 1915 budget for a contribution of 15,000 Marks from the Government. The new school, located just west of the Lutheran Church, was no sooner erected than it had to be vacated to serve as an additional hospital for the German troops, and school classes had to be given once again in the bowling alley building. The teacher in 1915 was a Mr. Mahle, formerly an Inspector of the German Police. As from

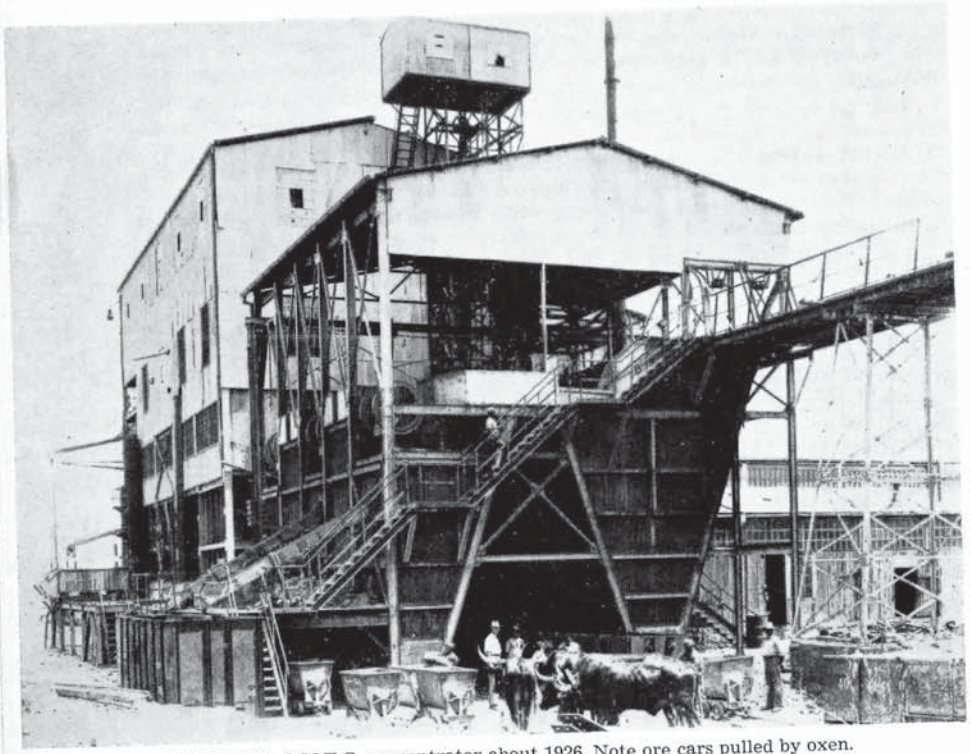


PHOTO 16: O.M.E.G. concentrator about 1926. Note ore cars pulled by oxen.
(O.M.E.G. collection of photographs)

1920, however, the children were back in their proper quarters and a local Schulverein was appointed to look after the affairs of the school. All O.M.E.G. employees were obliged to contribute 3 Marks per month to finance the education of the children.

When the mine was forced to curtail production and reduce wages in 1931, the parents were no longer able to finance their private school. At a meeting of the Schulverein it was resolved to approach the Director of Education for help, and in August it was agreed that the Department would take over the building and equipment to found a German-medium public school, retaining the principal and four assistant teachers. This arrangement came into force as from the fourth term in 1931, and continued until the end of the Second World War.

The religious needs of the community were met soon after the mine came into full operation in 1907. The Rhenish Mission founded stations for serving mainly the non-whites in Tsumeb and Usakos, while the Roman Catholic Church

at Tsumeb was erected simultaneously for the Europeans. It was nearly twenty years later before the Lutheran Church was built, the consecration taking place in June, 1926.

In 1915 many families from the south had fled northward before the advancing Union troops, seeking domicile in Tsumeb. This dilemma fortunately was cut short, as the troops occupied Tsumeb on 6th July, 1915, and the railway was taken over by them three weeks later. The German Schutztruppe had dumped most of their rifles and cannon into the Otjikoto Lake to prevent their falling into the hands of the enemy. For a few years the O.M.E.G. was crippled through the confiscation and removal of much equipment, spare parts and building materials from the mine.

As early as 1905 the O.M.E.G. started with cattle ranching and agricultural development while the Tsumeb mine was still being prepared for production. When construction of the narrow-gauge railway came within reach of Tsumeb draught animals were in peak demand to haul all sorts of equipment by cart and wagon from nearest railhead to the mine. On 31st March, 1906, the O.M.E.G. owned 254 trek-oxen, 115 cows and 6 horses, as against 125, 0 and 1, respectively, in 1905. Ploughfields were laid out at Otavifontein to raise wheat and maize, and the value of livestock two years later was estimated at about 200,000 Marks. By 1914 the O.M.E.G. was able to market 383 head of cattle and 376 small stock after providing for town, location and compound requirements. Additional farms were developed and fenced round the Tsumeb and Asis mines (including Gross Otavi), and also on Nosib, Ombanje-Danevis, and Klein Otavi; each of these was under direct supervision of a farm manager. The Tsumeb farmlands supplied all the hardwood poles and firewood for mine and town, the timber being transported by railway from as far as fifteen miles east of Tsumeb. Wells and boreholes were sunk to multiply the number of cattle posts in good grazing areas away from natural springs and seepages. According to the Annual Report of 1939 the farmland owned by the O.M.E.G. totaled 235,000 hectares, the farm buildings were valued at £8,600 and livestock at about £4,500. Excess slaughter oxen and even karakul sheep sent to the Cape meat market brought in substantial profit. Grain crops were utilised mainly to sustain native farm labour and cattle herds.

Prospecting under O.M.E.G. Auspices.

While attention was at first focused mainly on the development of the Tsumeb mine it had all along been the intention also to resume exploration on the mines in the Otavi Valley, especially following the completion of the Otavi-Grootfontein railroad. The Guchab copper mine was reopened in 1907 and consideration was given to using its leaner iron-bearing copper ore as flux in the proposed smelter at Tsumeb. The following year exploration started at the Asis (Klein Otavi) mine and in 1909 investigations were also carried out at the Gross Otavi mine. The latter was considered the least attractive, as in 1904 already the geologist J. Kuntz noted that the Bushmen and Bergdama preferred this deposit only because the ore veins and clusters were easily reached and yielded abundant relatively pure malachite; for their modest needs this was more important than a large reserve of partly sulphidic ore.

In order to enable the O.M.E.G. management to devote the whole of its resources to the opening up of the known mines, a subsidiary company was

formed in 1909 under the title of Otavi Exploring Syndicate, Limited, registered in London with a capital of £63,000, to prospect the 1,000 square mile concession exclusive of the mines at Tsumeb, Guchab, Asis and Gross Otavi. The O.M.E.G. contributed 11 per cent. of the capital and apart from this participation would be entitled to 35 per cent. of eventual profits. The Syndicate undertook to expend at least £5,000 yearly over the next ten years. By arrangement with the firm Wernher, Beit & Co., the services of the mining engineer W. M. Chandler were secured to conduct the prospecting campaign, while Mr. T. Toennesen was appointed General Representative, with offices in Grootfontein. In 1911 the Syndicate opened up the high-grade copper and lead ore veins at Asis Ost in the Otavi Valley. Attention was also given to the tin-bearing areas of the Karibib and Omaruru Districts.

The vanadium mineral, mottramite, was first recognized in Tsumeb ore by W. Maucher (1908), and its value as an economic ore at that time appears from the fact that 158 tons of sorted concentrates containing 12—15 per cent. vanadium pentoxide were produced from the Tsumeb mine in 1909 and 1910 (W. Koert, 1913). The ore was taken mainly from the hanging wall of the East ore-body between 2 and 3 levels. The first discovery of vanadium ore away from Tsumeb mine was made in 1912 by the experienced prospector J. Sinclair, working for the S.W.A. Company on the farm Rietfontein, eighteen miles west of Grootfontein. In the same year a bigger deposit was found by R. Scheibe at Tsumeb West, from which 200 tons of concentrates were soon recovered containing 10 per cent. vanadium pentoxide; the following year more than double this amount was produced.

In 1913 the Otavi Exploring Syndicate abandoned operations on the tin properties of the Erongo area and concentrated on developing the Asis Ost copper mine. The new shaft was sunk to a depth of 60 metres and some 600 tons of high-grade ore were extracted. Exploration in the neighbourhood of Gross Otavi (Kupferberg?) produced 320 tons of rich copper ore. In 1914 the Syndicate also opened up promising exposures of copper ore at Bobos, ten miles west of Tsumeb, where a shaft sunk 17 metres deep under supervision of A. Zboril, mining engineer, produced 127 tons of hand-sorted ore. The work at Bobos and Kupferberg continued through the war years and shipments of copper ore concentrates to England totaled about 1,000 tons. At this time too Zboril opened up the vanadium prospects on Nageib Mountain north of the Otavi Valley. The Syndicate discovered the Nosib vanadium occurrence in 1915 and exported limited quantities of concentrates for the next four years. In January, 1919, an important discovery of mottramite ore was made at Karavatu, near Bobos, from which some 360 tons of vanadium concentrates were shipped to England. This mine had started as a small copper prospect in October, 1918, when lumps of oxidic copper ore were won from sand-filled hollows in the dolomite formations. The new mine brought about the cessation of work at Bobos and Nosib by 1920. Another large deposit of vanadium ore (mainly eluvial) was found at Uris late in 1920, following an intensive search by test-pitting in the surrounding area. These two vanadium producers were in operation over the periods 1919—1924, 1931—1932, and 1938—1943, the total output amounting to 5,234 tons of concentrates averaging 11.87 per cent. vanadium pentoxide.

The Administrator of South West Africa had in the meantime approved renewal of the exclusive prospecting rights by issuing the "Otavi Minen und

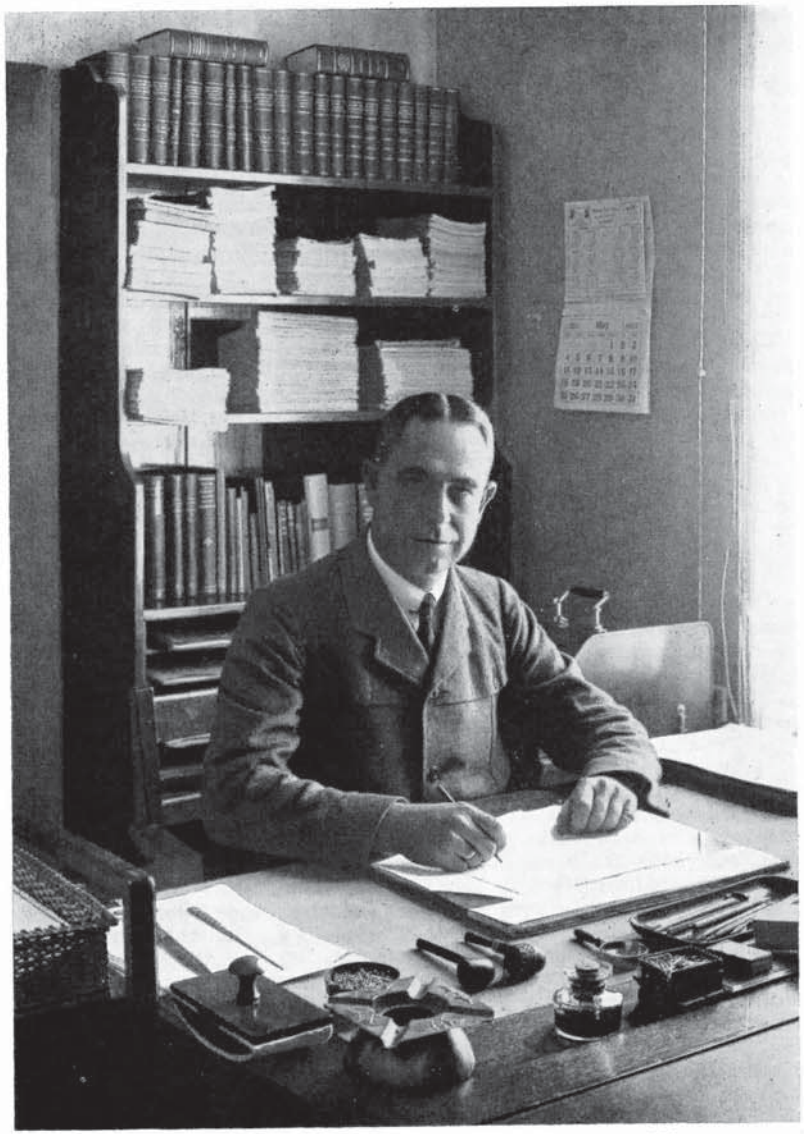


PHOTO 17: Herr F. W. Kegel, General Manager of the O.M.E.G. 1922—1938.

