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THE MINERAL PRODUCTION OF INDIA DURING 1917. BY
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I.—INTRODUCTION.

THE method of classification adopted in the first Review of Mineral Production published in these *Records* (Vol. XXXII), although admittedly not entirely satisfactory, is still the best that can be devised under present conditions. The methods of collecting the returns are becoming more precise every year and the machinery employed for the purpose more efficient. Hence the number of minerals included in Class I—for which approximately trustworthy

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annual returns are available—is gradually increasing, and it is hoped that before long the minerals of Class II—for which regularly recurring and full particulars cannot be procured—will be reduced to a very small number. In the case of minerals still exploited chiefly under primitive native methods and thus forming the basis of an industry carried on by a large number of persons each working independently and on a very small scale, the collection of reliable statistics is impossible, but the total error from year to year is not improbably approximately constant and the figures obtained may be accepted as a fairly reliable index to the general trend of the industry. In the case of gold, the small indigenous alluvial industry contributes such an insignificant portion to the total outturn that any error from this source may be regarded as negligible.

From table I it will be seen that there has been an apparent increase of nearly £1½ million or 12½ per cent. in the value of the total production over that of 1916. The value figures, however, are largely artificial. In some instances although the output has fallen in quantity, it has increased in value; such increase does not necessarily give a true indication of the state of an industry, since the prevailing high freights and increased cost of production have in certain cases resulted in the closing down of all but high-grade propositions.

The number of mineral concessions granted during the year amounted to 574 as against 532 in the preceding year; 515 of these were prospecting licenses and 39 mining leases. As in the preceding year, most of the increase is due to prospecting activity in Lower Burma

TABLE 1.—*Total value of Minerals for which returns of Production are available for the years 1916 and 1917.*

Mineral.	1916.	1917.	Increase.	Decrease.	Variation per cent.
	£	£	£	£	
Coal	3,878,564	4,511,645	633,081	...	+16.3
Gold	2,303,023	2,221,889	...	81,134	-3.5
Manganese-ore	1,487,026	1,501,080	14,054	...	+0.9
Petroleum	1,119,405	1,092,964	...	26,441	-2.4
Salt	728,358	983,157	254,799	...	+34.9

TABLE 1.—*Total value of Minerals for which returns of Production are available for the years 1916 and 1917—contd.*

Mineral.	1916.	1917.	Increase.	Decrease.	Variation per cent.
	£	£	£	£	
Tungsten-ore	497,397	623,074	125,677	...	+25.3
Saltpetre	607,488	527,666	...	79,822	-13.1
Lead and Lead-ore	428,383	510,539	82,156	...	+19.1
Mica(a)	311,680	508,173	196,493	...	+63
Building materials and road metal	209,334	249,776	40,442	...	+19.3
Silver	88,687	237,216	148,529	...	+167.5
Tin-ore and tin	39,302	66,533	27,231	...	+69.3
Jadestone(a)	48,926	67,502	18,576	...	...
Monazite	37,714	56,489	18,775	...	+50
Ruby, sapphire and spinel	37,513	51,831	14,318	...	+38.2
Iron-ore	37,981	39,977	1,996	...	+5.2
Copper-ore	3,259	30,162	26,903	...	+825.5
Chromite	16,401	26,216	9,815	...	+59.8
Magnesite	14,065	14,559	494	...	+3.5
Clay	4,645	9,019	4,374	...	+94.1
Steatite	2,628	6,470	3,842	...	+146.2
Corundum	2,783	3,874	1,091	...	+39.2
Alum	6,205	3,707	...	2,498	-40.3
Diamond	361	1,826	1,465	...	+405.8
Ochre	941	1,630	689	...	+73.2
Gypsum	745	1,034	289	...	+38.8
Amber	157	684	527	...	+335.7
Molybdenite	202	626	424	...	+209.9
Bauxite	463	620	157	...	+33.9
Graphite	1,501	547	...	954	-63.5
Asbestos	...	303	303	...	...
Agate	783	255	...	528	-67.5
Bismuth	...	163	163	...	...
Antimony-ore	503	139	...	364	-72.4
Platinum	46	19	...	27	-58.7
Total	11,916,469	13,351,364	1,626,663	191,768	+12.4
			+1,434,895		

(a) Export values.

II.—MINERALS OF GROUP I.

Chromite.	Gold.	Lead.	Monazite.	Salt.
Coal.	Graphite.	Magnesite.	Petroleum.	Saltpetre.
Copper.	Iron.	Manganese.	Platinum.	Silver.
Diamonds.	Jadeite.	Mica.	Ruby, Sapphire and Spinel.	Tin. Tungsten.

Chromite.

The remarkable rate of increase in the production of chromite recorded in the preceding year was not maintained in 1917. There was, however, an increase of over 34 per cent. in the output. This was due almost entirely to operations in Baluchistan, where the output was more than doubled. There was a slight increase in the Singhbhum production, and a decrease in Mysore.

TABLE 2.—*Quantity and Value of Chromite produced in India during 1916 and 1917.*

	1916.		1917.	
	Quantity	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
Baluchistan	7,620	7,620	15,659	15,659
Bihar and Orissa	2,737	2,495	3,266.4	3,111
Mysore	9,802	6,286	8,136	7,446
Total	20,159	16,401	27,061.4	26,216

Coal.

There was an increase of nearly a million tons or 5½ per cent., and a proportionately greater increase in value — 16.3 per cent.— in the output of coal. The pit's mouth value increased largely everywhere, except in the case of Hyderabad. There was an increase of Rs. 9 per ton in pit's mouth value in the North-West Frontier Province, but as the output is less than 100 tons, the figures for that province may be left out of consideration. In the fields of Bengal and Bihar and Orissa, the rates of increase were respectively Re. 0-6-4 and Re. 0-6-0 per ton.

TABLE 3.—*Average price (per ton) of Coal extracted from the Mines in each province during the year 1917.*

Province.	Average price per ton.
	RS. A. P.
Assam	7 0 7
Baluchistan	11 0 11
Bengal	3 15 1
Bihar and Orissa	3 5 10
Central India	3 6 2
Central Provinces	4 1 3
Hyderabad	6 0 0
North-West Frontier Province	14 0 0
Punjab	7 8 8
Rajputana	4 5 8

TABLE 4.—*Origin of Indian Coal raised during 1916 and 1917.*

	Average of last five years.	1916.	1917.
Gondwana Coalfields	15,937,670	16,863,466	17,814,524
Tertiary Coalfields	409,700	390,843	398,394
Total	...	17,254,309	18,212,918

There was a fall of over 50 per cent. in the amount of coal exported, and a small rise in imports. The total amount of coal, coke and patent fuel imported, however, was only 37,626 tons. The quantity exported was 408,117 tons against nearly 882,000 tons in 1916.

There was a general increase in the output of coal in most provinces, with the exception of Baluchistan, Bengal, Central India and Rajputana. The decrease in Bengal amounted to nearly 361,000 tons; Bihar and Orissa, on the other hand, shows an increase of over a million tons, the Central Provinces nearly 84,000 tons, and Hyderabad over 65,000 tons. The decrease in the output of the Bikaner coalfield in Rajputana amounted to more than 50 per cent. as compared with the preceding year.

TABLE 5.—*Provincial Production of Coal during the years 1916 and 1917.*

Province.	1916.	1917.	Increase.	Decrease.
	Tons.	Tons.	Tons.	Tons.
Assam	287,315	301,480	14,165	...
Baluchistan	42,163	40,785	...	1,378
Bengal	4,992,376	4,631,571	...	360,805
Bihar and Orissa	10,767,683	11,932,419	1,164,736	...
Burma	200,285	198,407	...	1,878
Central India	287,832	371,498	83,666	...
Central Provinces	615,290	680,629	65,339	...
Hyderabad	75	215	140	...
North-West Frontier Province	47,449	49,869	2,420	...
Punjab	13,841	6,045	...	7,796
Rajputana (Bikaner)	...	...	...	...
Total	17,254,309	18,212,918	1,350,466	371,857

TABLE 6.—*Output of the Gondwana Coalfields for the years 1916 and 1917.*

Coalfields.	1916.		1917.	
	Tons.	Per cent. of Indian Total.	Tons.	Per cent. of Indian Total.
<i>Bengal, Bihar and Orissa—</i>				
Daltonganj	76,298	44	79,627	44
Giridih	866,055	502	824,007	452
Jaintia	75,089	44	86,894	48
Jharia	8,950,318	5187	9,783,788	5372
Bokaro-Ramgarh	197,255	114	360,760	198
Raniganj	5,535,307	3209	5,376,022	2952
Sambalpur (Hingir-Rampur).	59,737	35	52,892	29
<i>Central India—</i>				
Umaria	200,285	116	198,407	109
<i>Central Provinces—</i>				
Ballarpur	84,889	49	95,303	52
Pench Valley	154,548	9	204,502	112
Mohpani	48,395	28	71,693	39
<i>Hyderabad—</i>				
Singareni	615,290	356	680,629	374
Total	16,863,466	9774	17,814,524	9781

TABLE 7.—*Output of Tertiary Coalfields for the years 1916 and 1917.*

Coalfields.	1916.		1917.	
	Tons.	Per cent. of Indian Total.	Tons.	Per cent. of Indian Total.
<i>Assam—</i>				
Mukum	283,830	166	291,484	165
Naga Hills	3,135		8,906	
Sibsagar	...		915	
Khasi and Jaintia Hills	350		175	
<i>Baluchistan—</i>				
Khost	32,995	19	29,517	22
Sor Range	9,168	05	11,268	
<i>North-West Frontier Province—</i>	75		215	
<i>Punjab—</i>				
Jhelum	44,944	28	40,322	29
Mianwali	817		2,916	
Shahpur	1,688		6,631	
<i>Rajputana—</i>				
Bikaner	13,841	08	6,045	03
Total	390,843	226	398,394	219

The average number of persons employed daily in the coalfields increased by nearly 11,000 or rather less than 7 per cent. The average output per person employed was 108.88 tons as against 110.21 in the preceding year. The total number of fatal accidents was 172 or 1.02 per thousand persons employed.

TABLE 8.—Average number of persons employed daily in the Indian Coalfields during 1916 and 1917.

Province.	Number of persons employed daily.		Output per person employed.	Number of deaths by accidents.	Death-rate per 1,000 persons employed
	1916.	1917.	1917.	1917.	1917.
Assam	2,814	2,952	102.1	24	8.13
Baluchistan	1,111	955	42.7	8	8.37
Bengal	43,040	38,585	129.03	35	9
Bihar and Orissa	92,053	106,571	111.96	83	7.7
Central India	1,480	1,244	159.49	1	8
Central Provinces	3,558	4,245	87.51	11	2.59
Hyderabad	11,299	11,566	58.84	8	69
North-West Frontier Province	7	14	15.35	...	...
Punjab	1,049	1,033	48.27	2	1.93
Rajputana (Bikaner)	143	197	56.5	...	...
Total	156,554	167,272	...	172	...
AVERAGE			108.88		1.02

Copper.

There was a large increase in the output of copper ore in Singhbhum from 2,173 tons, valued at £3,259, in 1916 to 20,108 tons valued at £30,162 in the year under review. It is hoped that the smelting operations of the Cape Copper Co. will soon result in a considerable increase in output.

TABLE 9.—Production of Copper-ore during 1916 and 1917.

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
<i>Bihar and Orissa—Singhbhum</i>	2,173	3,259	20,108	30,162
<i>Burma—Katha</i>	498	1,347	...	...
Total	2,671	4,606	20,108	30,162

Diamonds.

The output of diamonds was again insignificant, being only 18.2 carats. The value (£1,827), however, shows a marked increase over that of the output of the preceding year.

Gold.

There was a further decrease amounting to 24,000 oz. in the output of gold. As in the preceding year, this was due chiefly to fall in the Kolar production. There was also a fall of over 5,000 oz. in the Hyderabad fields and of nearly 2,000 oz. in Madras. The output in Singhbhum increased from 861 oz. to 2,462 oz.

TABLE 10.—Quantity and value of Gold produced in India during 1916 and 1917.

	1916.		1917.		
	Quantity.	Value.	Quantity.	Value.	Labour
	ozs.	£	ozs.	£	
<i>Bihar and Orissa—Singhbhum</i>	864	3,977	2,462	10,133	119
<i>Burma—</i>					
Myitkyina.	1,901.05	7,289	1,005.55	3,895	165
Katha	21.21	85	31.19	113	
Upper Chindwin	46.96	276	42.18	240	
Shwebo	7.41	36	...	...	...
Salween	6	24	...	...	...
<i>Hyderabad</i>	18,657.2	71,577	13,466.7	52,013	1,140
<i>Madras</i>	22,371	94,789	20,529	87,066	1,768
<i>Mysore</i>	554,301	2,124,329	536,559	2,067,541	24,531
<i>Punjab</i>	186.23	810	190.08	857	407
<i>United Provinces</i>	7.63	31	7.31	31	39
Total	593,369.69	2,303,023	574,293.01	2,221,889	28,169

Graphite.

There was a considerable reduction in the production of graphite in Kalahandi, where the output fell from 252 tons, valued at £168, in 1916 to 60.4 tons, valued at £242, in the year under review, while in Rajputana there was a still greater fall from 1,066.4 to 42.3 tons valued at £305.

Iron.

There was a small rise in the output of iron-ore. The Tata Iron and Steel Company produced 167,870 tons of pig iron and 114,027 tons of steel including steel rails, while the Bengal Iron and Steel Company produced 80,262 tons of pig and 2,256 tons of cast-iron castings. In the Central Provinces there was a slight increase in the number of indigenous furnaces at work, 312 being operated during the year; at the same time there was a fall in production.

TABLE 11.—*Quantity and value of Iron ore produced in India during 1916 and 1917.*

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
<i>Bihar and Orissa—</i>				
Singhbhum	150,258	10,919	184,815	13,778
Orissa	240,918	21,271	195,998.5	17,543
<i>Burma</i>	16,081	4,288	28,763	7,670
<i>Central Provinces</i>	4,464.3	1,493	3,669	978
<i>Rajputana</i>	33.5	9	25	7
<i>United Provinces</i>	3	1	2.2	1
Total	411,757.8	37,981	413,272.7	39,977

Jadeite.

There was a slight increase in the output of jadeite produced in Burma from 3,783.37 cwt. in 1916 to 3,961.28 cwt. in the year under review. There was a very marked increase in the value from £9,315 to £28,931. This increase is attributed to a preponderance in the output of the high-grade qualities used for jewellery and other ornamental purposes.

Lead.

There was a very large increase in the output of ore from the Bawdwin mines, which rose from about 14,000 tons in 1916 to over 71,000 tons in the year under review. There was not, however, a commensurate increase in the amount of lead extracted, which was only 16,962 tons, as against 13,790 tons in the preceding year. There was an increase of over 100 per cent., however, in the quantity of silver extracted, which amounted to 1,580,557 oz. in 1917 as against 759,012 oz. in the preceding year.

TABLE 12.—*Production of Lead and Silver ore during 1916 and 1917.*

	1916.			1917.		
	QUANTITY.	VALUE.		QUANTITY.	VALUE.	
	Lead-ore and lead.	Lead-ore and slag.	Silver.	Lead-ore and slag.	Lead-ore and lead.	Silver.
	Tons.	£	£	Tons.	£	£
<i>Burma—</i>						
Northern Shan States.	8,839 (ore)	273,850(a)	70,732	54,616 (ore)	451,555(g)	228,756
	4,771 (slag)	147,976(b)	15,989	6,282 (slag)	48,017(h)	4,361
	202 (gossan flux)	6,239(c)	1,831	10,589 (gossan flux)	9,292(i)	3,966
Southern Shan States.	143.58	275	...	146.8	1,675	...
<i>Central Provinces—</i>						
Drug	7	43	...	...	...	...
<i>Kashmir</i>	7.2(d)	...	...	...	...	...
<i>Mysore—</i>						
Chitaldrug	1.78	(e)	...	.09	(j)	...
Total	13,971.56	428,383	88,552(f)	71,633.89	510,539	237,083(k)

(a) Value of 8,822 tons of lead extracted.

(b) Value of 4,767 tons of lead extracted.

(c) Value of 201 tons of lead extracted.

(d) Dug-out by a licensee under a prospecting license. Value not returned.

(e) Value not returned.

(f) Value of 759,012 ozs. of silver extracted.

(g) Value of 15,051.85 tons of lead extracted.

(h) Value of 1,600.56 tons of lead extracted.

(i) Value of 309.72 tons of lead extracted.

(j) Value not returned.

(k) Value of 1,580,557 ozs. of silver extracted.

Magnesite.

There was a further slight increase in the production of magnesite, which rose from 17,640 tons in 1916, to 18,202 tons, valued at £14,559, in the year under review.

TABLE 13.—*Quantity and value of Magnesite produced in India during 1916 and 1917.*

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value
	Tons.	£	Tons.	£
<i>Madras—</i>				
Salem	17,540	14,032	18,192	14,554
<i>Mysore</i>	100	33	10	5
Total	17,640	14,065	18,202	14,559

Manganese.

There was a slight fall in the production of manganese, but at the same time the value of the output was higher than that of the preceding year. This, of course, is due to the artificial conditions prevailing at present.

TABLE 14.—*Quantity and value of Manganese ore produced in India during 1916 and 1917.*

	1916.		1917.	
	Quantity.	Value f. o. b. at Indian ports.	Quantity.	Value f. o. b. at Indian ports.
	Tons.	£	Tons.	£
<i>Bihar and Orissa—</i>				
Singhbhum	2	4	126	292
Gangpur	2,832	6,018	11,780	27,290

TABLE 14.—*Quantity and value of Manganese ore produced in India during 1916 and 1917—contd.*

	1916.		1917.	
	Quantity.	Value f. o. b. at Indian ports.	Quantity.	Value f. o. b. at Indian ports.
	Tons.	£	Tons.	£
<i>Bambay—</i>				
Belgaum	1,765	3,751		
Chota Udepur	7,951	16,896	417	966
Panch Mahals	46,160	98,090	26,690	61,832
<i>Central Provinces—</i>				
Balaghat	264,032	627,076	260,706	686,526
Bhandara	86,344	205,067	44,997	118,492
Chhindwara	53,977	128,195	66,235	174,419
Nagpur	153,899	365,510	145,603	383,421
Jubbulpore	576	727	300	790
<i>Madras—</i>				
Vizagapatam	2,755	2,893	1,682	1,864
<i>Mysore</i>	24,911	32,799	32,277	45,188
Total	645,204	1,487,026	590,813	1,401,080

Mica.

