

No. 68.

*From*

J. W. DALRYMPLE, ESQUIRE,  
*Offg. Under Secy. to the Govt. of India,*

*To*

J. LAWRENCE, ESQUIRE,  
*Chief Commissioner of the Punjab,*  
*Dated Fort William, the 10th January, 1854.*

SIR,—I have the honor to transmit to you the accompanying copy of a letter from Captain James, of the 32nd N. I., to the address of the Private Secretary to the Governor-General, dated the 6th ultimo, with its enclosure, regarding the exportation of "Borax" or "Tincal" from India, and to request that you will be pleased to favor Government with your sentiments on the subject.

Foreign Dept.

I have, &c.,  
(Signed) J. W. DALRYMPLE,  
*Offg. Under Secy. to the Govt. of India.*  
*Fort William, the 10th Jany., 1854.*

---

*From* CAPTAIN H. C. JAMES,  
*32nd Regt., Bengal N. I.*  
*To* F. F. COURTENAY, ESQUIRE,  
*Private Secy. to the Governor-General,*  
*Dated Calcutta, the 6th Decr., 1853.*

SIR,—During my furlough, from which I have just returned, I devoted much of my time to the study of Chemistry, as connected with Geology and Mineralogy in the Government School of Mines in London, which is under the Superintendence of Sir Henry De-la-Bèche. While studying in the Laboratory, attached to the institution, conducted by Professor Lyon Playfair, my attention was constantly drawn by him to various natural products from India, from the constant enquiries made there by manufacturers and others, for information regarding substances imported from this country.

Among various subjects, to which I gave my attention, was "Borax" or "Tincal," which is a salt of soda found in almost a pure state on the high plains of Thibet and Ladak, where it appears as an efflorescence from the soil. Shortly before going home, in 1849, I visited

Ladak, and at a place called "Pooga," about sixty miles to the South-East of Leh, I saw the "Tincal" in great quantities, and found the Merchants loading their flocks of sheep with it, for the purpose of bringing it into our Provinces, where it is used either as a flux for the smelting of iron, or for cleaning the surfaces of metals previous to soldering them. I collected some of this "Tincal," with which the manufacturers at home were much pleased, and I ascertained, by analyzing it, that it was almost entirely free from impurities.

It is now most extensively used in all the potteries, as it forms the best glaze known, but its price is so rapidly rising, owing to the monopoly which exists, that the manufacturers will soon be obliged to return to the lead glaze, formerly employed, and the use of which was attended with such fatal results.

In order that I might satisfy myself as to the extent to which Tincal is used, I visited nearly all the Staffordshire potteries, and while at Stoke-upon-Trent, I was requested to attend a meeting of the Chamber of Commerce, and there communicated to Messrs. Minton, Wedgewood, Copeland and others, having seen large quantities of native Tincal in Ladak. They immediately asked me if I would take charge of a Memorial to the Governor-General, begging for a report to be furnished as to the probable supply of the salt in that locality, as in the event of its being procurable to any great extent, they were willing at once to make arrangements for importing it wholesale into England, in order to do away with the monopoly, which at present prevents a more extended use being made of this important article.

As I am fully aware how anxious the Most Noble the Governor-General is to develope, in every way, the natural resources of India, I have taken the liberty to forward the accompanying Memorial from the Staffordshire potteries, which, I trust, will receive His Lordship's best attention.

I am fully aware that the place, which I visited, "Pooga," is in Maharaja Goolab Sing's Territories, but from the very great civility I received from the officials there, and from the subsequent conversation I had with the Maharaja in Kashmeer, I feel quite sure that there would be no reluctance on his part to allow a survey of the place to be made, and that he would give all assistance in improving the road northward from "Kaneem," as well as facilitate the transport

of the Tincal, particularly if a small duty, to which the Memorialists would not object, were allowed to be levied on the article, which, when I visited the spot, was allowed to be carried away by whomsoever chose to pick it up.

I beg to state that I shall be happy to furnish any further information on the subject of Tincal, which His Lordship may think fit to require.

I have, &c.,  
 (Signed) HENRY H. C. JAMES,  
 Captain, 32d Regt. B. N. I.

Calcutta, Decr. 6th, 1853.

To

THE MOST HONORABLE THE MARQUIS OF  
 DALHOUSIE K. G. T., GOVERNOR-GENERAL OF INDIA.

*The Memorial of the undersigned Manufacturers of China and Earthen-Ware, carrying on business in the Staffordshire Potteries.*

SHEWETH,—That the article of “Borax” is very extensively used in the manufacture of China and earthenware, the total quantity consumed in the Staffordshire potteries alone being about 2,000 tons annually.

That Borax is made from Boracic acid, which can at present only be obtained from certain mineral springs at Tasso, in the kingdom of Tuscany.

That these springs are now in lease to a private individual, who has, therefore, the complete monopoly of the supply of Borax, and has taken advantage of such monopoly to raise the price, within the last few years, from £48 to £95 per ton, and there is every probability that he will raise it still higher.

That no other substance has hitherto been discovered which would answer the purpose of Boracic acid, except Tincal.

That only small quantities of the last-named article have hitherto been brought to England, but, if a largely increased supply could be obtained at moderate prices, it would be of great advantage to your Memorialists and other manufacturers of China, earthenware, glass, &c.

That your Memorialists are informed that large quantities of Tincal exist in different parts of India, and particularly at Pooga, in the Province of Ladak, within the Territories of Maharaja Goolab Sing, where Tincal can be obtained, free of cost, and is found in very large quantities, so that it is frequently used as a flux in the manufacture of iron.

That the only obstacle to the more extended exportation of Tincal from India arises from the danger and difficulty of the roads in the interior of the country.

That your Memorialists have reason to believe, that it is in the power of the Government of India to diminish these difficulties by improving the roads and mode of transit, and also by erecting small rest-houses for the use of the Merchants, travelling over an almost uninhabited country.

That your Memorialists have been informed that your Lordship has ordered a road to be constructed from Simla to Chinee in the province of Kanawar.

That by extending this road through the District of Spitee into Ladak, great facilities would be afforded to the merchants bringing Tincal from Pooga, for at present they are obliged to convey the article almost entirely on the backs of sheep over a very bad road, and have to cross the Palung Pass, which is upwards of 18,000 feet in height.

That your Memorialists venture to recommend that a person, acquainted with the Geological and Chemical properties of Borax, be at once employed to survey and report upon the locality from whence this article comes, and also to ascertain whether so valuable a substance to our manufacturers may not be obtainable in other parts nearer to the East-India Company's Territories, and also, whether it might not be sent home in a purer state than at present ?

That by these means the Government would assist in developing one of the natural resources of the country, and fostering an important branch of commerce.

Your Memorialists have entrusted the presentation of this memorial to Captain James, of the Bengal Army, who has visited the place from whence the Tincal comes, and who has taken much interest in endeavouring to obtain an increased supply from India.

Your Memorialists humbly pray your Lordship to take the above statement into consideration, and to adopt such measures as may appear desirable for promoting and extending the export of Tincal from India.

(Sd.) John Pratt and Co.	(Sd.) Thomas Fill and Son.
„ John Hawley.	„ Beech, Hancock and Co.
„ T. Flackett and Co.	„ Marple, Turner and Co.
„ Halland and Green.	„ F. Morley and Co.
„ Anderson and Bettens.	„ W. Treakly and Co.
„ Deakin and Son.	„ Barrow and Co.
„ Bradbury, Mason and Brad-	„ Josiah Wedgwood & Sons.
bury.	„ J. Tumerial.
„ John and Thomas Jockett.	„ John and Robert Godwin.
„ Sampson, Bridgwood and	„ Pearson and Hancock.
Son.	„ Elijah Hughes.
„ Harding and Cockson.	„ John Venables and Co.
„ W. T. Coveland.	„ James Edwards and Sons.
„ T. and G. Menkin.	„ Thomas, John and Joseph
„ Levisby Rowell and Co.	Mayer.
„ William Brownfield.	„ Samuel, Alcock, and Co.
„ Edward Walley.	„ Minto Hollins and Co.
„ T. W. J. Brote.	„ John Ridgway and Co.
„ Cook and Ellye.	„ Joseph Clementine,
„ William Adams.	„ Thos. Demmok, junr. & Co.
„ Anthony Shaw.	„ J. W. Pankhurst and Co.
„ E. Ridgway, and Abington.	„ Jonath. Lowe Chethum.
„ Thomas Huckwood.	„ Warren and Adams.
„ John Alcock.	„ Hamilton and Moore.
„ Charles May and Son.	„ Beard, Moor, Berk & Blood.
„ George T. Bowers.	„ Elkin and Newton.
„ Padmore, Walker and Co.	„ Allerton, Brough and Green.
„ John Meir and Son.	„ Stanley and Lambert.
„ H. Minton, and Co.	„ Cope and Berks.
„ W. Adams and Sons.	„ Adams and Carpen.
„ F. and R. Pratt and Co.	„ Knight and Wileman.
„ W. Baker and Co.	„ John Maddock.
„ Joseph Heath.	„ W. S. Kennedy.

(Sd.) James Vernon and Co. (Sd.) Robert Beswick.  
 „ William Ridgway. „ Edward Chullmart and Co.  
 „ Hildetch and Hopwood.

(True Copies.)

(Signed) J. W. DALRYMPLE,  
*Offg. Under Secy. to the Govt. of India.*

---

No. 498, of 1830.

*From*

D. F. McLEOD, ESQUIRE,  
*Commissioner and Superintendent,  
 Trans-Sutlej States,*

*To*

P. MELVILL, ESQUIRE,  
*Secy. to the Chief Commr., Lahore.  
 Camp, Santokhgar, dated 18th March, 1854.*

SIR,—With reference to your letters, noted in the margin, I have

Genl. Dept.

the honor to forward herewith, a

1.—No. 118, dated 23rd Jany. 1854.

copy of a letter, dated 13th cur-

2.—No. 455, dated 7th Current.

rent, to my address, from Cap-

tain William Hay, Assistant Commissioner, stationed in Kulu, which supplies the best information probably at present procurable, in regard to the production of Borax or Tincal, (Hind. Sohaga,) in such of the Trans-Himalayan regions as have been hitherto explored.

2.—Captain Hay, for his love of travel, the opportunities he has enjoyed, and the scientific bent of his studies and pursuits, is peculiarly fitted for enquiries of this kind. The very interesting and valuable information, which he has given in the accompanying paper is the result of personal observation, and enquiries made on the spot. I have no doubt it may be perfectly relied on.

3.—Previous to the receipt of the accompanying letter, I had applied for information to Thakur Sing, the head man of Lahol, a Trans-Himalayan Purguna of Kangra, immediately adjoining Pitee, which separates it from Kanawar. The Laholies are the chief traders

of this portion of Himalaya, as the Kanawaries are of the portion further East, and it is by them almost exclusively that Borax is brought into Kulu and Kangra.

4.—He informs me that 2,000 standard maunds is the largest quantity which he and his brethren could undertake at present to supply during the year. He states Ruksu to be the purgana or district from which they bring it, the value demanded for it on the spot being altogether uncertain and undefined. In Kulu, he states it to sell, when unrefined at from two to three rupees ordinarily, per kucha maund of thirty two pounds, though in the present season, owing to the disasters caused by premature falls of snow, the price has risen to Rupees 3-8-0; after purification, the prices rise to Rupees 5-8-0 and upwards.

5.—This account corresponds in the main, with that given by Captain Hay, and neither holds out at present much prospect of such a supply being available, as would meet the want of manufacturers in England. In our markets I find the selling price to vary from sixteen to twenty rupees per standard maund, wholesale, and from two to two and a half seers per rupee retail. The *best* description, however, is stated to be imported from lower Hindoostan, realizing twenty rupees per maund when the Himalayan realizes but eighteen rupees.

6.—In connexion with this subject, Captain Hay touches on the following points as worthy the attention of Government:—

*First.*—The procuring a correct and scientific analysis of the deposits in particular, from which, or in connexion with which, the Borax is obtained, and of the salts found in-solution in the Trans-Himalaya lakes generally.

*Second.*—The determination of the best route by which those regions can be reached from our provinces, and the adoption of the requisite measures both physical and diplomatic, for rendering that route as easy of access as possible.

*Third.*—The establishment of some understanding with the Thibetian or Chinese authorities on the frontier, both to allow of further exploration being made, and to permit of traders or travellers from Shee-alkur in Kanawar, passing through a tongue of Thibetian territory, which intervenes between that place and the nearest point of Maha-

raja Goolab Sing's dominions. On the first of the above points, Captain Hay's suggestions appear to me to be well worthy of adoption, and he is himself in position to facilitate, in conjunction with Mr Marcadieu, its execution during the approaching season.

7.—In regard to the second point likewise, it is probable that his judgment, derived, as it is, from a tolerably intimate acquaintance, with those parts, is correct. But without a map, to accompany the description, his account will probably not be found very intelligible, and at all events a correct opinion will be greatly facilitated, when we shall have been put in possession, as I trust we shortly shall be, of the results of the Himalayan Trigonometrical Survey. A work which will be hailed with admiration by all the scientific world, and will reflect lasting honor, alike on those who have planned and executed it, and the Government under which it has been brought to a completion.

