

RECORDS OF THE GEOLOGICAL SURVEY OF INDIA.

Part 3.]

1916.

[August.

REGINALD COOKSEY BURTON.

Born, March 10th, 1890 : Died of wounds, April 9th, 1916.

I greatly regret to have to record the death, on April 9th, of Mr. R. C. Burton, Assistant Superintendent, Geological Survey of India. Mr. Burton joined the Department in January 1912, and was posted to the Central Provinces, where, during his short period of service, he did admirable work in helping to solve the question of the origin of the calcareous gneisses which constitute such an important element of the Archaean group of that area. His investigations into the origin of the bauxite of Seoni and adjoining districts also gave evidence of marked ability and by his death the Geological Survey has lost one of the most promising, as well as one of the most popular, of its younger members.

Mr. Burton joined the Indian Army Reserve of Officers early in April, 1915, and after a short training in India, was attached to the 104th Rifles in Mesopotamia, where he died on April 9th from wounds received in action on the previous day. His loss is keenly felt by all his colleagues.

H. H. HAYDEN.

THE MINERAL PRODUCTION OF INDIA DURING 1915. 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 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 native alluvial industry contributes such an insignificant portion to the total outturn that any error from this source may be regarded as negligible.

From Table 1 it will be seen that there has been an increase of 7 per cent. in the value of the total production over that of the previous year and this that value is now for the first time over 10 million pounds sterling. The increase in value is highly satisfactory in view of the many disturbing factors introduced by the war; and analysis of the figures shows that only a few of our industries have been affected adversely, while many of them have profited considerably by the higher prices realised during the past year.

TABLE 1.—*Total Value of Minerals for which Returns of Production are available for the years 1914 and 1915.*

Mineral.	1914.	1915.	Increase.	Decrease.	Variation per cent.
	£	£	£	£	
Coal	3,907,380	3,781,064	..	126,316	— 3·2
Gold	2,338,355	2,369,486	31,491	..	+ 1·3
Petroleum	958,565	1,256,803	298,238	..	+ 31·1
Manganese-ore (a)	877,264	929,546	52,282	..	+ 5·9
Salt (b)	483,289	660,254	176,965	..	+ 36·6
Saltpetre	272,462	373,891	101,429	..	+ 37·2
Lead and lead-ore	202,330	316,182	113,852	..	+ 56·2
Tungsten-ore	178,543	296,772	118,229	..	+ 66·2
Building materials and road metal	218,879	204,652	..	14,227	— 6·5
Mica (c)	237,310	183,947	..	53,363	— 22·5
Tin-ore and Tin	38,203	54,980	16,777	..	+ 43·9
Jadestone (c)	40,092	52,070	11,978	..	+ 29·9
Ruby, Sapphire and spinel	43,133	36,298	..	6,835	— 15·8
Monazite	41,411	33,238	..	8,173	— 19·7
Iron-ore	40,665	31,886	..	8,779	— 21·6
Silver	26,896	31,150	4,254	..	+ 15·8
Copper-ore	7,294	14,381	7,087	..	+ 97·2
Alum	4,649	4,393	..	256	— 5·5
Magnesite	557	3,973	3,416	..	+ 613·3
Clay	2,792	3,834	1,042	..	+ 37·3
Chromite	2,611	3,531	920	..	+ 35·2
Steatite	4,146	2,578	..	1,568	+ 37·8
Agate	175	1,019	844	..	+ 482·3

(a) Value f. o. b. at Indian ports.

(b) Prices without duty.

(c) Export values.

TABLE 1.—*Total value of Minerals for which Returns of Production are available for the years 1914 and 1915—contd.*

Mineral.	1914.	1915.	Increase.	Decrease.	Variation per cent.
	£	£	£	£	
Gypsum . . .	979	979	..	..	..
Diamond . . .	791	603	..	188	+ 23·8
Ochre . . .	157	459	302	..	+ 192·4
Corundum . . .	447	277	..	170	— 38·0
Antimony . . .	4	236	232	..	..
Amber . . .	274	199	..	75	— 27·4
Zinc-ore . . .	10,762	174	..	10,588	— 98·4
Graphite . . .	..	158	158	..	..
Platinum . . .	213	100	..	113	— 53·0
Bauxite . . .	32	29	..	3	— 9·4
Garnet . . .	4,806	10	..	4,796	— 99·8
Samarskite . . .	121	..	..	121	..
Asbestos . . .	23	..	..	23	..
Pitchblende . . .	13	..	..	13	..
Triplite . . .	13	..	..	13	..
Total .	9,945,636	10,649,512	939,496	235,620	+ 7·0
			+ 703,876		

Of the eight leading industries only one, namely coal, shows a decrease in the value of its output; at the same time, although the value of the outturn has decreased, the actual quantity produced has increased considerably and has risen from a little under 16½ million tons in the preceding year to over 17 million tons. This, of course, means that there has been a considerable fall in the price of coal, the direct cause being the scarcity of steamers and the consequent restriction of exports from Calcutta to other Indian ports. In the case of manganese-ore the relationship between the value and the amount of the output was exactly the reverse of that in the case of coal, for the actual output during the year 1915 was nearly 34 per cent. less than that of the preceding year, whereas the value of the exports was considerably higher; this again was due to the unnatural conditions introduced by the war. Similarly the action of the British Government in fixing the price of tungsten-ore at 55 shillings per unit has resulted in a proportionate increase in value of the output of wolfram. Another mineral of which the output was affected by

the war is mica, the trade in which was reduced by the restriction of exports to British countries and to a few neutrals. The export of zinc-ore also has practically ceased; in previous years the zinc concentrates from the Bawdwin mines had been sent to Germany and Belgium for reduction. The difficulty of obtaining graphite has caused a slight revival of attempts to work the deposits known to occur in the province of Bihar and Orissa. A small quantity of the material was extracted towards the end of the year under review; it is hoped that this will lead to a further revival of the industry. The garnet industry of Rajputana has been completely suspended owing to the absence of demand for cheap stones of that description.

Mineral concessions granted.	The number of licenses and leases granted during the year } amounted to 307 as against 363 in the preced- } ing year; 46 of these were mining leases and } 261 prospecting licenses.
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II.—MINERALS OF GROUP I.

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

Chromite.

There was a fall amounting to 36 per cent. in the output of chromite in the year 1915 as compared with that of the previous year. The industry, however, has never been more than an insignificant one and owing to the difficulty of access, and distance of the mines from the sea-board, the production has always been very sensitive to any fluctuation in the market price of the ore. The chief producing countries during recent years have been New Caledonia, Rhodesia and Russia, the two former, however, largely preponderating, while the Indian contribution to the world's output is only about 2 per cent. of the total. During the past year shipments have been dependent on the cost of freight, and prices of chromite in the open market have been artificial and considerably higher than in normal times. There was a falling-off in the output both in Baluchistan and Mysore, but a slight increase in the Singhbhum district of Bihar and Orissa; the last-named locality has only become a producer within the last few years and conditions have not hitherto been sufficiently promising to encourage very energetic development. The only property that has been systematically exploited is in the hands of Messrs. Rae and Co., of Calcutta, to whom I am indebted for the information that they are at present (July, 1916) turning out about 200 tons per mensem, carrying from 48.79 to 51.20 per cent. Cr_2O_3 . The chromite occurs in serpentine, in layers varying from 1" to 12" in thickness; the layers, however, are very capricious both in size and in their manner of distribution. It has not been found possible to work profitably ore lying at a depth of more than 35 feet below the surface, since the ore-bodies are too small to repay the cost of much dead-work.

It is not likely that all the chromite deposits of Singhbhum have yet been discovered and it is possible that more promising ore-bodies will be found in the course of further prospecting operations. So far, however, there are no indications that India is likely to be a big chromite producer in the future.

TABLE 2.—*Quantity and value of Chromite produced in India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity	Value.
	Tons.	£	Tons.	£
Baluchistan	3,006	1,052	2,161	2,161
Bihar and Orissa	552	301	565	282
Mysore	2,330	1,258	1,041	1,088
Total	5,888	2,611	3,767	3,531

Coal.