As in the case of manganese, there was an apparent fall in the amount of mica produced, but a rise in the value of the output, the total production in 1917 being returned as 40,907·6 cwt. valued at £141,605. The amount exported, on the other hand, was 62,434 cwt., or over 50 per cent. more than the quantity reported as produced in the country. This cannot be due entirely to stocks held from previous years, and, as has been pointed out before, indicates imperfect returns. Owing to the recent heavy demand for mica and to the higher prices offered, there was increased activity in mining during the past year, and there is very little doubt that the output figures are too low. There is a thriving trade in mica theft in some of the mining areas, and stolen mica naturally does not appear in the output returns.

TABLE 15.—*Quantity and Value of Mica produced in India during 1916 and 1917.*

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value.
	Cwt.	£	Cwt.	£
Bihar and Orissa	26,819.8	76,040	34,137	91,825
Madras	15,675	28,045	6,050.4	45,718
Mysore	18	72		
Rajputana	887	3,287	720.2	4,062
Total	43,399.8	109,244	40,907.6	141,605

Monazite.

The production of monazite in Travancore rose from 1,292.48 tons valued at £37,714 in 1916 to 1,940.3 tons valued at £56,489 in 1917.

Petroleum.

There was a decrease of over 14 million gallons in the output of petroleum in Burma and India, the total production being 282,759,523 gallons. The details of the respective fields are shown in the attached table. The production of the Yenangyaung Oilfield fell from nearly 199 million gallons in 1916 to 176,979,020 gallons in the year under review. The yield of the Singu Oilfield was 85,639,166 gallons, approximately the same as in the preceding year. There were slight increases in the outputs of the Yenangyat and Minbu fields, but a falling off in Kyaukpyu. In Assam the output of the Digboi Field increased by over 1 million gallons, or nearly 23 per cent, while the new Badarpur field in Assam produced nearly 3 million gallons. In the Punjab the Attock Oilfield increased its production more than threefold, the output having risen from a little over 182,000 gallons to 618,598 gallons in 1917.

TABLE 16.—*Quantity and Value of Petroleum produced in India during 1916 and 1917.*

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value.
	Gallons.	£	Gallons.	£
<i>Burma—</i>				
Akyab	11,882	228	10,894	210
Kyaukpyu	68,843	321	46,821	1,408
Yenangyaung Field	199,152,938	766,562	176,979,020	681,212
Singu Field	85,146,138	305,002	85,639,166	329,635
Yenangyat Field	5,310,740	19,980	6,620,908	24,825
Minbu	2,043,542	8,515	3,468,382	14,452
Thayetmyo	35,000	293	30,000	253
<i>Assam—</i>				
Digboi (Lakhimpur)	5,236,890	17,274	6,419,840	21,176
Badarpur			2,924,975	14,625
<i>Punjab—</i>				
Attock	182,480	1,216	618,598	5,155
Mianwali	1,334	14	919	13
Total	297,189,787	1,119,405	282,759,523	1,092,964

The imports of kerosene oil decreased largely in 1917, being only a little over 33 million gallons as compared with nearly 60 million gallons in the preceding year. 438,888 cwt. of paraffin wax, valued at £669,479, were exported.

Platinum.

The output of platinum fell to almost nothing, being only 3.79 oz; this was obtained, as usual, during the dredging operations of the Burma Gold Dredging Company at Myitkyina.

Ruby, Sapphire and Spinel.

There was a slight decrease in the output of the Ruby Mines during the year under review. The estimated value of the output however, rose to £51,831.

TABLE 17.—*Quantity and Value of Ruby, Sapphire and Spinel produced in India during 1916 and 1917.*

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value.
	Carats.	£	Carats.	£
Burma—	136,783	35,848	132,409	43,575
Mogok	(Rubies) 34,100	1,442	(Rubies) 32,369	8,017
	(Sapphires) 38,841	223	(Sapphires) 33,422	239
	(Spinel)		(Spinel)	
Total	209,724	37,513	198,200	51,831

Salt.

There was a slight decrease in the amount, and a slight rise in the value, of the output of salt in 1917 as compared with that of the preceding year. There was also a slight decline in the amount imported, from 446,069 tons, valued at £1,260,295 in 1916, to 341,986 tons valued at £1,360,093 in the year under review.

TABLE 18.—*Quantity and Value of Salt produced in India during 1916 and 1917.*

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
Aden	129,406	45,614	122,926	65,952
Bengal.	2	1	21	28
Bombay and Sind	484,742	128,420	457,989	
Burma.	38,774	184,812	43,650	229,882
Central India	6.7	32	25.1	114
Gwalior State	114	364	269	854
Kashmir	36.7	27	...	...
Madras	481,170	267,065	394,985	384,617
Northern India	354,398	102,023	405,731	136,917
Rajputana	...	...	2,057	247
Total	1,488,649.4	728,358	1,427,653.1	983,157

TABLE 19.—*Quantity and Value of Rock-Salt produced in India during 1916 and 1917.*

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
Salt Range	160,358	27,283	152,351	25,921
Kohat	19,978	1,983	23,787	2,559
Mandi	4,568	5,440	4,829	5,752
Total	184,904	34,706	180,967	34,182

Saltpetre.

The production of saltpetre fell from over 25,000 tons in 1916 to 21,283.8 tons valued at £527,666 in 1917. Most of the reduction occurred in the United Provinces. There was an increase in the quantity exported, which amounted to 515,374 cwt., valued at £677,856, in 1917 as against 485,000 cwt. in the preceding year.

TABLE 20.—*Quantity and value of Saltpetre produced in India during 1916 and 1917.*

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£.	Tons.	£.
Bihar	5,904	143,188	5,024.3	122,995
Central India	25.1	481	29.9	252
Punjab	8,146	191,878	9,141	226,793
Rajputana	244	5,700	234.2	6,893
United Provinces	10,743	266,241	6,855.4	170,733
Total	25,056.1	607,488	21,283.8	527,666

Silver.

Practically the whole of the silver production comes from the Badwin lead-zinc mines, which, as already stated (see *Lead*), produced 1,580,557 oz. in the year under review. The Anantapur gold mine in Madras also produced 1,281 oz.

Tin.

There was a considerable increase—amounting to 43 per cent.—in the amount of tin-ore produced. This all came from Burma, which yielded 13,326 cwt. valued at £65,533. 2,817·9 cwt. of block tin were also produced in Mergui district as the result of local smelting operations. The imports of block tin amounted to 28,180 cwt., valued at £292,135.

N.B.—The tin-ore of the Southern Shan States is produced in the form of mixed cassiterite-wolfram concentrates; the output is therefore returned in terms of the mixed concentrate, the approximate composition of which is usually 43 per cent. wolfram to 57 per cent. cassiterite. The total figure for 1917 is 14,239 cwt.; for the purposes of this Review it has been assumed that 8,088 cwt. of this represent tin-ore and the remainder wolfram.

TABLE 21.—Quantity and value of Tin and Tin-ore for the years 1916 and 1917.

	1916.				1917.			
	Block Tin.		Tin Ore.		Block Tin.		Tin Ore.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Cwt.	£.	Cwt.	£.	Cwt.	£.	Cwt.	£.
<i>Burma</i> —								
Amherst	...	...	10	16	...	...	33	176
Mergui	2,257·19	19,802	1,897	10,531	2,817·9	27,962	1,761	10,930
Southern Shan States	...	...	4,862	16,965	...	...	8,088	40,440
Tavoy	...	...	1,644	8,192	...	...	1,762	11,015
Thaton	...	...	900	3,598	...	...	1,677	3,972
Total	2,257·19	19,802	9,313	39,302	2,817·9	27,962	13,321	66,533

Tungsten.

The production of wolfram rose by nearly 22 per cent., from a little under 3,700 tons in 1916 to over 4,500 tons in the year under review. The Central Provinces have now ceased to produce, and there has only been a small increase in the output in Singhbhum. The output of the Degana mines in Rajputana has increased somewhat but is still insignificant, the absence of water being a serious handicap to efficient treatment of the material. Over 80 per cent. of the total output of wolfram came from Tavoy, where the industry has shown highly satisfactory progress, the production having increased by nearly 75 per cent. during the last two years.

TABLE 22.—Quantity and value of Tungsten-ore produced in India during 1916 and 1917.

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
<i>Bihar and Orissa</i> —				
Singhbhum	8	640	20	1,333
<i>Burma</i> —				
Mergui	340	46,014	368	49,541
Southern Shan States ²	185	18,500	307	39,910
Tavoy	3,034	410,586	3,697·5	508,794
Thaton	91·5	15,079	107·5	15,366
<i>Central Provinces</i> —				
Nagpur	1·3	220	...	...
<i>Rajputana</i> —				
Marwar	32·7	6,358	42	8,130
Total	3,692·5	497,397	4,542	623,074

¹ Figures taken from "Note on the mineral production of Burma" for 1916 and 1917.
² See note under *Tin*.

III.—MINERALS OF GROUP II.

Agate. The output of agates amounted to 120 tons valued at £255. All of these came from Rajpipla.

Alum. The production of alum fell by nearly 50 per cent. from 9,419 cwt. in 1916 to 5,434 cwt. valued at £3,707 in 1917. This production was from the Mianwali district in the Punjab.

Amber. 59.6 cwt. of amber, valued at £684, were produced during the year in the Myitkyina district of Upper Burma.

Antimony. The production of antimony ore fell from 1,040 tons in the year 1916 to 130.5 tons valued at £139 in the year under review. Of this 105 tons came from the Amherst district in Upper Burma and 25½ from the Chitaldrug district of Mysore.

Aquamarine. Nearly 26,000 carats of aquamarine were produced from the Kashmir workings during the year under review. The output was valued at £297.

Asbestos. A small quantity of asbestos was produced during the year, the total output being 148 tons valued at £303, of which 7 tons were produced in the Central Provinces and 141 tons in the Hassan district of Mysore.

Bauxite. The output of bauxite in the Jubbulpore district amounted to 1,363 tons. The estimated value was £620. The output in the preceding year was 750 tons.

Bismuth. A small quantity (5 cwt.) of bismuth was mined in the Tavoy district, where native bismuth is occasionally found associated with the wolfram. The estimated value of the output was £163.

Building Materials. The total estimated value of building stone and road-metal produced during the year 1917 was £249,776.

Clay. The production of clay was 86,745 tons valued at £9,019.

Corundum. There was a slight increase in the output of corundum from 37,361 cwt. in 1916 to 41,425.8 cwt. in the year under review. With the exception of 200 cwt. from Rewah and 26 cwt. from South Canara, the whole of the production came from Assam.

TABLE 21.—*Production of Building Materials and road metal in India during the year 1917.*

	GRANITE.	LATERITE.		LIME.		LIMESTONE AND KANKAR.		MARBLE.		SANDSTONE.		SLATE.		TRAP.		MISCELLANEOUS.	
	Quantity.	Value.	Tons.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Assam	..	£	..	..	£	57,100	5,178	..	..	..	..	..	..	..	..	..	..
Bihar and Orissa	17,995	3,678	..	121	3	284,966	69,039	..	..	70,166	2,249	2,000	1,900	13,584	220	179,837	7,234
Bombay	..	..	..	..	..	1,192	100	..	..	86,636	6,195	..	..	677	34	295,954	19,723
Burma	255,290	18,730	..	..	..	174,034	12,437	..	..	..	..	..	..	..	..	3,026	30
Central India	..	..	..	17,057	8,959	69,512	4,420	..	..	..	..	..	..	..	..	..	..
Central Provinces.	..	..	..	..	..	86,444	6,917	..	..	..	..	..	..	..	..	..	..
Hyderabad	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Madras	58,878	2,466	..	..	..	9,541	551	..	..	..	..	..	..	..	..	88,518	5,900
North-West Frontier Province	..	..	..	..	..	2,541	114	..	..	..	..	..	..	..	..	..	..
Punjab	..	..	..	..	..	15,497	895	..	..	109,432	7,269	6,831	7,798	..	..	9,208	143
Rajputana	..	..	..	..	..	820	479	3,032	3,182	39,894	11,479	..	..	..	..	49,995	2,897
United Provinces.	..	..	..	63	28	3,361	805	..	..	5,000	1,500	43,025	546	..	..	136,432	18,440
TOTAL	332,163	24,874	422,371	17,241	8,990	685,068	100,935	3,032	3,182	316,128	28,692	51,856	10,244	14,261	254	757,990	54,367

The output of gypsum shows a slight increase over that of the preceding year. The figures are given in table 22.

TABLE 23.—*Production of Gypsum during 1916 and 1917.*

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
<i>Punjab—</i>				
Jhelum	615	31	1,068	53
<i>Rajputana—</i>				
Bikaner (Jamsar)	11,613	520	8,116	661
Marwar	3,800	194	7,499	320
Total	16,028	745	16,683	1,034

27 cwt. of molybdenite, valued at £626, were produced from the Tavoy wolfram mines during the year 1917.

Molybdenite.

Ochre.

The output of ochre rose from 850·5 tons in 1916 to 3,143 tons valued at £1,630 in the year under review.

TABLE 24.—*Production of Ochre during 1916 and 1917.*

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
<i>Bihar and Orissa</i>	3·5	1	69	49
<i>Central India</i>	839	939	2,174	773
<i>Central Provinces</i>	8	1	900	808
Total	850·5	941	3,143	1,639

Samarskite.

67 lbs. of samarskite, valued at £2, were produced from the Sankara mica mine in Nellore.

There was a very marked rise in the quantity of steatite produced. The total production amounted to 7,828·7 tons valued at £6,470.

Steatite.

TABLE 25.—*Quantity and value of Steatite produced in India during 1916 and 1917.*

	1916.		1917.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
<i>Bihar and Orissa—</i>				
Singhbhum	(a)	250	...	...
Mayurbhanj	52	333	50	267
<i>Burma—</i>				
Meiktila	...	...	4,846	1,197
Myingyan	...	...	16	25
<i>Central India—</i>				
Bijwar	...	...	73·3	386
<i>Central Provinces—</i>				
Jubbulpore	891·75	794	2,421·8	2,619
<i>Madras—</i>				
Bellary	36	12	23	8
Kurnool	10·45	116	10·3	115
Nellore	50·5	251	19·5	77
Salem	87	325	149·6	762
<i>Mysore</i>	...	...	8·5	17
<i>Rajputana (Ajmer-Marwara)</i> . .	...	...	119·7	319
<i>United Provinces—</i>				
Hamirpur	76	504	80	630
Jhansi	10	43	11	48
Total	1,213·7	2,628	7,828·7	6,470

(a) Quantity not returned.

IV.—MINERAL CONCESSIONS GRANTED.

TABLE 26.—Statement of Mineral Concessions granted during 1917.

ASSAM.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Cachar	(1) Mr. F. H. Carslaw	Mineral oils	P. L.	16,000	21st May 1917.	1 year.
Khasi and Jaintia Hills.	(2) Khasi Hills prospecting and mining syndicate, Ltd.	Ore of tin, lead, titanium, silver, mercury, bismuth, nickel, cobalt, copper, zinc, antimony, arsenic, sulphur, tungsten, molybdenum, vanadium, uranium, tantalum, niobium, thorium, cerium, beryllium, zirconium, lanthanum, praseodymium, neodymium, samarium, yttrium, terbium, dysprosium, gadolinium, holmium, erbium, thulium, thallium, ytterbium, scandium, radium, iron and manganese, the miner's corundum and emery, the metal gold and miner's and metals carrying gold, the metal platinum and the platinum metals, and minerals and metals containing platinum and the platinum metals.	M. L.	1,920	1st March 1917.	30 years.
Chimpur	(3) Assam Railways and Trading Co., Ltd.	Coal, iron, slate and shale.	M. L.	2,227.2	1st April 1917.	Do.
Do.	(4) Durga Datta and Sridal Beria.	Coal	P. L.	8,238.08	6th October 1917.	1 year.
et	(5) The Burma Oil Co., Ltd.	Mineral oils	P. L.	11,603.2	15th May 1917.	Do.
2.	(6) Do.	Do.	P. L.	2,944	Do.	Do.

P. L.=Prospecting License. M. L.=Mining Lease.

BALUCHISTAN.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Kalat	(7) The Indo-Burma Petroleum Co., Ltd., Rangoon, through their Managing Agents, Messrs. Steel Brothers & Co.	Oil	P. L.	15,360	20th May 1917.	1 year.
Do.	(8) Do.	Do.	P. L.	17,920	Do.	Do.
Do.	(9) The Burma Oil Co., Ltd., Rangoon.	Do.	P. L.	24,000	18th December 1916.	Do.
Quetta-Pishin.	(10) Khan Bahadur B. D. Patel, C.I.E., Quetta.	Chromite	M. L.	80	1st July 1917.	30 years.
Do.	(11) Mr. Tikam Dass Girdhari Dass of Shikarpore.	Coal	M. L.	80	Do.	Do.
Sibi	(12) W. C. Clements, Esq., through his Agent Babu Ganda Singh.	Do.	M. L.	16.46	1st January 1917.	Do.
Do.	(13) Mr. Tikam Dass Girdhari Dass of Shikarpore.	Do.	M. L.	80	Do.	Do.

BIHAR AND ORISSA.

Gya	(14) Mr. Surendra Nath Tagore of Calcutta.	Mica	M. L.	1,567.05	1st October 1915.	20 years.
Hazaribagh	(15) Babu Probodh Chandra Mukharji.	Do.	P. L.	80	20th August 1917.	1 year.
Do.	(16) Babu Shivajee Waljee	Do.	P. L.	3.70	25th June 1917.	Do.
Do.	(17) Babu Jagannath Rasan Lal.	Do.	P. L.	280	18th September 1917.	Do.
Do.	(18) Babu Lakshmi Narain Sukhani.	Do.	P. L.	137.07	23rd August 1917.	Do.
Do.	(19) Babu Shivaji Walji	Do.	P. L.	3.23	10th October 1917.	Do.
Do.	(20) Babu Banka Behari Chaudhuri.	Do.	M. L.	70	Lease not yet executed.	30 years.
Sambalpur	(21) Mr. T. P. Ycoman	Coal	M. L.	1,300	1st July 1917.	Do.
Santal Parganas.	(22) Babu Bansi Ram Marwari.	Do.	M. L.	.33	1st October 1917.	6 months up to 31st March 1918.