8.—I may here mention, that Mr. Forsyth, in communication with Major Longden, is engaged in preparing a rope-bridge with planking, to be substituted for that of willows, across the Chandra at Khoksar, to which Captain Hay alludes. This, if successful, will prove an immense boon to the traders, and if a sum of 500 Rupees were, at the same time, placed at Captain Hay's disposal to be expended experimentally, in improving and keeping open the Shigree pass, as proposed by him, I think the outlay would be well bestowed. The Laholies have been greatly disheartened, during the present year, by ruinous losses, and such efforts on their behalf would greatly cheer and encourage them.

9.—As to the third point :—I doubt whether any thing could be attempted at present, with effect, towards coming to an understanding with the Thibetian or Chinese authorities on the frontier, though it is, perhaps, impossible to foretel what changes the next few years may bring about. On Captain Hay's visiting this year the Lahol and Pitee Purgunas, it will no doubt be his duty to make enquiries as to the case of murder alleged to have been perpetrated there. But it would be a very delicate matter to attempt to found upon it any plea for closer intercourse, and as far as I am aware, the local authorities have been in no way to blame in that matter. It would appear that they entertain very friendly feelings towards us, though the



jealous rulers of their Government preclude them from admitting strangers, and Captain Hay, will no doubt, do well to improve these favorable impressions, or to test them as opportunity may offer.

I have, &c.,

(Signed) D. F. McLEOD,  
*Commr. and Supdt. Trans-Sutlej States.*

*Commr. & Supdts'. Office,*  
*T. S. S.,*  
*Camp, Santokgarh,*  
*The 18th March, 1854.*

*From*

CAPTAIN W. E. HAY,  
*Asst. Commr. of Kangra.*

*To*

D. F. McLEOD, ESQUIRE,  
*Commr. and Supdt., Trans-Sutlej States.*  
*Dated Kangra, 13th March, 1854.*

SIR,—I have the honor to acknowledge the receipt of your letter.

Genl. Dept. No. 177, of the 27th January, 1854, forwarding a letter, in original, No. 118, dated 23rd current, from the Secretary to the Chief Commissioner, with its enclosures, making enquiries in regard to the importation of Borax, or Tincal, from the Trans-Himalayan regions; and requesting me to throw any light upon the subject I could give or obtain.

2.—In obedience to your instructions, I have the honor to comply as far as in my power.

3.—In the first place I think it right to observe that the letter addressed by Captain James, to the private Secretary to the Most Noble the Governor-General, although written with the best intentions, is, in one or two instances, calculated to give an erroneous impression, and as the Government, before entering upon such a gigantic undertaking, as opening or even improving roads leading through the main Himalayan range to Thibet, would wish to have solid and undoubted information, I will state the results of my personal observations, which, added to others, which they may have the means of obtaining, will enable them to form some idea of the principal difficulties and obstacles to be surmounted.

4.—I have visited Pooga, in the Territory of H. H. Maharaja Goolab Sing. It is a small valley, which may roughly be calculated at two miles in length, and three-quarter mile in breadth; *i. e.*, the portion from whence the Sohaga or Tincal is collected; running East and West, and has a fine stream running through it into the river Indus, but the portion, producing the Borate of Soda, is, if not watered by, still under the influence of thermal springs, varying in four places, where I took the temperature from 130, 140, 150 to 167, the temperature of the streams, into which these empty, being in July, 56.

5.—One circumstance stated by Captain James is at present incorrect, whatever might have been the case when he visited Pooga in 1849, *viz.*, “that the Tincal is allowed to be carried away by whoever chose to pick it up.” For several years past it has greatly increased in demand and value, and for the last two years squabbles have risen among some of the oldest traders (usually people from Lahol, Kulu or Kunawur,) for the right of collecting at the most favorable spots, and I was petitioned to interfere to prevent the price of the Sohaga being increased on the spot, as it would eventually become beyond their means to purchase.

6.—The valley, producing this Sohaga, is now farmed, but I cannot ascertain precisely at how much, and it is probably an object with the Gatpo, or headman over the entire Rupchoo population, consisting of about 400 people, to hide from the Tuhseeldar of Leh, who collects the revenue, what it really is worth. In 1850, the price paid for the Tincal in barter was usually sixteen haths of coarse lungi cloth, said there to be valued at one rupee, for which

\* Equal 4 Puka or standard maund of 80 lbs. they procured three kucha maunds of the Sohaga, equal to about one puka maund of forty seers. I then ascertained, however, that for a (Sd.) D. F. McLeod. Co.'s silver Rupee, 10\* kucha maunds would be given.

7.—Within the last two years it has increased in price, in consequence of the greater demand, and its present price, I am informed by some of the principal carriers and traders, is three sheep loads for one rupee, equal to eighteen butees or about two maunds and two butees of kucha weight†.

† Equal to about 72 lbs.  
(Sd.) D. F. McLeod.

8.—Another circumstance is that Captain James seems to raise the hopes of the merchants, in England, to calculate a far greater quantity, for market than can be, or rather than has ever yet been produced.

9.—Immediately after Kulu became a British possession, an Armenian merchant, (Mr. Arratoon,) I remember, informed Mr. Erskine, the then Superintendent of Hill States, that he had sent all the Sohaga he could procure to Bombay, where he reaped, on sale, a clear profit of 200 per cent,—he remarked, however, that it was in such small quantity that unless he could obtain several thousand maunds, it would not be worth his while to engage in the trade.

10.—Remembering this when I reached the spot, I ascertained, as nearly as I could, that the entire produce of the valley might be roughly calculated at 20,000\* Kucha maunds, the greater portion of which found its way to Rampoor in Basahir, some to Kulu via Munde to the lower hills, and a small quantity via Chumba to Noorpoor; nearly all that going via Rampoor is taken into the lower hills in the neighbourhood of Sabathu, Bhujee, &c., where wood is procurable, and where, during winter, it is refined by the carriers; who go there to graze their flocks; and becomes Borax, in which state it nearly all finds its way to Jugadaree in the plains, and, I presume, goes down the river, Jumna or Ganges, and it is probable that little, if any, finds its way to England.

11.—Pooga is not, however, the only place where the Sohaga is produced; there is another locality near Rodok, yielding it, which finds its way to the plains via the Nite pass; this is said to be of a very superior quality, nearly pure, and requiring little or no cleaning, but this is produced from a portion of Thibet in Chantan subject to China; doubtless, other localities exist, if the jealousy of the factors could be overcome, and enable us to explore. Nearly all the Trans-Himalaya lakes seem to contain salts of various description, well worthy chemical analysis; to this I shall advert in a future paragraph.

12.—The transport of this Tincal is almost entirely effected on goats and sheep, being the animals at present best adapted to the mountainous path-ways, and the trade being to a certain extent pre-

carious, the profits they demand to protect themselves from loss, would, at a first view, appear large ; when, however, the severity of the climate, which they have to encounter, and the losses from snow, falling over precipices, &c., &c., are taken into consideration, it is not so exorbitant.

13.—The price of three sheep loads at Pooga, I have stated to be one rupee, the average journey of a laden sheep is about four koss per diem, and it takes nearly one month to reach Kulu from Pooga, where the same sells for eight rupees, and if cleaned as Borax it sells at Sultanpoor, (Kulu,) at five rupees the kucha maund, and if taken to the lower hills at Kudli, Sisova and Teki, at six rupees the kucha maund ; after it is purchased by the Jugadaree merchants, I cannot say what expences attend it, but the difficulties are over, and the prices here quoted clearly show the immense risk that is run on the first month's journey, compared to the second from Sultanpoor, to the lower hills, which occupies upwards of a fortnight and sometimes a month, as the sheep get out of condition, and are soon tired after the long journey.

14.—The next difficulty which Captain James so easily gets over, is the assistance which he calculates that the Maharaja would afford in improving the road. I am afraid this difficulty would be greater than he surmises, and considering that any road made to facilitate our traffic in that quarter, would cross the road by which he derives his present trade with Rodok, and indirectly as far as Lohassa, he would, I think, regard it with jealousy, as his notions on the subject of trade are cramped and unenlightened, and the avaricious eye with which he is known to guard his direct wool and pushm trade, via the Chumurireeto Leh and Kashmeer, would, I fear, make him throw difficulties instead of encouragement and assistance in our path.

15.—The subject of roads is one, that I will now venture upon with diffidence.

16.—The present transit is effected over the Parung, a high pass, 18,000 feet into Pitee, whence one portion of the trade goes direct down the valley into Kunawar, and eventually when that colossal undertaking of running the Hindoostan and Thibet road as far as Sheealkur, is completed, the further transit will be comparatively easy, but at pre-

sent the traders complain greatly of the difficulties attending the journey in upper Kunawar, especially near Nako, and prefer the shorter, but equally dangerous road via the "Shigree" into Kulu, and thence over the Julaori or Bishleo passes into the valley of the Sutlej. The other route is over the Long-Lacha and Bara-Lacha passes through Lahol, Kulu and Mundee, avoiding the Parung altogether.

17.—The year before last, I gave some attention to the "Shigree," which is in our own district. The pass so called is a vast glacier, or rather two glaciers, called the great and little "Shigree" which is crossed a little above the bed of the river Sutlej, where the glacier terminates; coming by this, and over the Rotang pass into Kulu saves to sheep nearly a fortnight, and the very great consequence of having this kept open, may be learned from what happened this last season. All the sheep that came by the "Shigree" reached Kulu, in safety, whereas those that went round by the Bara-Lacha were caught in the snow-storm which killed some 5,000 sheep, and has buried for this winter all their trade.

18.—With a view to encouragement, and adding impulse to the trade, I would propose that Government should, for the next year or two, keep open the road across these glaciers, from July until the end of September, as a trial. If fifty men from Kulu and an equal number from Lahol and Pitee were to open the road across the glacier, once in the beginning of July, I think very little after-work would be required to keep the rolling rocks off the path, filling up the cracks in the ice and occasionally strewing earth over the slippery portions of the ice. The labor might be unpopular, as the glaciers are not near villages, but the people should be paid, and about 300 Rupees a year might be divided amongst them.

19.—But this sum, or at all events a portion of it, the traders themselves would be too happy to pay, and coming by this route, they avoid the dangerous passage of the "Chundra" river, which is only bridged by ropes made of willow twigs, which is constantly getting out of repair, and when large flocks pass, requires frequent repairs, as the twig ropes get cut by the hoofs of the sheep, and stoppages are frequent. If the "Shigree" were kept open, yaks and ponies could come laden all the way from Pooga into Kulu.

20.—I have dwelt at some length upon this, as the importance of this route suggested itself to me the first time I crossed, and traders have often spoken to me on the subject, preferring it to all the other routes at present open to them. When the grand Hindoostan and Thibet road is completed, this, of course, would no longer be required, except for the facility of throwing grain into Pitee, which, in case of need, could be done in five days, whereas by the Bara-Lacha it could not be done under a very much longer period, at shortest twelve days.

21.—I here allude to the Shigree alone, for, of course, the other portion of the road, connecting Kulu with Pitee, could be made as any other roads through our hill possessions. The road via Bara-Lacha, (if preferred,) besides crossing the Chundra river, encounters various glaciers, which would require to be cleared every now and then for ponies and yaks.

22.—After leaving Pooga, as far as the ascent to the Parung, the road is pretty good, the natural course, one would then look to pursue is, instead of climbing that very high pass, to follow the course of the Para river, which would take you out not very far above Seealkur in upper Kunawar; I have never travelled that route, besides which it has to pass through a very small portion of territory claimed by the Chinese, and I shall add for the information of Government, an extract of a private letter addressed to me last year by a gentleman, travelling in those parts, as bearing on the subject.—“The Chinese wont allow people to go to Rockchin direct from Bisahir, the distance is not more than thirty or forty miles, over two very small passes that must be open all the year round, and from “Chang” the most northerly village in Bisahir to “Hula” is four days easy march; could, and would the Governor General if he knew of it, open the road? If so traffic with Rodak would be easier to us than with Goolab Sing, besides being a *great* boon to all who go from Bisahir to Ladak either for pleasure or business.” I quote this to show that the opinion is, that a road into Bisahir to the north of the Parung range would certainly be the most direct route.

23.—The remarks in a report to Government by the late Mr. Vans Agnew throw altogether a doubtful light on our boundary, which is not, I believe, yet clearly defined.

24.—You are aware that a charge has been brought against the Chinese of murdering a Lahol trader within the last year, near Rodak, and it is probable that it may be necessary as soon as the passes open to call for some explanation; this might be thought a fitting time to make any demand to open the portion of road above alluded to; but, of course, any agitation of such a subject must proceed by direct orders of our Government, and would require to be conducted with delicacy.

25.—In attempting to meet the wishes expressed in the petition of the merchants to the Governor General for developing the resources of the country. I advert to the concluding part of para. 5 of this letter, and in continuation of the subject, suggest that before any final steps be taken, that an experienced chemical examiner should be deputed to visit the Pooga, and adjoining valleys, to determine the exact nature of the deposits; and also what quantity of the Sohaga could be produced, if artificial means were used to flood the valley by means of the water of the river, and prepare the soil for evaporation.

26.—At present the people depend entirely upon falls of snow, as rain never falls in those regions, and they suppose that snow is necessary to produce the Sohaga, which probably might be equally well produced by flooding. The time I am informed required for its reproduction is only ten or twelve days; but the sun in July and August is so very powerful, that probably a succession of evaporations might be caused; this would form ground for a chemical report.