The anomaly of a considerable increase in output accompanied by a decrease in the value of the output has already been referred to. It will be seen from table 4 that the output of 1915 showed an increase amounting to between six and seven hundred thousand tons over that of 1914; the considerable increase in the output combined with the lack of sea-borne transport resulted in a considerable fall in the pit's mouth value in the chief producing areas, the price falling in the Bengal fields from Rs. 3-13-10 per ton in 1914 to Rs. 3-6-2 in 1915, and in Bihar and Orissa from Rs. 3-3-4 to Rs. 2-15-6.

TABLE 3.—*Average price (per ton) of Coal extracted from the Mines in each province during the year 1914.*

Province.	Average price per ton.
	Rs. A. P.
Assam	6 15 6
Baluchistan	9 11 9
Bengal	3 6 2
Bihar and Orissa	2 15 6
Burma	6 0 0
Central India	3 0 0
Central Provinces	4 4 6
Hyderabad	6 0 0
North-West Frontier Province	5 0 0
Punjab	5 6 11
Rajputana	3 15 2

TABLE 4.—*Origin of Indian Coal raised during 1914 and 1915.*

	Average of last five years.	1914.	1915.
	Tons.	Tons.	Tons.
Gondwana Coalfields	14,023,329	16,039,261	16,673,237
Tertiary Coalfields	404,982	425,002	430,695
Total .	..	16,464,263	17,103,932

As might have been expected the imports of coal were insignificant, amounting only to a little over 175,000 tons. Exports from Bengal to Ceylon rose considerably, while those by sea to Indian ports fell from the normal figure of over 2,000,000 tons to a little over 1,000,000.

TABLE 5.—*Exports of Indian Coal.*

	1914.		1915.	
	Quantity	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
Ceylon	340,289	203,810	554,885	343,202
Straits Settlements (including Labuan).	111,024	61,230	99,363	55,475
Sumatra	83,698	47,838	64,263	38,688
Other Countries	42,933	26,737	33,290	21,505
Total .	577,944	339,615	751,801	458,870
Coke	1,802	1,509	1,241	1,327
Total of coal and coke .	579,746	341,124	753,042	460,197

TABLE 6.—*Imports of Coal, Coke and Patent Fuel during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
Australia (including New Zealand)	33,419	36,543	28,106	35,958
Japan	32,232	33,427	18,069	20,533
Natal	39,140	47,066	15,292	16,437
Portuguese East Africa . .	58,742	69,650	52,312	61,519
Transvaal	40,355	53,560	26,448	29,224
United Kingdom	156,863	229,160	30,149	45,948
Other Countries	39,612	49,865	3,075	3,303
Total	400,363	519,271	173,451	212,922
Coke	12,729	28,215	10,241	29,221
Patent Fuel	5,666	6,116	6,962	11,007
Government Stores . . .	54,738	83,904	12,379	30,635
Total	473,496	637,506	203,033	283,785

The relative proportions of the output contributed by the Jharia and the Raniganj fields respectively were slightly different to that of recent years, the output of the Jharia field having fallen slightly in 1915, whereas that of Raniganj rose by over $\frac{1}{2}$ million tons; the respective percentages of the total output of India as regards these two coalfields were Jharia, 53·44, and Raniganj, 32·07 in 1915 as against 55·55 and 30·04 per cent. in the preceding year.

TABLE 7.—*Provincial Production of Coal during the years 1914 and 1915.*

Province.	1914.	1915.	Increase.	Decrease.
	Tons.	Tons.	Tons.	Tons.
Assam	305,160	311,296	6,136	..
Baluchistan	48,234	43,607	..	4,627
Bengal	4,424,557	4,975,460	550,903	..
Bihar and Orissa	10,661,062	10,718,155	57,093	..
Burma	..	25	25	..
Central India	152,906	139,680	..	13,226
Central Provinces	244,745	253,118	8,373	..
Hyderabad	555,991	586,824	30,833	..
North-West Frontier Province	94	60	..	34
Punjab	54,303	57,911	3,608	..
Rajputana (Bikaner)	17,211	17,796	585	..
Total .	16,464,263	17,103,932	657,556	17,887

TABLE 8.—*Output of the Gondwana Coalfields for the year 1914 and 1915.*

Coalfields.	1914.		1915.	
	Tons.	Per cent. of Indian Total.	Tons.	Per cent. of Indian Total.
<i>Bengal, Bihar and Orissa—</i>				
Daltonganj	81,680	·50	85,785	·50
Giridih	825,026	5·01	872,647	5·10
Jainti	..	..	40,730	·24
Jharia	9,146,653	55·55	9,140,800	53·44
Bokaro-Ramgarh	16,920	} ·15	10,232	·06
Rajmahal	8,145		5,484,596	32·07
Raniganj	4,946,295	30·04	58,825	·34
Sambalpur (Hingir-Rampur).	60,883	·37	..	..
Darjeeling District (non-act).	17	..	..	..
<i>Central India—</i>				
Umaria	152,906	·93	139,680	·82
<i>Central Provinces—</i>				
Ballarpur	89,292	·54	94,880	·56
Pench valley	95,679	·58	103,152	·60
Mohpani	59,774	·37	55,086	·32
<i>Hyderabad—</i>				
Singareni	555,991	3·38	586,824	3·43
Total .	16,039,261	97·42	16,673,237	97·48

TABLE 9.—*Output of Tertiary Coalfields for the years 1914 and 1915.*

Coalfields.	1914.		1915.	
	Tons.	Per cent. of Indian Total.	Tons.	Per cent. of Indian Total.
<i>Assam—</i>				
Makum	303,890	1·86	308,071	1·82
Naga Hills	778		2,872	
Khasi and Jaintia Hills .	492		353	
<i>Baluchistan—</i>				
Khost	39,557	·24	35,782	·21
Sor Range, Mach, etc. .	8,677	·05	7,825	·05
<i>Burma—</i>				
Bhamo	..	..	25	..
<i>North-West Frontier Province—</i>	94	·33	60	·34
<i>Punjab—</i>				
Jhelum	45,867		51,613	
Mianwali	1,557	·33	2,029	·34
Shahpur	6,879		4,269	
<i>Rajputana—</i>				
Bikaner	17,211	·10	17,796	·10
Total	425,002	2·58	430,695	2·52

There was a steady rise in the total number of persons employed in the industry, this now amounting to 160,086; the output per person employed, however, was again less than in the preceding year, having fallen from 108·76 tons in 1914 to 106·84 tons in the year under review. There were altogether 178 fatal accidents, the death-rate being 1·11 per thousand persons employed.

TABLE 10.—Average number of persons employed daily in the Indian Coalfields during 1914 and 1915.

Province.	Number of persons employed daily.		Output per person employed.	Number of deaths by accidents.	Death rate per 1,000 persons employed.
	1914.	1915.	1915.	1915.	1915.
Assam . . .	2,888	2,909	107.01	25	8.59
Baluchistan . . .	1,001	963	45.28	3	3.15
Bengal . . .	38,882	42,093	118.20	46	1.09
Bihar and Orissa . .	90,855	95,292	112.48	83	.87
Burma . . .	..	16	1.56	..	..
Central India . . .	3,038	2,884	48.43	1	.35
Central Provinces . .	3,254	3,184	79.50	3	.94
Hyderabad . . .	10,141	11,302	51.92	11	.97
North-West Frontier Province.	7	9	6.67	..	..
Punjab . . .	1,161	1,273	45.49	6	4.71
Rajputana (Bikaner) .	149	161	110.53	..	..
Total .	151,376	160,086	..	178	..
Average .	..	..	106.84	..	1.11

Diamonds.

The decline in the output of diamonds still continued in 1915, and fell from 54.65 carats to 35.99 carats, valued at £603.

TABLE 11.—Quantity and Value of Diamonds produced in India during 1914 and 1915.

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Carats.	£	Carats.	£
Central India . . .	54.65	791	35.99	603
Total .	54.65	791	35.99	603

Gold.

There was a still further increase in the output of gold during the year under review ; the output of the Kolar fields increased by over 8,000 ozs. and that of Anantapur by a bout 4,000. There was, however, a decline of between 3,000 and 4,000 ozs. in Hyderabad.