P. L.=Prospecting License. M. L.=Mining Lease.

BIHAR AND ORISSA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Santal Parganas.	(23) Babu Bansi Ram Marwari.	Coal . . .	M. L.	1-90	1st October 1917.	6 months up to 31st March 1918.
Do.	(24) Babu Jamuna Prasad.	Do. . . .	M. L.	2-00	Do. . .	Do.
Do.	(25) Babu Benode Behari Dey.	Do. . . .	M. L.	2-15	Do. . .	Do.
Do.	(26) Messrs. Jardine Skinner & Co.	Do. . . .	P. L.	5,158-48	License not yet executed.	
Do.	(27) E. Villiers, Esq.	Do. . . .	P. L.	5,081-28	Do. . .	
Do.	(28) Baidya Nath Dey	Do. . . .	M. L.	10-15	17th December 1917.	Up to 31st March, 1918.
Singhbhum	(29) Singhbhum Chromite Co., Ltd., Calcutta.	Chromite . .	P. L.	521-9	25th January 1917.	1 year.
Do.	(30) Do.	Do. . . .	P. L.	633-6	Do. . .	Do.
Do.	(31) Babu Ajit Kumar Mallik, Howrah.	Yellow ochre .	P. L.	11-90	8th January 1917.	Do.
Do.	(32) Mr. S. Luxman Rao Naidu, Nagpur.	Chromite . .	M. L.	218	25th April 1917.	15 years.
Do.	(33) Do.	Do. . . .	M. L.	506-30	Do. . .	Do.
Do.	(34) F. Dundas Whiffin, Esq., Panposh.	Manganese and iron ore.	P. L.	12,800	14th October 1917.	1 year.
Do.	(35) Mr. A. C. Maitra of Calcutta.	Chromite . .	P. L.	200	22nd May 1917.	Do.
Do.	(36) The Bengal Iron and Steel Co., Ltd.	Manganese and iron ore.	P. L.	1,088	Do. . .	Do.
Do.	(37) Mr. A. C. Maitra of Calcutta.	Galena, gold and other kindred minerals.	P. L.	1,330	22nd August 1917.	Do.
Do.	(38) Babu Moti Lal Iswar Das of Calcutta.	Manganese . .	P. L.	75-90	16th May 1917.	Do.
Do.	(39) Babu Ajit Kumar Mallik of Howrah.	Red ochre . .	P. L.	150	18th April 1917.	Do.
Do.	(40) The Bengal Iron and Steel Co., Ltd.	Iron ore . . .	P. L.	56	16th June 1917.	Do.
Do.	(41) Do.	Do. . . .	M. L.	800	7th December 1917.	30 years.
Do.	(42) Mr. A. C. Maitra .	Chromite . .	P. L.	360	24th July 1917.	1 year.
Do.	(43) The Bengal Iron and Steel Co., Ltd.	Manganese and iron ore.	M. L.	1,267-2	License not yet executed.	30 years.

P. L.=Prospecting License. M. L.=Mining Lease.

BIHAR AND ORISSA—*concl.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Singhbhum	(44) The Tata Iron and Steel Co.	Manganese and iron ore.	P. L.	22,144	The area consisted of two plots of lands, one measuring 9,792 acres and the other 12,352 acres. The license for the former land has been executed and the date of the commencement is 30th November, 1917. The license of the latter area has not yet been executed.	1 year.
Do.	(45) Messrs. M. D'Costa and Goredutt Ganesh Lal.	Chromite	P. L.	310	30th November 1917.	Do.
Do.	(46) Babu Mangi Lal Marwari.	Yellow and red ochre.	P. L.	4-00	16th October 1917.	Do.
o.	(47) Mr. A. C. Maitra .	Gold	M. L.	1	Draft lease not yet executed.	20 years.
Do.	(48) Singhbhum Chromite Co., Ltd.	Chromite . .	M. L.	400 320	Lease not yet executed.	30 years.

BOMBAY.

Dharwar (also in Kanara district).	(49) Mr. L. C. Oliver .	Galena . . .	P. L.	1,143	18th June 1917.	1 year.
Ka'ra	(50) Shivrampur Syndicate, Limited, by their agent H. J. Winch, Esq., Mine Manager, Shivrampur.	Manganese and Aluminium.	P. L.	301-95	2nd July 1917.	Do.
Panch Mahals.	(51) Messrs. Shaw Wallace & Co., Managing Agents to the Bamankuva Mines.	Manganese ore .	M. L.	680-22	1st June 1912.	8 years 1 month and 9 days.
Do.	(52) H. J. Winch, Mine Manager, Shivrampur Syndicate, Shivrampur.	Manganese . .	P. L. (renewal).	45-5	5th October 1917.	1 year.

P. L.=Prospecting License. M. L.=Mining Lease.

BOMBAY—concl'd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Sukkur	(53) The Managing Agents, Indo-Burma Petroleum Co., Ltd., Rangoon.	Mineral oil.	P. L.	6,008	20th August 1917.	1 year.

BURMA.

Akyab	(54) Messrs. The Burmah Oil Co., Ltd.	Mineral oil.	P. L.	3,620	1st September 1916.	1 year.
	(55) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do.	P. L. (renewal).	5,440	15th December 1917.	2 years.
Amherst	(56) Mukunda Lal Kundu.	All minerals (except oil).	P. L.	640	23rd November 1916.	1 year.
Do.	(57) Messrs. J. W. Darwood & Co.	Do.	P. L.	1,280	15th February 1917.	Do.
Do.	(58) Messrs. T. D. Findlay & Son.	Do.	P. L.	426.66	10th February 1917.	Do.
Do.	(59) Saw Bein Nga	Do.	P. L.	640	13th February 1917.	Do.
Do.	(60) Abdul Bari Chowdhry.	Do.	P. L.	640	5th February 1917.	Do.
Do.	(61) Maung Ba Thein	Do.	P. L.	640	10th March 1917.	Do.
To.	(62) Messrs. T. D. Findlay & Son.	Do.	P. L.	1,920	Do.	Do.
To.	(63) Maung Tun Hla	Do.	P. L.	426.66	13th February 1917.	Do.
To.	(64) Maung Ba Tsee	Do.	P. L.	640	20th April 1917.	Do.
Do.	(65) Mr. L. Hong Seng	Do.	P. L.	960	17th April 1917.	Do.
Do.	(66) Mr. L. Gwan Shein	Do.	P. L.	1,280	20th April 1917.	Do.
Do.	(67) Messrs. T. D'Ca tro & Son.	Do.	P. L.	640	17th April 1917.	Do.
Bhamo	(68) Messrs. S. Crawshaw and B. Hardinge.	All minerals (except oil and jade).	P. L.	5,516.8	11th December 1917.	Do.
Katha	(69) Messrs. Jamal Bros. & Co., Ltd.	Tin, wolfram, silver, copper, lead, zinc and gold.	P. L. (renewal).	24,320	4th November 1916.	Do.
Lower Chin-dwin.	(70) Mr. A. K. A. S. Jamal.	All minerals (except oil).	P. L. (renewal).	1,680	23rd March 1917.	Do.

P. L.=Prospecting License. M. L.=Mining Lease.

BURMA—cont'd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Lower Chin-dwin.	(71) Messrs. Jamal Bros. & Co., Ltd.	All minerals (except oil).	P. L. (renewal).	140	23rd March 1917.	1 year.
Do.	(72) Do.	Do.	P. L. (renewal).	1,120	Do.	Do.
Do.	(73) Messrs. The Burma Oil Co., Ltd.	Mineral oil.	P. L.	640	15th August 1917.	Do.
Do.	(74) Do.	Do.	P. L. (renewal).	960	1st May 1917.	Do.
Do.	(75) Messrs. Jamal Bros. & Co., Ltd.	Do.	P. L. (renewal).	1,440	1st August 1917.	2 years.
Mergu	(76) U Shan Byu	All minerals (except oil).	P. L.	91.90	1st October 1916.	1 year.
Do.	(77) Tan Kar Lim and two others.	Tin.	P. L.	29.16	15th January 1917.	Do.
Do.	(78) Maung San Mo	All minerals (except oil).	P. L.	583.68	26th January 1917.	Do.
Do.	(79) Maung Nyun	Do.	P. L.	2,876.43	10th March 1917.	Do.
Do.	(80) Messrs. Wightman & Co.	Tin.	P. L.	53.76	26th February 1917.	Do.
Do.	(81) Maung Po Thak	Wolfram and Tin	P. L.	486.40	12th February 1917.	Do.
Do.	(82) Mr. H. W. Watts	All minerals (except oil).	P. L.	2,343.60	22nd March 1917.	Do.
Do.	(83) Maung Pan On	Do.	P. L.	135.60	19th March 1917.	Do.
Do.	(84) Maung Po	Do.	P. L.	691.20	3rd April 1917.	Do.
Do.	(85) M. Haniff	Do.	P. L.	350.72	24th March 1917.	Do.
Do.	(86) Mrs. B. I. Jewett	Do.	P. L. (renewal).	3,056.64	12th February 1916.	Do.
Do.	(87) Do.	Do.	P. L. (renewal).	471.04	Do.	Do.
Do.	(88) M. Haniff	Do.	P. L. (renewal).	2,580.48	6th January 1917.	Do.
Do.	(89) Yew Shwe Ni	Do.	P. L. (renewal).	1,449	28th January 1917.	Do.
Do.	(90) C. Sco Don	Do.	P. L. (renewal).	1,176.64	28th February 1917.	Do.
Do.	(91) U. Shwe Don	Do.	P. L. (renewal).	793.60	1st February 1917.	3 months.
Do.	(92) U. Shwe Thi	Do.	P. L. (renewal).	852.48	14th February 1917.	6 months.

P. L.—Prospecting License. M. L.—Mining Lease.

BURMA—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Mergui	(93) Nyaung Tat .	All minerals (except oil).	P. L. (renewal).	353	13th March 1917.	1 year.
Do.	(94) Messrs. Bulloch Bros. & Co., Ltd.	Do.	P. L.	1,530.88	1st January 1917.	Do.
Do.	(95) Yew Shwe Ni .	Do.	P. L.	1,775.52	20th April 1917.	Do.
Do.	(96) Mr. C. Swee Htin .	Wolfram	P. L.	2,626.56	2nd May 1917.	Do.
Do.	(97) Maung Ngwe Thi .	Wolfram and tin	P. L.	746.52	3rd April 1917.	Do.
Do.	(98) Mr. Meera Saib .	All minerals (except oil).	P. L. (renewal).	327.68	19th January 1917.	Do.
Do.	(99) Maung Shwe Don .	Do.	P. L. (renewal).	793.60	1st May 1917	3 months.
Do.	(100) Tan Po Chit .	Do.	P. L.	320	18th September 1917.	1 year.
Do.	(101) Ma Mo Thu .	Do.	P. L.	320	Do.	Do.
Do.	(102) Messrs. Finlay Fleming & Co.	Do.	P. L.	983.04	17th September 1917.	Do.
Do.	(103) Mr. A. H. Noyes .	Do.	P. L. (renewal).	100	26th November 1916.	Do.
Do.	(104) U. Shwe Thi .	Do.	P. L. (renewal).	852.48	15th August 1917.	6 months.
Do.	(105) Mr. J. C. Galsbaur	Do.	P. L.	1,971.20	8th December 1917.	1 year.
Do.	(106) Maung Maung .	Do.	P. L.	640	1st November 1917.	Do.
Do.	(107) Mr. G. H. Hand .	Wolfram and tin	P. L.	2,150.40	Do.	Do.
Minbu	(108) Messrs. The Indo-Burma Petroleum Co., Ltd.	Mineral oil	P. L. (renewal).	320 northern half of block 16 N of the Minbu Oil Field.	6th August 1916.	Do.
Do.	(109) Maung Talk Gyi and Maung Shwe Mo.	Do.	M. L.	19 in Block 20 P of the Minbu Oil Field.	23rd February 1916.	30 years.
Do.	(110) Messrs. The Yomah Oil Co., Ltd.	Do.	P. L.	2,570.24 Blocks 4 P, 8 P, 12 P, 24 P and portion of 11 P of the Minbu Oil Field.	23rd October 1917.	1 year.
Myingyan	(111) Maung Tun Hman and three others.	Do.	P. L.	270	18th January 1917.	Do.

P. L.=Prospecting License. M. L.=Mining Lease.

BURMA—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Myingyan	(112) Baijnath Singh .	Mineral oil	P. L.	11,520	27th August 1917.	1 year.
Myitkyina	(113) Mr. H. F. Leslie .	Gold and platinum	P. L.	1,132.8	4th January 1917.	Do.
Do.	(114) Messrs. The Burma Gold Dredging Co. (1911), Ltd.	Gold and Iridio-Platinum.	P. L. (renewal).	3,200	23rd February 1917.	Do.
Do.	(115) Mr. H. F. Leslie .	Gold . . .	P. L. (renewal).	2,931.2	1st April 1917	Do.
Do.	(11) Do.	Do. . .	P. L. (renewal).	640	1st November 1917.	Do.
Northern Shan States.	(117) Messrs. The Burma Mines, Ltd.	Iron . . .	P. L.	640	12th February 1917.	Do.
Do.	(118) Do.	Do.	P. L.	2,560	14th March 1917.	Do.
Do.	(119) Do.	Coal . . .	P. L.	3,200	17th March 1917.	Do.
Do.	(120) Do.	Do.	P. L.	2,560	14th March 1917.	Do.
Do.	(121) Messrs. The Mohochaung Exploration Co., Ltd.	Gold, silver, iron and zinc.	P. L. (renewal).	3,200	8th April 1917	Do.
Pakokku	(122) Messrs. The British Burma Petroleum Co., Ltd.	Mineral oil	P. L.	261 & 614.40	19th December 1916.	Do.
Do.	(123) Do.	Do.	P. L. (renewal).	76.80 & 371.20	14th November 1916.	Do.
Do.	(124) Messrs. The Nath Singh Oil Co., Ltd.	Do.	P. L. (renewal).	1,920	12th January 1917.	Do.
Do.	(125) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do.	P. L.	800 East of Blocks Nos. 18, 19 and 20 in the Yenangyat Oil Field.	6th September 1917.	Do.
Do.	(126) Messrs. The Nath Singh Oil Co., Ltd.	Do.	P. L. (renewal).	12,399.4	26th April 1917.	2 years.
Do.	(127) Messrs. The British Burma Petroleum Co., Ltd.	Do.	P. L. (renewal).	640	16th August 1917.	Do.
Do.	(128) Messrs. The Rangoon Oil Co., Ltd.	Do.	P. L. (renewal).	320	Do.	Do.
Prome	(129) Maung Gyi .	Do.	P. L.	249.6	25th January 1917.	1 year.

P. L.=Prospecting License. M. L.=Mining Lease.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Prome	(130) Messrs. The Burmah Oil Co., Ltd.	Mineral oil	P. L. (renewal).	3,200	7th June 1917	1 year.
Ruby Mines	(131) Ma Shwe Bwin	Copper	P. L.	640	25th April 1917.	Do.
Salween	(132) Messrs. Steel Bros. & Co., Ltd.	All minerals (except oil).	P. L.	3,840	5th December 1917.	Do.
Shwebo	(133) Messrs. The Indo-Burma Petroleum Co., Ltd.	Mineral oil	P. L.	1,280	9th January 1917.	Do.
Do.	(134) Do.	Do.	P. L.	3,424	23rd February 1917.	Do.
Southern Shan States.	(135) Maung Law Pan	Lead, copper and silver.	M. L.	2,680	1st July 1916	10 years.
Do.	(136) Maung Ye	Wolfram	P. L.	140	7th January 1917.	1 year.
Do.	(137) Messrs. Bachardass Manekchand Kharwar.	Lead	P. L.	2,500.	10th February 1917.	Do.
Do.	(138) Maung Hnya	Wolfram	P. L.	228.73	5th April 1917.	Do.
Do.	(139) The Hon'ble Mr. Lim Chin Tsong.	All minerals (except oil).	P. L. (renewal).	166	20th November 1916.	Do.
Do.	(140) Messrs. Steel Bros. & Co., Ltd.	Do.	P. L.	3,680	17th September 1917.	Do.
Do.	(141) Do.	Do.	P. L.	2,560	4th September 1917.	Do.
Do.	(142) Ko Law Pan	Wolfram	P. L.	64	17th August 1917.	Do.
Do.	(143) Maung San Hein	All minerals (except oil).	P. L.	160	4th September 1917.	Do.
Do.	(144) Messrs. Bechardass Manekchand Kharwar.	Wolfram	P. L.	2,355.20	13th September 1917.	Do.
Do.	(145) Maung Kya Ywet, A.T.M.	All minerals (except oil).	P. L.	640	12th September 1917.	Do.
Do.	(146) Saw Lein Lee	Do.	P. L. (renewal).	599	30th May 1917.	Do.
Do.	(147) Rathana	Gold	P. L.	3,200	27th December 1917.	Do.
Do.	(148) Do.	Do.	P. L.	1,440	Do.	Do.
Do.	(149) Do.	Do.	P. L.	4,920	Do.	Do.
Do.	(150) Maung Pan Aung	All minerals (except oil).	P. L.	640	28th December 1917.	Do.
Do.	(151) Shain Thwe	Do.	P. L.	960	27th November 1917.	Do.