27.—It may be presumptuous in me to point out to Government the ample means they have at present of ascertaining the nature and value of these deposits, but Mr. Marcadieu, an eminent chemist now in the employ of Government purposes to be in Kulu this hot season, and extension of his travels to the Pooga valley would secure an unprejudiced and scientific report upon which the Government might fully depend.

28.—Independent of the Sohaga, (which Captain James is mistaken in supposing to be the efflorescence upon the surface of the soil; for this is always swept off by the hand before the Sohaga, which is a greasy substance of a greenish yellow appearances, is collected, and which underlies this efflorescence,) there is a very valuable deposit of

Sulphur, which is necessary to the formation of Boracic acid, and procured in abundance: and it would be a chemical question, whether Boracic acid might not be prepared on the spot, and the pure Borax made from it for transport. I merely offer this as a suggestion, and to prove that it would be better to have the facts properly ascertained at once, and before Government take into consideration the necessity of extending the road.

29.—To enable you to form an estimate of the relative value of the maund, I have calculated that about twenty-eight puka maunds will be equal to one ton, of which the annual consumption in the Staffordshire potteries alone is stated to be 2,000 tons.

30.—If the Government should conceive that my services would be useful, in the event of sending Mr. Marcadieu, I shall be most ready to accompany him; in fact, my presence in Lahol, this year, will probably be necessary to see that no unfair advantage is taken in recovering the immense quantity of property, which, in October last, was buried by the early and heavy fall of snow, and which probably will not become visible again before the end of June.

31.—In reference to the petition of the merchants—one suggestion is extremely important, viz., the erection of small rest-houses, and as soon as any line of road was determined, the orders would only be requisite to carry them into effect.

32.—Such are the observations, which it occurred to me to make, and should any further information be required hereafter, I shall consider it my duty to note any facts relating to the subject, under the impression that they may be desirable to Government.

I have, &c.,  
 ( Signed ) W. E. HAY,  
*Assistant Commissioner.*

*Kangra, 13th March, 1854.*

---



No. 952

No. 57.

*From*

G. C. BARNES, ESQUIRE,  
*Commissioner and Superintendent,*  
*C. S. Division.*

*To*

P. MELVILL, ESQUIRE,  
*Secy. to the Chief Commissioner for the Punjab.*  
*Dated Kusowlee, 20th March, 1854.*

SIR,—I have the honor to acknowledge the receipt of your letter, No. 117, dated 23rd January, regarding the supply and price of Borax in this Division.

**General.**

2.—I annex copy of Lord W. Hay's letter, which supplies full particulars regarding the places where Borax is found, the routes by which it is brought to the plains, the process of purifying the Borax, and the prices at which it sells in the hill markets.

3.—Captain James has correctly described the spot where Borax is found. It covers the plain of Pooga in Ladak in a white efflorescence. The depth is not stated, nor is the extent of the area clearly described; but I believe the supply is nearly inexhaustible. Doctor Thompson states, that the depth of this salt is "considerable," and Captain James declares that the plain is covered with Borax in "large quantities." When I was at Kangra, this Borax was a valuable article of trade with people of the remote Province of Lahol above Kulu. They used to spend the winter months at Sooltanpoor in Kulu in refining and crystallizing the Borax. Their invariable report was that any amount was forthcoming, if required.

4.—The price at Simla, is stated at 25£ a ton; but in the plains at Umbala and Feerozpoor, the price is two Rupees, nearly, a seer, or 55£ to 60£ a ton.

\* By reports of District Officers.

5.—The road via Kangra and Sooltanpoor in Kulu appears to me more feasible, and to offer less impediments, than the Rampoor and Simla route. When these roads are both completed, the carriage will be less expensive, and materially reduce the price.

6.—The present price in England is 95£ a ton, and the exportation of Borax via Feerozpoor and Kurachee would be hardly remun-

nerative at present rates, but when the Thibet road is completed to Chinee and Sheealkur, and the road from Hoosheearpoor to Kangra placed on an equally good footing, the price of Borax may fairly be expected to fall about thirty per cent.

7.—Borax is used throughout India as a flux, and also as an alterative medicine.

I have, &c.,  
(Signed) G. C. BARNES,  
*Commr. and Supt. C. S. S.*

*Commr.'s Office,  
Cis-Sutlej Division,  
The 20th March, 1854.*

}

-----  
No. 81.

*From*

LORD W. HAY,  
*Depy. Commr., Simla,*

*To*

G. C. BARNES, ESQUIRE,  
*Commr. and Superintendent, C. S. S.*  
*Dated, Camp, Kusowlee, 14th March, 1854.*

SIR,—I have the honor to acknowledge the receipt of your Circular, No. 16, dated the 30th January, calling with reference to a Memorial, presented by certain English Manufacturers, for information regarding the supply and cost of Borax.

2.—Borax, or as it is more technically designated, the Borate or Biborate of Soda, is found in great quantities in the valley of Pooga

in Ladak, and in Chinese Tartary.\* “At Foo-

\* Dr. Thompson's,  
Thibet, &c.

ga the plain is covered to a considerable depth  
with white salt—principally Borax, which is ob-

tained in a tolerably pure state by digging. The Superficial layer  
which contains a little mixture of other saline matters, being rejected.”

The substance thus obtained, is called Ischalleh by the Ladakees, and  
Thibetians, and Sohaga, by the people of the lower hills, and plains of

India. It resembles in appearance pounded chalk. It is also found  
mixed up with other earthy matter in the shape of stones. This kind

is called Ischoochal by the Thibetians and Teleca by the people of the

plains. It is chiefly found in Tartary in the edges and shallows of the salt lakes, which abound in that region, specimens of both descriptions have been forwarded by the Post.

3.—The Borax is conveyed on the backs of sheep and goats to Rampoor in Bisahir and Sooltanpoor in Kulu, and if not disposed of at either of these marts, is taken to the lower hills bordering on the Suttlej in the states of Mundee and Baghul.

4.—At the Pooga mines a duty of eight anas for every twenty seers is levied.

5.—The people who engage in the Sohaga trade are chiefly Kunorees and Khampos (a class of wondering traders,) of Lahol, Thibet, and Spitee. In the summer months they resort to the Pooga mines and other places, to which the Sohaga found in Tartary is brought, and return in the autumn before the passes are closed, to the lower hills, where they remain during the winter pasturing their flocks, refining their Sohaga, effecting sales of it to the Simla merchants, and making purchases of miscellaneous goods to take back with them in the ensuing summer.

6.—The refining process is exceedingly simple, and consists of dissolving the crude Borax in two parts of hot or ten parts of cold water, and then allowing it to crystallize. The Ischoochal Sohaga is similarly refined, the stones which contain it being first broken up. Formerly it was the custom to cover over the crude Borax with ghee to prevent efflorescence; this practice has been, I believe, discontinued of late years. The Ischaleh Sohaga loses one-fifth and the Ischoochal one-half in weight in the course of purification. Sohaga is also refined, and generally with much more care, at Jugadaree, a large mercantile town between Umbala and Saharunpoor.

The process above described costs not more than two Rupees a pukka maund.

7.—The routes principally frequented by the Sohaga traders are three in number; two to Rampoor, and one to Sooltanpoor. The first is from Pooga to Sheealkur about ten marches, and thence to Rampore, via Chinee, about thirty marches more. The second is through Pitee across the Parougho and joins the former road at the Wangtoo bridge over the Suttlej.

This route occupies about thirty-five days, and is preferred to the former from being shorter. The third route is through Pitee and Lahol to Sooltanpoor. It is frequented by the Khampas, the other two by the Kunourees.

8.—Solhaga produced in Thibet, also finds its way to the plains through Gurhwal and Kumaon, and, I believe, Darjeeling. I have not, however, been able to ascertain of what quality or in what quantity.

9.—To Rampoor and Sooltanpoor, about 2,500 maunds or ninety tons are annually brought. Last year it sold at Simla for nine Rupees a maund or 25£ a ton, and at Jugadaree it is now selling for twelve Rupees or 37£ a ton.

10.—Borax finds a ready sale all over India, being used by workers in metals as a flux and in soldering by jewellers in the manufacture of false gems, and by Native physicians in cases of eolic and ulcerations of the mouth. It is given to young children to promote articulation, and is considered a very valuable medicine.

11.—From the above account it will be seen that the supply of Borax is by no means abundant, and that what is imported into India finds a very ready market and fetches high prices. Indeed, I doubt, very much, whether as much is annually imported into India from all parts, as is annually consumed in Staffordshire alone. Notwithstanding the scantiness of the article in the Indian market, I am convinced that sufficient is produced in Thibet and Ladak to meet any demand, and that the reason it is not brought down in greater abundance is correctly given by the Staffordshire Memorialists, viz., “that the only obstacle to the exportation of Tincal from India arises from the danger and difficulty of the roads in the interior of the country.” as soon as a road feasible for mules and ponies is constructed to the confines of Tartary, Tincal will be procurable at Rampoor in any quantity and at reasonable prices.

I have, &c.,  
 (Signed) W. E. HAY,  
*Deputy Commissioner.*

---

No. 15.

*From*

M. P. EDGEWORTH, ESQUIRE,  
*Commr. and Supdt., Mooltan Division,*

*To*

P. MELVILL, ESQUIRE,  
*Secy. to the Chief Commr., Lahore.*

*Dated, Camp, Mutteethul, 3rd Feby., 1854.*

SIR,—In reply to your letter, No. 116, I have the honor to state, that I have not personally any knowledge of the Borax springs of Thibet. I know that a large quantity of it is brought down by the Bhooteecas by all the passes of the Himalaya from Kashmeer to the frontiers of Nepal.

2.—I beg to annex an interesting Memo. written for me by Major Cunningham, of the Engineers, who has visited those regions.

3.—I also find a slight notice of some other Borax springs in Captain Strachey's tour towards the Munsoorawur lake, which shows that the article is produced along a considerable extent of country.

4.—The price of Borax in the Mooltan market is 20-8 per Company's maund, and is brought here from Umritsur.

I have, &c.,

(Signed) M. P. EDGEWORTH,  
*Commr. and Supdt.*

---

Borax in Thibetan *Tshale*, is thrown up in the form of Boracic acid, by the hot springs of lowest temperature, (*viz.* varying from eighty to 130; those from 130 to 158 had no trace of Boracic acid) in the valley of Pooga. The banks of the rivulet, for about two miles in length, are quite white with the saline matters that are continually being precipitated. These salts are chloride of soda and borate of soda. They are carefully scraped from the surface, as the under coating is only the refuse of former years; those of a faint pinkish hue, inclining occasionally to green are preferred, but these colors entirely disappear as the salts become dry. This impure mixture is the Tincal of commerce from which the Borax is obtained in India in the shape of crystals by solution and evaporation. The quantity annually collected is stated, at 500 maunds, on which there is an export duty of Rupees 1-4 per maund.

Pooga is an uninhabited spot on the banks of the Rulang-chee, a small stream full of hot springs, which joins the Indus to the eastward of the Tshomoriree lake at an elevation of more than 15,000 feet. Boracic acid is ejected in the bed of the stream by the numerous hot springs at various temperatures from eighty degrees upwards. The salt (Borate of Soda,) is found along both banks of the rivulet for about two miles in combination with chloride of soda, it is in a damp state owing to the vapors emitted by the hot springs. In collecting the Borax the surface of the salt, which is generally of a light pink color, sometimes inclining to green, is carefully scraped, and tied up in leather bags; when dry, it is of a dull white color, in this state it is collected by the shepherds, who pasture their flocks on the rich summer grass of the plains of Rukchoo. The quantity annually exported is said to be 500 maunds. See Moorcroft, I., 355.

But the greatest quantity of Borax is derived from the plains of Thibet to the North East of Ladak; the price in Chang Tang is one rupee for sixty-four seers; in Ladak it is one rupee for thirty-two seers; in the bazaars of the lower hills, it is usually sold in its impure state at sixteen seers per rupee.

The Borax of Monte Cerboli in Tuscany is found also combined with hot springs, and with sulphur in the immediate neighbourhood. The Pooga hot springs rangé from eighty to 158 degrees, and there is a sulphur mine on the banks of the stream and numbers of coarse garnets.

(True copy.)

(Signed) M. P. EDGEWORTH, *Commr. and Supdt.*

—  
No. 1,624.

*From*

J. W. DALRYMPLE, ESQUIRE,  
*Offg. Under Secy. to the Govt. of India,*

*To*

J. LAWRENCE, ESQUIRE.,  
*Chief Commr. of the Punjab.*

*Dated Fort William, the 15th April, 1854.*

SIR,—With reference to the last para. of the letter to your address, dated the 24th ultimo, No. 1,234. I am directed by the Governor-General in Council to

Foreign Dept.  
Dated 28th March,  
1854.

forward to you the accompanying copy of a letter, and of a Memo. by Captain James, containing such information as might be useful to Mr. Marcadieu during his enquiries on the subject of Borax, and to request that you will forward the same to Mr. Marcadieu, and expedite and facilitate enquiries.