TABLE 12.—*Quantity and Value of Gold produced in India during 1914 and 1915.*

	1914.		1915.		Labour.
	Quantity.	Value.	Quantity.	Value.	
	Ozs.	£	Ozs.	£	
<i>Bihar and Orissa—</i> <i>Singhbhum . . .</i>	..	..	450	1,800	138
<i>Burma—</i>					
Myitkyina . . .	3,635·60	13,905	3,106·83	11,913	} 213
Katha . . .	12·59	67	16·99	91	
Upper Chindwin . .	45·60	268	50·25	295	
Shwebo . . .	10·55	55	7·31	36	
Salween . . .	..	..	1·20	5	
<i>Hyderabad . . .</i>	21,200	80,479	17,869·7	68,338	1,522
<i>Madras . . .</i>	19,873	82,959	23,870	101,324	2,025
<i>Mysore . . .</i>	562,355	2,159,604	571,199	2,185,409	27,008
<i>Punjab . . .</i>	249·98	994	149·59	604	325
<i>United Provinces . .</i>	5·75	24	7·37	31	26
Total .	607,388·07	2,338,355	616,728·24	2,369,846	31,257

Graphite.

It is pleasing to be able to replace graphite among the minerals produced in India. Since the closing down of the Travancore mines, attention has been paid to the graphite of Bihar and Orissa and of Rajputana. As a rule, however, the material won is impure and requires special treatment ; at present the industry is only in its infancy. The total output of the year was 54 tons in Merwara (Rajputana) valued at £147 and 16 tons in Kalahandi (Bihar and Orissa) valued at £11.

Iron.

There was a considerable decline in the output of iron-ore which fell from a little under 442,000 tons in 1914 to about 390,000 in the

year under review. The amount of pig-iron produced during the year by the Tata Iron and Steel Company, Limited, was 154,509 tons and by the Bengal Iron and Steel Company, Limited, 87,285 tons. The former company produced also 76,355 tons of steel including 16,817 tons of steel rails, whilst the latter company produced 25,634 tons of cast iron castings.

In October, 1915, one of the Tata Iron and Steel Co.'s blast furnaces was put on ferro-manganese and 2,658 tons of that alloy were produced by the end of the year. The average composition of the ferro-manganese was 65 to 75 per cent. manganese, '6 to '8 per cent. phosphorus and '6 to 2 per cent. silicon¹.

TABLE 13.—*Quantity and Value of Iron-ore produced in India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
<i>Bengal—</i>				
Burdwan	1,204	171	2,243	370
<i>Bihar and Orissa—</i>				
Singhbhum	151,662·3	15,083	127,040	10,253
Orissa	249,958	16,674	240,321·8	16,032
Other districts	617	278	386	103
<i>Bombay</i>	75	..	..	..
<i>Burma</i>	19,482	5,195	15,526	4,140
<i>Central India</i>	326·5	59	..	..
<i>Central Provinces</i>	18,402	3,198	4,747	986
<i>United Provinces</i>	21·7	7	6·7	2
Total	441,674·25	40,665	390,270·5	31,886

Jadeite.

There is nothing further to record about the jadeite industry; the decline noticed in previous years still continues while the figures returned for exports also continue to be greater than those for production. The former figures therefore are adopted as more likely to indicate the true condition of the industry.

¹ Information furnished by the Company.

TABLE 14.—*Quantity and Value of Jadeite produced in Burma during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
Myitkyina	Cwt. 3,764.75	£ 13,643	Cwt. 3,692.75	£ 12,678

TABLE 15.—*Export of Jadeite by Sea during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
Burma	Cwt. 2,959	£ 40,092	Cwt. 5,001	£ 52,070

Lead.

The output of the Bawdwin mines maintained the steady increase recorded last year, the ore and slag smelted being over 42,000 tons and representing an increase of nearly 9,000 tons over the output of the preceding year. Owing to the rise in the price of lead the value of the output was considerably higher than it would have been in normal times. I am indebted to the Resident Manager, Burma Mines, Limited, for a considerable amount of information as to the present development of the mines. The total production of the metal during 1915 amounted to 13,522 tons of hard lead, of which 6,947 tons were refined and sold in the Eastern markets and 6,575 tons, containing 284,875 ozs. of silver, were shipped to England to be refined.¹ Extensive concentration tests have been carried out on the ore. The roasting plant, which consists of three roasters in operation and two under construction will, when completed, have a daily capacity of 150 to 200 tons of ore. It has not yet been found practicable to produce fine silver on the spot, but retort furnaces and a cupelling furnace have been built with a view to

¹ The output for the first few months of the year 1916 indicates that the year's production will be considerably higher than that of last year and the Resident Manager states that the daily production "at present" (June, 1916) is at the rate of over 50 tons of lead containing from three to four thousand ounces of silver.

future refining. Practically no zinc concentrates were exported during the year (*infra*, page 168).

The amount of lead-ore produced otherwise than at Bawdwin during the past year was insignificant, being 28 tons from the Southern Shan States and 7 tons from the Drug district of the Central Provinces.

TABLE 16.—*Production of Silver-lead ore during 1914 and 1915.*

	1914.			1915.		
	Quantity.	Value.		Quantity.	Value.	
	Lead-ore and slag.	Lead-ore and lead.	Silver.	Lead-ore and slag.	Lead-ore and lead.	Silver.
	Tons.	£	£	Tons.	£	£
Burma—						
Northern Shan States.	$\left\{ \begin{array}{l} 8,769 \\ \text{(ore)} \\ 24,901 \\ \text{(slag)} \end{array} \right\}$	$\left\{ \begin{array}{l} 27,346(a) \\ 174,933(b) \end{array} \right\}$	$\left\{ \begin{array}{l} 13,039 \\ 13,857 \end{array} \right\}$	$\left\{ \begin{array}{l} 4,094 \\ \text{(ore)} \\ 32,534 \\ \text{(slag)} \\ 5,620 \\ \text{(gossan flux)} \end{array} \right\}$	$\left\{ \begin{array}{l} 36,301(d) \\ 273,067(e) \\ 6,709(f) \end{array} \right\}$	$\left\{ \begin{array}{l} 8,540 \\ 20,258 \\ 2,301 \end{array} \right\}$
Southern Shan States.	12	32	..	28	75	..
Central Provinces—						
Drug . . .	3.25	19	..	7	30	..
Total . .	33,685.25	202,320	26,896(c)	42,283	316,182	31,099(g)

(a) Value of 1,426 tons of lead extracted.

(b) Value of 9,122 tons of lead extracted.

(c) Value of 236,446 ozs. of silver extracted.

(d) Value of 1,553 tons of lead extracted.

(e) Value of 11,682 tons of lead extracted.

(f) Value of 287 tons of lead extracted.

(g) Value of 284,875 ozs. of silver extracted.

Magnesite.

There was a considerable increase in the production of magnesite in the Salem district, the outturn being 7,450 tons valued at £3,973 as against 399 tons in the preceding year. During 1915, however, none was produced in Mysore.

Manganese.

Manganese was one of the minerals which were largely affected by the war, the exports being restricted almost entirely to consignments to the United Kingdom, with a comparatively small quantity to the United States; the quantity exported fell from about 538,000 tons in 1914 to less than 420,000 tons in the year under review. The latter figure again is only a little more than half the quantity exported in the year 1913. This naturally resulted in a considerable decrease in the production of ore which fell from a little under 683,000 tons in 1914 to a little over 450,000 tons, a decrease of 34 per cent. It is impossible to estimate accurately the value of this outturn since the price of the ore at the present time is purely artificial and depends to a great extent on the cost of freight; at the prices which have prevailed during the year, the value, based on the usual methods of calculation, would amount to £929,546, which, however, is not the true value of the material extracted, but is deduced from the value of only so much of the outturn as was actually exported during the year. If the conditions which prevailed during the year 1915 were to continue for a considerable period, the above figures would no doubt fairly represent the true value of the output, but if the stringency in the matter of markets and of freights were to be relieved, the value of the material produced, but not yet exported, would naturally be considerably reduced. There are no means therefore of estimating more accurately the value of the year's output; but it is considered desirable to draw attention to the anomaly of a heavy fall in the quantity produced accompanied by an apparent rise in the value of the total production, an anomaly which is due to the artificial state of the manganese market.