P. L.=Prospecting License. M. L.=Mining Lease.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.
Southern Shan States.	(152) Maung Po Ku	All minerals (except oil).	P. L.	2,560	21st November 1917.
Tavey	(153) Messrs. The Hpanngdaw Prospecting Co., Ltd.	Do.	P. L.	2,688	3rd January 1917.
Do.	(154) Mr. H. G. Mathews	Do.	P. L.	820	14th February 1917.
Do.	(155) Messrs. Hitakari & Co.	Do.	P. L.	512	27th January 1917.
Do.	(156) Mr. A. E. Wallenberg.	Do.	P. L.	1,600	13th March 1917.
Do.	(157) A. S. Mahomed	Do.	P. L.	358	5th February 1917.
Do.	(158) Mr. James I. Milne	Do.	P. L.	813	2nd January 1917.
Do.	(159) Mr. A. G. Fraser	Do.	P. L.	922	22nd January 1917.
Do.	(160) Messrs. Lim Kim Seng Bros. & Co.	Do.	P. L.	922	4th January 1917.
Do.	(161) Eu Shwe Swai	Do.	P. L.	578	22nd March 1917.
Do.	(162) Maung Sein Knang	Do.	P. L.	640	8th January 1917.
Do.	(163) Maung Ba Don	Do.	P. L.	640	18th January 1917.
Do.	(164) Eu Shwe Swai	Do.	P. L.	640	15th March 1917.
Do.	(165) Maung Ba Maung	Do.	P. L.	1,306	25th January 1917.
Do.	(166) Maung Saw Hlaing	Do.	P. L.	548	2nd January 1917.
Do.	(167) Netram Rambux	Do.	P. L.	240	4th January 1917.
Do.	(168) Maung Saw Hlaing	Do.	P. L.	1,144	2nd January 1917.
Do.	(169) Maung Po Swe	Do.	P. L.	931	22nd January 1917.
Do.	(170) Maung E Zin	Do.	P. L.	435	15th February 1917.
Do.	(171) Do.	Do.	P. L.	640	Do.
Do.	(172) Messrs. The High Speed Steel Alloys, Ltd.	Do.	P. L.	256	24th March 1917.
Do.	(173) Maung Ba Maung	Do.	P. L.	1,920	Do.

P. L.=Prospecting License. M. L.=Mining Lease.

BURMA—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(219) Mr. A. Rowland H. Ady.	All minerals (except oil).	P. L.	1,280	28th June 1917.	1 year.
Do.	(220) Maung Me . . .	Do.	P. L.	614	5th June 1917	6 months.
Do.	(221) Maung Paw Tun .	Do.	P. L.	947	19th April 1917.	Do.
Do.	(222) Messrs. The Bombay Burma Trading Corp., Ltd.	Do.	P. L.	708	10th April 1917.	Do.
Do.	(223) Messrs. Poncar & Co., Ltd.	Do.	P. L.	112	17th May 1917.	Do.
Do.	(224) Maung Ba Thauug Bros. & Co.	Do.	P. L.	1,280	22nd May 1917.	Do.
Do.	(225) Maung Paw Tun .	Do.	P. L.	343	14th June 1917.	Do.
Do.	(226) Messrs. Finlay, Fleming & Co.	Do.	P. L.	276	19th May 1917.	Do.
Do.	(227) Maung Kya Pe, Maung Lu Chaw and Ma Kin.	Do.	P. L.	282	22nd June 1917.	1 year.
Do.	(228) Maung Saw Hlaing	Do.	P. L.	179	17th May 1917.	Do.
Do.	(229) Mr. H. G. Mathews	Do.	P. L.	71	13th June 1917.	Do.
Do.	(230) Mr. A. Rowland Ady.	Do.	P. L.	184	11th June 1917.	Do.
Do.	(231) Ma Hnit . . .	Do.	P. L.	691	14th June 1917.	Do.
Do.	(232) Mr. Ung Kyi Pe .	Do.	P. L.	205	18th June 1917.	Do.
Do.	(233) Maung Ze Ya	Do.	P. L.	484	31st May 1917.	Do.
Do.	(234) Maung Shwe Yin .	Do.	P. L.	240	19th June 1917.	Do.
Do.	(235) Ma Kin . . .	Do.	P. L.	860	Do.	6 months.
Do.	(236) Mr. S. Crawshaw .	Do.	P. L.	527	1st June 1917.	1 year.
Do.	(237) Maung Tun Mya .	Do.	P. L.	282	15th June 1917.	Do.
Do.	(238) Mr. Rowland H. Ady.	Do.	P. L.	588	28th June 1917.	Do.
Do.	(239) Messrs. The High Speed Steel Alloys Ltd.	Do.	P. L.	51	27th June 1917.	Do.
Do.	(240) Messrs. Finlay Fleming & Co.	Do.	P. L.	1,434	22nd June 1917.	Do.

P. L.=Prospecting License. M. L.=Mining Lease.

BURMA—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(241) Mr. Khoo Tun Ryan.	All minerals (except oil).	P. L.	148	18th June 1917.	1 year.
Do.	(242) Maung Than and Ma Thein.	Do.	P. L.	589	29th June 1917.	Do.
Do.	(243) Mr. A. E. Wallenberg.	Do.	P. L.	320	28th June 1917.	Do.
Do.	(244) Maung Lun Pin .	Do.	P. L. (renewal).	947	6th September 1916.	Do.
Do.	(245) Messrs. Hossain Hamadance, Rowland Ady and R. S. Giles.	Do.	P. L. (renewal).	765	6th December 1916.	Do.
Do.	(246) Messrs. The Bombay Burma Trading Corporation, Ltd.	Do.	P. L. (renewal).	1,000	7th December 1916.	6 months.
Do.	(247) Maung Kya Pe, Maung Lu Chaw and Ma Kin.	Do.	P. L. (renewal).	358	9th December 1916.	1 year.
Do.	(248) Eu Kya Ban and Mr. A. G. Fraser.	Do.	P. L. (renewal).	584	26th December 1916.	6 months.
Do.	(249) Messrs. The London and Burmese Woolfram Co. (transferred from Messrs. Turnbulls (Glasgow), Ltd.)	Do.	P. L. (renewal).	2,409	12th January 1917.	1 year.
Do.	(250) Messrs. Steel Bros. & Co., Ltd.	Do.	P. L. (renewal).	716	1st February 1917.	Do.
Do.	(251) Messrs. Hooth & Milne.	Do.	P. L. (renewal).	405	14th February 1917.	Do.
Do.	(252) Maung Sein Daing Bros. & Co.	Do.	P. L. (renewal).	276	23rd February 1917.	Do.
Do.	(253) Do. . .	Do.	P. L. (renewal).	717	Do.	Do.
Do.	(254) San Sine Tin .	Do.	P. L. (renewal).	460	16th December 1916	6 months.
Do.	(255) Maung Sein Thwe	Do.	P. L. (renewal).	256	9th April 1917.	Do.
Do.	(256) C. Gyaw Saing .	Do.	P. L. (renewal).	1,106	22nd February 1917.	Do.
Do.	(257) Maung Sein Daing	Do.	P. L. (renewal).	700	23rd March 1917.	1 year.
Do.	(258) Ong Hoe Kyin .	Do.	P. L. (renewal).	605	4th April 1917.	6 months.
Do.	(259) Maung Ba Don .	Do.	P. L. (renewal).	829	Do.	Do.
Do.	(260) Do. . .	Do.	P. L. (renewal).	282	11th May 1917.	Do.

P. L.=Prospecting License. M. L.=Mining Lease.

BURMA—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(261) Mr. Mahomed Aslam Khan.	All minerals (except oil).	P. L. (renewal).	392	24th March 1917.	1 year.
Do.	(262) Mr. Khoo Tun Buan.	Do.	P. L. (renewal).	322	21st March 1917.	Do.
Do.	(263) Mr. M. A. Sooratee	Do.	P. L. (renewal).	1,024	4th May 1917.	Do.
Do.	(264) Mr. Osman Musti Khan.	Do.	P. L. (renewal).	2,278	12th April 1917.	6 months.
Do.	(265) Maung Ba Thauung Bros. & Co.	Do.	P. L. (renewal).	737	23rd March 1917.	1 year.
Do.	(266) Mr. C. Soo Don	Do.	P. L. (renewal).	604	23rd April 1917.	Do.
Do.	(267) Mr. A. D. Brown	Do.	P. L. (renewal).	666	5th April 1917.	Do.
Do.	(268) Mr. A. S. Minus	Do.	P. L. (renewal).	768	27th April 1917.	6 months.
Do.	(269) Mr. Chew Lu Yin	Do.	P. L. (renewal).	870	4th May 1917.	Do.
Do.	(270) Maung Po Htin	Do.	P. L. (renewal).	460	4th April 1917.	1 year.
Do.	(271) Maung Ni	Do.	P. L. (renewal).	1,917	11th March 1917.	6 months.
Do.	(272) Messrs. Gillanders Arbuthnot & Co.	Do.	P. L. (renewal).	760	25th November 1916.	1 year.
Do.	(273) Mr. R. C. N. Twite	Do.	P. L. (renewal).	625	14th May 1917.	6 months.
Do.	(274) The Shwo Zun	Do.	P. L. (renewal).	512	20th May 1917.	Do.
Do.	(275) Ong Hoc Kyin	Do.	P. L. (renewal).	610	20th May 1917.	1 year.
Do.	(276) A. S. Mahomed	Do.	P. L. (renewal).	1,894	12th June 1917.	Do.
Do.	(277) Messrs. The Rangoon Mining Co., Ltd.	Wolfram and tin	M. L.	3,209.86	4th October 1913.	30 years.
Do.	(278) Messrs. The Wagon-Pachaung Wolfram Mines, Ltd.	Do.	M. L.	1,763.10 at Wagon.	20th July 1914.	Do.
Do.	(279) Messrs. The Hemyingyi Mining Co., Ltd.	All minerals except oil and precious stones.	M. L.	1,782.85	17th December 1913.	Do.
Do.	(280) Messrs. The Tavoy Concessions, Ltd.	Do.	M. L.	750.94 at Thingandon.	Do.	Do.
Do.	(281) Do.	Do.	M. L.	994.22 at Kadwe.	Do.	Do.

P. L.—Prospecting License. M. L.—Mining Lease.

BURMA—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(282) Messrs. The Wagon-Pachaung Wolfram Mines, Ltd.	Wolfram and tin	M. L.	2,162.38 at Pachaung.	5th September 1914.	30 years.
Do.	(283) Messrs. Radcliff & Co., Ltd.	All minerals except oil and precious stones.	M. L.	4,843.79	30th December 1913.	Do.
Do.	(284) Messrs. The Tavoy Concessions, Ltd.	Do.	M. L.	1,092.86 at Kalouta.	18th January 1917.	Do.
Do.	(285) Do.	Do.	M. L.	616.72 at Byaukchaung.	19th January 1917.	Do.
Do.	(286) Mr. Quah Cheng Guan.	Wolfram and tin	M. L.	199.69	16th June 1915.	Do.
Do.	(287) Osman Musti Khan.	All minerals (except oil).	P. L.	747	10th August 1917.	6 months.
Do.	(288) Mr. C. Willison	Do.	P. L.	26	1st August 1917.	1 year.
Do.	(289) Quah Cheng Guan	Do.	P. L.	1,003	3rd September 1917.	Do.
Do.	(290) Messrs. Finlay Fleming & Co.	Do.	P. L.	287	30th July 1917.	6 months.
Do.	(291) Maung Po Gywe	Do.	P. L.	694	6th August 1917.	1 year.
Do.	(292) Quah Cheng Teck	Do.	P. L.	2,176	13th July 1917.	Do.
Do.	(293) Do.	Do.	P. L.	988	3rd September 1917.	Do.
Do.	(294) Seinbondaung Mining Co.	Do.	P. L.	502	17th September 1917.	Do.
Do.	(295) Mr. A. R. H. Ady	Do.	P. L.	460	8th August 1917.	Do.
Do.	(296) Maung Maung	Do.	P. L.	763	26th September 1917.	Do.
Do.	(297) Maung Po Gywe	Do.	P. L.	297	Do.	Do.
Do.	(298) Maung Lu Pe and Mr. A. G. Fraser.	Do.	P. L. (renewal).	780	5th December 1916.	6 months.
Do.	(299) Messrs. Steel Bros. & Co., Ltd.	Do.	P. L. (renewal).	589	16th May 1917.	1 year.
Do.	(300) Ung Kyi Pe	Do.	P. L. (renewal).	614	17th May 1917.	Do.
Do.	(301) Messrs. The Bama-Burma Trading Corporation, Ltd.	Do.	P. L. (renewal).	1,439	12th May 1917.	6 months.
Do.	(302) Do.	Do.	P. L. (renewal).	947	Do.	Do.

P. L.—Prospecting License. M. L.—Mining Lease.

BURMA—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(303) Maung Kya Tun	All minerals (except oil).	P. L. (renewal).	307	20th May 1917.	6 months.
Do.	(304) Maung Po Mye	Do.	P. L. (renewal).	856	1st June 1917.	1 year.
Do.	(305) Messrs. Tata Sons & Co.	Do.	P. L. (renewal).	292	6th June 1917.	Do.
Do.	(306) Mahomed Aslam Khan.	Do.	P. L. (renewal).	1,536	16th June 1917.	6 months.
Do.	(307) Maung Mo	Do.	P. L. (renewal).	1,280	22nd June 1917.	1 year.
Do.	(308) Khoo Zun Nee	Do.	P. L. (renewal).	739	7th June 1917.	Do.
Do.	(309) Maung Saw Hlaing	Do.	P. L. (renewal).	1,280	21st June 1917.	6 months.
Do.	(310) Do.	Do.	P. L. (renewal).	548	2nd July 1917.	Do.
Do.	(311) Ong Hoe Kyin	Do.	P. L. (renewal).	179	13th June 1917.	1 year.
Do.	(312) Ganpat Rai	Do.	P. L. (renewal).	384	16th June 1917.	6 months.
Do.	(313) Mr. Fowle	Do.	P. L. (renewal).	320	13th June 1917.	Do.
Do.	(314) The High Speed Steel Alloys, Ltd.	Do.	P. L. (renewal).	1,433	Do.	Do.
Do.	(315) Khoo Tun Byan	Do.	P. L. (renewal).	148	30th May 1917.	Do.
Do.	(316) Mr. A. E. Wallenberg.	Do.	P. L. (renewal).	720	20th May 1917.	Do.
Do.	(317) Chan Kin Way	Do.	P. L. (renewal).	256	8th July 1917.	1 year.
Do.	(318) Netram Rambux	Do.	P. L. (renewal).	240	4th July 1917.	6 months.
Do.	(319) Messrs. The Bombay-Burma Trading Corporation, Ltd.	Do.	P. L. (renewal).	1,000	7th June 1917.	1 year.
Do.	(320) Ma Yin Bi	Do.	P. L. (renewal).	640	29th November 1916.	Do.
Do.	(321) Mr. Fitzherbert	Do.	P. L. (renewal).	238	24th February 1917.	6 months.
Do.	(322) Eu Kya Ban & Mr. Fraser.	Do.	P. L. (renewal).	584	29th June 1917.	Do.
Do.	(323) Mr. S. S. Halker	Do.	P. L. (renewal).	1,587	1st July 1917.	3 months.
Do.	(324) Messrs. Finlay Fleming & Co., Ltd.	Do.	P. L. (renewal).	445	7th July 1917.	6 months.

P. L.=Prospecting License. M. L.=Mining Lease.

BURMA—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(325) San Sine Tin	All minerals (except oil).	P. L. (renewal).	911	9th August 1917.	6 months.
Do.	(326) Messrs. Hitakari & Co.	Do.	P. L. (renewal).	589	28th May 1917.	Do.
Do.	(327) Maung Mya Pe	Do.	P. L. (renewal).	537	26th June 1917.	Do.
Do.	(328) Maung Sein Khaing.	Do.	P. L. (renewal).	640	8th July 1917.	Do.
Do.	(329) Maung Sein Khaing.	Do.	P. L. (renewal).	682	23rd May 1917.	Do.
Do.	(330) Mr. A. R. H. Ady	Do.	P. L. (renewal).	620	6th July 1917.	Do.
Do.	(331) Maung E. Zin	Do.	P. L. (renewal).	435	15th August 1917.	3 months.
Do.	(332) Mr. A. Fraser	Do.	P. L. (renewal).	922	22nd July 1917.	6 months.
Do.	(333) Maung Paw Tun	Do.	P. L. (renewal).	450	19th April 1917.	Do.
Do.	(334) Maung Min Gyaw	Do.	P. L. (renewal).	1,182	8th August 1917.	1 year.
Do.	(335) Maung Mo Thu	Do.	P. L. (renewal).	1,536	14th June 1917.	6 months.
Do.	(336) Maung Khine	Do.	P. L. (renewal).	809	24th August 1917.	Do.
Do.	(337) Maung Sein Thwe	Do.	P. L. (renewal).	580	19th August 1917.	Do.
Do.	(338) Mr. Fitzherbert	Do.	P. L. (renewal).	238	4th August 1917.	Do.
Do.	(339) Maung Shwe Gaing	Do.	P. L. (renewal).	512	23rd September 1917.	Do.
Do.	(340) Ma Mya Yin	Do.	P. L.	1,039	21st December 1917.	1 year.
Do.	(341) Mr. G. Willison	Do.	P. L.	548	22nd October 1917.	Do.
Do.	(342) San Sine Tin	Do.	P. L.	620	7th November 1917.	Do.
Do.	(343) Mr. J. J. Page	Do.	P. L.	701	10th October 1917.	Do.
Do.	(344) The Hon'ble Mr. Lim Chin Tsong.	Do.	P. L.	320	12th October 1917.	Do.
Do.	(345) Eu Kya Ban	Do.	P. L.	640	28th December 1917.	Do.
Do.	(346) Mr. A. R. H. Ady	Do.	P. L.	512	28th November 1917.	6 months.

P. L.=Prospecting License. M. L.=Mining Lease.

BURMA—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(347) Maung Me .	All minerals (except oil).	P. L.	358	30th November 1917.	1 year.
Do.	(348) Mr. G. Willison .	Do.	P. L.	317	26th November 1917.	Do.
Do.	(349) Messrs. Tata Sons & Co.	Do.	P. L. (renewal).	780	9th June 1917.	6 months.
Do.	(350) Mr. A. E. Wallenberg.	Do.	P. L. (renewal).	1,422	21st June 1917.	Do.
Do.	(351) Maung Po Swe .	Do.	P. L. (renewal).	488	22nd July 1917.	Do.
Do.	(352) C. Gyaw Saing .	Do.	P. L. (renewal).	1,106	22nd August 1917.	1 year.
Do.	(353) Maung Gun .	Do.	P. L. (renewal).	768	3rd September 1917.	6 months.
Do.	(354) Mr. A. E. Wallenberg.	Do.	P. L. (renewal).	1,600	13th September 1917.	Do.
Do.	(355) Mr. R. C. N. Twite	Do.	P. L. (renewal).	460	22nd September 1917.	Do.
Do.	(356) Maung Ba Maung	Do.	P. L. (renewal).	1,920	24th September 1917.	Do.
Do.	(357) Messrs. The High Speed Steel Alloys Mining Co., Ltd.	Do.	P. L. (renewal).	256	24th September 1917.	Do.
Do.	(358) Ma Mya Yin .	Do.	P. L. (renewal).	1,075	Do.	Do.
Do.	(359) Maung Po Hnan	Do.	P. L. (renewal).	640	Do.	Do.
Do.	(360) Lim Kyee Yan .	Do.	P. L. (renewal).	161.28	28th September 1917.	1 year.
Do.	(361) Maung Sein Thwo	Do.	P. L. (renewal).	256	9th October 1917.	6 months.
Do.	(362) Mr. S. S. Halkar .	Do.	P. L. (renewal).	681	1st October 1917.	Do.
Do.	(363) Maung Tun Mya .	Do.	P. L. (renewal).	988	9th September 1917.	1 year.
Thaton	(364) Ma Nyein .	Do.	P. L.	608	2nd January 1917.	Do.
Do.	(365) Mr. H. F. Singleton and Messrs. Binning & Co.	Do.	P. L.	512	26th January 1917.	Do.
Do.	(366) Mr. J. W. Darwood	Do.	P. L.	1,145.6	22nd January 1917.	Do.
Do.	(367) Ma Nyein .	Do.	P. L.	576	18th January 1917.	Do.