I have, &c.,

(Signed) J. W. DALRYMPLE,

*Offg. Under Secy. to the Govt. of India.*

*Fort William,  
The 15th April, 1854.*

}

*From*

CAPTAIN H. C. JAMES,

*32nd Regiment, Bengal Native Infantry.*

*To*

J. P. GRANT, ESQUIRE,

*Secy. to the Govt. of India.*

*Calcutta, 28th March, 1854.*

SIR,—With reference to your letter, dated 24th March, 1854, No. 1,232, regarding the employment of Mr. Marcadieu to investigate and report on the subject of Borax, I beg, herewith, to forward a memorandum, containing such information as I think may be useful to him during his enquiries. As I take a very great personal interest in this matter, I have to request that you will solicit the Most Noble the Governor-General in Council to allow me to be furnished with copies of any reports, which may be furnished to the Government from time to time by Mr. Marcadieu on this interesting subject. I will address Mr. Marcadieu privately regarding his equipment and supplies, for although these matters are of much importance, I did not consider it necessary to include them in the memorandum.

I have the honor to be,

(Signed) H. C. JAMES,

*Captain, 32nd Regt. N. I.*

#### MEMORANDUM.

Borax or Tincal, technically called "Biborate of Soda," is a saline compound, which occurs as an efflorescence from the soil.

One of the few places at which it is known at present to occur in a pure state, is Thibet, but it is doubtless to be found on the further side of the whole Himalayan Range, from Leh to Lohasa, on the high plains, where the absence of rain would allow the efflorescence to remain on the surface of the ground.

A somewhat similar salt is found in Peru, but it is a "Biborate of Lime."

Borax crystallizes in irregular hexahedral prisms, and its chemical formula is  $\text{ho. O. } +2 \text{ B. oz. } | +10 \text{ H. O.}$

Its chief use now is for glazing pottery. The pottery, after being baked, is dipped in its unglazed state into a solution containing Borax, which, when exposed to the heat of the potter's furnace, melts, and covers the articles with a thin transparent glaze or glass, which we so much admire in the finer kinds of porcelain. Borax is also used to a great extent for soldering, as it possesses the quality of dissolving the oxides of the different metals, and cleaning their surfaces so as to allow them the more easily to be joined together. It is also employed in the manufacture of artificial gems, and in glass manufacture, it would be used to an almost unlimited extent, provided it could be procured at a moderate price. Within the last few years it has risen from £50 per ton to £104, its present price.

The Borax hitherto brought into the European market is chiefly manufactured from the Boracic acid, (B. O. 3,) which occurs in some hot springs, or "Saffioni" in Tuscany, mixing carbonate of soda with the latter salt. Whereas the "Thibet Tincal," in its crude state, with a slight purification, is immediately fit for the manufacturer. All the Boracic acid from Tuscany has lately fallen into the hands of one individual, who has rented the springs for a long period, and the consequence of this monopoly is, that the price has risen so much, that it is with difficulty, the potteries can afford to use it as a glaze, and unless some endeavours are made to encrease the supply from other parts into England, the manufacturers of porcelain will be driven to use the white lead glaze, which is so dangerous to employ, and consequently important to avoid. The Chamber of Commerce of Stake-upon-Trent, have offered a large reward to any one, who will produce a substitute for Borax as a glaze, allowing the inventor to retain the patent in his own hands.



To give an idea of the increase in the Borax trade with India, during the last few years, it is only necessary to mention, that while in the years 1846-47, when the price was nine rupees a maund, only 1,731 maunds were exported from Calcutta ; during the last six months the large amount of 10,896 maunds, at twenty-two rupees per maund, have been shipped for Europe.

The points, on which the Staffordshire potteries require information, are :—

1st.—The extent to which the Tincal exists in any spot, or spots, accessible to Europeans.

2nd.—The price at which it could be delivered at any particular place in the plains of India. I would recommend that Mr. Marcadieu should proceed, as soon as practicable, *via* Simla, through Kunawur, over the Polunga pass, in Ladak ; he should pass on to the Chumairee lake, and so on to Pooga, which is situated between two places called “ Nagpo Goonzin,” and “ Meta Loomzum.” The locality of the Borax is well known, and if Mr. Marcadieu were furnished with purwanas from Maharaja Goolab Sing, and were *accompanied by an intelligent interpreter*, he would find no obstacles on the road. The Hindoostanee name for Borax is “ Sohaga,” but I have now forgotten what the people of Ladak call it.

On his arrival at Pooga, which is not a village, but merely the name of a small plain, on which the efflorescence of Borax occurs, he should make an accurate survey of the quantity of Borax existing there, and also ascertain if it is to be found at any other spot in the neighbourhood ; he should see in what state the salt exists, and if it crystallizes in an uniform manner. It would be important to know how much pure Borax there is in a given quantity of the efflorescence, and whether there is more of the salt per cent. in some portions than in others. The description of the impurities should also be stated, and the size and form of the crystals accurately noted.

Mr. Marcadieu should then ascertain on what terms the natives procure this valuable salt, and what quantities are yearly carried away from the different places where it is found. It would be interesting to know when, and to what extent, they cover it with oil or other fatty matter, to prevent it deliquescing in its journey to the plains ; and also, whether the objectionable practice might not be obviated by

packing it in water-tight bags ; also to what extent the merchants consider they would be losers if they packed it in the state in which it is found, and brought it into Hindoostan in the canvas bags at present in use.

The roads from Pooga, or other localities where this salt occurs should be carefully surveyed, and the easiest passes selected for its transit, and the safest and quickest routes should be reported on. There is little doubt that when the Thibet road, now being constructed, is carried forward through Spiti into Ladak, that will be the route which all merchandize will take in transit to the plains of India ; and, as an almost unlimited demand for this valuable product, seems about to be created, it is of the utmost importance that every facility, in the shape of a good road, should be formed for its conveyance.

Mr. Marcadieu should be requested to visit every spot accessible to Europeans, where Borax is supposed or known to exist, and he should report on each separately ; he should ascertain whether there would not be a great saving in carriage if the salt could be purified and refined on the spot ; but if that were not practicable, he might state where he considers this might be done most economically and efficiently.

The Tincal, or unrefined Borax, comes into the Calcutta market, containing many impurities, evidently added in transit to increase its weight ; it would be desirable to know if these adulterations take place before the salt leaves the hills.

The Brokers, in Calcutta, being always accustomed to see Tincal in that state, will not buy it unless it is covered with some fatty matter, though that constitutes one of its greatest impurities, requiring it to be boiled in lime to rid it of its grease ; but this kind of ignorance is unfortunately not uncommon with regard to many articles of merchandize : of course if the crude Tincal were sent to Calcutta, it would be intrinsically of much greater value than if covered with oil, which, at present, is always the case, as the refining would be a much more simple process, and it would require little purification.

As the Chamber of Commerce of Stoke-upon-Trent are anxious to get all the information possible regarding the Borax of Thibet, as soon as it can be furnished, I think Mr. Marcadieu should be requested to report his proceedings in the matter from time to time, and also

send to Calcutta, by the earliest opportunity, specimens of the salt as it occurs in different localities.

I need not point out to a chemist, such as I suppose Mr. Marcadieu to be, simple tests for salts of Borax; but I would warn him that several salts occur in Thibet very similar in appearance to Borax, and, indeed, containing a small per cent. of that substance; but, from my own experience, I can state, that the true Tincal or "Biborate of Soda," appears to be confined to particular and small localities. The "Biborate of Lime," mentioned in a former paragraph, is not nearly so valuable a salt as Borax.

When I visited Pooga, in 1849, I found that sheep were the only beasts of burden used for conveying the Tincal to the plains of India, whereas Maharaja Goolab Sing employed ponies to transport the sulphur found at the same spot into Kashmeer. The reason for sheep being solely employed, was, that the road at that time, over the Polunga pass, was in a very bad state; it would, therefore, be desirable that Mr. Marcadieu should report, at once, where the road is most in want of repairs: for, I believe, it could *immediately*, at a very small expense, be rendered *passable* for yaks and ponies, though it would require a large sum to make it a good road. He should also state where, and at what cost, rest-houses, for merchants and their flocks, could be conveniently placed.

In conclusion, he should report at length his opinion as to the best means of increasing the Borax trade, provided he thinks the salt exists in those parts to any great extent; and it would be interesting to know what arrangement he would propose should be made with Maharaja Goolab Sing, in whose territories "Pooga" is situated.

I am aware that by far the greatest quantity of Tincal at present comes into our territories from north of Kamaon and Almora, as the passes there are less steep than those to the westward; but, I think, it would be of the utmost importance to develop the trade with Ladak, which Maharaja Goolab Sing *appeared* so anxious to promote, and which would be so materially assisted (if the Thibet road, at present under construction, were completed.

I would respectfully suggest, that while Mr. Marcadieu is in those parts, he should be directed to give his attention to the gold washings so common along the higher portions of the Indus valley. I took

home some specimens of gold with me, and they were pronounced to be of the greatest purity.

I cannot but regard Mr. Marcadieu's employment in that part of the world as of the greatest importance ; for at present very little is known of the natural resources of that wild, but interesting country.

( Signed )      HENRY C. JAMES,  
*Captain, Bengal Army.*

---

No. 8.

*Report on the productions of the Pooga Valley.*

*Dhurmsala, October 25th, 1854.*

While employed in my Geological researches in the " Kulu " district, an order, emanating from the Most Noble the Governor-General of India, and transmitted to me from the superior authority of the Punjab, to proceed to the Pooga valley in Thibet, and to examine with care, and to report fully on its produce of Borax, and to determine, in a commercial sense, if the salt existed in sufficient abundance, and pure enough to offer real advantages to metropolitan industry, and to ascertain also if the produce of the salt could not be increased by artificial means.

To remove the difficulties I might have met with during the journey, owing to my total ignorance of the country, I was about going over, Captain Hay, Assistant Commissioner of the Kangra district, who had before visited that locality as an observer, intelligent, and zealous, came to my aid in joining me in the excursion, and in placing at my disposal all the judicious observations he had made during his previous journey. I own that I owe much to his kindness, and to his knowledge.

The considerable quantity of snow on the passes only allow a communication with Thibet from three to four months of the year. Two very bad roads, with no end of difficulties, are open during that short space of time. The route, *via* Lahol, is the first open in the season by the partial melting of the snow. The road through Spiti was not open when I commenced my journey in the early part of June, consequently I was obliged to take the first *via* Lahol in going ; but to form a comparison between the two roads, I returned *via* Spiti.

Of these I will speak hereafter when I attack the question of the transport of the Borax.

From Sultanpoor, the residence of the ancient Rajas of Kulu, a march of nineteen days enabled me to reach the Pooga valley in passing through Lahol. The three principal passes, the Rotung, the Bara Latcha, and the Long Latcha, were still covered with snow, though accessible to travellers, and to those who wished to be first rendered on the Borax grounds. I entered the Pooga valley by Rooksheim, skirting a lake called the "Curoah-Talao," of about six miles in length, by one and a half in breadth, surrounded by mountains of crystalline rocks of mica schists, and granite. The lake is much reduced during the hot season by the evaporation of its waters, and leaves in evaporating a saline substance uniting in taste the sapidity of the chlorine of sodium, and the bitterness of the sulphate of soda. An analysis of the water furnished the presence of these two salts in large proportions, and small portions of carbonate of lime, and carbonate of soda. The elevation of the lake, taken on the 21st of July, 1854, at quarter to nine, was 14,850 feet above sea level. I was told that the Maharaja Goolab Sing had, last year, extracted a considerable quantity of nitre for the fabrication of gun-powder; but this cannot be true, for the strictest examination made with copper filings and sulphuric acid, did not disclose the smallest traces. Some of the natives employ it in their food, but the bitterness given to it by the sulphate of soda, renders its use very limited. The salt could only be used as a purgative; but for whatever use this produce is employed, it is not of sufficient value to fix the attention of European industry. The Pooga valley is situated eighteen miles east of Rooksheim, and runs from west to east. A small river runs through the valley from west to east. The Pooga valley is of about three miles in length, and forms a slight bend near its entrance, gradually becomes wider, and forms an oval, the eastern extremity of which is barred up by a large mountain of schist, (micaceous,) which forms a rampart leaving only a small outlet for the waters of the valley. Its elevation, taken on the 24th of July, 1854, at seven o'clock A. M., was 14,208 feet above sea level. The mountains surrounding the valley, are of micaceous schist, presenting varieties remarkable enough to fix one's attention. At the eastern extremity the mica schist is