TABLE 17.—*Quantity and Value of Manganese-ore produced in India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value f. o. b. at Indian ports.	Quantity.	Value f. o. b. at Indian ports.
	Tons.	£	Tons.	£
<i>Bihar and Orissa—</i>				
Singhbhum . . .	..	..	507	993
Gangpur . . .	6,070	7,613	..	..
<i>Bombay—</i>				
Chota Udepur . .	7,735	9,701	..	..
Panch Mahals . .	19,488	24,441	26,915	52,709
<i>Central India—</i>				
Jhabua . . .	6,642	6,144	366	558
<i>Central Provinces—</i>				
Balaghat . . .	221,159	296,722	180,609	374,189
Bhandara . . .	82,055	110,090	78,627	166,427
Chhindwara . . .	87,114	116,878	46,941	99,358
Nagpur . . .	174,562	234,204	93,027	196,907
Jabalpur . . .	..	..	11	23
<i>Madras—</i>				
Sandur . . .	33,643	29,858	..	..
Vizagapatam . .	26,375	23,408	288	418
<i>Mysore . . .</i>	18,055	18,205	23,125	37,964
Total . . .	682,898	877,264	450,416	929,546

Mica.

Like that of manganese, the mica industry was also affected by the war, exports to countries other than the United Kingdom being very largely restricted. This resulted in a decrease of over 30 per cent. in production; there was also a corresponding decrease in the amount exported which fell from over 2,000 tons in 1914 to a little over 1,500 tons in the year under review.

TABLE 18.—*Quantity and Value of Mica produced in India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Cwt.	£	Cwt.	£
Bihar and Orissa	33,275	46,796	22,195	49,980
Madras	5,989.5	36,140	3,894	20,728
Rajputana	1,192.1	4,968	1,042	3,398
Mysore	50	186	8.7	33
Total	40,506.6	88,090	27,139.7	74,139

Monazite.

There was a small decrease, from 1,185.65 tons valued at £41,411 in 1914 to 1,107.9 tons valued at £33,283 in the year under review in the output of monazite from Travancore and the industry was considerably disorganised by the war. Enemy interests in the company working the monazite sands were found to be considerable; but these have now been eliminated, and the industry has been placed on a satisfactory basis.

Petroleum.

The output of petroleum increased by nearly 30 million gallons, from a little under 260 million gallons in the year 1914 to a little over 287 million in the year under review; the value of the production during 1915 was over 1¼ million pounds sterling. The chief increase was in the Yenangyaung field, where the output rose by about 24 million gallons. Wells continue to be carried down into the deep sands, which are still found to be productive at depths of nearly three thousand feet, and there is no indication yet as to the limiting depth at which oil will be found in this field.

There was also an increase, amounting to over 3½ million gallons, in the output of the Singu field and an increase of over ½ million gallons in Minbu. The recent discovery of an oil-sand at a considerable depth on the southern extension of the Minbu belt has led to a considerable revival of interest in the adjoining areas.

For the first time the returns from the Punjab include an appreciable amount of petroleum; this is from the newly discovered field at Khaur, where borings are being put down by the Attock Oil Company; the output during 1915 is returned at $\frac{1}{4}$ million gallons.

TABLE 19.—*Quantity and Value of Petroleum produced in India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Gallons.	£	Gallons.	£
<i>Burma—</i>				
Akyab	12,948	249	12,045	231
Kyaukpyu	25,987	777	23,220	716
Magwe (Yenangyaung) .	174,981,799	673,525	198,809,315	765,240
Myingyan (Singu) . .	73,409,518	244,698	77,005,880	448,307
Pakokku (Yenangyat) .	4,516,685	16,729	4,099,345	15,525
Minbu	1,683,190	7,013	2,316,207	9,651
Thayetmyo	22,836	95	25,920	108
<i>Assam—</i>				
Digboi (Lakhimpur) . .	4,688,547	15,466	4,550,150	15,009
<i>Punjab—</i>				
Attock	..	..	250,000	2,000
Mianwali	1,200	13	1,494	16
Total . . .	259,342,710	958,565	287,093,576	1,256,803

Imports of kerosene during the year under review were considerably less than in the preceding year, the total quantity imported falling from nearly 84 million gallons to a little over 68 million gallons. The greater part of the decrease was in the imports from Borneo, but imports from Persia fell by nearly 2 million gallons, and from the United States by about $3\frac{1}{2}$ million gallons. There was a small rise in the quantity of paraffin wax exported,

TABLE 20.—*Imports of Kerosene Oil during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Gallons.	£	Gallons.	£
From—				
Borneo	26,966,642	661,243	17,861,500	451,258
Persia	2,765,685	81,237	783,669	23,490
Russia	1,661,870	43,662	..	..
Straits Settlements (in- cluding Labuan) . . .	5,553,268	147,183	6,156,330	161,489
United States of America	46,931,641	1,328,352	43,371,165	1,326,929
Other countries . . .	428	15	426	47
Total .	83,879,534	2,261,692	68,173,090	1,963,213

TABLE 21.—*Export of Paraffin Wax from India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Cwt.	£	Cwt.	£
To—				
United Kingdom . . .	95,210	144,171	153,267	221,974
China	69,775	94,255	46,551	57,551
Japan	58,355	88,506	57,500	87,209
Other countries . . .	139,336	207,808	126,983	192,263
Total .	362,676	534,740	384,301	558,997

Platinum.

Every year a small amount of platinum figures in the returns of the precious metals won by the Burma Gold Dredging Company at Myitkyina; it never amounts to more than a few ounces, the figures for 1915 being 17.7 ounces valued at £100.

Ruby, Sapphire and Spinel.

There was a decrease of about 50,000 carats in the output of the Burma Ruby Mines, which fell from a little under 305,000 carats valued at £43,000 to a little over 251,000 carats valued at £36,300.

TABLE 22.—*Quantity and Value of Ruby, Sapphire and Spinel produced in India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
<i>Burma—</i>				
Mogok	193,333 (Rubies)	40,781	167,904 (Rubies)	34,881
Do.	56,709 (Sapphires)	2,052	39,718 (Sapphires)	1,276
Do.	54,830 (Spinels)	300	43,827 (Spinels)	141
Total	304,872	43,133	251,449	36,298

Salt.

There was an increase of nearly 30 per cent. in the amount of salt produced in India during the year 1915 as compared with the preceding year, the total production, including that of rock-salt, amounted to a little less than $1\frac{3}{4}$ million tons valued at £660,000. The imports fell from a little over 562,000 tons to nearly 520,000 tons, but there was a considerable rise in the value of the import owing to the artificial conditions introduced by the war.

TABLE 23.—*Quantity and Value of Salt produced in India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
Aden	144,463	57,636	352,232	47,838
Bengal.	6	2	(a)	..
Bombay and Sind	486,898	113,453	524,257	129,180
Burma.	21,522	75,536	28,521	108,870
Gwalior State	99	271	127	347
Kashmir	73	55	36·7	27
Madras	298,862	115,494	345,714	209,897
Northern India	396,302	120,842	494,634	164,095
Total	1,348,225	483,289	1,745,521·7	660,254

(a) Quantity of salt educed was $24\frac{1}{2}$ maunds (nearly 1 ton) valued at Rs. 9-3-0.

TABLE 24.—*Quantity and Value of Rock Salt produced in India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
Salt Range	135,519	19,113	154,772	26,332
Kohat	18,239	1,810	21,387	2,123
Mandi	2,792	3,325	3,633	4,327
Total	156,550	24,248	179,792	32,782

TABLE 25.—*Quantity and Value of Salt imported into India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Tons	£	Tons	£
Aden and Dependencies	153,928	146,790	102,286	108,995
Egypt	93,615	101,693	125,123	224,218
Germany	35,014	40,174	(a)1,020	926
Spain	68,119	64,410	102,286	152,736
Turkey, Asiatic	62,255	60,896	..	2
United Kingdom	103,017	104,395	131,018	138,478
Other countries	46,500	42,299	57,790	52,617
Total	562,448	560,657	519,523	677,972

(a) From prize cargoes.

Saltpetre.

The demand for saltpetre for the manufacture of explosives has given a considerable impetus to the indigenous industry; the effect of this is seen in the increased exports during the year 1915 which were 46 per cent. higher than those of the preceding year; about 70 per cent. of the quantity exported went to the United Kingdom.