P. L.=Prospecting License. M. L.=Mining Lease.

BURMA—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Thaton	(368) Maung Tun Hla .	All minerals (except oil).	P. L.	1,241.6	25th January 1917.	1 year.
Do.	(369) Maung Ba Si .	Do.	P. L.	601.6	10th February 1917.	Do.
Do.	(370) Lim Kar Chang .	Do.	P. L.	3,238.4	1st March 1917.	Do.
Do.	(371) Mr. A. Samed .	Do.	P. L.	9.50	3rd March 1917.	Do.
Do.	(372) Li Ah Lye .	Do.	P. L. (renewal).	640	18th December 1916.	Do.
Do.	(373) Ma Thein Zin .	Do.	P. L. (renewal).	320	14th February 1917.	Do.
Do.	(374) Mr. C. H. Stork .	Do.	P. L. (renewal).	819.2	17th February 1917.	Do.
Do.	(375) U Pan Dwe and Ma Khin, alias Messrs. Bah Too.	Do.	P. L. (renewal).	2,649.6	10th March 1917.	Do.
Do.	(376) Dr. Shaw Loo .	Do.	P. L.	1,536	4th April 1917.	Do.
Do.	(377) Mr. P. M. Pillay .	Do.	P. L.	1,491.2	11th April 1917.	Do.
Do.	(378) Maung Pu .	Do.	P. L.	1,574.4	Do.	Do.
Do.	(379) The Hon'ble Mr. Lim Chin Tsong.	Do.	P. L.	1,318.4	22nd May 1917.	Do.
Do.	(380) Do.	Do.	P. L.	896.8	18th April 1917.	Do.
Do.	(381) Maung Ba Tin .	Do.	P. L.	672	26th April 1917.	Do.
Do.	(382) Mr. F. A. Boog .	Do.	P. L.	8,968	25th April 1917.	Do.
Do.	(383) Mr. A. D. Keith .	Do.	P. L.	5,657.6	Do.	Do.
Do.	(384) The Hon'ble Mr. Lim Chin Tsong.	Do.	P. L.	825.6	15th April 1917.	Do.
Do.	(385) Mr. F. A. Boog .	Do.	P. L.	4,313.6	Do.	Do.
Do.	(386) Maung Shan Byu	Do.	P. L.	4,640	10th April 1917.	Do.
Do.	(387) Mr. Tan Toe .	Do.	P. L.	518.4	5th June 1917.	Do.
Do.	(388) Mr. L. Hong Seng	Do.	P. L.	678.4	15th March 1917.	Do.
Do.	(389) Mr. C. H. Noyce .	Do.	P. L.	2,931.2	2nd May 1917.	Do.
Do.	(390) Mr. C. R. Connell	Do.	P. L.	3,513.6	27th April 1917.	Do.

P. L.=Prospecting License. M. L.=Mining Lease.

BURMA—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Thaton	(391) Mr. C. R. Connol.	All minerals (except oil).	P. L.	2,444.8	25th April 1917.	1 year.
Do.	(392) The Hon'ble Mr. Lim Chin Tsong.	Do.	P. L.	864	19th May 1917.	Do.
Do.	(393) Mr. Tan Kim Chye	Do.	P. L.	51.2	21st May 1917.	Do.
Do.	(394) Maung Ni	Do.	P. L.	1,850.4	19th May 1917.	Do.
Do.	(395) Maung Pu	Do.	P. L.	563.2	25th April 1917.	Do.
Do.	(396) Mr. L. Ah Choy	Do.	P. L.	563.2	19th May 1917.	Do.
Do.	(397) Mr. Tan Kim Chye	Do.	P. L.	4,064	28th May 1917.	Do.
Do.	(398) Maung Ni	Do.	P. L.	953.6	24th May 1917.	Do.
Do.	(399) Mr. C. A. Meredith	Do.	P. L.	1,305.6	7th June 1917.	Do.
Do.	(400) Maung Shwe Goh	Do.	P. L.	1,049.6	6th June 1917.	Do.
Do.	(401) Maung Kaing	Do.	P. L. (renewal).	678.4	14th February 1917.	Do.
Do.	(402) Mr. H. E. Singleton.	Do.	P. L. (renewal).	1,657.6	21st February 1917.	Do.
Do.	(403) Mr. A. Kader	Do.	P. L. (renewal).	499.2	1st April 1917.	Do.
Do.	(404) Maung Pu	Do.	P. L. (renewal).	108.8	7th April 1917.	Do.
Do.	(405) Mr. A. J. Salvador	Do.	P. L. (renewal).	851.2	Do.	Do.
Do.	(406) Messrs. A. V. Joseph & Co.	Do.	P. L. (renewal).	524.8	2nd May 1917.	Do.
Do.	(407) Maung Chit Maung	Do.	P. L. (renewal).	1,836.8	11th April 1917.	Do.
Do.	(408) Mr. C. Soo Don	Do.	P. L. (renewal).	876.8	2nd February 1917.	Do.
Do.	(409) Mr. C. R. Connell	Do.	P. L.	1,881.6	29th May 1917.	Do.
Do.	(410) Ko Chang Kaing	Do.	P. L.	889.6	26th April 1917.	Do.
Do.	(411) M. Ah Khee	Do.	P. L.	563.2	27th June 1917.	Do.
Do.	(412) Mr. C. P. Vlieland	Mineral oil.	P. L.	819.2	14th July 1917.	Do.

P. L.—Prospecting License. M. L.—Mining Lease.

BURMA—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Thaton	(413) Mr. P. M. Pillay	Mineral oil	P. L.	29.44	20th June 1917.	1 year.
Do.	(414) Maung Pe Gyi	All minerals (except oil).	P. L.	1,920	23rd July 1917.	Do.
Do.	(415) U. Shan Byu	Do.	P. L.	2,144	23rd March 1917.	Do.
Do.	(416) Maung Tun Hla	Do.	P. L.	1,952	24th May 1917.	Do.
Do.	(417) Maung San Dun	Do.	P. L.	1,075.2	12th July 1917.	Do.
Do.	(418) Mr. C. A. Meredith	Do.	P. L.	236.8	27th June 1917.	Do.
Do.	(419) U. Pan Dwe	Do.	P. L.	128	20th June 1917.	Do.
Do.	(420) U Po Ngwe	Do.	P. L.	2,048	5th June 1917.	Do.
Do.	(421) Tan Kin Chye	Do.	P. L.	691.2	31st August 1917.	Do.
Do.	(422) Ma Pyu Pyu	Do.	P. L.	1,254.4	14th July 1917.	Do.
Do.	(423) U Po Ngwe	Do.	P. L. (renewal).	729.6	7th August 1917.	6 months.
Do.	(424) U Ba Wet	Do.	P. L. (renewal).	1,190.4	16th August 1917.	1 year.
Do.	(425) M. A. Kader	Do.	P. L.	640	18th October 1917.	Do.
Do.	(426) The Hon'ble Mr. Lim Chin Tsong.	Do.	P. L.	6,368	17th September 1917.	Do.
Do.	(427) Maung Ba Si	Do.	P. L.	1,260.8	7th August 1917.	Do.
Do.	(428) Lim Tha Nyeln	Do.	P. L.	2,003.2	31st July 1917.	Do.
Do.	(429) Mr. C. A. Meredith	Do.	P. L.	3,174.4	12th July 1917.	Do.
Do.	(430) M. Hashim	Do.	P. L.	640	27th September 1917.	Do.
Do.	(431) M. Ah Khee	Do.	P. L. (renewal).	467.2	20th July 1917.	2 years.
Do.	(432) Maung Pu	Do.	P. L. (renewal).	108.8	22nd November 1917.	6 months.
Thayetmyo.	(433) Messrs. The Twinzas Oil Co., Ltd.	Mineral oil	P. L.	1,920 Blocks Nos. 13, 20 and 23 of the Minhla Oil Field.	21st December 1916.	1 year.

P. L.—Prospecting License. M. L.—Mining Lease.

BURMA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Thayetmyo.	(434) Mr. B. Cowasjee	Mineral oil	P. L.	1,123-2 Blocks 1, 2 and 8 and the eastern half of block 9 of the Minhla Oil Field.	21st December 1916.	1 year.
Do.	(435) Messrs. The Burma Oil Co., Ltd.	Do.	P. L.	5,120 Eastern halves of blocks Nos. 18, 25, 28 and 39, and western halves of blocks Nos. 19 and 30 and the whole of blocks 24, 29, 33, 34, and 40 of the Minhla Oil Field.	Do.	Do.
Do.	(436) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do.	P. L.	2,858-0 Blocks Nos. 3 and 4 excluding area held by the B. B. P. Co. in block No. 4, blocks Nos. 16 and 17; western half of block 18 and eastern half of block 19 of the Minhla Oil Field.	Do.	Do.
Do.	(437) Messrs. The British-Burma Petroleum Co., Ltd.	Do.	P. L. (renewal).	94-72 Block 4 of the Minhla Oil Field.	23rd December 1916.	Do.
Do.	(438) Messrs. The London-Rangoon Trading Co., Ltd.	Do.	P. L.	2,560 (Blocks Nos. 26 and 27, E of 30, W of 9, 25 and 28 of the Minhla Oil Field.	9th March 1917.	Do.
Do.	(439) Do.	Do.	P. L.	10,240	30th May 1917.	Do.
Do.	(440) Messrs. The Nath Singh Oil Co., Ltd.	Do.	P. L.	4,800	18th October 1917.	Do.
Do.	(441) Mrs. H. V. Murray	Do.	P. L.	3,200	13th November 1917.	Do.

P. L.=Prospecting License. M. L.=Mining Lease

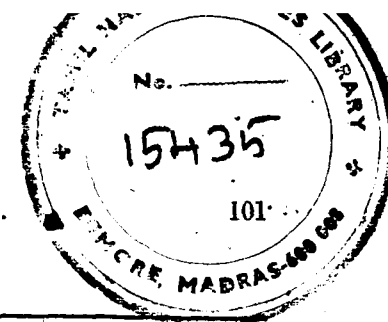
BURMA—*concl'd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Upper Chinthe.	(442) Messrs. Osman Muste Khan & Co.	Mineral oil	P. L.	3,840	18th December 1916.	1 year.
Do.	(443) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do.	P. L. (renewal).	12,800	12th September 1916.	Do.
Do.	(444) Do.	Do.	P. L.	3,200	24th May 1917.	Do.
Yamethin.	(445) Messrs. Bochar Dass Manekchand Kharwar.	Lead	P. L.	2,560	20th April 1917.	Do.

CENTRAL PROVINCES.

Balaghat.	(446) Mahan Bahadur Byramji Pestonji.	Manganese	P. L.	280	7th February 1917.	1 year.
Do.	(447) Indian Manganese Company, Limited.	Do.	P. L.	1	18th January 1917.	Do.
Do.	(448) Do.	Do.	P. L.	153	Do.	Do.
Do.	(449) Babu Kripashankar.	Do.	P. L. (renewal).	271	5th February 1917.	6 months.
Do.	(450) Do.	Do.	P. L. (renewal).	350	8th January 1917.	Do.
Do.	(451) Khan Bahadur Byramji Pestonji.	Do.	M. L.	346	28th April 1917.	30 years.
Do.	(452) Seth Gowardhandas.	Do.	P. L.	20	5th May 1917.	1 year.
Do.	(453) Babu Kripashankar.	Do.	P. L. (renewal).	272	5th August 1917.	6 months.
Do.	(454) Indian Manganese Company, Limited.	Do.	P. L.	60	28th August 1917.	1 year.
Do.	(455) Khan Bahadur Byramji Pestonji.	Do.	M. L.	4	27th June 1917.	5 years.
Do.	(456) Do.	Do.	M. L.	48	13th August 1917.	Do.
Do.	(457) Babu Kripashankar.	Do.	P. L. (renewal).	38	29th August 1917.	6 months.
Do.	(458) Khan Bahadur Byramji Pestonji.	Do.	P. L.	171	13th October 1917.	1 year.
Do.	(459) Babu Kripashankar.	Do.	P. L.	.	Do.	Do.
Do.	(460) Pandit Rewashankar.	Do.	P. L.	35	Do.	Do.

P. L.=Prospecting License. M. L.=Mining Lease.



CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Balaghat	(461) Messrs. Ramprasad Lakshminarayan.	Manganese	P. L.	2	17th December 1917.	1 year.
Do.	(462) Babu Kripashankar.	Do.	P. L.	171	13th October 1917.	Do.
Do.	(463) Messrs. Tata Sons & Co.	Bauxite	P. L.	63	31st December 1917.	Do.
Do.	(464) Do.	Do.	P. L.	107	Do.	Do.
Do.	(465) Do.	Do.	P. L.	241	Do.	Do.
Do.	(466) Do.	Do.	P. L.	96	21st December 1917.	Do.
Bhandara	(467) Nagpur Manganese Mining Syndicate, Ltd.	Manganese	M. L.	18	23rd January 1917.	10 years.
Do.	(468) Messrs. Lalbehari and Ramcharan.	Do.	M. L.	25	15th December 1916.	Do.
Do.	(469) Seth Gowardhandas.	Do.	M. L.	62	12th December 1916.	30 years.
Do.	(470) Hon'ble Dewan Bahadur Sir Kasturchand Daga, K.C.I.E.	Do.	M. L.	87	18th December 1916.	5 years.
Do.	(471) Khan Bahadur Byramji Pestonji.	Do.	M. L.	13	21st February 1917.	Do.
Do.	(472) Seth Gowardhandas.	Do.	P. L.	232	15th January 1917.	1 year.
Do.	(473) Seth Mahadeo	Do.	P. L.	29	27th March 1917.	Do.
Do.	(474) Pandit Rewashankar.	Do.	P. L.	47	3rd February 1917.	Do.
Do.	(475) Seth Gowardhandas.	Do.	P. L.	30	21st June 1917.	Do.
Do.	(476) Do.	Do.	P. L.	50	Do.	Do.
Do.	(477) Seth Mahadeo	Do.	P. L. (renewal).	8	26th September 1917.	Do.
Do.	(478) Do.	Do.	P. L. (renewal).	38	15th June 1916.	Do.
Do.	(479) Do.	Do.	P. L. (renewal).	30	26th August 1917.	Do.
Do.	(480) Do.	Do.	P. L.	348	13th September 1917.	Do.
Do.	(481) Do.	Do.	P. L.	611	Do.	Do.

P. L.—Prospecting License. M. L.—Mining Lease.

CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Bhandara	(482) Seth Gowardhandas.	Manganese	M. L.	19	19th April 1917.	Will expire with the original lease dated the 5th March 1916, to which it is supplementary.
Do.	(483) Seth Shriram	Do.	P. L.	38	9th August 1917.	1 year.
Do.	(484) Seth Jagannath	Do.	P. L.	313	13th August 1917.	Do.
Do.	(485) Seth Shriram	Do.	P. L.	274	29th September 1917.	Do.
Do.	(486) Messrs. Lal Behari and Ramcharan.	Do.	P. L. (renewal.)	16	11th July 1917.	Do.
Do.	(487) Seth Mahadeo	Do.	P. L.	45	30th September 1917.	Do.
Do.	(488) Seth Shriram	Do.	P. L.	47	29th September 1917.	Do.
Do.	(489) Seth Gowardhandas.	Do.	M. L.	29	17th October 1917.	4 years.
Do.	(490) Seth Shriram	Do.	P. L.	89	3rd December 1917.	1 year.
Do.	(491) Do.	Do.	P. L.	29	13th October 1917.	Do.
Bilaspur	(492) Tata Iron and Steel Co., Ltd.	Iron ore and other minerals (Dolomite and limestone).	P. L.	6,799	28th May 1917.	Do.
Chanda	(493) Messrs. H. Verma and Kanhaiyalal.	Coal	M. L.	1,221	5th February 1917.	Will expire with the original lease dated the 30th October 1915 to which it is supplementary.
Do.	(494) Mr. Narsibhoy.	Do.	P. L.	8,827	17th May 1917.	1 year.
Do.	(495) Do.	Do.	P. L.	400	17th June 1917.	Do.
Do.	(496) Do.	Do.	P. L.	640	17th May 1917.	Do.

P. L.—Prospecting License. M. L.—Mining Lease.

CENTRAL PROVINCES—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Chanda	(497) Messrs. Hashambhoy & Sons.	Coal . . .	P. L. .	2,439	10th October 1917.	1 year.
Do.	(498) Mr. Padamsy Narsimbhoy.	Do. . . .	P. L. .	70	26th November 1917.	Do.
Chhindwara	(499) Khan Bahadur Byramji Pestonji.	Manganese .	P. L. .	134	27th January 1917.	Do.
Do.	(500) Do.	Do. . . .	M. L. .	83	21st February 1917.	5 years.
Do.	(501) Messrs. H. Verma and Kanhaiyalal.	Coal . . .	P. L. .	437	21st May 1917	1 year.
Do.	(502) Rai Bahadur Bishesar Das Daga.	Manganese .	P. L. .	39	2nd April 1917.	Do.
Do.	(503) The Hon'ble Mr. M. B. Dadabhoy, C.I.E.	Do. . . .	P. L. .	129	3rd April 1917.	Do.
Do.	(504) Messrs. H. Verma and Kanhaiyalal.	Coal . . .	P. L. .	146	4th October 1917.	Do.
Do.	(505) Do.	Do. . . .	P. L. .	370	19th December 1917.	Do.
Do.	(506) Indian Manganese Co.	Manganese .	M. L. .	21	17th October 1917.	Will expire with the original lease dated the 6th February 1904 to which it is supplementary.
Drug.	(507) Messrs. Bahman-shah Fouzdar Bros.	Bauxite, lead, silver, cobalt and copper.	M. L. .	3	2nd November 1917.	Will expire with the original lease, dated the 20th June, 1910, to which it is supplementary.
Jubbulpore	(508) Messrs. Burn & Co.	Coal . . .	P. L. .	1,127	29th January 1917.	1 year.
Do.	(509) Mr. P. C. Dutt	Bauxite . .	P. L. .	443	5th January 1917.	Do.
Do.	(510) Do.	Manganese .	P. L. .	55	22nd May 1917.	Do.