Eisenbahn Temporary Mining Reserve Proclamation, 1920", which was again extended several times until it finally expired in November, 1934. The discovery of the Abenab vanadium deposit in 1920 and its rapid development since September, 1921 stimulated ore search particularly outside the 1,000 square mile concession, so that interest in the numerous prospects and mines of the Otavi Exploring Syndicate gradually faded and in June, 1930, the South West Africa Company withdrew, the O.M.E.G. acquiring the entire S.W.A. Co. holding (subject to certain reserved areas) at the price of transferring to the S.W.A. Company the Syndicate's undelivered stocks of concentrate in France. It was then arranged that the geologist, Dr. H. G. Poock, and the mining engineers, W. Klein and F. Heberling thoroughly re-examine the more promising mineral finds within the 1,000 square mile area, which they did between 1930 and 1932.

Meanwhile ore search and small scale production by the O.M.E.G. had continued at its prospective mines in the vicinity of Tsumeb and in the Otavi Valley. The original mining concession protecting the Tsumeb mine covered a circular area of 43,272 hectares and thus included all mineral prospects within a radius of about 7.5 kilometres from the town. In the period 1910—1914 numerous test pits and trenches were made on all visible ore leads in this area. At Tsumeb West a shaft was sunk to a depth of about 50 metres on a copper showing that bore some slight resemblance to that of the Tsumeb mine. The results were disappointing and operations stopped when about 750 tons of ore grading 9.6 per cent. copper had been won. In 1920 a fire broke out in the shaft, which eventually collapsed, and no underground work was done since.

Geological and mineralogical research on the Tsumeb ore-body made great advance during the O.M.E.G. regime. J. Kuntz appears to have been the first professional geologist to have visited Tsumeb. He spent a few days at the mine and published a short description of the ore occurrence in 1904. W. Maucher of Freiberg gave an early description of the great variety of ore minerals in 1908, based on samples selected from the high-grade ores exported to Germany for smelting. Microscopic thin-section studies on the ores were first reported by P. Krusch (1911), and additional data on mine geological aspects, observed in 1910—1911, were presented by E. Rimann in 1914. When W. Thometzek took over from Dr. Heimann as Mine Manager in 1913 it was decided that the Tsumeb ore-body should be more thoroughly studied by a qualified geologist. The O.M.E.G. appointed H. Schneiderhöhn in 1914 to make a detailed investigation of the now famous oxidic ore minerals of the Tsumeb mine. He was also required to study the geological features and extend his research to all mineral prospects in the Otavi Mountain Land. He received full support from the management who issued instructions (from Berlin) that employees were forbidden to collect mineral samples for themselves. There was a short interruption in these studies at the start of World War I, but in August, 1915, Schneiderhöhn was commissioned to resume work, and returned to Germany only in 1919. By adapting and modifying a biological and a petrographical microscope he fashioned an experimental reflecting ore microscope and developed the technique of opaque mineral identification for which he soon after became world famous. His views on the origin of certain rock formations and their sequence were challenged by A. Stahl who was engaged mainly as field geologist during the period 1922—1926. Both investigators shared their data and ideas with geologists at large in numerous publications, thereby reaping fame for Tsumeb. The discovery of germanite — until then totally unknown — was made in 1922 when O. Pufahl by chemical analysis established the presence of germanium in a reddish sulphidic mineral first spotted, but not successfully identified by Schneiderhöhn in 1915. A comprehensive doctorate study on the sulphidic ores and their trace elements was carried out in Germany by H. Moritz (1933).

After the First World War vanadium ore mining at Tsumeb West and Tsumeb South (Hufeisenberg) was resumed. A railway was built from the Tsumeb concentrator to the Hufeisenberg and the records show a total production over the period 1920—1929 of 3,900 tons of concentrates containing 8 per cent. vanadium pentoxide. In 1938 further mining added 150 tons of concentrates. About 1923 the prospector L. de Fries reported to the S.W.A. Company a discovery of vanadate ore about 7 kilometres due south of Tsumeb. When checked by the land surveyor W. Volkmann it was found to be located within the circular area of the O.M.E.G. mining grant, and so the prospect, now named Friesenberg after its discoverer, was devolped by the latter company who extended the narrow-gauge line from Tsumeb West to reach the new mine. The Friesenberg mine operated from 1924 until 1928, shipping 10,116 tons of vanadium ore with 2.6 per cent. vanadium pentoxide to Tsumeb for beneficiation.

At Gross Otavi the copper ore in the karst holes had been largely mined out by 1914, O.M.E.G. production amounting to 193 tons @ 36.5 per cent. copper plus 1,238 tons @ 12.9 per cent. copper. An adit was driven into the south facing cliff of the dolomite terrace to explore another surface showing. During the period 1921—1930 further operations yielded 378 tons of 37 per cent. copper concentrates, 190 tons of 12 per cent. copper ore, and 22 tons of vanadium ore. In 1939—41 the mine produced 74 tons of vanadium concentrates containing 17 per cent. vanadium pentoxide. These comparatively insignificant tonnages reflect the irony of fate: the copper deposit regarded as the best in the days of primitive miners, the one from which the Otavi Minen- und Eisenbahn-Gesellschaft took its name, failed completely as an underground mining proposition in the first half of the twentieth century.

At Asis (now Kombat) the efforts to establish a mine were a little more successful, although a summing up of the production from 1908 to 1925 indicates that the venture probably never showed a net profit. Small scale exploration continued through the war years. From somewhat incomplete records the mine is estimated to have yielded 1,122 tons of 38 per cent. copper concentrate plus 11,592 tons of smelting ore grading 11.4 per cent. copper. The O.M.E.G. initially found four shafts at Asis that had apparently been sunk by M. Rogers and C. James before 1901, reaching a depth of only 8 metres. Subsequently a new shaft (now called IA) was sunk to a depth of 120 metres (i.e. to 4 Level) and ore was mined from a zone of steep copper-bearing veins down to 3 Level. During the strike of the Tsumeb miners in August, 1925, personnel changes had to be made at Asis, and when water was struck on 4 Level the men in charge were unable to master the situation, so that the level became flooded. Two months after the strike the pumps successfully drained the mine, and exploration was resumed on 4 Level. When a still larger flow of water was struck in a crosscut on 4 Level in November, 1925, the pumps were quite unable to cope; as very little ore had been found in the entire lower part of the mine it was decided to abandon operations and use the buildings for managing the company farm that streched west as far as Gross Otavi.

PHOTO 18: Mine plant and village, Tsumeb 1928. (Collection: E. Pfafferot)

When the Board of Directors in Berlin requested the O.M.E.G. about the middle of 1908 to start systematic mining at Guchab (and Asis), Bergassessor Hassinger had to beg for postponement of such outside activities as there was not enough staff even at Tsumeb. However, he made an examination of the workings at Guchab in the company of Dr. Heimann, Manager of the Tsumeb mine, on 5th December, 1908. The miner Manetti had produced 1,800 tons of sorted ore assaying 33 per cent. copper, but in so doing had also covered much of the ground with discarded waste and robbed high-grade material from cavities and fissures in the dolomite. He had made no use of the two adits driven in 1900 by Christopher James. A shiftboss, Globisch, was then put in charge of operations at Guchab and Asis, and provided with a house near Guchab station. In the next few years the old adits were driven deeper, but ore production was small, only 646 tons of concentrates being reported for 1911. Prospecting eventually led to the opening up of another ore-body to the east on the lofty "Rodger" mountain (named for Captain M. Rogers). Over the period 1919—1931 altogether 1,978 tons of 36 per cent. copper ore concentrate plus 5,587 tons of smelting ore grading 11 per cent. copper were transported by cableway down to the railroad in the valley. This mine became famous not so much for its rich chalcocite ore as on account of the beautiful green crystals of dioptase found in the upper part of the ore-body, the occurrence of which is quoted in many textbooks of mineralogy. The ore pinched out at a depth of 27 metres below the original adit level and when the mine closed down in 1931 there was no further payable ore in sight.

When the 1,000 square mile special prospecting grant in favour of O.M.E.G. expired late in 1941 the Gesellschaft exercised its mineral rights by pegging a number of prospecting claims within the area. These included mainly the vanadium ore prospects that were named Gauss, Harasib, Tigerschlucht, Uitzabpad and Wolkenhaube. The Auros claim had been pegged three years before.

Exploration and Mining by the S.W.A. Company.

Although the South West Africa Company at the outset was more interested in land development and general prospecting than in actual mining, its contribution to the growth of bushiness and industry in northern South West Africa has through the years proved to be far reaching. In 1895 it had acquired half of the shares in the Hanseatische Land-, Minen- und Handelsgesellschaft für Deutsch-Südwestafrika, which held concessions in the Rehoboth area. The next year it took over the Kaoko Land- und Minengesellschaft by an investment of £415,000, thus obtaining rights covering an area of about 37,500 square miles in the Kaokoveld. Reconnaissance of this area commenced on a small scale in 1906, continuing through 1909, 1910 and 1911 under the leadership of the geologist J. Kuntz. He was succeeded by Dr. Krause in 1912. Their investigations located potentially valuable iron ore deposits besides indications of gold and tin.

Having spent most of its capital, the Kaoko company arranged with the Government to surrender gratis each year tracts of land in lieu of taxes, reserving only those portions where further prospecting seemed justified. Meanwhile interest switched to the Damaraland concession of 22,000 square miles where prospectors of the S.W.A. Company started to comb the ranges east, north and west of the 1,000 square mile concession ceded to the O.M.E.G. Near Gagarus, ninety miles northwest of Outjo, claims were pegged in 1914 on a copper occurrence later named Kopermyn. During the next two years several expeditions covered the terrain north of Tsumeb to Tsintsabis and westward to the salt pans northwest of Okaukuejo; this led to the discovery in 1915 of a trona deposit, just before exploration was suspended due to the war.

As soon as the Government of the Union of South Africa recognized the Company's title to the Damaraland Concession in 1921 active exploration was resumed. A Bushman had found showings of vanadium ore at Abenab the year before, and further exploration now indicated that the discovery was one of major importance. No time was lost in bringing the new mine into production, the first concentrates being recovered about September, 1921.

The search for vanadium deposits outside the 1,000 square mile O.M.E.G. concession was promptly intensified, and at the end of 1924 J. Sinclair started mine development for the S.W.A. Company at Berg Aukas. From 1925 to 1926 this mine produced 1,300 tons of high-grade zinc ore in addition to vanadium concentrates. Less important discoveries were made inside the concession by J. Weekley in the Nageib-Auros area and just east of Tigerschlucht on the farm Harasib in 1925, while G. H. Rotherham opened up payable vanadium ore farther east on the Harasib Block at localities called Vanadium Hill and Brown's Creek. The following year the Uitsab vanadium mine was brought into production under G. C. Caddy. A minor discovery was also reported from the Otavi Spitze Range. When the Baltika vanadium deposit was discovered in the western Otavi Valley in 1931, the Company lost no time bringing it into production, again under the supervision of J. Sinclair, the operations continuing until 1942.