TABLE 26.—*Quantity and Value of Saltpetre produced in India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
Eihar	4,896	76,946	5,673	113,147
Bombay (Cutch)	1	11	..	..
North-West Frontier Province	2.2	51	..	..
Punjab	3,520	73,404	5,253	109,548
Rajputana	405.9	4,232	137	2,568
United Provinces	6,664	117,818	7,035	148,628
Total .	15,489.1	272,462	18,098	373,891

TABLE 27.—*Distribution of Saltpetre exported during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Cwt.	£	Cwt.	£
Ceylon	44,085	28,674	57,221	45,393
China	49,266	40,305	31,692	27,335
Mauritius and Dependencies	23,406	17,778	15,146	13,408
United Kingdom	127,936	112,924	296,106	315,372
United States of America	19,163	15,096	..	..
Other countries	21,300	19,987	18,443	20,876
Total .	285,156	234,764	418,608	422,384

Silver.

Although no silver ores are worked in India a certain amount of that metal is obtained as a by-product in the extraction of lead at Bawdwin, and of gold at Anantapur, where the Jibutil Gold Mines of Anantapur, Limited, won 512 ozs. during the year under review. As already stated above (page 157) the Burma Mines, Limited, exported during the year argentiferous lead bullion containing 284,875 ozs. of silver.

Tin.

There was a considerable increase in the amounts of block-tin and tin-ore extracted in Burma; the value of the output rose from £38,203 in 1914 to £54,980 in the year under review. The imports into India of unwrought tin fell by about 30 per cent. in 1915 as compared with the preceding year.

TABLE 28.—*Quantity and Value of Tin and Tin-ore for the years 1914 and 1915.*

	1914.				1915.			
	BLOCK TIN.		TIN-ORE.		BLOCK TIN.		TIN-ORE.	
	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.
	Cwt.	£	Cwt.	£	Cwt.	£	Cwt.	£
<i>Bihar and Orissa</i>								
Hazaribagh	1	16	..	..	7	6	..	..
<i>Burma—</i>								
Mergui	1,963	16,235	1,861	9,263	2,553·5	20,534	1,762·25	8,678
Southern Shan States.	..	..	2,767	8,993	..	..	6,613·9	24,802
Tavoy	..	..	767	3,696	6	4	253	956
Total	1,964	16,251	5,395	21,952	2,554·8	20,544	8,629·15	34,436½

TABLE 29.—*Imports of Tin unwrought (blocks, ingots, bars and slabs) into India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Cwt.	£	Cwt.	£
<i>From—</i>				
United Kingdom	5,113	40,806	2,722	23,670
Straits Settlements (including Labuan).	35,340	312,318	27,014	224,524
Other Countries	254	1,969	466	3,883
Total	40,707	355,093	30,202	252,077

Tungsten.

The demand for wolfram for the manufacture of high-speed steel gave an impetus to the wolfram industry of Tavoy towards the latter part of the year under review; and,—as already pointed out in the General Report of the Geological Survey of India for the year 1915, published in this volume of the *Records* (*supra*, page 24),—steps were taken by Government to increase the efficiency of the local mining methods; as those steps did not become effective until the latter part of the year, the result will be apparent in the returns for the following year rather than in those for the year under review. The output, however, for the year 1915 showed an increase of about 13 per cent. over that of the preceding year, while the value of the output rose from £178,543 to £296,772. The industry is gradually being placed on a sound and firm basis, and it is hoped that before long the annual outturn will be twice as great as it was before the war.

TABLE 30.—*Quantity and Value of Tungsten-ore produced in Burma during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
<i>Burma—</i>				
Mergui	194	16,647	232·3	29,554
Southern Shan States	138·4	8,993	330·7	24,802
Tavoy	1,976·6	152,333	2,032·9	235,827
Thaton	17	570	49·4	6,589
Total	2,326	178,543	2,645·3	296,772

Zinc.

In the years 1913 and 1914 considerable amounts of zinc concentrates were shipped to Belgium and Germany for reduction; in 1915 only 196 tons were exported as against over 8,000 tons in the preceding year. The question of the ultimate treatment of the Bawdwin concentrates is an important one for India, since, should it be found feasible to erect zinc smelteries in this country, the resultant production of large quantities of cheap sulphuric acid should have a far-reaching effect on industrial development.

III.—MINERALS OF GROUP II.

There was a considerable rise in the amount of agate produced during the year in Cambay, the quantity having increased from 101 tons valued at £175 in the year 1914 to 508 tons valued at £1,019.

Agate.

There was a fall in the amount of alum produced, the figures being 7,026 cwt. valued at £4,393 in 1915, as against 8,731 cwt. valued at £4,649 in the preceding year.

Alum.

The production of amber also fell slightly from 13 cwt. to 11½ cwt., the value of the latter being £199.

Amber.

A small quantity, amounting to 13 tons, of stibnite was produced in the Amherst district of Burma; the deposit, however, is said to be small and of no particular value.

Antimony.

The amount of bauxite produced in 1915 was 876 tons valued at £29. This was extracted chiefly by the Katni Cement and Industrial Company Limited at Katni. Experiments are in progress with a view to the manufacture of bauxite bricks from this material.

Bauxite.

A discovery of aquamarine in Kashmir resulted in the collection of 3¾ cwt. of stones of good quality and considerable value, some being large, of excellent quality and of great beauty.

Aquamarine.

The returns for building-stones and road-metal show a value of £204,652 for the year 1915 as against £218,879 in the preceding year. As has been pointed out in previous reviews, however, these figures are only partial.

Building-stones.

The figures for clay are also very incomplete and show only an output of 64,139 tons valued at £3,834.

Clay.

There was a considerable increase in the amount of copper-ore produced during the year 1915 over the output of the preceding year; the total production was nearly 9,000 tons valued at over £14,000.

Copper.

TABLE 31.—*Quantity and Value of Copper-ore produced in India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
<i>Bihar and Orissa—</i>				
Singhbhum	4,400	6,600	8,010	12,015
Northern Shan States . .	924	693(b)	875	2,366
United Provinces (Jhansi)	(a)	1	..	..
Total .	5,324	7,294	8,885	14,381

(a) Quantity produced was only 1·5 qr.

(b) Diminished value was due to increased cost of sea freight and smelting charges in England.

There was a considerable fall in the amount of corundum produced during the year 1915, the figures being 1,246 cwt. valued at £277 against 2,360 cwt. in the year 1914 valued at £447; most of the output came from Mysore.

The garnet industry was almost entirely suspended owing to the lack of demand for garnets, and the workings in the Kishengarh State, which during the year 1914 produced 464 cwt. of garnet valued at £4,333, were closed during the year under review. Similarly the workings in the Tinnevely district of the Madras Presidency, which produced over 1,000 tons of garnet sand for abrasive purposes in the year 1914, produced nothing during the year under review. The total output for the year 1915 amounted only to 115 cwt. most of which was won in the Nizam's Dominions.

The amount of gypsum produced was almost exactly the same as in the preceding year, namely 22,563 tons valued at £979.

There was a slight decrease in the amount of ochre produced, from 608 tons valued at £157 in 1914 to 476 tons valued at £459 in the year under review. Practically the whole output came from Central India.

TABLE 32:—*Production of Building Materials and Road Metal in India during the year 1915.*

	GRANITE.		LATERITE.		LIME.		LIMESTONE AND KANKAR.		MARBLE.		SANDSTONE.		SLATE.		TRAP.		MISCELLANEOUS.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£
Assam .	..	..	..	..	..	..	103,736	6,395	..	..	..	..	..	..	..	..	..	..
Bihar and Orissa.	14,085	3,260	2,732	36	..	..	242,364	35,245	..	..	21,002	1,317	2,800	3,067	7,460	876	376,571	10,781
Bombay .	..	..	..	..	..	..	9,080	333	..	..	..	..	..	..	..	..	..	..
Burma .	122,173	10,675	228,124	20,554	..	..	160,498	7,933	..	..	51,539	4,022	..	..	..	..	324,809	24,009
Central India	..	..	..	..	18,973	1,296	33,715	1,801	..	..	..	..	..	..	..	..	..	..
Central Provinces.	..	..	16,445	876	..	..	63,079	5,201	..	..	..	..	..	..	..	..	186	2
Hyderabad	..	..	..	..	..	..	..	..	..	..	..	..	not known	1,341	..	..	..	..
Madras .	94,618	2,784	94,574	3,405	..	..	11,250	572	..	..	..	..	..	..	..	..	85,460	4,071
North-West Frontier Province.	..	..	..	..	..	..	6,444	290	..	..	..	..	..	..	..	..	..	..
Punjab .	..	..	..	..	..	..	28,988	1,514	..	..	38,215	3,051	7,910	7,328	..	..	4,744	74
Rajputana .	..	..	..	..	..	..	3,008	549	3,735	3,047	39,781	13,315	..	..	..	..	39,806	3,015
United Provinces.	..	..	..	..	18	11	408	56	..	..	166,185	18,471	1,045	385	..	..	2,984	513
Total .	230,876	16,719	341,875	24,871	18,991	1,307	662,570	59,889	3,735	3,047	316,812	40,176	11,755	12,121	7,469	876	888,803	46,186

PART 3.]