P. L.—Prospecting License. M. L.—Mining Lease.

CENTRAL PROVINCES—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Jubbulpore	(511) Mr. P. C. Dutt	Manganese	M. L. .	19	2nd April 1917.	Will expire with the original lease, dated the 4th September 1915, to which it is supplementary.
Do.	(512) Do.	Do. . . .	P. L. .	82	Do.	1 year.
Do.	(513) Do.	Bauxite and iron	P. L. (renewal).	148	22nd October 1916.	Do.
Do.	(514) Do.	Bauxite . .	M. L. .	52	12th July 1917.	30 years.
Do.	(515) Do.	Bauxite and iron oxide.	P. L. .	404	9th August 1917.	1 year.
Do.	(516) Do.	Coal . . .	P. L. .	384	23rd July 1917.	Do.
Do.	(517) Do.	Manganese, iron, thallium, bauxite, vanadium, caesium, cerium, columbium, didymium, erbium, gallium, germanium, indium, lithium, niobium, rubidium, tantalum, thorium, uranium, yttrium and zirconium.	P. L. .	566	30th November 1917.	Do.
Do.	(518) Do.	Bauxite lead, gold, barytes, silver, and copper.	P. L. .	212	5th November 1917.	Do.
Do.	(519) Do.	Bauxite and iron	P. L. .	653	Do.	Do.
Do.	(520) Do.	Manganese, iron, Bauxite, nickel, cobalt, cadmium, molybdenum, thallium, vanadium, titanium, copper, caesium, cerium, columbium, didymium, erbium, gallium, germanium, indium, lithium, niobium, rubidium, tantalum, thorium, uranium, yttrium and zirconium.	P. L. .	293	21st December 1917.	Do.

P. L.—Prospecting License. M. L.—Mining Lease.

CENTRAL PROVINCES—contd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Jubbulpore	(521) Khan Bahadur Byramji Pestonji.	Manganese .	P. L. .	75	7th December 1917.	1 year.
Do.	(522) Messrs. Burn & Co.	Bauxite .	P. L. .	4,159	17th November 1917.	Do.
Do.	(523) Mr. S. R. Dutt .	Bauxite and barytes.	P. L. .	154	7th December 1917.	Do.
Nagpur	(524) Messrs. H. Verma and Kanhaiyalal.	Manganese .	M. L. .	171	15th January 1917.	30 years.
Do.	(525) Mr. Lakshman Damodhar Lelo.	Do. .	M. L. .	59	28th November 1916.	Do.
Do.	(526) Khan Bahadur Byramji Pestonji.	Do. .	P. L. .	489	16th January 1917.	1 year.
Do.	(527) Messrs. Goredutt, Ganeshlal and M. D'Costa.	Do. .	P. L. .	44	1st May 1917	Do.
Do.	(528) Messrs. Bahmansha Foudar Bros.	Do. .	P. L. .	184	21st April 1917.	Do.
Do.	(529) Central India Mining Co., Ltd.	Do. .	P. L. .	545	27th April 1917.	Do.
Do.	(530) Messrs. Bahmansha Foudar Bros.	Do. .	P. L. .	30	19th September 1917.	Do.
Do.	(531) Seth Gowardhandas	Mica .	P. L. .	39	21st August 1917.	Do.
Do.	(532) Nagpur Manganese Mining Syndicate.	Manganese .	P. L. .	53	20th July 1917.	Do.
Do.	(533) Rao Sahib D. Lakshminarayan.	Manganese and pyrolusite.	P. L. .	20	31st August 1917.	Do.
Do.	(534) Central India Mining Co., Ltd.	Manganese .	P. L. .	7	9th November 1917.	Do.
Do.	(535) Do.	Do. .	P. L. .	475	7th December 1917.	Do.
Do.	(536) Do.	Do. .	P. L. .	153	18th October 1917.	Do.
Do.	(537) Do.	Do. .	P. L. .	240	Do.	Do.
Do.	(538) Mir Aslam Khan .	Do. .	P. L. .	7	9th November 1917.	Do.
Do.	(539) Rai Bahadur Bissessardas Daga.	Do. .	P. L. .	81	7th December 1917.	Do.
Do.	(540) Do.	Do. .	P. L. .	70	21st November 1917.	Do.

P. L.—Prospecting License. M. L.—Mining Lease

CENTRAL PROVINCES—concl'd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur	(541) Mir Aslam Khan .	Manganese .	P. L. .	629	12th October 1917.	1 year.
Do.	(542) Messrs. Bahmansha Foudar Bros.	Do. .	P. L. .	32	9th November 1917.	Do.
Do.	(543) Mir Aslam Khan .	Do. .	P. L. .	442	Do.	Do.
Do.	(544) Mr. N. Venkat Ramannah.	Do. .	P. L. .	111	21st November 1917.	Do.
Yeotmal	(545) Mulla Hasan Ali Nathubhoy.	Coal .	M. L. .	1,206	26th January 1917.	30 years.
Do.	(546) Do.	Do. .	M. L. .	563	Do.	Do.
Do.	(547) Do.	Do. .	M. L. .	1,291	17th February 1917.	Do.

MADRAS.

Coimbatore	(548) Messrs. Startin & Co. of London.	Mica .	P. L. .	4.37	24th March 1917.	1 year.
Do.	(549) Messrs. Startin & Co.	Do. .	P. L. .	9.34	2nd August 1917.	Do.
Kurnool	(550) A. Ghose, Esq. .	Barytes .	P. L. .	62.57	27th February 1917.	Do.
Do.	(551) Do.	Do. .	P. L. .	20.85	18th May 1917.	Do.
Do.	(552) Do.	Do. .	P. L. .	66.70	4th August 1917.	Do.
Do.	(553) Do.	Do. .	P. L. .	58.82	18th July 1917.	Do.
Nellore	(554) P. Krishnasami Mudaliyar.	Mica .	M. L. .	174.76	10th December 1913.	30 years.
Do.	(555) Messrs. F. F. Chrestien & Co.	Do. .	M. L. .	2.32	28th November 1916.	Do.
Do.	(556) P. Venkatasami Chetti.	Do. .	P. L. .	0.74	10th January 1917.	1 year.
Do.	(557) Indupur Subbarami Reddi.	Do. .	P. L. .	31.26	26th June 1917.	Do.
Do.	(558) V. K. M. K. R. Karuppan Chetti.	Do. .	P. L. .	5	2nd March 1917.	Do.

P. L.—Prospecting License. M. L.—Mining Lease.

MADRAS—concl'd.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nellore	(559) K. Venkataramanah	Mica . . .	P. L. . .	15	1st April 1917.	1 year.
Do.	(560) Khan Bahadur Muhammad Saifdar Hussain.	Do. . . .	M. L. . .	344.54	1st April 1914.	30 years.
Do.	(561) M. R. M. A. Subramania Chettiar.	Do. . . .	M. L. . .	34.71	5th August 1911.	Do.
Do.	(562) B. Venkata Subba Reddi.	Do. . . .	P. L. . .	17.76	1st September 1917.	1 year.
Do.	(563) P. Venkataswami Chetti.	Do. . . .	P. L. . .	48.28	9th April 1917.	Do.
Do.	(564) V. K. M. K. R. Karuppan Chetti.	Do. . . .	P. L. . .	64.02	28th July 1917.	Do.
Do.	(565) I. Subbarami Reddi	Do. . . .	P. L. . .	30.09	15th August 1917.	Do.
Do.	(566) The Sankara Mining Syndicate.	Do. . . .	M. L. . .	136.30	1st December 1906.	30 years.
Do.	(567) A. Govindu Reddi	Do. . . .	P. L. . .	26.58	20th October 1917.	1 year.
Do.	(568) N. Raghavalu Nayakkar.	Do. . . .	P. L. . .	11.96	5th December 1917.	Do.
Do.	(569) V. K. M. K. R. Karuppan Chetti.	Do. . . .	P. L. . .	24.62	1st December 1917.	1 . .
Do.	(570) N. Raghavalu Nayakkar.	Do. . . .	P. L. . .	9.41	5th October 1917.	Do.
Do.	(571) Moolji Govindji .	Do. . . .	P. L. . .	20	15th October 1917.	Do.
Trichinopoly	(572) Messrs. T. Stanes & Co., Ltd., Coimbatore.	Phosphatic nodules	P. L. . .	430.69	23rd June 1917.	Do.

PUNJAB.

Attock	(573) Attock Oil Co., Ltd.	Mineral oil . .	P. L. . .	1,230	5th June 1917.	1 year.
Shahpur	(574) The Burma Oil Co., Ltd.	Do. . . .	P. L. . .	4,992	10th July 1917.	Do.

P. L.=Prospecting License. M. L.=Mining Lease.

SUMMARY.

Province.	Prospecting Licenses.	Mining Leases.	Total of each Province.
Assam	4	2	6
Baluchistan	3	4	7
Bihar and Orissa	21	14	35
Bombay	4	1	5
Burma	380	12	392
Central Provinces	81	21	102
Madra-	20	5	25
Punjab	2	..	2
Total of each kind and Grand Total 1917	515	59	574
TOTAL OF 1916	482	50	532

CLASSIFICATION OF LICENSES AND LEASES:**TABLE 27.—Prospecting Licenses and Mining Leases granted in Assam during 1917.**

DISTRICT.	1917.		
	No.	Area in acres.	Mineral.
Prospecting Licenses.			
Cachar	1	16,000	Mineral oils
Lakhimpur	1	8,238.08	Coal.
Sylhet	2	14,547.2	Mineral oils.
TOTAL	4	...	

Mining Leases.

Khasi and Jaintia Hills	1	1,920	Metallic ores.
Lakhimpur	1	2,227.2	Coal, iron, slate and shale.
TOTAL	2	...	

TABLE 28.—Prospecting Licenses and Mining Leases granted in Baluchistan during 1917.

DISTRICT.	1917.		
	No.	Area in acres.	Mineral.
Prospecting Licenses.			
Kalat	3	58,240	Oil.

TABLE 28.—Prospecting Licenses and Mining Leases granted in Baluchistan during 1917.

DISTRICT.	1917.		
	No.	Area in acres.	Mineral.
Mining Leases.			
Quetta Pishin	1	80	Chromite.
Do	1	80	Coal.
Sibi	2	96.46	Do.
TOTAL	4	...	

TABLE 29.—Prospecting Licenses and Mining Leases granted in Bihar and Orissa during 1917.

DISTRICT.	1917.		
	No.	Area in acres.	Mineral.
Prospecting Licenses.			
Hazaribagh	5	504	Mica
Santal Parganas	2	10,239.76	Coal.
Singbhum	5	2,025.5	Chromite.
Do.	1	11.90	Yellow ochre.
Do.	3	36,032	Manganese and iron ore
Do.	1	1,330	Galena, gold and other kindred minerals
Do.	1	75.90	Manganese.
Do.	1	150	Red ochre.
Do.	1	56	Iron ore.
Do.	1	4.60	Yellow and red ochre.
TOTAL	21	...	

TABLE 29.—*Prospecting Licenses and Mining Leases granted in Bihar and Orissa during 1917.*

DISTRICT.	1917.		
	No.	Area in acres.	Mineral.
Mining Leases.			
Gya	1	1,557.05	Mica.
Hazaribagh	1	70	Do.
Sambalpur	1	1,300	Coal.
Santal Parganas	5	17.13	Do.
Singhbhum	3	1,532.30	Chromite.
Do.	1	800	Iron-ore.
Do.	1	1,267.2	Manganese and iron ore.
Do.	1	1	Gold.
TOTAL	14	...	

TABLE 30.—*Prospecting Licenses and Mining Leases granted in Bombay during 1917.*

DISTRICT.	1917.		
	No.	Area in acres.	Mineral.
Prospecting Licenses.			
Dharwar (also in Kanara district)	1	1,143	Galena.
Kaira	1	301.95	Manganese and aluminium.
Panoh Mahals.	1	45.5	Manganese.
Sukkur	1	6,008	Mineral oil.
TOTAL	4	...	
Mining Leases.			
Panoh Mahals	1	680.22	Manganese ore.

TABLE 31.—*Prospecting Licenses and Mining Leases granted in Burma during 1917.*

DISTRICT.	1917.		
	No.	Area in acres.	Mineral.
Prospecting Licenses.			
Akyab	2	9,060	Mineral oil.
Amherst	12	10,133.2	All Minerals (except oil).
Bhamo	1	5,516.8	All minerals (except oil and jade).
Katha	1	24,320	Tin, wolfram, silver, copper, lead, zinc and gold.
Lower Chindwin	3	2,940	All minerals (except oil).
Do.	3	3,040	Mineral oil.
Mergui	26	27,420.46	All minerals (except oil)
Do.	2	82.92	Tin.
Do.	3	3,383.32	Wolfram and tin.
Do.	1	2,626.56	Wolfram.
Minbu	2	2,890.24	Mineral oil.
Myingyan	2	11,790	Do.
Myitkyina	1	1,132.8	Gold and platinum.
Do.	1	3,200	Gold and iridio-platinum.
Do.	2	3,571.2	Gold.
Northern Shan States	2	3,200	Iron.
Do.	2	5,760	Coal.
Do.	1	3,200	Gold, silver, iron and zinc.
Pakokku	7	17,402.80	Mineral oil.
Prome	2	3,449.6	Do.
Ruby Mines	1	640	Copper.
Salween.	1	3,840	All minerals (except oil).
Shwebo	2	4,704	Mineral oil.
Southern Shan States	4	2,787.93	Wolfram.
Do.	1	2,560	Lead.
Do.	9	11,965	All minerals (except oil).
Do.	3	9,560	Gold.
Tavoy	201	147,824.28	All minerals (except oil).
Thaon	68	98,825.5	All minerals (except oil).
Do.	1	29.44	Mineral oil.
Thayetmyo	9	31,916.82	Do.
Upper Chindwin	3	19,840	Do.
Yamethin	1	2,560	Lead.
TOTAL	380		

TABLE 31.—*Prospecting Licenses and Mining Leases granted in Burma during 1917—contd.*

DISTRICT	1917.		
	No.	Area in acres.	Mineral.
Mining Leases.			
Minbu	1	19	Mineral oil.
Southern Shan States	1	2,680	Lead, copper and silver.
Tavoy	4	7,335.03	Wolfram and tin.
Do.	6	10,081.38	All minerals except oil and precious stones.
TOTAL	12		

TABLE 32.—*Prospecting Licenses and Mining Leases granted in the Central Provinces during 1917.*

DISTRICT.	1917.		
	No.	Area in acres.	Mineral.
Prospecting Licenses.			
Balaghat	14	2,135	Manganese.
Do.	4	507	Bauxite.
Bhandara	18	2,274	Manganese.
Bilaspur	1	6,799	Iron ore and other minerals (Dolomite and Lime-stone).
Ohanda	5	7,376	Coal.
Chindwara	3	302	Manganese.
Do.	3	953	Coal.
Jubbulpore	2	1,511	Do.
Do.	2	4,602	Bauxite.
Do.	3	212	Manganese.
Do.	2	801	Bauxite and iron.
Do.	1	404	Bauxite and iron oxide.
Do.	1	566	Manganese, iron, bauxite, and all metals of the rare earth.

TABLE 32.—*Prospecting Licenses and Mining Leases granted in the Central Provinces during 1917—contd.*

DISTRICT.	1917.		
	No.	Area in acres.	Mineral.
Prospecting Licenses—contd.			
Jubbulpore	1	212	Bauxite, lead, gold, barytes, silver and copper.
Do.	1	293	Manganese, iron, bauxite, nickel, cobalt, cadmium, molybdenum, lithium, copper and minerals of the rare earths.
Do.	1	154	Bauxite and barytes.
Nagpur	17	3,592	Manganese.
Do.	1	39	Mica.
Do.	1	20	Manganese and pyrolusite.
TOTAL	81		

Mining Leases.

Balaghat	3	398	Manganese.
Bhandara	7	253	Do.
Ohanda	1	1,221	Coal.
Chindwara	2	104	Manganese.
Drug	1	3	Bauxite, lead, silver, gold, cobalt and copper.
Jubbulpore	1	19	Manganese.
Do.	1	52	Bauxite.
Nagpur	2	230	Manganese.
Yeotmal	3	3,060	Coal.
TOTAL	21		

TABLE 33.—*Prospecting Licenses and Mining Leases granted in Madras during 1917.*

DISTRICT.	1917.		
	No.	Area in acres.	Mineral.
Prospecting Licenses.			
Coimbatore	2	13.71	Mica.
Kurnool	4	208.94	Barytes.
Nellore	13	304.63	Mica.
Trichinopoly	1	430.69	Phosphatic nodules.
TOTAL	20		
Mining Leases.			
Nellore	5	692.63	Mica.

TABLE 34.—*Prospecting Licenses and Mining Leases granted in the Punjab during 1917.*

DISTRICT	1917.		
	No.	Area in acres.	Mineral
Prospecting Licenses.			
Attock	1	1,280	Mineral oil.
Shahpur	1	4,992	Do.
TOTAL	2		

THE SUPPORT OF THE MOUNTAINS OF CENTRAL ASIA
(BEING AN APPENDIX TO THE MEMOIR ON THE STRUCTURE OF THE HIMALAYAS, AND OF THE GANGETIC PLAIN, AS ELUCIDATED BY GEODETIC OBSERVATIONS IN INDIA). BY R. D. OLDHAM, F.R.S. (With Plate 3).