found in layers mixed with quartz and mica, that is under the true form of mica schist. In nearing the centre of the valley the mica insensibly diminishes, so as to form species of rocks consecutives, and the rock loses then, more, and more, its primitive character, becomes more quartzzy, and presents the aspect of a mica schist, passing to the Hyalomict, and participates physically of the virtues of this last-named rock. This modification is noticed sensibly in the vicinity of the sulphur mine, worked solely for the Maharaja's own use, situated on a mountain to the north, and facing the most productive part of the valley in Borax. It is probable that the sulphur has been deposited in crystals, and is still deposited in the same manner in the fissures of the mica schist by aqueous vapours loaded with sulphureous vapours. This deposit is always met conjointly with a fibrous gypsum, with the fibres generally straight, parallel, and of a silky appearance. I am led to believe that this sulphureous deposit continues to operate thus on account of the moist heat you feel when you enter a few paces into the cavern, from whence the mineral is extracted. The 26th July, 1854, at half-past six A. M., the thermometer in open air, read 52° Farenheit, while, at thirteen or fourteen feet in the interior of the mine, the mercury rose to 75° farenheit, and the glass of the instrument was covered with an aqueous vapour. I was suffocated by the puffs of humid heat of an odour similar to that developed by sulphur boiling in water. The extraction of the sulphur is of small importance at present, but might become of great interest, and value to Goolab Sing, if he would give a rapid and intelligent movement to the work; for I have not the slightest doubt that if galleries were made in the body of the mountain, large quantities of the mineral might be extracted. In the actual state of things, the mine is worked without system, and the workmen have not the remotest idea of purifying it. If the rocks, surrounding the valley, only offer a secondary interest, it is not so with the soil of the valley itself. It is in the widest part of the valley that the Borax is produced, (see plan,) on a porous soil, generally moist, and sometimes marshy. The saline efflorescence, the protecting cloak of the Borax, covers the whole of the soil, and gives it a snowy white appearance, fatiguing to the eyes, but flattering to the traders, who make sure of large profits. This snowy appearance is interrupt-

ed from distance to distance by small clusters of thermal springs, some alkaline and others sulphureous, which proves that the central heat has played its part, and continues to play it, though less energetically on the soil producing the Borax. Passing over the smaller springs which are in reality, but annexes of the larger ones, I will mention five deserving of notice. The temperature of the air being 50° Farenheit. The first spring, which is alkaline gaseous, rose the mercury of the instrument to 83° Farenheit; the four others, which are sulphureous, rose the thermometer, No. 1, to 135°; No. 2, to 170°; No. 3, to 170°, and No. 4, to 130°. No saline deposit exists on the brinks of these springs, and what is more remarkable, the water contains no Borax. They are of the same composition as the sulphureous waters of Lasa. As in this last source the hydro-sulphuric acid is combined with the soda, in the state of hydro-sulphate of soda, and the barigene is met with in the same manner. If, on account of their distance from any centre of civilization, medical art cannot expect to derive the advantages generally obtained from mineral waters of this discription, I will prove, hereafter, that the working of the Borax may find, in their temperature, a powerful auxiliary to increase the produce of that salt. From information gathered on the spot, with the assistance of Captain Hay, it would appear that the collection of the Borax is carried on during five months of the year, from May to September; but I could not ascertain precisely how long the valley remained covered with snow; but as the collecting of the Borax is only carried on during five months of the year, we must suppose that the seven months interruption is caused either by the snow, or by its melting. It is only from the month of June, when the passes are open, though still difficult of access, that the valley is covered with tents belonging to the traders from Lahol, Spiti, and other places from the southern Hymalayas. It is then that the valley, generally so dull and so deserted, becomes animated. In the grassy part of the valley, where no Borax exists, thousands of beasts of burden (principally sheep and goats,) find their food, until they can be laden and despatched to their respective destinations. Directly after the melting of the snow, the soil, which produces the Borax as before stated, is distinguished from the grassy part by saline efflorescences, hastened by the dryness of the climate. Two layers of salt, of different nature, are

naturally produced by the law which governs the crystallization of bodies. The first of these layers, which is at the surface, is composed of sesqui carbonate of soda, of sulphate of soda, chlorine of sodium ; the second of Borax, under a confused crystalline form, of a dirty white colour, nearly grey, owing to a certain quantity of earth it contains. Under this comes the porous earth, much impregnated with several salts. The natives have acquired, by long experience, a remarkable ability in distinguishing the good from the bad produce. Without the slightest hesitation they class it with rare sagacity. With a small piece of wood, of a spoon bill shape, they begin, by raking the surface of the soil, to remove the efflorescence of the soda salts, always porous, white and dry ; then they sink their small instruments, from two to three inches in depth, into the soil ; they dig out the Borax under an agglomerated form ; and, according to the weight of the salt, or its hardness, (and consequently less porous), they determine its commercial value with great exactness. They distinguish two qualities for commerce, which a chemical analysis, considered in a commercial sense, has not once found in fault, and a third quality, which the traders will not even carry away. One man can collect one maund of eighty pounds daily. The analysis on the two qualities, from specimens taken without being chosen, furnished the following results :—

First quality two trials :—

*First.*—Trial on hard Borax, presenting an agglomeration of microscopic crystals.

Borax varying from .....	76	to	85	per 100
Chlorine of sodium, .....	4½	„	5	„
Earth, .....	8	„	12	„

With traces of sulphate and sesqui carbonate of soda, and humidity in variable quantities. Traces of sulphate of lime :—

*Second.*—Analysis on Borax in powder, first quality.

Borax,.....	68	to	80	per 100
Chlorine of sodium, .....	4	„	5	„
Sulphate of soda and lime, .....	3	„	6	„
Earth,.....	10	„	20	„



Traces of sesqui carbonate of Soda. Humidity in variable quantities :—

*Second quality.*—This quality always furnishes different results :—

Borax from, .....	50	to	72	per 100
Sulphate of soda and lime, .....	10	„	20	„
Chlorine of sodium, .....	5	„	6	„
Earth, .....	10	„	24	„

Traces of sesqui carbonate of soda. Humidity, variable.

It is seen, from these results, that the agglomerated Borax, first quality, contains, in foreign salts, only chlorine of sodium, and that the powdery Borax owes its tendency to become powdery to the presence of sulphate of soda, salt which effloresces with great ease. The first and second qualities are generally mixed and form but one quality, containing from 70 to 72 per cent. of pure Borax. The third quality is rejected by the traders, who will not carry it away in its impure state, but leave it on the ground to purify itself, without the help of art, and it is very remarkable that the purification is accomplished in a few days by means that nature employs without the participation of hand-work. This phenomenon of purification took place once while I was on the spot, and this lucky circumstance has enabled me to explain this work of nature, which occurs during the formation of this interesting production. It is well known that the climate of Thibet is dry, that rains are of rare occurrence, and never are abundant or lasting. It is on account of this dryness, during the hot season, that the saline soil of the Pooga valley indicates the presence of Borax; but when by chance slight rains occur, the efflorescence disappears dissolved by the water, the saline dissolution infiltrates, into the earth, and the soil becomes again its natural colour, a yellowish grey. When the sun makes its appearance, the soil covers itself again with fresh efflorescences, and after an interval of ten or twelve days, the traders are enabled to collect Borax, of good quality, from the very spots that they had exhausted, as well as from the places that yielded, at first, to them, but Borax of inferior quality. This fact proves, in the most evident manner, that water, in moderate quantities, and a porous soil, are necessary to accomplish the phenomenon, but their importance, in my opinion, would be weakened and rendered nearly void, if they did not find in the saline efflorescence of the surface, that natural virtue of ascensional force, which allows it to direct in

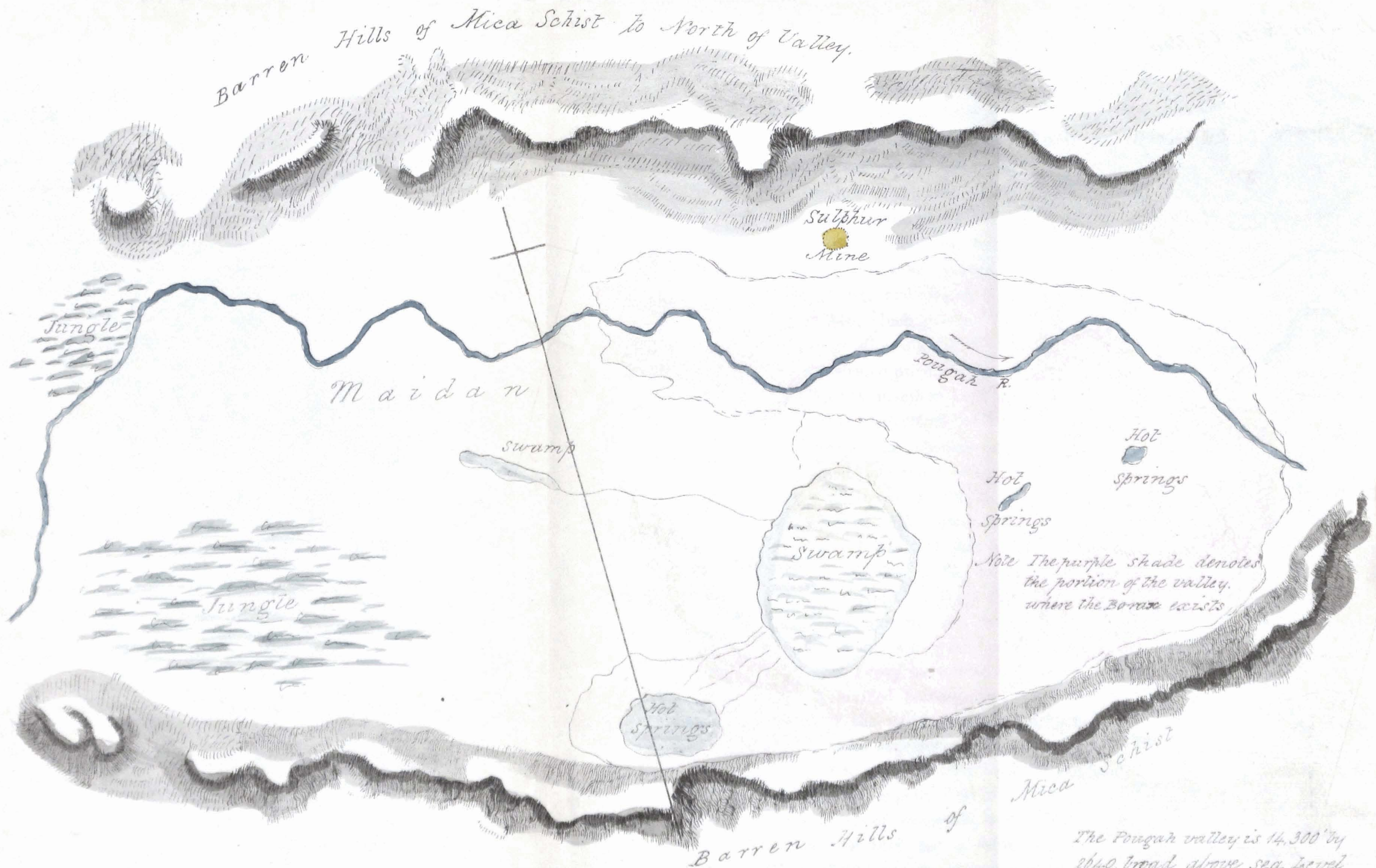
sovereign Manner this admirable work. Then, as long as it rains, the saline solution penetrates more or less into the soil, saturates itself in preference with Borax, than with the other soda salts that the Borax may contain; and as soon as the rains cease, and that the upper pores, of the soil, are warmed by the heat of the sun, and are more or less dried; the saturated solution, by reason of the capillary action of bodies, ascends towards the surface, separates itself in large portions from the Borax in forming an efflorescence, and serves, as before stated, as a cloak, and allows the Borax to crystallize confusedly. The Borax drawn thus to the surface by the powers of suction of the soda salts, never exceeds in thickness two to three inches, succeeded by an inferior quality, then comes the earth impregnated with different salts. Thus as a general rule, the saline layers may be classed in the following manner:—

Layer No. 1, efflorescence of soda salts.

„ „ 2, Borax, of 1st and 2nd quality.

„ „ 3, ditto 3rd ditto

„ „ 4, Soil impregnated with different salts. It must not be imagined that the layers are thus placed on the whole surface of the valley, there is nothing absolute in nature. It occurs often enough that immediately after the efflorescence of the soda, salts are found separately, sometimes rich layers, sometimes layers of mediocre value, or poor. This circumstance having fixed my attention, I examined and tried to find out the cause of such a difference, and was soon able to explain it, in a satisfactory manner. Though the valley may generally be said to be a level surface, without inequalities, the surface of the soil has the same aspect as all marshy places; that is to say, small cavities are found by the stagnant waters, separated by small mounds of turf. When these small cavities dispersed here and there, in some parts only of the saline portion of the valley are placed so as to receive the liquid containing the Borax, this liquid remains longer, and takes more time to evaporate, and the Borax crystallizes slower, but with more purity, and rids itself more easily of any foreign bodies it may contain. It is in these cavities nearly imperceptible, that the traders collect the best quality of Borax. It is impossible to witness this remarkable exterior saline production, without wishing to know what are the probable phenomena interior, that im-



Note The purple shade denotes the portion of the valley where the Borax exists

The Pougah valley is 14,300' by 2640. broad, above sea level. 14,208'

This is only a 'rough sketch' to accompany Mr. Marcadieu's report.