HAYDEN : *Mineral Production, 1915.*

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There was a slight rise in the quantity, and fall in the value, of
 steatite produced during the year under review.
 Steatite. The figures are given in table 33.

TABLE 33.—*Quantity and Value of Steatite produced in India during 1914 and 1915.*

	1914.		1915.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
<i>Bihar and Orissa—</i>				
Singhbhum	(a)	400	(a)	333
Mayurbhanj	60	173	50	133
<i>Central Provinces—</i>				
Jubbulpore	502	429	329	336
<i>Madras—</i>				
Bellary	25	17	28	19
Kurnool	210	1,576	..	..
Nellore	60	715	45·75	407
Salem	..	..	529·4	720
<i>United Provinces—</i>				
Hamirpur	120	744	95	630
Jhansi	22	92	..	..
Total	999	4,146	1,077·15	2,578

(a) Quantity not returned.

IV.—MINERAL CONCESSIONS GRANTED.

TABLE 34.—*Statement of Mineral Concessions granted during 1915.*

ASSAM.

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Khasi and Jaintia Hills.	(1) Mr. R. D. Coggan .	Gold and certain other allied minerals.	P. L. (renewal).	12,704	14th April, 1915.	1 year.
Do. .	(2) Do. .	Tin and wolfram .	P. L. (renewal).	12,704	Do. .	Do.
Do. .	(3) Do. .	Gold, tin and certain other allied minerals.	P. L. (renewal).	8,160	Do. .	Do.

BALUCHISTAN.

Kalat .	(4) Sirdar Bahawal Khan, Satikzai of Bolan.	Coal . . .	M. L. .	80	1st July, 1915.	30 years.
Quetta .	(5) Mian Mohammad Ismail of Quetta.	Do. . .	M. L. .	169.76	Do. .	Do.
Sibi . .	(6) W. C. Clements, Esq., of Shahrig.	Do. . .	M. L. .	80	1st January, 1915.	Do.
Do. . .	(7) Khan Bahadur B. D. Patel, C.I.E.	Do. . .	M. L. .	80	Do. .	Do.
Zhob . .	(8) The Baluchistan Mining Syndicate.	Chromite . .	M. L. .	80	Do. .	Do.
Do. . .	(9) Do. .	Do. . .	M. L. .	80	Do. .	Do.
Do. . .	(10) Baluchistan Chrome Company.	Do. . .	M. L. .	80	1st July, 1915.	Do.

BENGAL.

Chittagong	(11) Messrs. Burma Oil Co., Ltd.	Mineral oil . .	P. L. .	4,000	1st September, 1914.	2 years.
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BIHAR AND ORISSA.

Hazaribagh	(12) Babu Lakshmi Narain Sukhani.	Mica . . .	P. L. .	80	15th July, 1915.	1 year.
Palamau .	(13) Bengal Coal Co., Ltd.	Coal . . .	P. L. .	6,119	9th July, 1915.	Do.

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.
Sambalpur .	(14) Hingir Rampur Coal Mining Co., Bombay.	Coal . . .	M. L. .	720.2	1st January, 1915.	30 years.
Do. .	(15) Karim Hussain of Rajkote.	Mica . . .	P. L. .	882.78	22nd December, 1915.	1 year.
Singbhum	(16) The Bengal Iron and Steel Co., Ltd.	Iron-ore . . .	M. L. .	2,035.20	The lease has not yet been executed.	30 years.
Do. .	(17) Mr. A. C. Moitra .	Gold . . .	P. L. .	6.5	4th June, 1915.	1 year.
Do. .	(18) Do. . .	Gold, manganese and bauxite.	P. L. .	320	Do.	Do.
Do. .	(19) Rai Srinath Pal Bahadur.	Manganese . .	P. L. (renewal).	about 400	9th August, 1914.	Do.
Do. .	(20) Mr. L. P. E. Pugh .	Chromite . . .	P. L. (renewal).	3,136	5th June, 1915.	Do.
Do. .	(21) The Bengal Iron and Steel Co., Ltd.	Iron-ore . . .	P. L. .	1,267.2	21st December, 1915.	Do.
Do. .	(22) Babu N. N. Goswami of Calcutta.	Manganese . .	P. L. .	67.54	6th December, 1915.	Do.
Do. .	(23) Do. . .	Do. . .	P. L. .	3.86	Do. .	Do.
Do. .	(24) Do. . .	Do. . .	P. L. .	25	Do. .	Do.
Do. .	(25) Mr. S. Luxman Rao Naidu of Nagpur.	Chromite . . .	P. L. (renewal).	927.38	16th October, 1915.	9 months.
Do. .	(26) Do. . .	Do. . .	P. L. (renewal).	1,621.18	Do. .	Do.

BURMA.

Akyab .	(27) The Burma Oil Co., Ltd.	Mineral oil . .	P. L. .	3,620	15th September, 1915.	1 year.
Amherst .	(28) Maung Pe . . .	All minerals (except oil).	P. L. .	537.6	9th January, 1915.	Do.
Do. .	(29) The Mudon Mineral Syndicate.	Do. .	P. L. (renewal).	640	11th August, 1914.	Do.
Do. .	(30) Mr. H. E. Singleton	Do. .	P. L. .	2,560	3rd May, 1915.	Do.
Do. .	(31) The Mudon Mineral Syndicate.	Do. .	P. L. (renewal).	640	11th August, 1915.	Do.
Do. .	(32) Mr. L. Sisman .	Do. .	P. L. (renewal).	640	10th June, 1915.	Do.
Do. .	(33) Mrs. M. M. Hla Ung.	Do. .	P. L. (renewal).	2,880	28th July, 1915.	Do.

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

BURMA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Amherst .	(34) Mrs. M. M. Hla Oung.	Tin, wolfram, gold, silver, copper and antimony.	P. L. .	640	14th October, 1915.	1 year.
Do. .	(35) Mr. C. E. Low .	All minerals (except oil).	P. L. .	640	18th December, 1915.	Do.
Bhamo .	(36) Mr. C. H. Hearsey .	Do. .	P. L. .	5,517	7th June, 1915.	Do.
Katha .	(37) Messrs. Jamal Bros. & Co., Ltd.	Tin, wolfram, gold, silver and copper.	P. L. .	4,800	15th May, 1915.	Do.
Do. .	(38) A. M. Hoosein Hamadance.	Zinc, lead and silver.	P. L. .	960	Do.	Do.
Do. .	(39) Do. . .	Gold, silver, tin, wolfram and copper.	P. L. .	2,796-80	9th July, 1915.	Do.
Do. .	(40) Messrs. Jamal Bros. & Co., Ltd.	Tin, wolfram, silver, copper, lead, zinc and gold.	P. L. .	23,568-64	3rd November, 1915.	Do.
Kyaukse .	(41) Do. . .	All minerals (except oil).	P. L. .	2,733	26th April, 1915.	Do.
Do. .	(42) Do. . .	Do. .	P. L. .	12,160	11th October, 1915.	Do.
Lower Chindwin.	(43) Do. . .	Copper, tin, lead, zinc, silver and gold.	P. L. .	1,260	23rd March, 1915.	Do.
Do. .	(44) Mr. A. S. Jamal .	Do. .	P. L. .	1,680	Do. .	Do.
Do. .	(45) Messrs. Jamal Bros. & Co., Ltd.	Copper . .	P. L. (renewal).	1,440	1st August, 1915.	Do.
Magwe .	(46) The Burma Oil Co., Ltd.	Mineral oil .	P. L. (renewal).	2,240	19th February, 1915.	Do.
Mergui .	(47) Mrs. B. I. Jewett .	All minerals (except oil).	P. L. .	471-04	12th February, 1914.	Do.
Do. .	(48) Mahomed Haniff .	Do. .	P. L. .	2,580-48	6th January, 1915.	Do.
Do. .	(49) Mr. J. J. A. Page .	Do. .	P. L. .	1,760	18th January, 1915.	Do.
Do. .	(50) U. Shwe I . .	Do. .	P. L. .	2,816	23rd March, 1915.	Do.
Do. .	(51) Saw Leng Lee	Do. .	P. L. .	204-8	26th January, 1915.	Do.
Do. .	(52) Mrs. B. I. Jewett	Do. .	P. L. (renewal).	3,056-64	12th February, 1914.	Do.
Do. .	(53) Messrs. Moola D'wood Sons & Co.	Do. .	P. L. (renewal).	3,011-04	15th November, 1914.	Do.
Do. .	(54) Lim Aw Kyi . .	Do. .	P. L. (renewal).	207-36	24th July, 1914.	Do.
Do. .	(55) Mr. C. S. Baker .	Do. .	P. L. (renewal).	600	31st December, 1914.	Do.