With so much success resulting from its exploration efforts the Company's Damaraland Concession (as well as the O.M.E.G. Concession) had been extended unaltered until 1936. The Administration then granted a further extension for five years, subject to a contribution of £10,000 to be used in making an aerial photographic survey of part of the concession to expedite ore search. Thus in 1937 the first aerial photographs were taken for purposes of mineral exploration, the area of survey (1,000 square miles) being so chosen that it covered a block about 25 miles wide stretching from Abenab southward beyond the Otavi Valley. Until the start of World War II the aerial photos were used only for spot prospecting by S.W.A. Company personnel, but systematic geologic mapping was carried out by the Government Geological Survey in 1940; their full report was never published. When the Damaraland Concession expired on 17th November, 1941, a new grant for a period of five years was given by the Administrator, this time reduced to an area of 3,000 square miles embracing the most promising part of the Otavi Mountain Land and including the 1,000 square mile block that used to be under O.M.E.G. control. It was required that the S.W.A. Company spend a minimum of £5,000 on vanadium ore prospecting within the 1,000 square mile block and £10,000 on the finds recommended by the Union Geological Survey. Furthermore, all maps and data established by this exploration were to be made available to the Inspector of Mines, free of cost, to make such use of as he might see fit. During the war years the Company also held grants over two areas in the Kaokoveld to conduct prospecting and mining operations, mainly on alluvial tin deposits.

The economic and strategic importance of vanadium ore production is evident from published statistics. From 1923 until 1948 the Abenab mine (excluding Abenab West) produced a total of 55,700 long tons of concentrates grading about 20 per cent. vanadium pentoxide.* Most of the ore was obtained from above 8 Level (420 feet below surface) as the mineralization at greater depth proved weaker and more sporadic. The Uitsab mine contributed roughly 800 tons of concentrates and Baltika somewhat more. From data compiled by G. Burg (1942) it would appear that the total value of the 52,000 odd tons of vanadium concentrates produced in the Otavi Mountain Land from 1912 until the start of World War II amounted to roughly R4,400,000. During the period of hostilities some further 20,000 tons of concentrates were exported, the strategic importance of which probably outweighed the sterling value.

Credit also goes to the South West Africa Company for developing its freehold property at the outset for agriculture and ranching, and for making many of the newly surveyed farms available to the settlers. Land alongside the Otavi railway was sold at a nominal price of 1—3 Marks per hectare, plus the costs of surveying each property and boring for water. The flow of supplies to the community in the nineties was assured by erecting a substantial building at Grootfontein to serve as a trading store and haven of safety in case of trouble. In later years considerable attention was given to experimental agriculture and stock-breeding, with the guiding principle to avoid competing with the farmers and rather develop the potential value of land by proving that planned development would bring in substantial profit.

* Information supplied by the Managament, S.W.A. Co. Ltd.

IV. Toward the Summit under Tsumeb Corporation Limited: 1947—1966.

The Awakening.

While the rest of the world was preoccupied in a struggle of life and death, Tsumeb disappeared from the scene like the Sleeping Beauty in the Wood. The military occupation of 1941—1944 completely paralyzed industrial and communal activity. Most of the male residents had been moved to internment camps, leaving only a skeleton staff of about fifteen to take care of essential services for mine, town and farm. The construction at this time of two-direction landing strips a mile east of town did, however, maintain a flicker of life, although the emergency airport was seldom used.

During the dormant period Tsumeb received very few visitors. Of importance for the future of the mine was the information gathered on a short tour of inspection by A. D. Storke, consulting engineer and geologist working for the British Ministry of Supplies during the war, who recommended that the Selection Trust and its American business asociates form a syndicate to tender for the purchase of the O.M.E.G. property. This led to the grouping of several American, British and South African companies: Newmont Mining Corporation, American Metal Company, Selection Trust, British South Africa Company, Union Corporation, South West Africa Company and the O'okiep Copper Company. A small interest was also held by A. D. Storke personally. Although it was most difficult to assess the value of the mixed copper-lead-zinc ore and probable future reserves, the gamble was considered worthwhile provided the challenge of metallurgical processing could be successfully met.

In 1946 the Custodian of Enemy Property for the Union of South Africa put up the mine for sale. Various parties showed interest, all facing the perplexity of making an economical bid for what could be a pig in a poke. Time was given for hurried investigation. On May 18th the Consulting Geologist and Chief Geologist of the O'okiep Copper Company in Namaqualand received instructions to take the road northward. Distances in South West Africa were known to be great, but they were far greater than expected — by virtue of the conditions of the roads after six years of neglect. Over the rocky terrain north of Goodhouse the winding track provided what might be called driving fun, but beyond Karasburg there were nearly five hundred miles of grim corrugations and potholes that made the car clamour like the percussion instruments in a shattering orchestral essay. The reason for this state of affairs was passed north of Mariental: a light scraper drawn by four donkeys, with two hundred miles to go. On the second day the car, suddenly five years older, rattled into Windhoek. Fitted overnight with several new springblades and four new shock absorbers, however, she was ready for more, and carried two leading

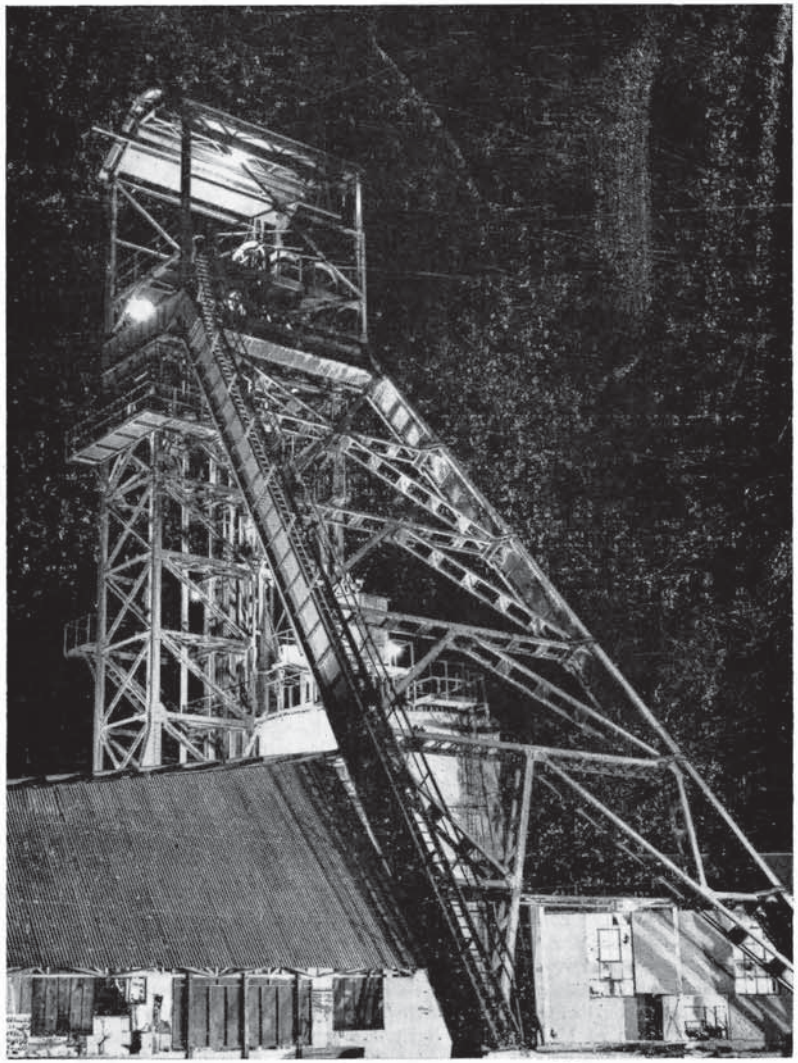


PHOTO 19: De Wet shaft headgear by night. (Alice Mertens, 1961)

passengers, H. De Witt Smith and M. D. Banghart, through to the slumbering town of Tsumeb. A meticulous examination was made of all office records and surface plant, including the six mine dumps and extensive cattle farms of the O.M.E.G. Three of the party returned to Windhoek on May 26th, the fourth remaining for a fortnight to collect representative samples from all ores on surface for metallurgical testwork. In all 7,000 lbs. of dump material was railed for shipment to New York and Salt Lake City, and 900 lbs. taken to the laboratory of the O'okiep Copper Company at Nababeep. The latter established that ore concentrate of export grade could be produced economically from the large stack of "Smelter ore" by hand-sorting, while excellent results were obtained overseas in making separate copper-lead-silver and zinc-cadmium concentrates from the various kinds of ores by flotation. This separation technique determined how high a bid could be tendered for the mine. According to O.M.E.G. records the surface dumps contained 434,000 tons ore averaging 4.48% Cu, 15.8% Pb, 10.9% Zn, while underground reserves to the 20th level totaled 610,300 tons containing 7.67% Cu, 20.89% Pb, 12.37% Zn. It was also evident from the mine assay plans that the ore-body increased in size and maintained high grade from 17 Level down to 20 Level.

Backed by this information the O'okiep Copper Company on behalf of the Tsumeb Corporation Limited submitted a bid of £1,010,000 (R2,020,000) for the assets of the O.M.E.G. in South West Africa. This was accepted on January 6, 1947, being the highest of several tenders.

Within a week personnel from O'okiep arrived in Tsumeb to start reorganizing essential services with the help of O.M.E.G. skeleton staff, to contract Ovambo labour and to create makeshift accommodation for new employees. The first hands that could be spared were allocated to sorting ore on the dumps, as metal prices were high and the opportunity to convert ore into cash had to be seized forthwith. As a result the first trainload of high-grade ore was railed from Tsumeb already on 17th March, 1947 (St. Patrick's Day), while the first shipment of 4,140 tons left Walvis Bay at the end of April.

When Tsumeb Corporation staff and crews of the construction firms began to invade the mining camp there were available some 20 rooms in the two hotels, 40 family dwellings and about 90 single rooms for bachelors. The old native compound east of the mine could accommodate 1,000 workers. Consequently employees had to be discouraged at first from bringing their families while mine and town were being set in motion again; the situation became so tight, in fact, that the big Turnhalle (Gymnastics Hall) was converted into sleeping quarters for additional personnel.

In the proposed construction program priority would be given to the expansion of power plant, a new hoist for the shaft, a sorting and tabling plant to treat dump ore, erection of selective flotation plant, a new European hospital and a suitable warehouse.

After the installation of diesel generators the mine would be unwatered, reconditioned and explored for ore extensions, while housing for families and water-borne sanitation would be started concurrently. In all, this program was estimated to require some R2,500,000 including the working capital to start production.

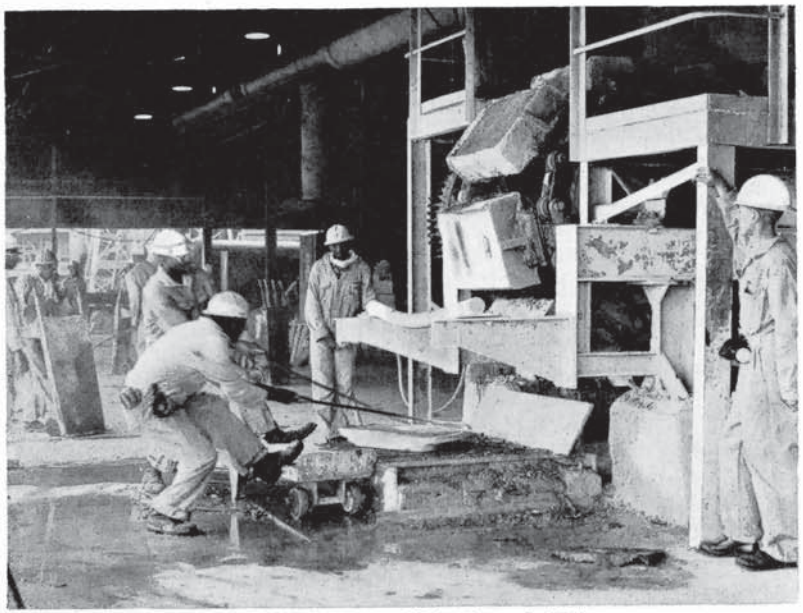


PHOTO 20: Casting cakes of blister copper. (John Everard, 1964)

Rudely awakened from hypnotic sleep, Tsumeb found herself in a dated dress that was already out of fashion. Strangers from the outside world came with modern designs to replace the old, and no time was lost in executing the transformation. The mine and town changed rapidly in outward appearance, and more fundamentally too its people took up the aggressive spirit and faith in the future that was infused by the new management.

Mine Development.