IN the memoir on "The Structure of the Himalayas and of the Gangetic Plain, as elucidated by Geodetic Observations in India,"¹ it was shown that the outer zone of the hills was a region of partial defect of compensation, or, in other words, of super-elevation of the surface, which increased in amount from the outer edge of the hills to as far in as definite observations have been made. This being only about 40 miles, the ultimate course of the discrepancy between topography and compensation cannot be traced, but less certain observations, and other considerations, indicate that the defect of compensation disappears at greater distances from the edge of the hills and may even be replaced by an excess. The conclusion, being an important one in view of its bearing on theories of the origin of mountains, requires confirmation and, in the absence of observations in the Himalayan region, this had to be looked for elsewhere. In the search for such information I came across a series of gravity measurements, made by the Russian Government, in the region of the Pamirs and neighbouring parts of Central Asia, which are of special interest as giving a complete section across a group of mountains not only comparable in elevation with the Himalayas but also, in other ways, of importance in the discussion of theories of mountain origin.

The geology of this region is still imperfectly known, but this is of no very great importance as the present investigation is not concerned with details of stratigraphy. Enough is known to show that the general strike of the strata, and of the axes of the folds, is about east and west right across the northern part of the district. In the southern part, the same strike is found towards the centre, but on the east it bends round to south-eastwards, and westwards

¹ *Mem., Geol. Surv. Ind., XLII, pt. 2. 1917.*

to the south-west. The topography shows a general agreement with the geological structure; on the north the upper waters of the Sir Daria, or Jaxartes, flow through the valley plain of Fergana, in what is evidently a structural depression between the mountains to the north and south. South of the Fergana valley come the parallel ranges of the Alai and Trans-Alai, separated by the Alai plain, near the head of the valley of the Kizil Su. These ranges are continued, further west, by others named on maps as the Peter the Great, Hissar, and Zerafshan, which together with the Alai ranges, may be regarded as the westerly continuation and termination of the Tian Shan mountains, now separated by the erosion of valleys, cut more or less along the strike of the rocks. To the south of these high ranges a number of minor ridges stretch in a more or less south-westerly direction towards the valley of the Oxus, following, in a general way, the strike of the rocks. The valley of the Oxus, or Amu Daria, occupies a structural depression to the westwards of the junction of the Kunduz river, but the upper reaches occupy what has all the characters of a valley of erosion, cut through the mountains, at times along, and at others across, the strike. Further still to the south comes the range of the Hindu Kush and its western continuation.

Throughout this region there is, as has been indicated, a general agreement between the geological structure of the rocks exposed at the surface and the geographical aspect of the country, but upon this general agreement of what may be called the minor topography, the course of crest and valley, there is superimposed a major relief, which is quite independent of the structure of the surface rocks and arranged along an axis transverse to the strike. This is very well seen in the hills of the drainage area of the Amu Daria, where we have the lowlands of Bokhara, on the west, eastwards comes a series of low hills which do not rise above 5,000 feet, followed by the high plateau of the Pamirs, and, still further east, by the mountains of Kungur and Mustagh Ata, which rise to heights of over 25,000 feet and form the highest summits of the region. The same feature may be recognised in the increase in average height from east to west of the series of ranges which form the backbone of the region and is also, and perhaps most conspicuously, marked by the feature known to geographers as the Mustagh Ata range, which lies outside the region covered by the gravity observations, but must be considered, as it will be shown to have an import-

ant bearing on the interpretation of them, and as its character is generally misunderstood.

Maps show a series of high mountains ranged along the border of the plains of Kashgaria, which are separated from the Pamir plateau by deep valleys, and are so conspicuously arranged along a nearly meridional line that, in spite of the interruption by two deeply cut valleys, it is natural to look upon them as forming a distinct and definite mountain range, which is variously designated as the Kashgar, Tagharma, or Mustagh Ata, range; the appearance is, in fact, so striking that it has even misled some geologists into regarding it as a true tectonic range, and accepting a system of disturbance of the strata which would cut right across the trend of the structure of the region immediately to the west, and of which no trace can be found in observation in the field. The Mustagh Ata and Kungur are composed of granite, and doubtless owe their preservation as the highest summits of the region to this, but to the north Dr. H. H. Hayden found that an easterly strike continued right across the line of the supposed range, up to the margin of the Kashgar plain,¹ and to the south Dr. F. Stoliczka found a south-easterly strike continued, with only a brief local occurrence of northerly strike from the edge of the plain till it bent round into the east-south-easterly strike of the Pamirs.² The similitude to a mountain range is largely due to the valleys which separate the summits from the Pamir plateau, and even if these valleys are not wholly due to erosion, there remains the fact that the greatest actual elevations lie in the extreme east of the region, and the common geographical interpretation has this much genetic justification, that the axis of the greatest uplift lies on the eastern edge of the hills, whence there is a rapid descent to the plains of Kashgar.

The major relief of the country is thus seen to cut right across the minor relief, or course of ridge and valley, and for this no satisfactory explanation can be found in the visible geological structure of the country. The structure very clearly indicates that the region has undergone compression in a north and south direction, and this compression would give rise to a thickening of the crust, to which the elevation of the hills might, and very commonly is, attributed; but there is nothing in our limited knowledge of this region to suggest that the compression has been greater in the east than in the

¹ *Rec., Geol. Surv. Ind.*, XLV, 318 (1916).

² *Scientific Results of the Second Yarkand Mission* Geology, pp. 35-37 (1878).

western portion, at any rate to the extent necessary to account for the difference in the present elevation of the ground. This, however, is merely a repetition of what may be found in other parts of the world. Even in those districts where the relation between inward structure and outward form are most intimate and obvious, there is not the same apparent connection between structure and absolute elevation. The Alps and the Himalayas, for instance, have both been compressed in a direction transverse to the general course of the range, and the amount of compression seems to be of much the same order of magnitude in both cases; the geology of the Himalayas is less fully known than that of the Alps, but so far as our knowledge goes the compression seems to have been, if anything, less in amount, and certainly there is nothing like the twofold greater compression, which would be needed to account in this way for the twofold greater elevation. In both these cases, as in others of a similar character, the major relief is ranged along much the same general direction as the minor, so that it is difficult to disentangle the effects of the two and decide how far each may or may not be determined by the geological structure. In the mountains of Turkestan the opposite is the case, and here the major and the minor relief are arranged along different lines, which cross each other nearly at right angles, and, for this reason, the region seems particularly favourable for the study of those problems of mountain formation, the solution of which seems impossible by geological observation and only to be approached by the study of geodetic measurements.

The results of the observations are published in the report of the 1909 meeting of the International Geodetic Association, but in less detailed form than is customary, for only the free air correction is given. The Bouguer correction for visible mass and the Hayford correction for local topography are easily obtained, but the orographic correction for departure of the actual surface from a plateau could not be determined with accuracy from the maps accessible to me. As the stations are mostly situated in open valleys or out in the plain, this correction will in the majority of cases be less than .01 dyne and only in a few cases, where the station is situated in a deep and narrow valley, will it exceed .02 dyne, and is not likely to be greater than .03 at any station of the series.

The correction for the effect of topography at a greater distance than 104 miles from the station has been determined. It was computed in detail by Messrs. Hayford and Bowie for the station of Kala Khum,¹ which is almost centrally situated in the group of stations being dealt with, and, as the amount of this correction varies comparatively slowly from station to station, the adoption of the same value at all would probably not introduce an error of more than .02 dyne at any one. Moreover, the error would be a systematic one, changing gradually from one margin of the map towards the other, and so easily recognisable, if not obscured by other and greater irregularities. As will be seen in the sequel, the differences in the anomalies are much greater in amount and more rapid in their variation than can possibly be accounted for by the neglect of this correction. Another consideration is the fact that the correctness of the adopted value for the force of gravity at Tashkent, on which all the other values depend, is in doubt,² and for this reason it has seemed best to confine attention to the differences, which are most conveniently expressed as positive or negative variations from the mean value of the whole group, excluding the anomalous station of Kala Wamar. The stations are numerous enough, and the area sufficiently extensive and diversified in character, to make it probable that the mean of the anomalies will approximately represent the true zero value for the area, while the exclusion of Kala Wamar is justified by the anomalous character of the record. The negative anomaly at this station is not only abnormally high, but is nearly two-tenths of a dyne higher than at the nearest stations. There is no apparent explanation of so great an anomaly at this station, and it is difficult to avoid the conclusion that a clerical error has crept into either the calculations or their transcription, the alternative explanation being that there is some exceptional and quite local peculiarity at this station; in either case its exclusion is justified.

On the map attached to this note (Pl. 3) the relief of the surface is indicated by the contours at intervals of 5,000 feet and the positions

¹ The effect of Topography and Isostatic compensation upon the Intensity of gravity. Washington; 1912; p 84.

² Comptes Rendues de la seizieme Conference generale de l'Association Geodesique Internationale, Vol. III, pp. 138-141.

of the gravity stations, with the amount, expressed in hundredths of a dyne, by which the anomaly differs from the mean value. As has been mentioned, these values require a correction for irregularity of the surface, which may reach .03 dyne and will be less at most of the stations in the mountain region; they are also subject to a correction on account of distant topography and its compensation which will vary gradually from a positive value near one margin to a negative value at the other, or possibly may vary in either positive or negative direction from some point within the area. Another possible correction is a divergence of the actual distribution of the compensation from that assumed in the Hayford and Bowie tables, from which the figures made use of were derived; any such assumption, however not inadmissible on other grounds, would make very small change in the amount of the anomaly, the maximum change, at the stations in the very heart of the mountains, could not exceed .02 dyne at any individual station and would vary in amount with the altitude.

An inspection of the map shows that the actual variation in the amount of the anomaly is not susceptible of explanation in any of these ways; not only is the amount of the difference too large, reaching as it does about two-tenths of a dyne, but the distribution shows no relation to the situation of the stations, whether in deep and narrow valleys or in the open plain, nor to the elevation, nor does it vary in a manner that could be attributed to the effect of distant topography. On the other hand, the variation does show a very decided relation to the general relief of the country; in the lowlands to the west we find the anomalies all positive, and the positive values continue into the hills on the east; as the higher hills are entered the anomalies become negative, and all the eastern stations show a negative anomaly, with the exception of two groups, one in the central region of the Pamir plateau, and the other in the depression of Fergana. Expressed in general terms, it may be said that the character of the anomaly is such that where lower ground borders on higher the anomaly is positive, and negative where high ground is bordered by lower. In the case of the western plains of Bokhara, and again in the Fergana depression this relationship is obvious, but not so on the Pamir plateau, yet there, too, high as the stations lie, there is higher ground on all sides, though the barrier on the west is breached by river valleys. The station of Jekindi, which shows a small positive anomaly, isolated in a region of defect of gravity, is no exception

for, though situated in a mountain region, it lies in the upper valley of the Kizil Su and not very far from the edge of the Alai plain, which, lying between the Alai and Trans Alai ranges, appears to mark a structural depression between two lines of excess of uplift.

Bearing in mind the fact that a positive anomaly, where the effect of compensation has been considered, means that the surface level stands higher than it would if a condition of complete isostatic equilibrium existed under the station, the distribution of the anomalies may be expressed in a different way, as indicating that the low ground is borne up above, and the ranges depressed below, their respective proper levels. This is the condition which was established as regards one part, and shown to be probable as regards the other, in the case of the Himalayas, and, in that connection, was shown to suggest a certain amount of residual rigidity in the crust of the earth. The way in which this would work can be illustrated by the diagram, fig. 1, where an originally level surface is supposed to have been subjected to elevatory forces such as would result in a surface as represented by the firm line between A and H, if the surface level everywhere coincided with the upward or downward forces; if, however, the crust were possessed of a degree of permanent rigidity which would not allow it to adapt itself to the flexures, the resulting surface would take some such form as that represented by the dotted line, the exact form depending on the degree of rigidity of the crust and the abruptness of the flexures.



Fig. 1.

Here we see that on either side of the central uplifted tract, the level surface is bent upwards and stands at a higher level than it otherwise would, while the outer edges of the uplift are held down below the level which they should have reached. In the centre of the plateau it might be that the surface would be forced up above its proper level by an arching upwards of the crust, as a result of the bending down on either side.

The conditions assumed in the diagram have been reduced to an extreme simplicity, but a similar result would follow in more

complicated circumstances, and, further, if we suppose the elevatory force to be the result of the same changes which have given rise to the compensation, we should find an apparent excess of gravity in all those regions where the dotted line runs above the firm one, and where the actual amount of the compensation would be less than that deduced from the measured altitude; where the dotted line runs below the firm there would, similarly, be an apparent defect of gravity, the real compensation being greater in amount than was allowed for in the computation.

Before passing on to the consideration of the observations it may be well to point out that if the compensation were an indirect result of the accumulation of surface material to form the plateau, the relationship between the real surface and the surface of equilibrium would be the opposite of that shown in the diagram. In this case the ground on either side of the plateau would be borne down, and a defect of gravity would be observed, while the plateau would be supported above the level of equilibrium and show an excess of gravity.

Examining the anomalies in the light of this explanation, we find, in the first place, high positive values in the most westerly stations; then, entering the hills, this positive anomaly decreases in amount in an easterly direction, as the high plateau of the Pamirs is approached, till it disappears and is replaced by a negative anomaly both in the stations along the course of the Oxus and in the hills to the north of it.

In the upper Oxus valley, the anomaly has a negative value of about $\cdot 06$ dyne at Kala Khum, of which $\cdot 01$ is due to the omission of the orographic correction. At Kala Wanj, Kharuk and Ishkasham the negative anomaly amounts to $\cdot 08$, of which some $\cdot 02$ to $\cdot 03$ may be due to the orographic correction, and at Langar Kisht, where this correction is probably larger than at any other station, the negative anomaly of $\cdot 11$ would be reduced to $\cdot 07$ or $\cdot 08$.

Eastwards of these high negative values there are no stations till the Pamir plateau is reached, where a group of positive anomalies is met with, the greatest of which amounts to $\cdot 11$ dyne, at Robat Muskol. This very high value may be attributable, in part, to a purely local variation in the density of the rocks under the station, and it may be that the lesser positive anomalies at the neighbouring

stations would be made negative by a computation including the effect of more distant topography, but any such change would still leave the values positive in comparison with the anomalies at the stations round about.

Taking an anomaly of $\cdot 03$ dyne as representing in round numbers the attraction of 1,000 feet thickness of average rock, we may interpret the figures as showing a super-elevation of about 3,000 feet in the plain about Bokhara, a depression of rather less along the edge of the high plateau of the Pamirs, about Kala Khum or Kala Wanj, and a super-elevation of about the same amount in the central part of the plateau round about Robat Muskol. The distance from Charjui to Robat Muskol is about 550 miles and the maximum difference of load equivalent to about 5,000 feet of rock, indicating a permanent strength of the crust of more than double that which, according to Prof. Barrell, is revealed by the observations in the United States, but only about one-half to three-quarters of that exhibited by part of the floor of the Pacific Ocean.¹

On this line of section, a disturbing element may come in, of the effect of which we can form no estimate, for the line is flanked on the north by the high ranges stretching westwards between the Oxus and Jaxartes valleys, and on the south by the Hindu Kush and its westerly continuation. Nothing of the same proportionate amount needs consideration on the transverse section from north to south across the Pamirs. Beginning from the south, we find a negative anomaly at Langar Kisht which, allowing for the effect of the orographic correction, is equivalent to a depression of about 3,000 feet. This station is close to the crest of the Hindu Kush and to peaks which rise to an altitude of 22,000 to 24,000 feet. At Murghabi, the depression has sunk to $\cdot 04$ dyne and, as the orographic correction would be comparatively small, the depression may be put at about 1,000 feet. At the next station, Robat Ak Baital, there is a super-elevation of about the same amount, which increases to 3,000 feet or more at Robat Muskol. Lake Karakul seems to stand at about the level due to the compensation but northwards the depression at Bordaba amounts to 1,000 feet and to 3,000 feet at Ak Bossaga, diminishing again to about 1,000 feet at Sufi Kurgan and Gulcha. At Liansar and Osh, in the Fergana valley, there is a positive anomaly, indicating a super-elevation of

¹ *Journ. Geol.*, XXII, 30, 37, 33 (1918).

less than 1,000 feet, surrounded on three sides by stations indicating a depression of the surface level, as the mountains are neared.

On this section the bearing up of the low ground, and the bearing down of the high, is very clearly exhibited. In the case of the Fergana valley it is obvious enough, and, as has been pointed out, the central region of the Pamir plateau is in much the same case, in spite of its altitude, but here another cause may co-operate in producing super-elevation. The observations indicate a bending down of the crust towards the north and south, and towards the west; on the east no observations exist but we may infer that a similar condition would be found towards the plains of Kashgar.

Granted the correctness of this interpretation, the strength and rigidity of the crust implied by it might well give rise to an upward bending of the portion of the crust lying between and so to an uplift, reaching its maximum in the centre and dying out on either side, as was suggested in dealing with the suppositious case illustrated in fig. 1.

However this may be, we have a section which may be regarded as something over a complete wave, having a length of about 150 miles from crest to crest or trough to trough, and a height of about 7,000 feet from trough to crest. This last figure may be excessive, and partly due to this increase of the maximum anomalies by purely local causes, but the general average of the observations shows that the difference is at least equivalent to some 5,000 feet or 2,500 above and below the mean level of equilibrium.

Westwards from Fergana the stations in the drainage area of the Sir Daria, or Jaxartes, show the same features, of negative anomalies on the east giving place to positive anomalies to the westwards, as was found further south. It is not possible to recognise any influence of the high mountains which lie between the two rivers, as there are no stations within the ranges or close to them, and the elevated mass is so insignificant in volume, as compared with the Pamir plateau, that the effect of the latter would be predominant, and any influence exerted by the former only recognisable by a larger number of more closely set stations than are available.

Taken as a whole, the results agree in a remarkable manner with those obtained from the study of the geodetic observations in the Himalayas, indicating that a condition of general isostatic equilibrium, of the mountains as a whole, is subject to considerable

local departures from this condition. In both cases these departures from complete equilibrium are distributed with a marked relation to the greater relief of the surface and are just such as would result from the uplift being due to some deep-seated cause, acting mainly in a vertical direction, combined with some considerable strength and permanent rigidity of the overlying crust, which is, consequently, prevented from adapting itself completely to the bending, and so may hold the surface level down below or upraised above that at which it would otherwise stand. The limit to the amount of the departure from the level of equilibrium is about the same in both regions and reaches a maximum of some 3,000 feet; the observations which have been made in the Andes suggest a similar departure from complete equilibrium and to about the same amount. We find, then, that three great mountain ranges, each of about the same magnitude, and the three greatest in the world, agree in showing the same phenomenon and to the same degree. This would in itself give great support to the supposition that there is a real connection and a cause common to all. There are, besides, within the limits of the region now under consideration, two groups of facts, wholly independent of each other, and each in its way giving support to the deduction that the greater relief of the surface is independent of the superficial geological structure, but is directly due to the same processes as have given rise to the compensation.