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

BURMA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Mergui	(56) E. Ahmed . . .	All minerals (except oil).	P. L. (renewal).	2,749-44	27th January, 1915.	6 months.
Do.	(57) Do. . . .	Do.	P. L. (renewal).	1,318-56	30th November, 1914.	1 year.
Do.	(58) U. Shwe Don . .	Do.	P. L. (renewal).	793-60	9th February, 1915.	Do.
Do.	(59) U. Po Tsee . . .	Do.	P. L. (renewal).	381-44	Do.	Do.
Do.	(60) Saw Leng Lee . .	Do.	P. L. (renewal).	664-48	2nd March, 1915.	6 months.
Do.	(61) Messrs. Wightman & Co.	Do.	P. L.	2,421-76	3rd May, 1915.	1 year.
Do.	(62) Maung Shwe Thi .	Do.	P. L. (renewal).	852-48	18th February, 1915.	6 months.
Do.	(63) U. Ne Gyi . . .	Do.	P. L. (renewal).	3,200	6th June, 1915.	Do.
Do.	(64) E. Ahmed . . .	Do.	P. L. (renewal).	2,316-80	30th April, 1915.	Do.
Do.	(65) Mr. J. J. Wytema .	Do.	P. L.	2,829-80	30th September, 1915.	1 year.
Do.	(66) U. Shwe I . . .	Do.	P. L. (renewal)	473-60	9th February, 1915.	Do.
Do.	(67) G. Shwe Yin . . .	Do.	P. L. (renewal).	1,002-52	21st July, 1915.	Do.
Do.	(68) Mr. E. Ahmed . .	Do.	P. L. (renewal).	2,747-44	27th July, 1915.	Do.
Do.	(69) Messrs. Wightman & Co.	Do.	P. L. (renewal).	1,550	26th August, 1915.	Do.
Do.	(70) Sit Khwet . . .	Do.	P. L. (renewal).	1,373-28	24th July, 1915.	Do.
Do.	(71) Lim Aw Kyi . . .	Do.	P. L. (renewal).	207-36	Do.	Do.
Do.	(72) Maung Shwe Thi .	Do.	P. L. (renewal).	852-48	18th August, 1915.	Do.
Do.	(73) Saw Leng Lee . .	Do.	P. L. (renewal).	664-48	2nd September, 1915.	Do.
Do.	(74) Mr. A. H. Noyce .	Do.	P. L.	100	26th November, 1915.	Do.
Do.	(75) Maung Kyaw Din .	Do.	P. L.	434-70	18th December, 1915.	Do.
Do.	(76) Mrs. B. I. Jewett .	Do.	P. L. (renewal).	3,056-64	12th February, 1915.	Do.
Do.	(77) Do. . . .	Do.	P. L. (renewal).	471-04	Do.	Do.
Do.	(78) Maung Kyaw Din .	Do.	P. L. (renewal).	3-8-64	1st August, 1915.	Do.

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

BURMA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Mergui	(79) E. Ahmed	All minerals (except oil).	P. L. (renewal).	2,316-80	30th October, 1915.	One year or until orders are passed on the application for a mining lease.
Minbu	(80) Messrs. The British-Burma Petroleum Co., Ltd.	Mineral oil	P. L. (renewal).	174	20th November, 1914.	1 year.
Do.	(81) Do.	Do.	P. L. (renewal).	440-32 Southern half of 16 N. and northern portion of 17 N.	27th November, 1914.	Do.
Do.	(82) Do.	Do.	P. L.	614	3rd May, 1915.	Do.
Do.	(83) Messrs. The Indo-Burma Petroleum Co., Ltd.	Do.	P. L.	960 Eastern half of Blocks I.S. and J.S. of the Minbu Oil Field.	28th June, 1915.	Do.
Do.	(84) Do.	Do.	P. L.	320 Northern half of Block 16 N.	6th August, 1915.	Do.
Do.	(85) Messrs. The Moola Oil Co., Ltd.	Do.	M. L.	640 Block 19 P. in the Minbu Oil Field.	25th August, 1913.	30 years.
Do.	(86) Do.	Do.	M. L.	2,513-40 Blocks B.S., C.S., D.S., and E.S., in the Minbu Oil Field.	10th January, 1914.	Do.
Do.	(87) Messrs. The British-Burma Petroleum Co., Ltd.	Do.	P. L.	640	17th May, 1915.	1 year.
Do.	(88) Messrs. The Yomah Oil Co., Ltd.	Do.	P. L.	2,570 (Blocks 4 P., 8 P., 12 P., and portions of blocks 11 P. and 16 P. in the Minbu Oil Field.)	5th July, 1915.	Do.

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

BURMA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Minbu .	(89) Messrs. The Yomah Oil Co., Ltd.	Mineral oil .	P. L. .	673.28 Undemarcated block 15P. and the northern portion of block 16P. in the Minbu Oil Field.	6th October, 1915.	1 year.
Myingyan	(90) Messrs. The British-Burma Petroleum Co., Ltd.	Do. . .	P. L. .	640 Block 52N. in the Singu Oil Field.	24th November, 1915.	Do.
Myitkyina .	(91) Mr. B. A. Baldwin .	Gold and platinum	P. L. (renewal).	1,440	8th October, 1914.	Do.
Do. .	(92) Mr. C. W. Chater .	Gold, platinum and allied metals.	P. L. .	960	1st June, 1915.	Do.
Do. .	(93) Do. .	Do. . .	P. L. .	480	18th June, 1915.	Do.
Do. .	(94) Do. . .	Do. . .	P. L. .	640	Do. .	Do.
Do. .	(95) The Burma Gold Dredging Co., Ltd.	Gold and other minerals (except oil).	P. L. .	1,466	1st September, 1915.	Do.
Do. .	(96) Mr. H. F. Leslie .	Gold . . .	P. L. .	4,941	1st April, 1915.	Do.
Do. .	(97) Do. . .	Do. . . .	P. L. .	640	12th August, 1915.	Do.
Northern Shan States	(98) Messrs. Mohochang Exploration Co., Ltd.	Gold, silver, lead, iron and zinc.	P. L. (renewal).	3,200	9th April, 1915.	Do.
Do. .	(99) The Burma Corporation, Ltd.	Copper, galena and allied minerals.	P. L. (renewal).	2,560	23rd July, 1915.	Do.
Pakokku	(100) Messrs. The Singu (Burma) Oil Syndicate.	Mineral oil . .	P. L. (renewal).	76.80 and 371.20 acres.	14th November, 1915.	Do.
Do. .	(101) Messrs. The Burma Oil Co., Ltd.	Do. . . .	P. L. (renewal).	351.63 acres Block D2 of the Yenang-yat Oil Field.	24th July, 1915.	Do.
Do. .	(102) Messrs. The British-Burma Petroleum Co., Ltd.	Do. . . .	P. L. (renewal).	614.40 and 261 acres.	23rd July, 1915.	Do.
Prome .	(103) The Burma Oil Co., Ltd.	Do. . . .	P. L. .	3,200	7th June, 1915.	Do.
Do. .	(104) Maung Gyi . .	Do. . . .	P. L. (renewal).	1,862	5th March, 1915.	Do.
Sagaung .	(105) C. Soon Thin	Do. . . .	P. L. (renewal).	3,190	13th February, 1914.	Do.