When the Tsumeb property changed hands in 1947 the bottom workings were 1,890 feet below the surface. Most of the ore down to 12 Level and about half of the ore from 12 to 16 Level had been removed, while extraction had begun from 16 to 20 Level. The mine was completely under water. With the power plant largely obsolete, four new diesel generators with 2,000 horsepower capacity were installed without delay. In August, 1948 dewatering reached the bottom level, and stopes could be prepared for production. Substantial bodies of residual ore were found by sampling and drilling into the walls of the old workings, and where feasible the mining method was revised by dividing the elongate ore area into a series of transverse stopes and pillars for greater safety. The O.M.E.G. had previously used a system of extraction by longitudinal stopes taking in the whole plan area of the ore-body, with no intermediate pillar support, and following up excavation with layer upon layer of waste fill.

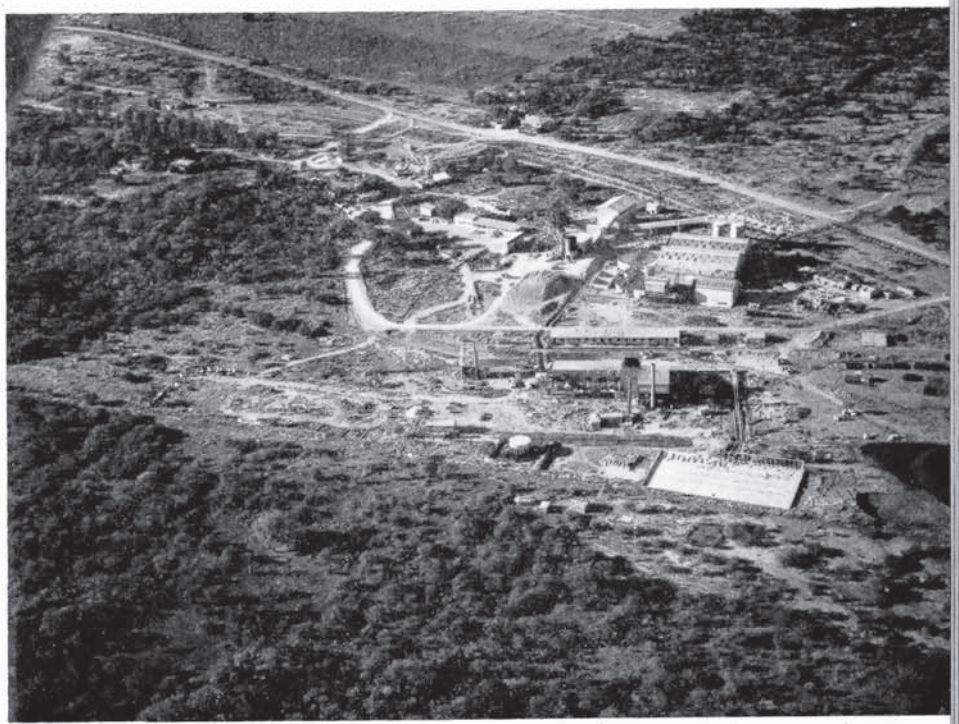


PHOTO 21: Kombat mine plant viewed from the northwest, showing power plant, warehouse, mill and office buildings, 1962. (Collection: Tsumeb Corporation)

This proved satisfactory while the overall width was not excessive, but with the ore-body expanding steadily from 18 Level downward the system became unsafe. The new method required many new ore passes to supplement the old and a pattern of raises connecting indirectly with the glory hole on surface, whence the waste fill could be drawn off at each level as required. The stopes now advanced transversely by horizontal cut-and-fill, while pillar ore was taken later by square-set mining using tambuti timber supported by waste pack.

By June, 1949, the mine had produced 133,000 tons of new ore, and geological investigations and proved up five times the reserve of mineable ore carried in the books two years before. When No. 5 winze reached 24 Level elevation a fan of horizontal boreholes established the largest mineralized area yet encountered in the mine, but excessive volumes of water under high pressure delayed lateral advance until adequate power and pumping facilities were available. The evidence that the ore-body widened considerably downward called for a new shaft to be sunk from the surface to 30 Level with a hoisting

capacity of 2,000 tons per day. To generate additional power it was decided to install steam turbines utilizing South African coal instead of diesel motors dependent on oil imported from overseas.

The enlargement of the lens-shaped ore-body into a flat-cylindrical pipe below 20 Level invited immediate deep exploration. It was already plain at about 23 Level that the pipe bent backward from its steep southward plunge to a steep northerly attitude. In 1951 development was sufficiently advanced to start production on 24 Level and provide special diamond drilling stations on the south side for this project. The first hole, No. 728 proved ore continuity down the pipe to a depth of 3,370 feet below surface, the average grade over 1,070 feet being 7.5% Cu, 15.3% Pb, 2.4% Zn. This early assurance of many years of ore supply may be regarded as the climax to three years of unparalleled ore finding success underground. The stage was set for long-range planning and orderly growth of mine, plant and town. During the next four years the new De Wet shaft, started late in 1949, was completed to a depth of 3,301 feet, and a pump station cut just below 30 Level at 3,186 feet to lift 4,320,000 gallons of water per day to the main pumping station on 24 Level. The shaft came into full service toward the end of 1953, with skips initially handling only developed waste from the lower levels, but a year later switching to ore hoisting. On surface a conveyor gallery and secondary crushing plant were installed to connect with the mill, while a 5,000 ton capacity bedding bin was erected to even out extreme fluctuations in the grade of ore hoisted from day to day. In time the No. 5 winze (promoted to internal subshaft status) advanced down to 30 Level and connecting haulages were driven to De Wet shaft.

By 1957 preparation of the De Wet Shaft block was completed and stopes had started to break ore on 30, 28 and 26 Levels. The working below 26 Level opened up more and more oxidic ore associated with numerous water-bearing fissures, so that widespread cementation cover was needed for development headings and increasing quantities of water had to be pumped to the surface. A pattern of boreholes directed mainly north and east controlled drainage of the water-laden formations dipping toward the ore-pipe. The success of cementation plus drainage over a period of years annulled the fear that groundwater might render parts of the ore-body too dangerous to mine. Three large steam turbines now supplied the necessary power, with several diesel engines serving as standby.

The drilling for purposes of water control revealed occasional patches of mineralization in certain stratigraphic beds on both sides of the ore-body. Further search by exploratory boreholes earned a rich bonus when a lobe of ore was found protruding from 29 Level down southward, giving 75,000 tons at a grade of 23 per cent copper. In this context it is of interest to record that a concentration of massive ore at the west end of the ore-pipe between 21 and 26 Levels has yielded a million tons at 3.6% Cu, 26.7% Pb, 12.4% Zn. By way of contrast the reader may be surprised to learn that substantial tonnages of marginal ore averaging as little as 2 percent total metal are being mined profitably along with high-grade ore in the fully prepared stopes.

From 1957 to 1958 a notable drop in metal prices retarded activity, but planning went ahead to prepare for mining below 30 Level where boreholes had already indicated ore for another 500 feet down. On surface the glory-hole

PHOTO 22: Head-office of the Tsumeb Corporation Limited on Main Street.
(Alice Mertens, 1961)

operation supplying waste fill to the stopes had reached the limits of efficiency, and so a new quarry was started on the crest of Hüttenberg whence broken dolomite is now delivered in 20-ton tip-trucks to a crusher on the north side of the hill. It then goes by conveyor belt through a tunnel to the fill raise in the old opencast.

For the sinking of No. 6 internal shaft from 28 Level the No. 5 subshaft first had to be enlarged and the downcast ventilation airway to 30 Level completed. The new shaft finally bottomed at a depth of 4,286 feet in 1962, and as soon as the pump station was ready drifts headed out to the ore-pipe from the deepened De Wet shaft as well as No. 6. Panel drilling then outlined the new block from 30 to 34 Level. In 1966 the mine could report a proved ore reserve of 8,500,00 tons after producing 9,100,000 since the take-over in 1947.

Expansion of Concentrator.

Through its great variety of minerals Tsumeb ore from the start presented singular problems to the metallurgical engineer. As no simple flotation procedure could cope with the range from mixed oxide to primary sulphide ores, it was decided to gain flexibility by installing three separate grinding and flo-

tation circuits to replace the old gravity plant. The contract for design and construction of the new concentrator was given to a South African firm who began to dismantle the existing building and part of the O.M.E.G. smelter in April 1947, thus reclaiming steel of which there was a world-wide shortage. By March 15, 1948, the first grinding and flotation section started treating 300 tons ore per day from ore dumps, the mine at this time being under water. The completed plant was formally opened the following September by Col. P. I. Hoogenhout, Administrator of South West Africa. The 1948 report of the Directors of the Tsumeb Corporation states: "The completion of the Tsumeb plant within eighteen months of the incorporation of the company is considered by your Board to be a remarkable achievement in view of the remote location of the property and general difficulty of obtaining labour, equipment and supplies in world markets in this period. Great credit is due to your Company staff, and to South African contractors on design and construction, for this performance."

Initially many difficulties were encountered, arising from the variable degree of oxidation of dump ore, mechanical problems, and general inexperience with this type of ore. The plant results did not equal those of the laboratory, and for a while metal recovery was unsatisfactory. Great improvement came when changes were made in the grinding and flotation circuits to remove concentrate as rapidly as possible, and to deal with excessively fine mineral particles by adding suitable collector reagent directly to the mills. In the first fiscal year of operation (1948—49) the concentrator treated 257,596 tons of mine and dump ore, attaining good copper-lead recovery, but with zinc separation remaining deficient. Laboratory research focussed mainly on suitable separation processes for the oxidic ores. By 1951 the mill ran separate circuits for sulphide ore and oxide ore and its capacity climbed to 1500 tons per day. Within a few more years the metal recovery of *sulphide ore* had been thoroughly mastered, as reflected in the following table of comparison:-

Item		1949—1950	1953—1954
Tons ore		253,078	452,535
Cu-Pb concentrate recovery percent	Cu	87.07	94.04
	Pb	89.69	96.79
	Zn	31.21	26.35
Zn concentrate recovery percent	Cu	3.34	1.89
	Pb	1.97	1.00
	Zn	53.64	66.16

The development of a commercial method of separating the *oxide ore* into copper-lead concentrate and zinc concentrate was achieved only after extended laboratory investigation employing a wide variety of reagents. A considerable part of the oxide minerals went into the tailings reject, though the sulphidic minerals responded well to flotation. Research was intensified from 1955 onward when the opening up of the deeper levels in the mine confirmed that future ore would be increasingly oxidic. Two years later laboratory studies were

PHOTO 23: View across part of concentrator showing thikener tanks, stockpiles of flotation reagents and abandoned fillwaste cuts on Huettenberg. (Alice Mertens, 1961)

started to develop a procedure for separating copper minerals from lead, and in June, 1958, a pilot plant went into operation to produce a copper concentrate and a lead-copper concentrate from oxide ore.

Analytical work, dating from 1952 had established that mine ore contained a small but fairly constant amount (0.015 percent) of germanium for which a lively demand had developed in the electronic industry. It was found that the germanium minerals germanite and renierite could be upgraded by two alternative methods, and in 1954 a flotation circuit treating *sulphide ore* went into operation. With further improvements the plant produced 1,216 tons of enriched concentrate carrying 0.39 percent germanium in the following year, which was sent to Belgium for further treatment. The germanium flotation section was enlarged in 1957 and two years later ferro-filters were installed to recover the magnetic portion (renierite) of the germanium minerals contained in oxide ore. Meanwhile research at Tsumeb and in the U.S.A. successfully developed an economic leach-precipitation process for making germanium dioxide from low-grade concentrate. Suitable plant was erected and taken into service in 1960; the end product, a white granular powder, assayed 98.7% GeO_2. The capacity

PHOTO 24: Aerial view of Tsumeb mine plant showing frontal view of old copencast (right) and fill glory-hole (right mid distance). (Alice Mertens, 1961)

was doubled in 1962, and to offset the high costs of sulphuric acid used for leaching, a separate plant was built to manufacture acid from elemental sulphur. Unfortunately, these developments had hardly been completed when there was a slump in world demand for germanium, caused by overproduction and substitution and the germanium plant was shut down in September, 1963.