By D. Williams.

press this constant exterior, movement. It is my opinion that this impulse is the result of the expansive force of aqueous vapours acting at a great depth. These vapours, loaded first with boracic acid, (in the same manner as the suffious of Italy,) carry this acid to the superior part near the surface of the soil, deposits it on an alkaline soil, which saturates it, and transforms it into borate of soda or Borax. This salt constantly repulsed by the energy of the aqueous vapours, and meeting above, a soil, porous, cold and damp, penetrates its issues in dissolving, and ascends towards the surface of the earth by reason of the law, which governs that movement. The sulphureous thermal springs disseminated only over the soil, where the Borax is found, is a sensible proof, that if the energetic strength of the aqueous vapours do not manifest their action on the surface of the soil in the valley, as in the suffious of Italy, that at a certain depth, not easy to calculate, the phenomenon, must be identical. The Pooga valley is farmed for the moderate sum of Company's Rs. 750 per annum by a Goupa or Chief, whose principal residence is near the Chomouraree lake, but in truth it is every where, where his duties call him. I was told that he was a very wealthy man, and that the largest portion of his income was derived from the produce of the Pooga valley. I fancy that Goolab Sing, who understands so well his own interest, must be ignorant of the profits of the Goupa, whose income increases yearly without any expense or trouble. It is possible that I may have been deceived, and that the revenue of the valley is divided between the great master and his steward. The situation of the valley, the only practical outlets for cattle laden with Borax, make superintendence easy, and does away with any fear of fraud. The moderate price that the traders pay the Goupa, would prevent ideas of cupidity, which might induce them to roguery. Borax, as an article of commerce, is accessible to all who present themselves, provided they pay a certain price. All who come, work separately, without any impediment, and with entire liberty. They select a spot, and settle to work wherever they please. The Borax, once collected, only requires packing after being sufficiently dried. This dessication is performed before the tents of the traders, on a piece of ground prepared for the purpose, first in heaps of about two feet in thickness, and when it becomes powdery, they

place it on blankets to finish the operation. The Borax, thus prepared, is then put into small woollen sacks of great strength, containing each from twenty-five to thirty pounds weight, and the two openings of the sack are carefully sown up to avoid loss; thus prepared, it is ready to place on the back of a sheep or goat. The method of payment adopted by the Goupa, is simple and disinterested. I did not see one pair of scales in the valley to determine the weight of the Borax; three sacks are supposed to contain a maund of eighty pounds, and, for the above weight, the Goupa receives one rupee in coin or in goods. The merchandize, for which the exchange is made, is attah, tobacco, cloth, &c. The Goupa much interested to keep secret, the increasing profits realized on the Borax, conceals with mistrust all means of investigation on the subject. It is impossible to mention the subject to him without becoming an object of suspicion. His agents, subjected to his will, speak only after the orders of their master, so that this small circle of slaves sing when the master sings, and become silent, when he is silent; but there exist men in the world, who are indiscreet and untrue without being aware of it. It was through an infraction of this kind, to the laws of discretion, that Captain Hay and myself were enabled to obtain a few approximate data on the cash value of the Borax carried away this year. This information I cannot warrant as being strictly correct, I believe it to be rather below the real figure than above it; however, it is based on the number of sheep and goats, and besides these there are numbers of tatoos, mules, donkeys and yaks employed in carrying off the Borax. Be this as it may, I was informed that 36,000 sheep and goats were employed in the transport of Borax, this year, and that a large portion of the salt had already been carried off, and that the remaining portion would soon be loaded, as the quantity of Borax, required to load that number of beasts, was collected. If three sheep carry off a maund of Borax, 36,000 will carry off 12,000 maunds, making a sum of 12,000 Rupees, received by the Goupa; deducting Rupees 750 for rent, the food and pay of the men employed by him in the valley, remains to the Goupa, Rupees 11,000, clear profit known, passing over that which escaped our investigation. I may now be asked if the saline soil of the valley was exhausted after the extraction of the 12,000 maunds.

This question did not escape me, and I did not fail to resolve it from my own observations, and from information gathered from the oldest traders of the valley, all practical men. These men, and evidence confirms the precision of their observations, said that as much more might easily be collected, and taken away without being missed, and that if four times the number of cattle came next year, than came this, they could be laden without difficulty. The opinion of these simple beings, in the mind of whom the imagination never comes to enlarge the reality of things observed, deserves to be taken into consideration, for it happens very often that the opinion of an uncultivated mind sees, with more justness, the truisms often concealed, which belong directly to the positive things of life, while it occurs often that the opinion of certain men of cultivated minds depart from simple argument, which leads directly to the truth.

The Borax, packed, as before stated, in small sacks, proportioned to the size and strength of the animal, is easily loaded. The greatest accident to be feared during the journey, are the rains met with, unfortunately too often, in the southern Himalayas. The damage done to the Borax is considerable, owing to the little precaution taken by the traders to protect their merchandise. The examples of loss, occasioned by the melting of the Borax, do not even make them abandon their old and bad method, and yet in covering their sacks with wax cloth, so easily obtained, and having with them a tarpaulin to cover their sacks when heaped at each station, they would be able to prevent the Borax from getting wet, and also to prevent the great loss of the salt, of which the finest part always escapes through the rough tissue of the sack by the jolting movement of the animal. The loss is of about a pound and half to two pounds for each sheep load, and, notwithstanding that enormous loss, and the cupidity of the traders for profit, they do not feel the necessity of obviating this inconvenience, they bear the loss with indifference.

The two most practicable roads for the transport of the Borax to the south are through Lahol and Spiti. The mode of transport is either on sheep or goats. In their present state, these two roads are very bad, especially the one through Spiti, where, for two-thirds of the journey, no traces of a road exist, but as it is the shorter of the two, it is preferred by the traders. I was told that laden

animals were a month in performing, by this road, the distance from Pooga to Kulu. A certain fact, which passed under my own eyes, proves irrevocably that the distance can be gone over in about half the time by animals laden with Borax. When I left the Pooga valley, a flock of laden sheep left at the same time. This flock constantly followed me as far as Sultanpoor, and I can affirm that during the fifteen days of my journey, they were always one or two hours at the halting ground before me. It is probable that if the sheep were hired for the transport of the Borax, they would take more time, but I think that twenty to twenty-five days would be ample for them to perform the journey from Pooga to the "Kulu" capital. To attempt to make a road through Spiti, would be to attempt the impossible, the difficulties are insurmountable. All that could be done, would be to remove the greatest difficulties, which occur yearly during the melting of the snow, and that is all that could be done. I marched seven days over fallen rocks which are yearly renewed. After leaving the Chomoraree lake, I entered a valley, the bottom of which is bathed by a torrent, its sides are covered with rocks of calcareous mountain limestone, and sometimes granite. It is over these rocks, heaped one over the other, that you are obliged to march during two days to reach the Parung pass. At this spot there is utter impossibility of making a road, then comes the Parung, which is crossed on the snow, with its rapid descent, which leads to a torrent embanked between two perpendicular mountains, the walls of which are separated by the rapid current of the torrent, leaving only a small footpath excavated in the rock, so narrow, that, in some places, a man can only pass with difficulty. At this spot, again, it would be impossible to construct a road. After having overcome these difficulties, you cross the Spiti valley, to meet with the detestable Chigree glacier. It is there especially that the disorder of nature is seen in all its splendour. The periodical landslips heap up the broken rocks of calcareous mountain limestone, and of granite, as in the valley just spoken of, and to crown all, you have to cross the glacier strewed with deep and narrow crevices, requiring all your attention to avoid danger. After three days march in that infernal locality, following the banks of the same torrent, (the Chandra,) you leave these delights of satan, and the fourth day you cross the Sulto Sarsee pass, which leads you

into the Kulu valley. There, again, is there impossibility of constructing a road. I repeat it, the road through Spiti belongs exclusively to sheep and goats. You acquire the conviction in seeing these animals sport with the difficulties of these infernal labyrinths, that they are organized to travel over that rugged locality.

As for the road via Lahol, though there are some bad places at present, they might easily be repaired, it is indisputably the road that should be selected, if European industry undertakes the extraction of the Borax on its own account from the Pooga valley. To make the transport of the Borax practicable and easy by yaks, three bridges would be required, one over the Chundra, one over the Lingtee, and one over the Chundra Baga. This expense once made, the repair of the road would cost very little; because you do not meet with, on this road, the difficulties caused by landslips met with on the other via Spiti.

Besides, this road once open for yaks, these strong animals, full of energy and courage, and of a well-known sobriety, plentiful in the country, hiring at the rate of three annas per diem, carrying easily two maunds of Borax, could carry it to the entrance of the Kulu valley in eighteen days. It is easy to judge of the enormous advantages which would result from this system of transport. The transport by sheep is far from being compared to it, and I do not think that the proprietors of the flocks would consent to hire their sheep for the transport of the Borax, while you are always sure of finding a considerable number of yaks on the spot always ready for the road. I am nearly sure that the Goupa of Rookshine, who is a large yak proprietor, could furnish himself a sufficient number of yaks for the transport of all the Borax collected in the valley. The Borax, being transported to the entrance of the Kulu valley, at the foot of the Rotung pass, could then be loaded on mules and poneys, and directed towards the plains with the greatest ease. I do not know which would be the best road to the plains from Kulu, but exact information on the subject could easily be obtained. From Murree, or Lena Sing's hutty, at the foot of the Rotung pass, to Sultanpoor, there are three marches, so that the Borax could be carried to the last-named place, from Pooga, in twenty-one days, for the moderate sum of Rs. 2-4-3 per maund of 80 pounds, or in paying four anas a day for each animal, the cost would be



Rs. 2-10-0. These data will enable one to fix the price it could be carried to the plains for, and from there to its place of destination. I was told that the Kulu market price was Rupees eight per maund, but this trifling commerce has nothing to do with our question. However small may be the sum paid for the transport of the Borax from the saline valley to Sultanpoor, it is a fact, that the transport of foreign matters, contained in the Borax, has been paid for, the same as if the Borax was purified. There would be then, a real advantage to transport it from the valley as pure as possible. If that sterile and naked country was not completely without combustible, the question would be easily resolved; but unfortunately it is otherwise, just sufficient is found in the prickled furze of the Himalays of the liquuminous family for cooking purposes. I was then obliged to find out other means, which, I believe, are simple, good and practicable, in the valley itself, and that European industrials will easily understand. On a piece of ground, dry and level, selected for the purpose, a series of small basins, from 10 to 12 feet square, should be established. The soil of these basins, should be well beaten with potter's earth, to prevent filtration. There should also be established, under a shed erected for the purpose, a certain number of wash tubs, arranged nearly in the same manner as those made use of in Europe for the purification of saltpetre. These tubs should be furnished, at a little distance from their bottom, with a diaphragm filled with holes, on which would be placed a thick settrinee, or cloth, to receive the Borax brut, and to retain the impurities it may contain. In this state the tubs being half filled with Borax brut, with the help of pipes, and a small lift and force pump, water should be conducted into the first tub from the basin, marking the highest degree of temperature, and then one would proceed to the solution of the Borax, and to the arimetric saturation required in passing the liquid from one tub to the other. This done, the saturated solution of Borax would be conducted into the basins, where, in a very short time, it would crystallize. With this simple and easy method, we should obtain, if not a Borax, pure, at least a Borax containing a very small portion of foreign matters, and it would then be easy to complete the purification in Kulu. The thermal sulphureous waters would in no way damage the Borax, or prevent its crystalliza-

tion. The hydrosulphate of soda, contained in the water, would be directly changed into hydrosulphate of same basis, and the smell would disappear. Use could also be made of the temperature of these springs, in conducting their waters into the double-bottomed tubs, but I fear as these springs are situated in the lowest part of the valley, that a sufficient slope would be difficult to obtain, but these springs, situated in a place where no combustible exists, are called upon to render great services on account of their temperature. On reflecting over the method of purification, which I have only sketched here, merely to fix the attention on the question, I might be asked by what means wood could be procured; to this I should answer, that at five days' march from Pooga, at a place called Kymeh, a celebrated place in Thibet, on account of a convent of Boodists, of which the Chiefs take and keep for themselves the fruits of the earth, and generously leave to their flock the dew from heaven, exists a large plantation of poplar trees, the white wood of which would suit admirably for this sort of construction. As for the iron work, it could easily be brought from Kulu. In giving an intelligent direction to the production of the Pooga valley, it would be very easy to increase the produce of the Borax by irrigations performed with care. When the workmen would have collected all the Borax from the surface of the soil, over a space of twenty to thirty square feet, with watering pots, similar to those used at home by gardeners, water could be spread over the surface, so as to dissolve the efflorescences of the soda salts, and allow them to return and saturate themselves again with Borax, and draw it to the surface of the soil, and there deposit it, in short to do artificially, that which is done by the rains when they chance to fall. I am convinced that in watering in the evening, the places exhausted by the workmen during the day, and regulating with care this method of operating, that the produce of the Borax could be increased in the most surprising manner. It is my opinion that the saline soil should always be kept in a working state, that is to say, so allow it to dry only to deposit the Borax, then wet it immediately after the Borax is collected. I believe, also, that the continued interior formation of this production, is far from throwing all to the surface, and that this deviation only takes place when the soil is dry. This opinion results from observations made on the

spot. If the Borax is to be transported, purified to England, I would propose to establish the place of purification in Kulu, on account of the quantity of combustibles, and water found in that district, and also wood for construction. With the help of an installation very simple, of which I would furnish a plan when required, the Borax could be purified as well as in the large establishments of Europe, and could obtain, according to will, either the Borax of hexahedral prism at ten equivalents of water, or the Borax octohedral at five equivalents of water only. These two qualities of Borax would contain in one hundred parts. Borax prism hexahedral.