The first of these is the fact that the course and distribution of the principal mountain ranges and the larger features of the relief of the ground are not directly determined by the geological structure. The point is very clearly brought out in a paper by Dr. Ellsworth Huntington, on the Mountains of Turkestan, and can hardly be more graphically and succinctly expressed than by three brief extracts from his account, in which he consistently writes of the Tian Shan Mountains as a plateau and never as a range.¹

"In physiographic terms, the Tian Shan plateau may be described as a peneplain which has been highly uplifted and warped, and is now in a state of extreme youth". * * * "The result of these geological changes is that, although the *internal structure* of the Tian Shan region is highly mountainous, its *external appearance*, or, in other words, its geographical aspect, is that of a plateau" * * * "The ridges rise by long gentle slopes to flat summits,

¹ *Geog. Journ.*, XXV, pp. 22-40, 139-158 (1905).

where often for many miles the sky-line is an almost straight crest from which the rounded slopes of pure white snowfields descend gradually toward the basins. Here and there the crest line is notched by high passes, the lowest of which are but 1,000 or 2,000 feet below the top of the ridge. Oftener the summit of the ridge is broken into individual mountains, broadly flat topped and of nearly equal height."

The description of this author is borne out by that of every other traveller, and the region appears as one which has undergone a very considerable amount of disturbance, accompanied by a general compression of the strata, which may have given rise to true tectonic irregularities in the form of the surface. These original features had been worn down and the country reduced to a lowland type of gentle relief, such as it is the fashion to describe as a peneplain, when, at a later date, the country was uplifted and, by the opportunity so given to the action of denudation, the surface carved into steep slopes, and deep-cut valleys, converting a downland plateau into the aspect of a series of mountain ranges. The uplift was not uniform, but greater along certain lines than elsewhere, and in some cases these lines of greater elevation followed the general course of the earlier axes of disturbance of the strata, so that the present range of high crests has the appearance of being a true tectonic range, but even in these cases the amount of the later elevation varies along the length of the range, and the variation has no relation to the geological structure. More generally, however, there seems no direct connection, and the most conspicuous geographical feature of the region, the line of mountains running north and south, between the Pamirs and the Plains of Yarkand and Kashgar, runs right across the trend of the geological structure. This series of mountains is so distinctly ranged along a definite axis that it may naturally be regarded as a definite range, and the study of the topographical map has even led geologists to infer the existence of a meridional range of true tectonic character. As has already been mentioned, the surface observations are opposed to this conclusion, and show that, if the range is in any sense of the word a tectonic one the tectonics are more deeply seated than those of the disturbance of the rocks near the surface.

The consideration of this range, which is seen to be probably a true range, genetically as well as in superficial appearance, merely emphasises the conclusion drawn from the general study of the region,

that the broad features of the major relief, as well as the determination of the more restricted zones of greater uplift, are not the result of processes apparent in the structures visible at the surface, but of more deeply seated, and possibly quite independent, processes, which are not accessible to surface observations, and are, presumably, connected with the cause of compensation.

The second group of facts has a more direct bearing on the particular nature of the changes, or processes, which produce the compensation. It is known that great earthquakes send out two sets of waves, which are transmitted through the interior of the earth and recorded at distant stations. In addition to the record of the waves which have travelled by direct courses, there are subsidiary records which are attributed to those which have been one or more times reflected; though the interpretation of the records has been questioned, and is certainly doubtful as to some of the supposed twice or more times reflected waves, the concordance of a very large proportion of the records seems to have established the presence of the two types of singly reflected waves, the condensational and the distortional, each reflected from a midway point as the same form of wave. In the mathematical treatment of this question it is usual to assume a reflection from the surface of a solid sphere, and this is too often taken to mean that it takes place at the surface of the earth; this, however, is impossible, in the case of the actual records, for the rocks of which the outer shell of the earth is composed are too heterogeneous to transmit a simple form of wave-motion without repeated breaking up into waves of more than one form, and the constituent rocks have, almost without exception, so different a degree of elasticity in different directions that they are incapable of transmitting either of the simple forms of wave-motion. The result is, that the simple waves, on entering the outer crust, become broken up into more complex forms and lost; consequently, it is not at the surface of the earth that we must look for the surface of reflection, but at the under surface of the heterogeneous crust, and it is reasonable to find an explanation, of the greater or less conspicuousness of the record of the reflected waves, in the varying degree of abruptness of transition to the more uniform material below. Now it has been observed that, of all the earthquakes registered at European observatories, those originating in the neighbourhood of the Philippines, that is, those which have the central point of reflection under the region of high

mountains of Kashmir and the Pamirs, give the most conspicuous record of the reflected waves, usually even larger than that of the distant ones.

The obvious interpretation of this is that the transition from the outer crust to the underlying material is more than usually rapid and sharply defined in the region under the Pamirs, and it is natural to associate this with the changes which have given rise to the compensation of this group of mountain ranges, the largest and loftiest in the world. And so we reach the same conclusion as was drawn from the gravity observations, that the processes and changes, to which the effect is due, are localised, or at least concentrated, in the lower part of the crust, or in the layer immediately beneath it.

The conclusion reached in the course of this investigation may not be without importance on the geodetic side, as a guide in the determination of the nature, and distribution in depth, of the compensation. On the geological side it is of great interest as showing that two distinct causes and actions have been at work and must be taken into account in any attempt to elucidate the origin of mountain ranges. On the one hand, we have the actions which have given rise to the disturbance of sedimentary rocks from their originally horizontal position, and to the intrusion of igneous rocks among them. The well-established importance of trend-lines of structure is unimpaired, and to the structure set up in this way, combined with the effects of surface denudation, the details of surface form and the course of ridge and valley are due. The boundary between hill and plain is often determined by the same cause, and to it ranges of hills may sometimes be due, but there is a distinct limit to the amount of the difference of elevation which can be produced in this way. No exact figure can be given for these limits; they are probably incapable of precise numerical definition, but the limit of height must be somewhere about 2,000, or possibly, 3,000 feet, and the limit of breadth 150 to 200 miles. Where the difference becomes greater than this, we must look to some other cause than compression of the rocks, for the load imposed on the crust becomes too great for it to bear, and so the conclusion is reached that the larger differences in elevation, and the more extensive areas of uplift, are due to some cause which is independent of that which has given rise to the structures revealed by the geological examination of surface rocks.

As a speculation this is not new, but the present investigation has given clearer indication of its truth than had previously been published, within my knowledge, and more especially has shown, in the first place, that the uplift of the higher mountain ranges is directly connected with those changes which have given rise to the defect of density under the ranges, known as their compensation, and, in the second place, that these changes are deep-seated and take place at the lower limit of the outer crust. Of the nature of these changes, or the way in which they are brought about, the investigation gives no direct indication, but, from the intimate connection between the uplift and the compensation, it follows that the centre of gravity of the two is probably at the same average depth, and this, according to Mr. Hayford's investigation, is somewhere about 35 miles below the surface. Further, the distribution of the departures from complete local equilibrium are such as to show that the compensation is not the indirect effect of the formation of the mountain ranges, but that it is the primary phenomenon and the originating cause of the uplift, of which the mountains are the indirect result and to which they owe their present altitude.

LIST OF STATIONS AND DETAILS OF OBSERVATIONS UTILISED.

[NOTE.—The Stations in this list belong to two series of observations, one based on Tashkent, the other on Tiflis. As the value adopted for the base station in the former differs from that determined for the same place in the latter, and earlier in point of date, by .015 dyne, a correction of this amount has been made at the other stations in order to bring the two series into uniformity. Stations of the series based on Tiflis, to which the correction has been applied, are distinguished by an asterisk. Spelling of place names follows the Survey of India, or a similar system where the name is not to be found on published maps.]

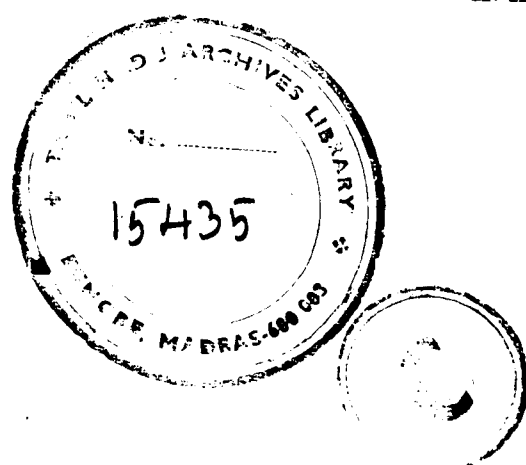
Station.	Longitude.	Latitude.	Elevation (in metres).	Observed value of gravity.	Theoretical value of gravity.	Apparent amount of defect.	CORRECTIONS.			Resulting anomaly.	Difference from mean.
							Height.	Mass.	Compensation.		
1. Murghabi .	73° 58.2'	38° 10.0'	3,700	978.832	980.004	1.172	1.142	.407	.320	-.117	-.04
2. Irkeshtam .	55.5'	39° 41.9'	2,850	9.203	0.139	0.936	0.880	.313	.232	-.137	-.06
3. Robat-Ak-Baital .	51.5'	38° 29.7'	4,100	8.842	0.033	1.191	1.265	.451	.326	-.051	+ .03
4. Robat Muskol .	31.7'	38° 42.0'	4,200	8.924	0.051	1.127	1.296	.462	.328	+ .035	+ .11
5. Lake Karakul .	31.2'	39° 6.4'	3,920	8.912	0.087	1.175	1.210	.431	.315	-.081	.00
6. Sufi Kurgan .	30.0'	40° 1.5'	2,115	9.424	0.168	0.744	0.653	.232	.210	-.113	-.03
7. Guleha .	25.7'	40° 19.0'	1,583	9.580	0.195	0.615	0.489	.174	.185	-.115	-.03
8. Bordaba .	16.2'	39° 30.9'	3,470	9.028	0.122	1.094	1.071	.382	.293	-.112	-.03
9. Ak Bossaga .	13.7'	39° 48.6'	2,875	9.134	0.149	1.015	0.887	.316	.259	-.185	-.10
10. Liansar .	5.7'	40° 24.6'	1,685	9.615	0.202	0.587	0.520	.185	.174	-.078	.00
11. Osh .	72° 46.6'	40° 31.4'	1,021	9.791	0.212	0.421	0.315	.112	.156	-.062	+ .02
12. Langer Kishit .	38.5'	37° 2.6'	2,915	8.847	979.906	1.059	0.900	.320	.289	-.190	-.11
13. Andijan .	20.6'	40° 45.8'	530	9.885	980.234	0.349	0.164		.111	-.132	-.05
14. Karaul Kishlak .	6.0'	40° 2.2'	1,300	9.611	0.169	0.558	0.401	.143	.166	-.134	-.05

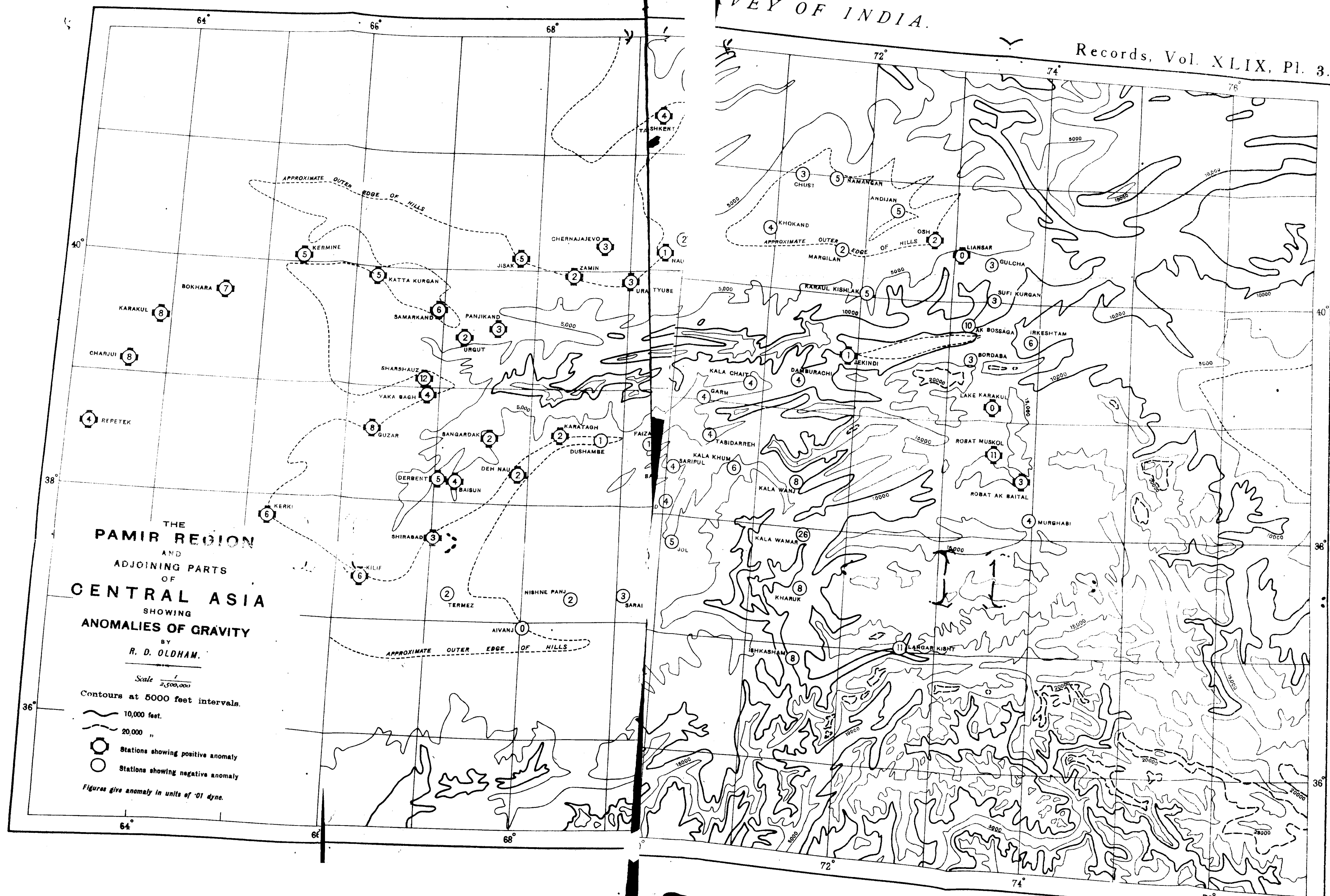
15. Jekindi .	71° 54.5'	39° 30.0'	2,380	9.321	0.121	0.800	0.734	.262	.260	-.068	+ .01
16. Margilan .	46.7'	40° 23.7'	581	9.863	0.201	0.338	0.179	.064	.122	-.101	-.02
17. Namangan .	38.7'	40° 59.7'	440	9.941	0.255	0.314	0.136	.048	.098	-.128	-.05
18. Kharuk .	32.2'	37° 29.5'	2,105	9.132	979.944	0.812	0.650	.231	.236	-.157	-.08
19. Kala Wamar .	32.0'	37° 56.7'	1,985	9.019	9.984	0.965	0.615	.218	.230	-.340	-.26
20. Ishkasham .	30.2'	36° 52.4'	2,460	8.967	9.981	0.924	0.759	.271	.277	-.159	-.08
21. Kala Wanj .	27.0'	38° 22.2'	1,795	9.290	980.021	0.731	0.554	.197	.218	-.156	-.08
22. Damburachi .	22.7'	39° 16.1'	1,735	9.393	0.101	0.708	0.554	.197	.228	-.123	-.04
23. Chust .	13.9'	40° 59.3'	639	9.916	0.254	0.338	0.197	.070	.098	-.113	-.03
24. Khokand .	70° 57.0'	40° 30.5'	437	9.913	0.211	0.298	0.135	.048	.089	-.122	-.04
25. Kala Chait .	52.0'	39° 10.8'	1,600	979.443	0.093	0.650	0.494	.176	.209	-.123	-.04
26. Kala Khum .	46.5'	38° 27.3'	1,345	9.462	0.029	0.567	0.415	.148	.165	-.135	-.06
27. Tabidarreh .	28.2'	38° 41.9'	1,630	9.440	0.051	0.611	0.503	.179	.167	-.120	-.04
28. Garm .	22.2'	39° 1.5'	1,370	9.498	0.079	0.581	0.423	.151	.189	-.120	-.04
29. Jol .	7.7'	37° 45.8'	1,380	9.437	979.968	0.531	0.426	.152	.127	-.130	-.05
30. Saripul .	5.5'	38° 24.5'	1,500	9.462	980.025	0.563	0.463	.165	.150	-.115	-.04
31. Muminabad .	1.7'	38° 6.5'	1,280	9.491	979.999	0.508	0.395	.141	.130	-.124	-.04
32. Bogarak .	69° 50.2'	37° 37.0'	610	9.609	9.956	0.347	0.188	.067	.160	-.120	-.04
33. Baljuan .	39.2'	38° 18.2'	890	9.591	0.015	0.424	0.275	.098	.113	-.134	-.05

NANABHAI DAYABHAI DARU.

IT is with much regret that I have to record the death on September 26th of Mr. N. D. Daru, Assistant Superintendent in this Department. Mr. Daru, after training in England and Canada, joined the Geological Survey of India on December 4th, 1907, and was employed at first in reporting on the alum industry in the Salt Range. He was subsequently attached to the Central India and Rajputana party, and carried out the revision of the geological map of Dungarpur State. His natural bent, however, led him rather to the educational side of his subject, and he occupied the post of Lecturer on Geology at the Poona Engineering College for three years and of Professor of Geology at the Presidency College, Madras, for two years. Soon after his resumption of field-work in 1916 his health gave way; he returned from leave on medical certificate only in April last, but was again compelled to take similar leave almost immediately. His early death is sincerely regretted by all his colleagues.

H. H. HAYDEN.





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