Although a satisfactory technique had been established by 1958 to separate copper from lead in sulphide as well as oxide ore, it appeared that exporting Tsumeb copper concentrate would be uneconomic due to the ever increasing costs of overseas smelting. With the assurance of good copper and lead values in future ores from the Tsumeb and Kombat mines it was decided in 1959 to build a copper smelter in South West Africa, and the following year the decision was made to construct a lead smelter also, thus freeing Tsumeb from dependence on overseas smelters for the two most important metals. As a result of these developments the rate of milling has been stepped up to 65,000 tons per month.

The advances in metallurgical practice since the new concentrator started in 1947 have contributed tremendously to the profitability of the Tsumeb enterprise. The importance of maintaining optimum recovery of the valuable minerals in Tsumeb ore is apparent from the high tonnage of metals contained in

a year's production — the average for the period 1962—1966 being 31,146 tons copper, 96,971 tons lead and 28,481 tons zinc, with which considerable credits are tied up for silver, cadmium and germanium.

Smelting and Refining.

When the Board of Directors authorized the building of a copper smelter in November, 1959, a site was selected and partly cleared at the foot of Hüttenberg alongside the old O.M.E.G. smelter. The work stopped when an economic study showed that it might pay to construct also a lead smelter and refinery at Tsumeb, for which much more space would be required. The final decision was taken in July, 1960, and a new position was picked in the valley flat two miles north of the mine, where ample area was available for handling large tonnages of materials. Ground clearing and foundation work commenced in September while the erection of structural steel began early in 1961. This vast project triggered off a chain-reaction of building activity throughout the town and mine, the end of which is not yet in sight.

The smelting plant was designed in the U.S.A., while actual construction and installation of items was carried out by various South African firms. In November, 1962, the first cakes of blister copper were poured; bars of refined lead were cast as from December, 1963. The Administrator of South West Africa, Mr. W. C. du Plessis, officially opened the smelter complex at a grand function on 3rd March, 1964. On this occasion it was stated that 52,820 cubic yards of concrete and 13,762 tons of steel had been used in the construction of the plant, which had cost over 14 million rand, with a further 2 million rand invested in housing and water supply. Materials and equipment to the value of 4.1 million rand had been purchased from the Republic of South Africa, representing 78 percent of the total.

Despite many initial difficulties and disappointments, particularly in the lead section, techniques improved rapidly. The metallurgical processes were far more complicated than those of overseas smelters where Tsumeb concentrates could be blended with simple ores from other mines. In 1965, the first full year of operation, Tsumeb produced 32,418 tons blister copper (98.6 percent Cu) and 63,091 tons refined lead (99.998 percent Pb).

The processing of concentrates has been uniquely adapted to treat the chemically complex ores from Tsumeb mine. The raw material consisting of copper concentrates, lead concentrates, silica, iron ore and limestone fluxes, as well as coke and coal are offloaded into separate stockpiles in a 1,300 ft. long receiving plant so that they can be reclaimed and blended to suit the metallurgical requirements of the copper and lead sections. The equipment is designed to handle 30,000 tons concentrate and 5,000 tons flux per month. Some concentrates must be dried before processing, while all fluxes require crushing before blending and smelting. The various materials are picked up by grab bucket and discharged on to an integrated conveyor belt system that delivers them to the driers, the crushing mill, and thence (or direct) to the storage bins.

Lead concentrates, combined with fluxes, are roasted in a sinter machine to remove sulphur and to agglomerate the fine powder into a coarser lump product suitable for treatment in a blast furnace. The crushed and screened sinter

PHOTO 25: Aerial view of Tsumeb showing rows of new houses going up adjacent to the residences of the old town in 1948. The plain of the Jordan water-course separates mine from town. Schuetzenhalle (now demolished) in left foreground. Turnhalle in left background. (Aircraft Operating Company, 1948)

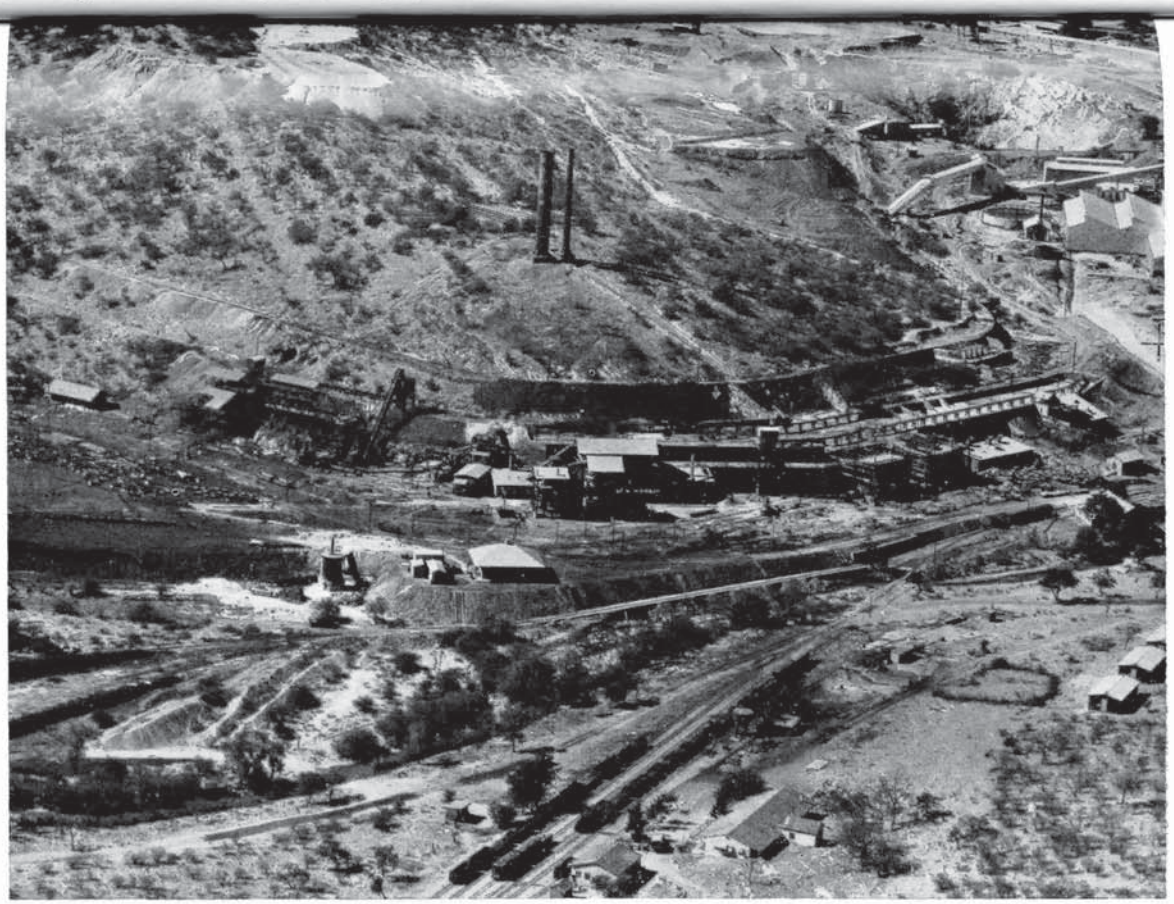


PHOTO 26: Partly dismantled O.M.E.G. smelting plant with railway station in foreground and new mill in far right. Note ore dumps on left of old opencast, all since turner into money. (Aircraft Operating Company, 1948)

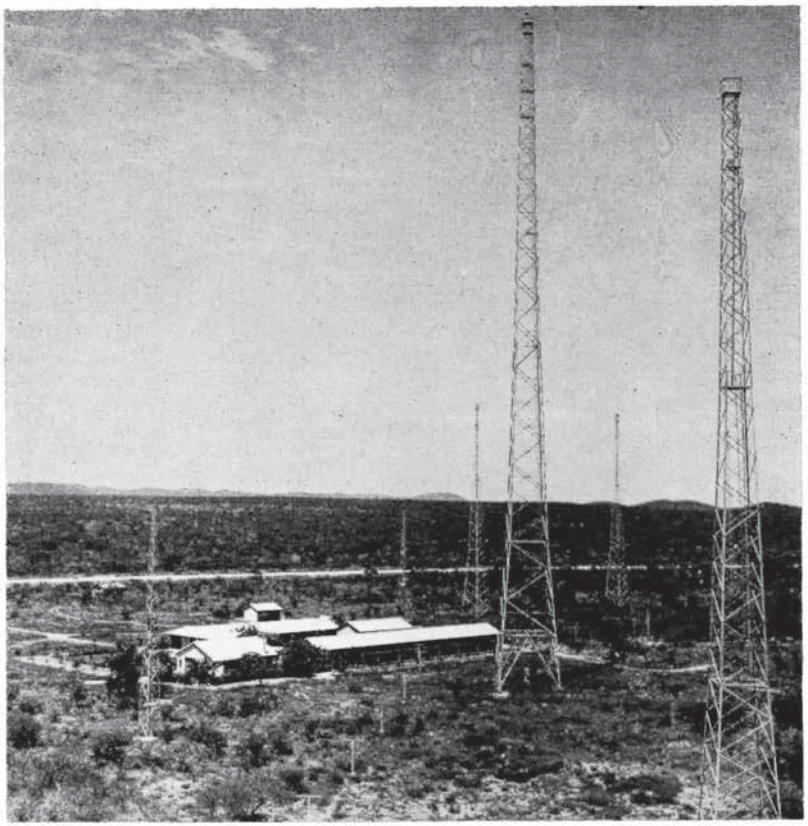


PHOTO 27: Ionospheric Research Station Jonathan Zenneck of the Max-Planck Institute for Aeronomy, 10 miles west of Tsumeb. (Photo: B. Jung, 1964)

is charged to the top of the blast furnace, mixed with sufficient coke to completely fuse the entire mass; the coke supplies the necessary heat and also reduces the metals to a heavy melt, while the molten fluxes form zinc-rich slag. The molten mixture is tapped into a forehearth where the liquid metals settle to the bottom, whereas the lighter slag overflows the top. Crude metal, consisting of a mixture of copper, lead, arsenic and sulphur, is withdrawn from the settler and transferred by ladle to a series of drossing kettles in which lead is separated from most of the copper, arsenic and sulphur. The slag from the settlers discharges into a stream of water to chill explosively into granular particles that are finally taken to a waste dump. A copper-rich mixture is removed from the drossing kettles and fused in furnaces where three separate layers of metal products are formed: impure lead, speiss and matte. The lead

is returned to the kettles, while the copper-arsenic-matte-speiss is withdrawn and granulated before being taken to the copper section for smelting.

The impure lead or "base lead bullion" still contains small amounts of copper, arsenic, antimony and silver. It is pumped to the refinery where copper is removed by treatment with sulphur; arsenic and antimony are taken out by caustic soda and sodium nitrate; silver is alloyed with zinc, the excess zinc being removed by vapourizing in vacuum followed by final treatment with caustic soda. At last the lead is pure and ready to cast into pigs weighing 100 lbs. each. In a retort furnace the silver-zinc alloy is cleared of zinc, following which the resulting silver-lead bullion is oxidized in a cupel-furnace to give an ultimate product of *Doré silver* as 1,000-ounce ingots ready for marketing.

Copper concentrates, mixed with silica as well as speiss and matte from the lead section, are smelted in a reverberatory furnace fired with pulverized coal. The slag is drawn from the furnace, granulated and transported to the waste dumps. The matte is tapped into ladles and poured into converter furnaces for removal of lead, zinc, arsenic, iron and sulphur. Air is blown into the molten bath of matte, the converters being tipped at the same time for the removal of slag. After about five hours of blowing and skimming, the blister copper melt is transferred to a holding furnace prior to final casting of the metal into cakes of 98.6 percent copper weighing 400 lbs. each. This copper which still contains slight amounts of lead and arsenic, is shipped overseas for electrolytic refining.

The dust associated with waste gases in the copper section is collected in a baghouse and contains recoverable quantities of lead that are treated in the lead section. The filtered gas finally disharges into the atmosphere in a stack 450 feet high. Similarly lead section dusts carried by waste gases are collected in a baghouse and recycled for metal recovery, while the gas escapes into the air through a 475-foot stack.