Borax anhyd, .....	52.90	} equal 100.
Water, .....	47.10	

## OCTOHEDRAL.

Borax anhyd, .....	69.19	} equal 100.
Water, .....	30.81	

The Borax octohedral would be the better suited for transport, because it contains less water, more pure Borax than the prismatic, and as its volume is much smaller, it would be carried to England at much less expense. The cost of transport would be reduced as 70.53. In this report, as during the time I passed in the Pooga valley, I have done all in my power to study well, and never depart from the principal question of material interest, which is the object of solicitude of Government, and of metropolitan industry. It is after having well reflected on the advantages that the industrials might derive from the working of Borax on their own account, that I advise them conscientiously, in finishing my report, to farm this saline locality, for whatever may be the consumption in England annually of this salt; the quantity which might be extracted from the Pooga valley, and its moderate price, would very likely alternate the high prices that the speculators have put upon the boracic acid, prices which impede the industry of Europe. Captain James had then well studied the question when he attracted the attention of Government to this saline produce, and thanks are due to him for having provoked by his remarks, as well as by his writings, the study of that interesting locality. I would have wished to have added to this report a geological description of the different species of rocks I met with during my excursion, but it will be easily understood that in travelling daily with-

out interruption from station to station, and going over a country partly covered with snow, and not being able to stop, because I might have missed my principal mission of the Pooga valley, it has not been possible for me to conciliate the two things. Geological studies require time, reflection, and lengthened stay on the same spot, to examine all with the minutest attention. The most striking features are only understood by a deep study of the localities which are joined to other localities which follow, and that have already been examined, so that the ensemble of the work requires years to be completed. To give an example, I will only say that Lahol, and especially Spiti offer great interest to the Geologist ; in including the interruptions caused by the intemperateness of the climate, a serious study of these two localities would take at least four or five years. So I have done all that possibly could be done. In passing near the Chomoraree lake, the elevation taken 29th July, 1854, at seven A. M., was 15,173 feet above sea level, lake so well described by different travellers and especially by Messrs. Gerard ; I was eager to verify a fact, remaining doubtful on account of the diversity of opinions put forth by a multitude of persons on the nature of the water of the lake. This water, which, I analyzed is far from being saline, for 10,000 parts only contain one part of saline matter composed of sulphate of Soda and sulphate of Lime. Although the quantity of these two salts is minim, it is, notwithstanding, sufficiently large to communicate to this water, a disagreeable bitter taste, rendering it unfit for use. This bitterness can only be occasioned by the presence of the sulphate of Soda, for, the sulphate of lime, not very soluble in water, can communicate no bad taste. Efflorescences of this saline mixture, of which the sulphate of Soda prevails, is found on the borders of the lake, in some places only, but that which struck me as remarkable, in skirting that enormous basin of fourteen miles in extent, of which the waters, without any exterior outlet, escape by subterranean issues, is a granitic cape, situated west of the lake advancing to its banks. This cape has undergone a plutonic action so striking, that the injecting rock has penetrated through the granite, and has metamorphosed it into a black granular crystalline rock ; a rigorous analysis only could permit one to class it. It is possible, but, I can say nothing positive on the subject, that the basin of the lake has been caused by the sinking of

the upheaved rocks during this movement. I am not aware if this observation of transformation has already been made ; I signalize it without any pretensions of anteriority. I had made a collection of rocks from the different localities I had travelled over, but unfortunately have lost many in crossing the torrent at the bottom of the Parung. I will class those that I have left and despatch them to the Chief Commissioner of the Punjab. Among them are : First, a specimen of magnetic iron ore, found west of the village of Romchou, in Thibet, by Captain Hay, while out herborizing. The mineral is of an excellent quality, but no profit can ever be derived from it, in an industrial sense, because it is situated in a locality where no combustible is procurable. No. 2, a specimen of sulphate of antimony, which I found near the Shigree Glacier among the fallen rocks. This sulphur, from what I heard from Captain Hay, exists in abundance in the vicinity of that locality. I send with this report a plan of a survey of the Pooga valley by my Assistant, with notes which will enable one to understand the matters described in this report, and send also a list of elevations. Some of these heights are known, but most of them do not figure on any map.

---

### SPECIMENS OF BORAX.

- No. 1.—Of the two qualities for trade.  
 „ 2.—Of third quality of Borax considered unfit for trade.  
 „ 3.—Earth from underneath the Borax.  
 „ 4.—Saline efflorescences.  
 „ 5.—Rocks containing Sulphur and Gypsum, and some rocks from the vicinity of the Sulphur mine, also some Gypsum taken from the ceiling of the gallery from whence the mineral is extracted.

( Signed )      MARCADIEU.

### LIST OF ELEVATIONS TAKING BY THE BOILING POINT THERMOMETER.

- |  |        |
|--|--------|
| No. 1.—Leena Sing's Hutty. Foot of Rotung pass,<br>the 13th of June, 1854, taken at half-past<br>eight A. M.,..... | 11,899 |
| „ 2.—Rotung pass, 14th June, 1854, at nine A. M.,  | 13,556 |

No. 3.—Koksar banks of Chundra, 15th June, at half-past seven, .....	9,610
„ 4.—Mungdy Southern, foot of the Bara Latcha pass, 23d June, 1854, at half-past nine A. M.,	14,688
„ 5.—Bara Latcha pass, 24th June, 1854, at seven A. M., .....	16,505
„ 6.—Lung Latcha, 28th June, 1854, at half-past seven A. M.,.....	16,120
„ 7.—Pung, in Thibet, 30th June, 1854, at half-past ten A. M., .....	14,640
„ 8.—Tung Ling pass, in Thibet, 19th July, 1854, at seven A. M., .....	18,709
„ 9.—Northern foot of Tung Ling, 18th July, 1854, at eleven A. M., .....	16,141
„ 10.—Himy Convent of Boodists, 6th July, 1854, at seven A. M., .....	11,610
„ 11.—Pomchow in Thibet, wheat cultivated, 17th July, 1854, at 12 A. M. Facing this village to the west, is a mine of magnetic iron of good quality, but cannot be worked, because there exists no combustible,.....	13,904
„ 12.—Leh, capital of Thibet, 9th July, 1854, at half-past seven A. M., .....	11,213
„ 13.—Salt Lake Rookshine, 21st July, 1854, at nine A. M., .....	14,850
„ 14.—Pooga, 24th July, 1854, at seven A. M., .....	14,208
„ 15.—Chomoraree Lake, 29th July, 1854, at seven A. M. Near the lake I saw a field of peas. Leguminus flowers, white and red, much cultivated in Spiti, .....	15,173
„ 16.—Parung pass, 3rd August, 1854, at 8 A. M.,..	18,794
„ 17.—Loosur. Spiti Valley, 8th August, 1854, at 7 A. M. The Tung Ling in Thibet is nearly as has the Parung, .....	13,457

*From*

CAPTAIN W. E. HAY,

*Assistant Commissioner in Kulu,*

*To*

R. TEMPLE, ESQUIRE,

*Secy. to the Chief Commr. Punjab,*

*Dated Nuggur, in Kulu, 29th November, 1854.*

SIR,—I have the honor to acknowledge the receipt, on the 27th November, of your letter, No. 2,480, dated 16th idem, requesting me to give further information, in continuation of my former report, on the subject of Borax.

1.—In compliance with the orders of the Chief Commissioner, I accompanied Monsieur Marcadieu to Pooga, which I ascertained to be the only place in Ladak, or in the territory of Maharaja Goolab Sing which yielded Borax.

2.—Mr. Marcadieu has, of course, reported at length on the qualities of the substance, and of the means in his opinion best adapted to amplify the supply; these are chiefly chemical questions, with which he is better able to deal than myself; in fact, I will not in any way interfere with the scientific portions of the details, but proceed to give what I may term common practical information.

3.—The copy of the report, I previously forwarded, I have unfortunately mislaid, though I believe it to be with Mr. Marcadieu; however, I have only to state, in reference to it, that on my second visit to the Pooga valley, I found my former opinions and statements corroborated. I estimated the maximum produce of the valley I think at 10,000 maunds, without any scientific exertions, to make the valley yield an increased quantity. This I find very nearly borne out by facts, as I shall hereafter mention, in giving an account of the quantity imported into Kulu and other places this year.

4.—Before entering into any account of the resources of the Pooga valley, and to make my opinions intelligible, I will give as brief an account as possible of the inhabitants of Rupchu, with the nature of their tenure of the valley.

The inhabitants are a variety of families of Bhote, living together in black woollen tents, their chief occupation being pastoral, and having peculiar laws and customs of their own. Their head man or

Gopa, answering to our Wazirs in Kulu, and under him are five others, who constitute a Punch, by whom the division of property is regulated, punishment for crime awarded, &c.

In former times the article of Sohaga, was not considered an article of much profit, or, at all events, of such little value, that traders, who carried it away, gave the Gopa only about two yards of cloth, (such as was sold in our Provinces at thirty yards per rupee,) for one sheep load. This article of commerce gradually increasing in demand, Maharajah Goolab Sing now receives an annual rent of 640 Bhotea Rupees for the Sohaga and Sulphur collected in the Pooga valley. The profits arising on the sale of the produce, whatever they be, are divided amongst these Rupchu families in shares ; so many to the head man, so many to the Punch, and to the rest, according to the length of residence, work performed, and other rules ; but as long as the 640 Bhotea Rupees were paid annually to the malik, no question was asked as to their amount of profit on the produce of this valley, as it was supposed to feed them, as little or no grain is grown, and they depend principally upon Spiti, Lahol and Kulu for their supply.

This Sohaga trade is now become of such importance, and the Gopa so much enriched, that by the people this last year he was styled a Wazir.

Our interference in the valley is a subject of great importance to these families ; they doubtless fearing that if Goolab Sing were aware of the real importance of the Borax trade, that he would either considerably raise the rent of the Pooga valley, or take the monopoly from them.

It becomes a matter of consideration, how we can interfere so as to preserve their interests intact, and at the same time secure for our market the full produce of the valley. I found there was little use in questioning the head man as to the real quantity of Borax produced ; he naturally fearing that it would be communicated to Goolab Sing, nor do I think that he could have stated any exact sum, since many of the traders do not pay in money, but exchange grain, cloth, goor, and sundry other articles, with which, after supplying themselves, they trade again to Rodok, receiving, in exchange, wool, pushm, &c.



The highest estimate of sheep, that had come there in one year, was something above 30,000. In my opinion the greatest boon that we could secure to these people, would be the Maharajas' promise that he would exercise no further interference than taking from them what they now pay, and this granted, it would be their own interest to furnish the greatest possible quantity for our market.

5.—I do not think that the best possible arrangement would ever increase the supply much above 10,000 pukka maunds, and to secure such a quantity, it would not be worth the while of government to go to any extravagant expense ; any common measures, to secure a larger supply, if practicable, would be adopted by the people themselves. The valley is without wood, the only fuel being a little brushwood, not sufficient for the purpose of purifying. There are some tamarisk trees in a valley leading from Puga to the river Indus, but such would soon be exhausted. The nearest place, to which the Sohaga can be brought for purification, is Kulu.

6.—The present families of Rupchu, own large herds of yaks, and would, I know, contract to supply the raw Sohaga, landing it one march on the N. or N. N. E. side of the passes leading into Kulu, at one rupee the maund, but this would interfere with our Lahol and Kulu traders, whose occupation, as carriers, would cease.

I cannot myself see a better plan than by encouraging the present trade by every means in our power, and the higher the price is in Kulu, the greater in proportion will be the number of people, who will engage in the trade. Yaks *may* succeed, but from my own experience of the dreary, desolate country, through which they have to pass, devoid of forage in quantity, I have no doubt, in my own mind, that the best description of carriage is that now used, sheep, goats, and donkeys.

The yak, in its own arid country, is an invaluable animal, but my experience tells me that it is not adapted for long marches, or many in succession, and it dies as soon as it is obliged to feed on rank herbage under the influence of the rains ; it would not thrive, in my opinion, on this side of the great Shigree glacier, where the vegetation begins to assume a different aspect, evidently receiving a portion of the moisture, which escapes over the range, which separates Kulu. I think this an argument in favor of sheep and goats.

7.—In my report, last year, I recommended a trial by opening a road from Kulu, over the Shigree glacier into Spiti, and from Lohsur in Spiti to the Shigree, to facilitate the progress of the Borax trade. It was nearly completed this year, and two rest houses have been built at the most desolate halting places. I am happy to say this has been attended with the most eminent success. Traders have been able to bring a load by this route, return and bring a second, and in one or two instances have, I am told, returned for a third, to come via Lahol, after the Parung pass into Spiti should be closed.

Until this season such an event, as a second trip to the Pooga valley in one year, has never been known, and the traders express great gratitude to Government for opening the communication.

This will continue the favorite route, no doubt, until the grand Thibet road is continued to the Spiti valley, or though a portion of the Chinese territory into the valley of the Indus, avoiding Spiti, and the frightful Parung pass.

The great and little Shigree, being Glaciers, changing more or less every year, will require annual superintendence; in my first report, I estimated the cost of keeping it open at 300 Rupees per annum, but I now think this an excess of what would be required, in fact, no sum has been yet publicly sanctioned, though I had the consent of the Financial Commissioner privately communicated.