The ore concentrates delivered to the smelter contain varying proportions of *arsenic* which must be eliminated to improve recovery of the metals. The fumes and dust collected from the copper and lead smelting operations are roasted in a separate plant where the volatilized arsenic trioxide in condensed in a series of flumes to a 96 percent pure product which is stockpiled. The lead blast furnace dusts also contain *cadmium* and a plant has been erected to extract this metal in highly pure form, the annual capacity rating 400,000 lbs.

A portion of the sulphur dioxide gases from the sintering machine, where lead concentrates undergo initial roasting, are ducted to a sulphuric acid plant with a capacity of 4,500 tons per annum. The acid is required for the treatment of certain smelter by-products, and would additionally be used in the germanium plant if brought into operation again.

The monthly fuel requirements for the smelter complex amount to 13,000 tons of coal and 3,500 tons of coke railed from the Republic of South Africa. Part of the coal is converted into producer gas and used for firing and heating in the dross treatment furnaces and refinery processes, the arsenic roaster and elsewhere. Coal firing is also employed in the smelter power station of 5,700 KW capacity.

Chemical control of the multiple processes is of paramount importance and for this the plant is served by an analytical laboratory equipped with the most modern instruments and apparatus for rapid routine assays as well as research.

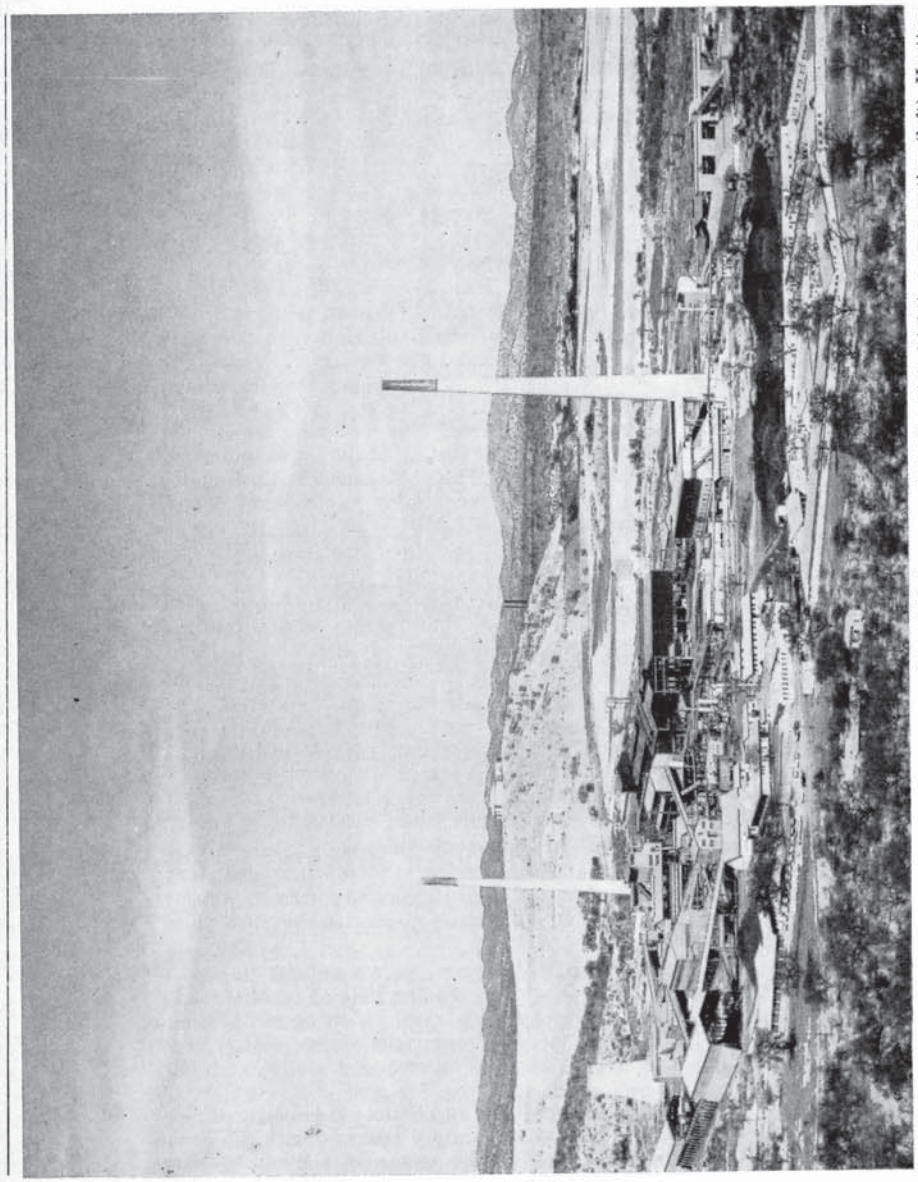


PHOTO 28: Tsumeb smelter complex showing compound in right foreground, lead section (right), copper section (left), Huettenberg fill quarry in left background. (Photo: T. le Roux, 1966)

Transformation of Town.

The „new look" of contemporary Tsumeb took shape in two cycles, the first associated with the growth of the mine from 1947 until 1954, the second with the smelter project from 1960 to 1966.

In the late forties, when materials were in short supply, the pressing need for houses dictated building a large number of comparatively austere dwellings with minimum facilities. What these houses lacked in appearance and comfort was partly offset by the unlimited supply of free water for gardening and by planting trees along all the streets. The old corrugated section of the Minen Hotel disappeared in 1951, being replaced by a much larger, modern structure. At the same time the Tsumeb Corporation built a Recreation Club (including swimmingpool and cinema-dance hall), Mine office, Assay laboratory, Ore Research laboratory and in 1953 a new Head-office on Main Street. The farm gained a slaughter house and dairy, while a large meat, milk and vegetable distribution cntre went up in the middle of the shopping area to replace the cramped premises of the old warehouse at the mine. The compound for non-white contract labour was completed in 1951 and enlarged shortly after, while 563 houses were erected in the location for married non-whites. These residential quarters were officially opened by the Secretary for South West Africa, Mr. J. Neser, in 1953. By the following year the Tsumeb Corporation had completed some 400 new houses for whites and restored or enlarged many older dwellings of the O.M.E.G. regime. Most of the streets had been given a tarmac surface whereby the town gained a neat, modern appearance taking firstcomers by surprise. Tsumeb became the magisterial seat of a new district in 1952, the Administration providing new Magistrate's and Post Office buildings. The mine payroll increased from 422 white and 2,003 non-whites in 1948 to 741 and 3,438, respectively, in 1957. When the drop in world prices forced curtailment of mining operations in 1958, personnel diminished by 15 percent. During this pause attention turned to the feasibility of smelting ores at Tsumeb to offset the escalating overseas treatment charges and make full use of the improved rail transport facilities upon completion of the standard gauge line.

The second wave of expansion followed the rise in price of copper, lead and zinc from 1959 onward. When the signal was given for construction of the smelter, Tsumeb burst out of its seams with the addition of block after block of houses southeast toward the airport, and with business premises changing face to present to the public modern show windows and, to the consumer's regret, also modern prices. The pressure for accommodation pushed the total of completed houses for whites to 1050, brought about major additions to the two hotels, a separate compound for non-white labour at the smelter, and a large number of houses for non-whites in town as well as on the T.C.L. farm. It was a great day for the residents of the Nomtsoub Location when the Lombard Hospital was officially handed over to the Administration of South West Africa by the Tsumeb Corporation in May, 1965. It is planned to add 200 more houses in Nomtsoub during 1967.

At the mine modern offices were built for the Engineering and Geology Departments, while various new workshops are under construction. The stylish offices of the Village Management Board were completed in 1960 and an elegant cinema was built for the Recreation Club in 1961. For every new building

PHOTO 29: Aerial view of Tsumeb in 1966. Main Street adjoining Jordan plain. De Wet shaft on right, Compound back centre, Nomtsoub location back right. (Photo: T. le Roux)

provision is made for water lines, sewerage pipes, power lines as well as telephone cables, items involving large additional expenditures. The water requirements now exceed the regular yield of 5 million gallons per day from the mine, and rationing has had to be introduced to ensure a fair quota for each house and garden. The quiet little mining camp is now a sprawling town with 25 miles of streets most of which have tarmac surface. And true to past practice, all the new streets are already fringed with rows of trees.

The development of schooling facilities only just kept pace with the growth of Tsumeb. Until 1945 the old Primary School adjoining the Lutheran Church had been teaching in German only. The following year the Administration decreed that all Government schools were to teach in Afrikaans and English, a policy which brought about fundamental changes in staff and curriculum, aimed at developing a better understanding between the three language groups. The makeshift boarding house opposite the O.M.E.G. head-office had to be vacated in 1947 and the children sent to other centres where hostel facilities were available. Several teachers found temporary domicile in the now demolished "Schützenhalle" at the north end of the present school grounds that used to be the shooting range. Within a year, however, the new Primary School was under construction, followed by the Maisie Shand Hostel, ready for occupation in January, 1950.

A year later the school was granted secondary status, the English-medium private school became incorporated with it, and a German-medium primary

section was instituted. The number of scholars had increased in four years from 51 to 423. With the population of the town and district still growing as never before the Department proceeded to build a separate Secondary School and Senior Hostel, which were officially opened by the Administrator in September, 1955.

With the sudden influx of smelter personnel since 1960 the Primary School had to stretch to make room for well over 800 children and a staff of 27 teachers. The solution to this chronic overcrowding came when separate primary schools were promptly built for the German- and English-medium sections in 1964. At the same time major extensions were added to the Secondary School, now granted full status and named the Etosha High School, and by 1967 a third hostel will be ready to accommodate 120 boarders. Served by a total staff of 51 teachers Tsumeb is finally catching up with its obligation to provide its 1,200 white school children with adequate educational facilities, while 550 non-white children are taught by a staff of 16 in two primary schools in Nomtsoub.

Most geographical maps of South Africa show the Mandated Territory as far north only as Windhoek, located on the same latitude as the Limpopo River, northern border of the Transvaal. Through the years this has given Tsumeb the quasi status of being out of bounds and to those deficient in pioneering spirit a feeling of remote isolation. This "off the map" mining town has been the end of the journey for many who dreamed they could here escape the arm of the law or the code of civilized society. The time when communications were slow, difficult and sometimes disrupted, has passed into history.

Since 1947 the S.A.R. supplemented the narrowgauge train service with a luxury bus transporting passengers swiftly between Windhoek and Tsumeb via Grootfontein. This boon to the general public proved a menace to motorists in summer when the mammoth tracks of the bus made the roads virtually impassable to the family automobile. During these years there must have been a continual conflict of prayers for dry weather by those going on tour and for adequate rains by the farmers struggling to tame the land. In the late fifties the Administration made a new direct road across the ranges due south of Tsumeb. This was tarred in the early sixties, at which time a modern gravel highway was also built between Grootfontein and Tsumeb. By the end of 1966 the tarmac road to Windhoek was open to traffic all the way and its extension northward through Ovamboland to the border of Angola well underway.

The rail link to Usakos has been the life-line of the Tsumeb mining industry for sixty years. When operations were resumed in 1948 new locomotives and rolling stock were ordered by the S.A.R. to run six trains of ore concentrates daily to Walvis Bay. Delivery on these orders was slow, and with increasing traffic in cattle, coal, general merchandise as well as concentrates, limits were set to permissible mine output. A bottleneck had developed at Usakos station where ore concentrates were being transloaded from narrow-gauge trucks on a high level to standard-gauge trucks at a lower level by an army of labourers swinging hand shovels. In June, 1954, the problem was eliminated when an overhead tip arrangement came into service to empty the narrow-gauge trucks into the larger railcars. At Walvis Bay a loading plant was erected in 1953 to store up to 25,000 tons concentrate on the wharf and pour it into freighters by conveyor-belt system at a rate of 300 tons per hour. This greatly relieved congestion in the port.

PHOTO 30: Mr. M. D. Banghart, General Manager and Managing Director of the Tsumeb Corporation, 1947—1966. (Photo: Juliet Newman; Greenwich, Conn.)

Despite all these improvements it became evident that the narrow-gauge railway would inhibit the growth of mining in the north to its full potential, and that construction of a standard-gauge line offered the only permanent solution. Embankment work for the wide line started northward from Kranzberg junction in 1958. To ease the tight transport situation temporarily, the Tsumeb Corporation purchased additional locomotives and railcars in 1957, and arranged to haul zinc concentrates 280 miles by road from the mine to Usakos. The official opening of the new line took place on January, 31st, 1961, when the Administrator, Mr. D. T. du P. Viljoen, arrived at Tsumeb on the first through passenger train in the company of many distinguished guests. A year later two modern wharves were completed in Walvis Bay harbour to increase the handling capacity in loading and off-loading general cargo.

The war-time landing field on the outskirts of Tsumeb immediately invited air traffic by charter service. Scheduled flights connecting with Windhoek came into operation in 1949, at which time the Tsumeb Corporation also acquired a six-passenger plane for longer trips. A second, smaller aircraft was purchased in 1960, mainly for commuting with Kombat, 20 minutes away by air, but 65 miles by road. The airport facilities have so encouraged private flying that a local club with its own plane was formed in 1966.

When the mine sprung to life in 1947 a sudden demand ensued for fresh produce in quantity. Cattle ranching had continued under O.M.E.G. control through the war years, but there was also instant need of milk, vegetables and fruit. Extensive gardens were laid out just north of town and subsequently also at Lake Otjikoto. Surplus water was available from the mine and the yield from the Otjikoto sinkhole was for all practical purposes inexhaustible. Misfortune befell the Tsumeb vegetable lands in the early fifties when dichromate water from the mill overflow reached the dam just above the gardens and rendered the soil unfit for agricultural use for a number of years. A power line to Otjikoto was erected in 1951 and electric pumps installed with a total capacity of

over 100,000 gallons per hour. In the next few years 1,700 citrus and 170,000 eucalyptus trees were planted and vegetables of all kinds raised on an ever increasing scale. Today the farm supplies 100,000 lbs. of vegetables per month to the two compounds in Tsumeb. The eucalyptus, intended for use as mine props, did not respond as well as hoped for. An experimental plantation in the gardens north of Tsumeb was doing better; on completion since 1957 of seven boreholes developing groundwater along the hidden dolerite dyke two miles northwest of town this plantation expanded to 95,000 trees. Many other new boreholes have been sunk on Corporation farmlands, the total area of 70,000 hectares now being divided into 48 grazing camps with 27 cattle posts yielding water to 7,000 head of cattle. The dairy herd of 200 Swiss and Simmentaler cows yields 54,000 quarts of milk per month. Some 220 oxen from the farm are slaughtered every month to augment meat supply to the community. In 1966 the personnel engaged on farm work for T.C.L. numbered 13 whites and 400 non-whites.

A new element of interest appeared in 1957, the International Geophysical Year, when the Max-Planck-Institute for Aeronomy of Göttingen, Germany erected a temporary ionospheric research station 10 miles west of Tsumeb. Chosen for its geographic position half-way between Cape Town (Hermanus) and Kinshasa (Leopoldville), this observation post could be guaranteed an unfailing supply of electric power from the Tsumeb mine. After two years the temporary installation disappeared, but with the approach of the "International Quiet Sun Year" in 1965 the institute decided to build a permanent station at the same site. The cluster of antennae masts 380 feet high has become an arresting landmark along the road to the Etosha Game Reserve. At the official opening on July 31st, 1954, Prof. W. Dieminger of the Institute named it the Jonathan Zenneck Research Station, in honour of one of the greatest pioneers in radiophysics. The facilities are available to research scientists from various countries interested in making ionospheric as well as astronomic observations.

Mineral Exploration.

Man's craving for mineral wealth will never be satisfied. His search is continually stimulated by improved techniques, while the target enlarges as new ways are devised of utilizing ores of lower grade. To develop a practical philosophy of ore finding for a particular area requires systematic prospecting, usually at considerable cost, in which geologic success often is not synonymous with economic profit.

The call for more ore at Tsumeb spurred immediate action. As the known ore-body appeared to follow the dolomite beds down dip it was thought likely to extend beyond the south boundary of the Tsumeb mining area where mineral rights were held by the South West Africa Company. By notarial agreement with the latter a subsidiary was formed in 1947 under the name of Tsumeb Exploration Company to conduct exploration over a 3,000 square mile special grant area enclosing all the well-known mines and prospects of the Otavi Mountain Land. Exclusive rights on vanadium deposits and certain reserved areas were retained by the South West Africa Company. To fulfil the obligations attached to the above agreement as well as pursue ore search within its own holdings

the Tsumeb Corporation established a Geological Department without delay, appointing four geologists in the first year and three more in the following eighteen months. In 1951 a full-time mineralogist joined the staff, which has since increased to thirteen, working on various programs for the two companies.

Investigations for Tsumeb Corporation Limited.

From the start geologic mapwork backed by sampling and diamond drilling provided the basic information to plan new development in the Tsumeb mine. At the same time the structural features and mineral distribution within the ore-body were studied in great detail.

The most impressive aspect of the Tsumeb deposit is the prodigious concentration of metals in a steep pipe-like body only 600 feet long in plan and up to 250 feet wide. The pipe dips 55° south from surface to a depth of 2,000 feet, beyond which it bends back northward to break steeply across the dolomite beds to a known depth of 4,350 feet. Present development has reached 3,650 feet (34 level) as shown on the generalized section (fig. 5). Within the pipe structure the dolomite formation is thoroughly fractured and intruded by irregular veins and larger masses of siliceous rock resembling aplite or feldspathic quartzite. Massive ore of very high grade is generally located round the periphery of the pipe, while irregular veins, pods and scattered blebs appear within the fractured core. Lead, the dominant metal is accompanied by copper throughout. The ore was poor in zinc and relatively rich in copper in the upper levels and behaves similarly below a depth of 2,700 feet. The mineral fame of Tsumeb derives mainly from its great variety of brightly coloured and beautifully crystallized secondary products, arising from oxidation of the primary ores. Surface waters percolating down the fissured and cavernous lode caused the formation of complex carbonates, sulphates, arsenates, vanadates, oxides and the like to a depth of 1,200 feet. Thence to 2,600 feet unaltered sulphides predominated. An aerated water-bearing zone in the dolomite reaches the north wall of the ore-pipe between 27 and 28 Levels and has induced further widespread oxidation down to the deepest workings.

Research over a period of fifteen years has led to the discovery of more than thirty mineral species not previously reported from the Tsumeb mine, ten of which have been identified as completely new natural minerals described for the first time in world literature. Some of them have not yet received names, while many are mixed minerals containing subordinate amounts of metals not normally present in the basic formula. The alphabetical list may be of interest to collectors:-

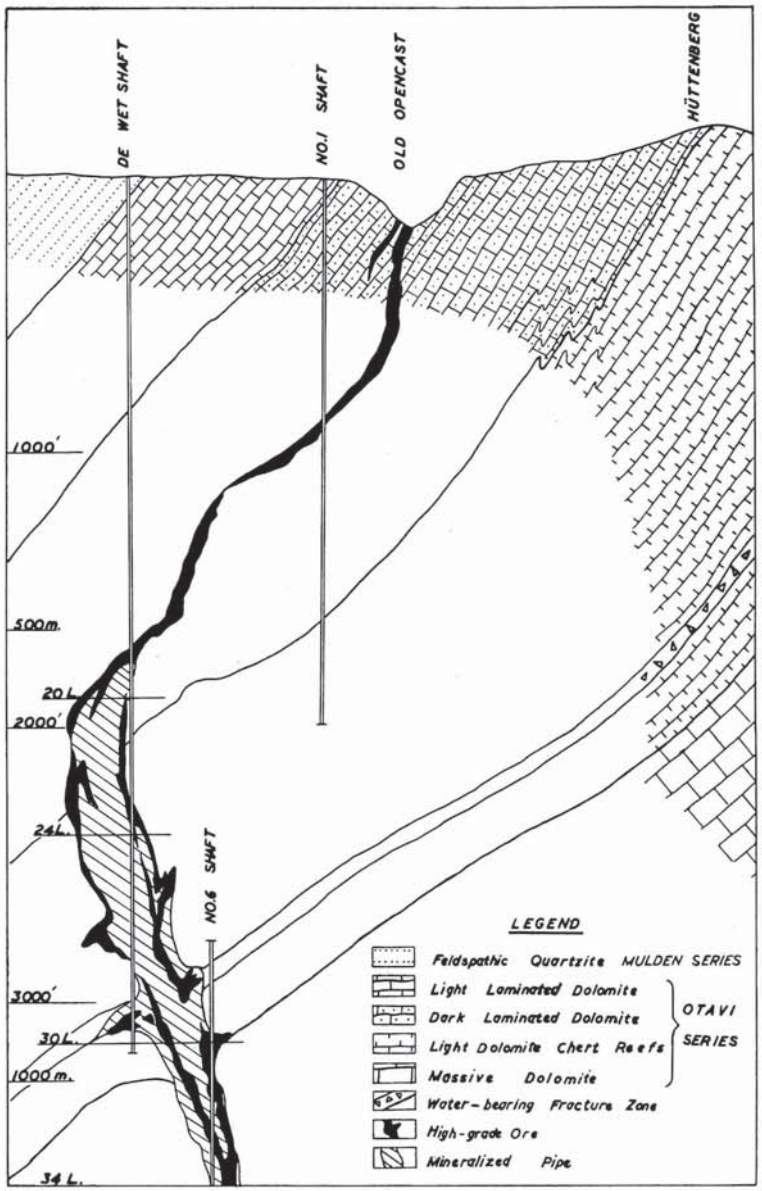


FIG. 5: Geological cross-section showing the pipe-like Tsumeb ore-body in relation to the dolomite formations from the surface down to 34 level.

PHOTO 31: The old O.M.E.G. head office. (Collection: W. Schatz)

Adamite, anglesite, aragonite, arsenosiderite, asbestos, asbolan, azurite, barite, beudantite, bornite, brochantite, briartite, calcite, caledonite, carminite, cerussite, chalcanthite, chalcophanite, chalcopyrite, chalcotrichite, chrysocolla, chudobaite, cinnabar, claudetite, conichalcite, native copper, covellite, cuprite, coronadite, digenite, dioptase, dolomite, duftite, enargite, fleischerite, fluorite, galena, gallite, germanite, glaucodot, goethite, greenockite, gypsum, hematite, hydrozincite, itoite, leadhillite, lepidocrocite, luzonite, malachite, mimetite, molybdenite, mottramite, nickel-carrolite, olivenite, otavite, patronite, pharmacosiderite, planchéite, pyrite, pyrolusite, quartz, reinerite, renierite, rosasite, schaurteite, schultenite, scorodite, seligmannite, shungite, siderite, native silver, smithsonite, söhngeite, sphalerite, stottite, stranskiite, stromeyerite, sulphur, sulvanite, tarnowitzite, tennantite, tenorite, tsumebite, umangite, vanadinite, willemite, witherite, wulfenite, cadmian wurtzite. Several other species have not yet been fully studied, bringing the total to about one hundred. Most of the mixed minerals are strikingly colourful, and include the following:- cuprian adamite, zincian carminite, zincian dolomite, zincian olivenite, zinc-cobaltian dolomite, lead-zinc dolomite, plumbo-calcite, magnesian smithsonite, cobaltian smithsonite, plumbian conichalcite, arsenian tsumebite, alpha-duftite, beta-duftite, vanadian bayldonite.