8.—I may here state, that on this side of the great Shigree, I discovered on my return a vast deposit of metals in granite, one of the principal being a sulphuret of antimony, which is very abundant, and may prove to be an article of commerce; it has been favorably reported on, and I have sent specimens to the Chamber of Commerce, in Calcutta; my time was limited, and I had not then sufficient to devote to explore properly; but the beds of metal were numerous, and of great thickness, and I saw in the distance above, what appeared to be other veins running at right angles with the beds. I can confidently state that the place is worthy of a complete survey, and more lengthened report than my rapid progress enabled me to supply.

This deposit of metals appears to have escaped the notice of Monsr. Marcadieu; but I learnt that he was suffering from severe indisposition when he passed the locality; and my reason for making mention of my discovery in this report, is to express a hope, that it

may prove to be a commercial object lying directly on the road made by me to the Shigree, which will have had the advantage of developing one of the natural resources of the country, and, at the same time, facilitating the ingress of another.

9.—In returning to the subject of Borax, I think it my duty to mention, that before I left Ladak, I heard it reported that the Maharaja Goolab Sing's attention had been drawn to the visit of Monsr. Marcadieu to the Pooga valley, and that he had determined to take all the Sohaga this next year to Kashmere, having warned the districts of Balti, Longchi, and other places, to have each 500 yaks in attendance for the purpose, I need hardly say how injurious this would be to our prospects, and how advisable it would be to try and dissuade him from such a purpose if he attempts to carry it into effect. Two of his own sepahis were said to have brought this intelligence from Kashmere to Leh.

10.—Although the merchants in England appear to have urged the Governor General, by petition, to facilitate the means of procuring a larger supply of Borax, and the Governor General immediately acted on the petition, it does not appear to have been met by them with any exertions on their part to secure the material after it had reached the plains of India.

The trade of Borax with Kulu is almost entirely confined to the merchants of Jugadari. I am informed that they had only a few days ago, a stock on hand of 2,000 maunds at Jugadari, which they could not find a ready sale for, the sales effected there this season being at 9-4-0, the pucka maund.

11.—With reference to the latter part of paragraph three of this report, I herewith state that, according to my information about 5,000 pucka maunds of eighty rupees the seer of Borax, have this year been brought to Kulu; 3,000 maunds more are said to be in Lahol, held back by the traders until what has reached Kulu has been sold and in the hope of getting a better price.

At Sultanpoor, in Kulu the Borax roughly cleaned, sold in October to the latter end of November, at from four Rs. to 4-8, the pucka maund it is now the end of November selling at five Rupees; and at Jugadari from the last accounts, is selling at ten Rupees, whereas last year it fetched twelve Rupees.

Ghoshain Wuzeer of Mundi, who is a great trader, has about 1,500 maunds, and I am informed that only about

Total import from Poo- ga in 1854.	Mds.
In Sultanpoor,	5,000
In Lahol, .....	3,000
Vuzeer Goshain,	1,900
In Bisahir, ...	1,200
Total, ... ..	10,200

1,200 maunds were taken this year through the state of Bissahir, so that the total brought from the Pooga valley this year appears as nearly as possible to agree with my former report, estimating the full produce of Pooga

annually at 10,000 maunds, for from the 1,500 maunds brought by the Wuzeer, I find 500 maunds, are still in Kulu, and calculated in the 1,500 left for sale at 7-8-0 the pucka maund, which would make the total import of Borax this year from Pooga 10,200 maunds of eighty rupees the seer. About 200 maunds remained buried in snow from last year's import.

12.—The Borax is purified in Kulu before it is forwarded to Jugadari, but there it undergoes another refinement before it is sent on to Furruckabad or Mirzapoor, and eventually to Calcutta, though I have reason to believe, that very little gets so far.

13.—In consequence of the imports into Kulu from above, being greater than the imports from the plains, carriage to the latter is very scarce, and although a mule brings four maunds of goods to Sultanpoor from Jugadari, for 6-4-0, a mule carrying the same weight from Sultanpoor to Jugadari receives from ten to twelve, or at the rate of from 2-8-0 to three rupees the pucka maund.

From Jugadari to Furruckabad it is taken on hackeries, twenty-five maunds on each, for the hire of which fifty rupees are paid, and from thence by water; the price of boat hire varying considerably. These statistics, however, would be a guide to any European merchant wishing to engage in the trade.

14.—The difficulty of procuring carriage here would, at once, suggest to a speculative person, the necessity of keeping up a certain number of mules in Kulu, and which the native merchants assure me would invariably be hired for nine months in the year, at from two to three rupees the pucka maund, as far as Jugadari.

As the expenses attending such an establishment might be considered unnecessarily swelling the reading matter, I affix the estimated expence in an appendix sheet.

15.—The expence of conveying a pukka maund of any goods on mules to Loodheeana is the same, viz., three rupees as to Jugadari. It would be for the consideration of merchant, whether the best and cheapest mode of conveyance of Borax to Europe would not be via the river Sutlej from Loodheeana and Indus to Kurrachee.

16.—The Chief Commissioner having expressed a wish for an early reply, you will observe that I have lost no time in endeavouring to meet his wishes—it may be that I have done it too hastily.

I am not aware that I have omitted in this report any thing connected with the subject, which has come to my knowledge.

I have no doubt there are great deficiencies, but if any should hereafter be pointed out to me, or should further investigation be considered necessary, I shall feel it my duty to give it the full weight of my ability and exertion.

17.—I may add, in conclusion, that at Leh I had an interview with the Choba, or head Chinese trader from Lahassa, and as he said there were many places in Thibet, where Borax was procured in the Chinese territory, I begged he would exert himself, and induce the traders to bring, as much as possible, to the nearest frontier boundary for sale, and this he promised to do.

I have, &c.,

(Signed) W. E. HAY,

*Assistant Commissioner in Kulu.*

*Nuggur, in Kulu, 29th November, 1854.*

#### APPENDIX SHEET TO REPORT.

Showing the probable expense of the Establishment of 100 mules in Kulu.

If mules are kept at Bajowra, in Kulu, they would make nine trips to Jugadari in a year.

To purchase 100 <i>good</i> mules at 80 .....	Rs.	8,000
Thirty-two men, at 5 Rs. per mensem for a year, ..	„	1,920
Two Darogahs, at 6 .....	„	144
1,800 maunds of grain, .....	„	1,800
Gear to last for three years, .....	„	500

---

Total outlay,..... Rs. 12,364

Grass might be an occasional expense, although the traders assure me that they never pay for it, but graze on the road side, or on the waste lands.

*Profits for one year.*

By hire of ninety mules for nine months, . . . .	} Rs.	6,480
Supposing 10 to be sick or out of work, . . . .		
Carrying burdens elsewhere during three months in the year, say, .....	Rs.	1,000
Total, .....	„	<u>7,480</u>

The mules would also be able to bring return goods from the plains, such as coarse cloth, goor, leather, and articles for the Ladak and Yarkund markets.

Camels also could come as far as Dehir, the Puttun on the Sutlej, near Balaspoor, if it were considered advisable not to employ mules the whole distance to Jugadari, or Loodheeana.

(Signed.) W. E. HAY,  
*Assistant Commissioner.*

*From*

CAPTAIN W. E. HAY,  
*Assistant Commissioner in Kulu,*

*To*

R. TEMPLE, ESQUIRE,  
*Secretary to the Chief Commissioner, Punjab.*

*Dated Camp Phuta Kull, December 8th, 1854.*

SIR,—With a view to endeavouring to give as much information as I am able on the subject of Borax, I beg to add some further particulars in continuation of the report on the same subject, which I had the honor to forward towards the latter end of last month, and which, if you see no objection, I beg may be added to it.

Iyungtchui-ki-Rigzhing, Kushok, is a Lamba from Lahassa, who first visited me in Spiti and subsequently in Kulu, he is an intelligent man, on a pilgrimage to Rawulsee in Mundi, and will probably be more than one year in our country, returning to Kulu and Spiti in the warm weather.

By him I am informed that Borax, in very great quantity, can be procured in Hundis from Kungri, which is just under the Tise

Kailas, to as far as I can make out, about longitude 80. 30' that there is a great fair held annually at Gya Nima, which is a large salt lake, and to which the people would bring it. According to his account it is in very large, pure, white crystals, and a finer description than any procured in Maharaja Goolab Singh's territory. On looking at the map, the natural route for this trade would appear to be through Gurhwal or Kemaon, but I suppose there would be no objection to my using the influence I possess with this and other Lambas, with whom I have frequent intercourse to facilitate our measures to secure what at present appears to be so desirable an article of commerce.

This Lamba has likewise promised to furnish me with his route from Lahassa to Spiti, with his remarks on the journey, which probably will prove of interests.

I have received a specimen of Borax, which differs from any I have hitherto seen, in very dark crystals, almost black, and said to be of very good quality. I shall submit it to Monsieur Marcadiou for examination, and should it prove to be of as good quality as it is represented to be, I expect through this Lamba, whose influence seems great, to be able to get permission from the Thibetan authorities for a few traders to proceed to Silipu, near Kungri, where it is procured.

Tchootul Marsen and Menzul are also places where the Borax is procured in large white crystals, all within four day's journey of Kungri but these places are not marked in any map which I possess.

The Borax trade at Sultanpoor is somewhat more brisk than it was when I last addressed you, having risen to Rs. 5-10, with every probability, the merchants tell me, of rising to Rs. 6 the pukka maund, and the traders are quite delighted at their prospect next year, which, I sincerely hope, may not be checked by any proceedings on the part of Maharaja Goolab Singh.

I have, &c.,  
 (Signed) W. E. HAY, *Captain,*  
*Assistant Commissioner in Kulu.*

*Camp Phuta Kull,* }  
*The 8th December, 1854.* }

No. 1330.

*From*

CECIL BEADON, ESQUIRE,  
*Secretary to the Government of India,*

*To*

JOHN LAWRENCE, Esquire,  
*Chief Commr. of the Punjab.*

*Dated Fort William, the 10th April, 1855.*

SIR,—I am directed by the Honorable the President in Council to forward to you a copy of a report on Tincal, of the committee of the Staffordshire potteries, Chamber of Commerce, and to request that you will state, for the information of Government, what further has passed on the subject of Borax, in reference to the instructions issued to you in the letter from this Department, dated the 12th January last, No. 189.

Foreign Dept.

I have to be,

Sir,

(Signed) C. BEADON,

*Secretary to Government of India.*

*Fort William,*  
*The 12th January, 1855.* }

The Committee of the Staffordshire potteries, Chamber of Commerce, to whom were referred the several reports and communications forwarded by the Governor-General of India, on the subject of Tincal, beg respectfully to direct the attention of the Indian Government to the following observations :—

1st.—From the discrepancies between several of the reports as to the price of Tincal, (which is stated as high as £2-2-0, and as low as 7 shillings per cent,) the committee see reason to suppose that some of the Gentlemen, by whom these reports were furnished, have been misled by the native dealers, or other parties, from whom they derived their information.

2nd.—It is, however, obvious from the tenor of all the reports that by far the greater portion of the cost of Tincal, at the place of shipment, arises from the heavy expense of inland carriage.

3rd.—That there does not appear to be much prospect of increasing the supply, or diminishing the price of the article, unless great improvements be effected in the roads of the interior.



4th.—That the conversion of Tincal into Borax appears to be more expensive in India, than in England, and it is better, therefore, to ship it from India in its raw state.

5th.—That Tincal possesses all the properties of Boracic acid, the substance from which Borax is usually made in this country, and will answer the purpose equally well.

6th.—That Boracic acid, is now only obtained from certain springs at the Lagoons in Tuscany, which are under the controul of a single proprietor, who has, therefore, the monopoly of the article.

7th.—That about 1,100 tons of Boracic acid are annually imported from Tuscany into England, and are there manufactured into Borax, of which about two-thirds are consumed in the Staffordshire potteries.

8th.—That the supplies of Tincal from India appear within the last few years to have varied from 300 to 600 tons per annum.

9th.—That the present price of Borax is about £92 per ton, to which it has been raised (under the operation of the existing monopoly,) from £50 within the last 5 years.

10th.—That the excessive price materially limits the consumption, and if the article could be purchased at about £60 per ton, there is no doubt the consumption would be doubled.

11th.—That an increase in the consumption of Borax would greatly diminish the use of lead and other substances, which are very injurious to the workmen.

12th.—That since the recent rise in the price of Borax, the Medical men in the district have observed a great increase in cases of Paralysis and other diseases, usually attendant upon the use of lead.

13th.—That it is, therefore of great importance in a sanitary, as well as in a commercial point of view, to take measures for diminishing the price, and thereby increasing the use of Borax for manufacturing purposes.

14th.—That assuming the freight, from Calcutta or Bombay to England, to be £4 per ton, the Tincal of India might (in the present state of the market) be brought into competition with the Boracic acid from Tuscany, even if the former should cost £70 per ton at the Port of shipment, although at such a price there is not likely to be a great increase of demand.

15th.—That if, however, Tincal could be obtained at Calcutta, or Bombay, at about £45 per ton, a ready sale could be found, and a handsome profit realized in this country for a much larger quantity than has hitherto been imported.

16th.—That in collecting the Tincal, great care is required to keep it free from sand, or other extraneous substance.

17th.—That as there appears to be little hope of increasing the supply or reducing the price of Tincal, except by a great improvement in the internal communications of India, the committee beg respectfully, in conclusion to impress upon the Indian Government the importance and desirableness of taking the best means in their power for effecting this object.

(Signed) M. D. HOLLIMS, *Chairman,*

---