As many of these unusual minerals occur in only very small quantity — some literally in grams — it has been impossible to respond to the continual

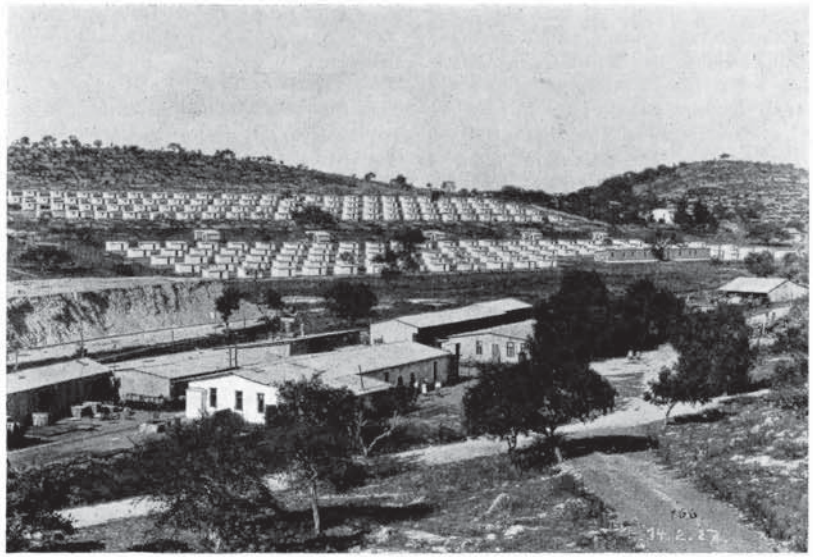


PHOTO 32: Compound on Huettenberg slope for contract labour at Tsumeb, 1927. Mine warehouse in foreground, Rhenisch Mission parsonage on far right. (O.M.E.G. collection of photographs)

stream of requests for samples from all over the world. Since 1950 some 200 collections have been officially donated to educational institutions on four continents, while countless personal applications from mineral collectors must be declined because the mine cannot become a mineral dealer's business. The public nevertheless manage to get large quantities of crystallized oxidic ores through employees who carry home the best material from the working stopes in their empty lunch boxes. Not all the pieces are small enough for such easy pilfering, the most famous exception being the magnificent cluster of dark blue azurite crystals, some up to six inches long and two inches wide, that was retrieved by the General Manager through purchase from the owner of a public bar in Tsumeb. This superb museum piece has finally left South West Africa to grace the head-office of the Newmont Mining Corporation in New York.

Although exploration away from Tsumeb has been carried out with vigour since 1947, few of the ore discoveries have led to the opening of new mines. Hope was fulfilled at Kombat, formerly the site of the Asis mine where operations had ceased in 1925. Why the change of name? In the Nama tongue, as used by the Bushmen living in the Otavi Valley at the turn of the century, Asis means "The drinking place." One may speculate whether this term is related to the "oasis" of North Africa whence the original black tribes are thought to have migrated southward. "Asis" was readily adopted by the Germans, but when new ore was found near the old mine by the Tsumeb Corporation some hesitation became manifest in using a name that, in broader English, had several

other connotations. It was decided to call the mine after the railway station Kombat, derived from the Herero name for the spring about a mile to the southeast, "Okombahe Tjinene", i.e. "The large drinking place of the giraffe"; a mile east of the mine was a smaller spring known as "Okombahe Katiti", i.e. "The small drinking place of the giraffe".

From 1953 to 1954 detailed geological and geophysical surveys were carried out over the Asis mining area and the indications followed up by exploratory drilling. The first five holes directed underneath the mined out ore-body gave negative results. Further holes located to the southwest found sporadic patches of mineralization, then a series of apparently interconnected short ore intersections, and finally in 1956 borehole As-31 proved copper-lead mineralization through a vertical distance of 313 feet almost underneath the railway. This indicated that bodies of mineable size and grade were awaiting discovery, and exploration was stepped up by doubling the drilling rate. Later in the same year a substantial lens of copper-lead ore was found 3,000 feet east of hole As-31, and in 1958 diamond drilling located a third ore-body still farther east. Taken together these ore masses constituted sufficient reserves to justify a new mining operation. With the ore essentially sulphidic, production was scheduled to coincide with the commencement of smelting at Tsumeb where the local ore concentrates were deficient in sulphur. In 1960 the old O.M.E.G. shaft was dewatered, a temporary power plant installed, and the first houses built. Within two years the quiet Otavi Valley had transformed into a beehive of activity with the gleaming plant of its centrally situated mine making a new landmark on the road to Grootfontein. The No. 1 Shaft bottomed at 1089 feet, four levels were partly developed and a town of 50 houses had sprung up. The new plant included a 1,000 ton-per-day flotation mill, 4,000 KVA steam turbine, warehouse and a compound for 200 Ovambo. The first ore from the West body passed through the mill in April, 1962. Sinking of No. 3 Shaft at the East ore-body started shortly after, and a haulage tunnel was cut to connect the two new shafts on 6 Level; in 1965 both were completed, and stoping in the East compartment started late in 1966 after about a million tons of ore had already been mined from the West section. When the production capacity of mine and mill is further raised to 1,300 tons per days as planned, the camp will have 120 houses for whites and the compound will provide room for 300 Ovambo.

The ore discoveries at Kombat must be seen as part of a much larger program of intensive search fraught with many disappointments, yet also bringing the occasional reward. Many historic prospects of rather uncertain merit have been investigated over the past twenty years and often there has been agony of decision whether or not to give up a particular project. In 1947 several thousand metres of trenches were cut in the vicinity of the Tsumeb mine and *Tsumeb West* prospect in search of ore extensions. This was followed up by detail geologic mapping and diamond drilling in stages over a period of fifteen years, and further work is contemplated. In the Otavi Valley the *Guchab* area, famous for its green dioptase ore, presented a physical challenge as the mine workings lay high above the road in rocky, mountainous terrain. The drill crew carried a machine piece by piece up the 800-foot climb to the Rogerberg adit in 1958 to bore a series of holes in the immediate vicinity. The program, interrupted by accidents and misfortunes, was suspended a year later. The *Gross Otavi* mine carried the name "Nageib" when Gerald McKiernan first came upon the Bushman miners in 1875. Nageib means "that which makes the others recede as it grows bigger", and refers to the dominating summit of the north range overlooking the Otavi Valley from an elevation of 7,000 feet above sea level, and flanked by a number of smaller peaks. Exploration of this area was resumed in 1962, and diamond drilling is still in progress. A group of old vanadium prospects on the *Harasib* farm block to the northeast attracted much attention in the early sixties. In the north surveys were carried out on the *Uris* and *Karavatu* mining areas twelve miles west of Tsumeb. A number of check boreholes established additional information without, however, leading to renewed activity.

Farther afield several major investigations have been carried out, starting in 1948 with the fluorspar deposits of *Okorusu* north of Otjiwarongo. A camp of fourteen temporary buildings was set up at the foot of the mountain and a sky-line road constructed to the top where ore lenses made disconnected outcrops across the crest of the range. Although substantial ore reserves were proved by trenching and drilling, the market for fluorspar weakened and exploration was suspended in 1949. Additional work followed in 1953—1955 when developments in the chemical industry promised a hardening of prices, but this did not materialize. The lead-zinc deposit at *Hohewarte,* 28 miles southeast of Windhoek, was investigated as a joint venture from 1951 to 1953. Iron ore deposits associated with the volcano-pluton just north of Kalkfeld were mapped in 1954, and ten years later attained economic importance when mining became feasible to supply fluxing ore to the smelter at Tsumeb. The *Klein Aub* copper deposit in Rehoboth district was intensively explored by mapping, trenching and drilling from 1959 to 1960. Though unattractive at the time this property has started production in September, 1966. Finally, the need for pyrite flux in the Tsumeb smelter spurred the search for suitable material within the Territory as an alternative to importation from overseas. Since January, 1965, exploratory drilling has been in progress at the century-old *Matchless copper* mine southwest of Windhoek where a pyritic formation containing accessory copper may prove to be an economic source of sulphur.

Investigations for Tsumeb Exploration Company Limited.

In 1940 the Geological Survey of the Union of South Africa made a reconnaissance map of the 1,000 square mile area of the central Otavi Mountain Land, using aerial photographs taken in 1937. The main objective was to report on the strategic vanadium ore occurrences and consequently this survey did not include the Tsumeb mine and environs.

The Exploration Company was concerned at the outset with the possible recurrence of ore near the Tsumeb mine and so directed its first all-out search to the adjoining terrain which was pegged in 1947 and converted into the *Teco* mining area. The following year the remainder of the 3,000 square mile concession was photographed to complete the coverage of aerial survey, and regional mapping of the formations proceeded without dalay. Experimental geophysical tests had been carried out for the O.M.E.G. near the Tsumeb ore-body in 1931 already. Additional self-potential, resistivity and gravimetric work was sponsored by the new Company in 1949, with indifferent results. Four years

later the induction polarization technique was tested extensively, using a truck-mounted mobile unit on various prospects at Tsumeb, Bobos, Harasib and in the Otavi Valley. Although anomalies of considerable magnitude showed up, they were found in most cases to be caused by rock conditions unrelated to disseminated sulphide ores. Several vagrant cows no doubt long remembered the first shocking surprise when they walked on the high-voltage cables attached to the "ice-cream truck" that made so much noise. Investigations by electromagnetic methods were likewise hampered by spurious effects, so that geophysical exploration was finally suspended in 1957. The ground and aerial surveys carried out over a span of several years furnished useful data about the rock formations in general, but have had little direct application in the search for ore.

Meanwhile geologic mapping throughout the concession area provided more and more data and special studies were made of selected areas where ore indications appeared favourable. Several lead-zinc showings at *Harasib* and *Rietfontein* were checked by trenching, soil sampling and diamond drilling, eventually proving potential reserves of low-grade ore. The old World War I copper workings at *Asis Ost* and *Alt Bobos* have likewise received much attention and drilling is still in progress to search for extensions. A comprehensive program of deep exploration for hidden ore is underway in the Otavi Valley, while many lesser prospects elsewhere are still awaiting further investigation.

Quo Vadis?

The reader who has never been directly involved in exploration may be mystified by the undying optimism of the prospector, despite many years of pioneer work in a particular district. The saying that "The surface has hardly been scratched", often heard in South West Africa, is a gross overstatement, for prospecting pits are found in the remotest desert regions of the Territory. Yet major ore discoveries are still being made in countries where prospecting started many decades ago. Who will say that there is only one Tsumeb ore-body in the dolomite formations of the Otavi Mountain Land? Does Kombat promise something bigger yet to come? Georgius Agricola, the famous physician and mining engineer of Renaissance Germany, stated four hundred years ago in his book "De Re Metallica": "For a miner must have the greatest skill in his work, that he may know first of all what mountain or hill, what valley or plain, can be prospected most profitably, or what he should leave alone; moreover, he must understand the veins, stringers and seams in the rocks. Then he must be thoroughly familiar with the many and varied species of earths, juices, gems, stones, marbles, rocks, metals and compounds." It is the application of "the greatest skill" that leads the geologist back again and again to a prospect, for even through failure he can become wiser and develop new insight. As long as reasonable hope remains of striking a bonanza the scout must stay out in the field, lest someone else should step in to reap a sudden harvest.

The life of a mine is unpredictable like the life of a man. Its future depends on innate strength blended with optimum development. Through a period of sixty years it has been the judgement of those in charge of operations at Tsumeb that largely determined its remarkable growth. High tribute is accorded to the men who carried the top responsibility during that time:-

1905—1908	Mr. T. G a t h m a n n
1908—1912	Dr. H e i m a n n
1912—1922	Mr. W. T h o m e t z e k
1922—1937	Mr. F. W. K e g e l
1938—1947	Dr. C. H e n s e n
1947—1949	Mr. M. D. B a n g h a r t
1949—1953	Mr. J. M e t z
1953—1965	Mr. C. E. S t o t t
1965— present	Mr. J. P. R a t l e d g e

But if the mine is sixty years old already, how is one to know whether it will reach a hundred? The Tsumeb ore-body resembles the tap-root of a tree: its downward extent will not be known until actually exposed to the deepest tip, for lateral search can provide little information. Therefore the inquirer must for the present be content with the assurance that mining will continue at least until 1980, as proved by the known reserves disregarding deeper extensions. Inasmuch as lead and copper ores from other sources may at some future time feed the smelter, and certain metals contained in the slag may one day be recovered by special pyrometallurgical treatment there is every likelihood of industrial activity sustaining the community for many more years.

Two giant fingers point skyward over the Tsumeb of today — a symbol of imaginative enterprise. Though the basic features of the town are plain, the tree-fringed streets and colourful gardens express the pride and esteem of a progressive community. And the traveller from the south, coming over the rise by night, is welcomed by a sudden diadem of lights — a gay token of modern living in the warm silence of the African bush.

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