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

BURMA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Shwabo	(106) Mr. D'Ortez	All minerals (except oil).	P. L. (renewal).	3,200	30th June, 1915.	1 year.
Southern Shan States.	(107) Mr. A. C. Martin	Do.	P. L.	2,560	9th June, 1915.	Do.
Do.	(108) Maung Yaing	Lead and silver	M. L.	18-75	20th July, 1914.	5 years.
Do.	(109) Mr. J. R. Browne	All minerals (except oil).	P. L.	1,120	28th June, 1915.	1 year.
Do.	(110) Messrs. Jamal Bros. & Co., Ltd.	Do.	P. L.	5,446	26th June, 1915.	Do.
Do.	(111) Maung Pan Aung	Do.	P. L.	640	14th August, 1915.	Do.
Do.	(112) E. E. Moola	Wolfram	P. L.	640	19th July, 1915.	Do.
Do.	(113) Mr. R. E. Smith	All minerals (except oil).	P. L. (renewal).	3,040	15th June, 1915.	Do.
Do.	(114) Ko Law Pan	Do.	P. L. (renewal).	360	21st August, 1915.	Do.
Do.	(115) Do.	Do.	P. L. (renewal).	1,600	4th September, 1915.	Do.
Do.	(116) Capt. John Terndrup.	Do.	P. L.	472-5	5th October, 1915.	Do.
Do.	(117) The Hon'ble Mr. Lim Chin Tsong.	Do.	P. L.	166	20th November, 1915.	Do.
Do.	(118) Mr. A. C. Martin	Do.	P. L.	3,007-5	14th December, 1915.	Do.
Do.	(119) Do.	Do.	P. L.	640	Do.	Do.
Tavoy	(120) Mr. Greenhow	Do.	P. L.	2,500	28th January, 1915.	Do.
Do.	(121) Mrs. C. F. Aubrey	Do.	P. L.	2,570	27th March, 1915.	Do.
Do.	(122) Mr. C. W. Chater	Do.	P. L.	6	25th March, 1915.	Do.
Do.	(123) Khoo Tun Byan	Do.	P. L.	64	6th March, 1915.	Do.
Do.	(124) Messrs. The Wagon Pachaung Wolfram Mines, Ltd.	Do.	P. L. (renewal).	2,600	3rd December, 1912.	(a)
Do.	(125) Kyong Nga	Do.	P. L. (renewal).	2,048	30th January, 1915.	1 year.
Do.	(126) The Bombay Tavoy Mining Co.	Do.	P. L. (renewal).	2,845-32	4th November, 1913.	(a)
Do.	(127) Maung Hpaw	Do.	P. L. (renewal).	2,745-60	24th November, 1913.	(a)
Do.	(128) Messrs. Radcliff & Co., Ltd.	Do.	P. L. (renewal).	4,320	30th December, 1913.	(a)

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

(a) Period extended under rule 30 (1) proviso, pending the grant of a mining lease.

BURMA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(129) Maung Hpaw	All minerals (except oil).	P. L. (renewal).	3,098.29	25th November, 1913	(a)
Do.	(130) Quah Cheng Guan.	Do.	P. L. (renewal).	271.36	23rd December, 1913.	(a)
Do.	(131) Khoo Tun Byan	Do.	P. L. (renewal).	3,086	24th January, 1914.	(a)
Do.	(132) Ma Sein Daing	Do.	P. L. (renewal).	500	2nd February, 1915.	1 year.
Do.	(133) Mr. T. Fowle	Do.	P. L. (renewal).	4,478	10th February, 1914.	(a)
Do.	(134) Teong Swee Sin	Do.	P. L. (renewal).	1,132	8th March, 1914.	(a)
Lo.	(135) Tavoy Concessions, Ltd.	Do.	P. L. (renewal).	2,086	9th September, 1913.	(a)
Do.	(136) Kyong Nga	Do.	P. L. (renewal).	2,846	27th May, 1913.	(a)
Do.	(137) Tavoy Concessions, Ltd.	Do.	P. L. (renewal).	2,943	28th February, 1914.	(a)
Do.	(138) Quah Cheng Gwan	Do.	P. L. (renewal).	720	11th December, 1914.	1 year.
Do.	(139) Mr. H. P. Selvey	Do.	P. L. (renewal).	737	12th February, 1915.	Do.
Do.	(140) Maung Shwe Pu	Do.	P. L.	813	25th August, 1915.	Do.
Do.	(141) Quah Cheng Gwan	Do.	P. L.	1,429	26th August, 1915.	Do.
Do.	(142) Maung E. Lin	Do.	P. L.	1,674	23rd August, 1915.	Do.
Do.	(143) Do.	Do.	P. L.	100	30th July, 1915.	Do.
Do.	(144) Quah Cheng Gwan.	Do.	P. L.	300	26th August, 1915.	Do.
Do.	(145) Mr. H. P. Selvey, Lim Kyee Yan and Ma Sein Daing.	Do.	P. L.	640	28th September, 1915.	Do.
Do.	(146) Maung Ni	Do.	P. L.	2,988	11th September, 1915.	Do.
Do.	(147) Maung Lun Bin	Do.	P. L.	2,064	6th September, 1915.	Do.
Do.	(148) Mr. H. P. Selvey and Lim Kyee Yan.	Do.	P. L.	320	28th September, 1915.	Do.
Do.	(149) L. M. Ismail	Do.	P. L.	455	29th September, 1915.	Do.
Do.	(150) Maung Lu Pe	Do.	P. L. (renewal).	200	18th February, 1915.	Do.
Do.	(151) Messrs. Radcliff & Co., Ltd.	Do.	P. L. (renewal).	390	22nd July, 1915.	Do.

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

(a) Period extended under rule 36 (1) proviso, pending the grant of a mining lease.

BURMA—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Tavoy	(152) Mr. J. C. Cross	All minerals (except oil).	P. L.	1,280	6th October, 1915.	3 months.
Do.	(153) Maung Min Gyaw Bros. & Co.	Do.	P. L.	665	22nd December, 1915.	Do.
Do.	(154) Mrs. L. Penna and Maung Ni Toc.	Do.	P. L.	972	2nd October, 1915.	1 year.
Do.	(155) Mr. John J. A. Page	Do.	P. L.	538	6th December, 1915.	6 months.
Do.	(156) Do.	Do.	P. L.	256	Do.	Do.
Do.	(157) Maung Maung	Do.	P. L.	798.72	7th October, 1915.	Do.
Do.	(158) Mr. H. G. Mathews	Do.	P. L.	538	2nd November, 1915.	Do.
Do.	(159) Ong Hoe Kyin	Do.	P. L.	519	4th October, 1915.	1 year.
Do.	(160) Maung Maung	Do.	P. L.	1,280	5th October, 1915.	Do.
Do.	(161) Eu Shwe Swe	Do.	P. L.	217	20th October, 1915.	6 months.
Do.	(162) Messrs. P. M. Illingworth, W. P. Leal and W. Ross.	Do.	P. L.	1,504	18th November, 1915.	Do.
Do.	(163) Lim Shain	Do.	P. L. (renewal)	1,000	2nd September, 1915.	1 year.
Do.	(164) Tan Chong Yean	Do.	P. L. (renewal).	275	9th November, 1915.	3 months.
Thaton	(165) Messrs. A. V. Joseph & Co.	Wolfram	P. L. (renewal).	1,600	17th October, 1914.	1 year.
Do.	(166) Mr. H. E. Singleton	All minerals (except oil).	P. L.	320	13th October, 1915.	Do.
Do.	(167) Ma Nyein	Do.	P. L.	704	11th October, 1915.	Do.
Do.	(168) Foo Ban Seng	Do.	P. L.	640	18th December, 1915.	Do.
Thayetmyo.	(169) Mr. J. A. Murray	Mineral oil	P. L. (renewal).	3,840	26th November, 1914.	1 year.
Do.	(170) The Burma Oil Co., Ltd.	Do.	P. L.	4,480	19th April, 1915.	Do.
Do.	(171) Do.	Do.	P. L. (renewal).	1,920	26th April, 1915.	Do.
Do.	(172) Do.	Do.	P. L. (renewal).	960	6th June, 1915	Do.
Do.	(173) Mr. J. A. Murray	Do.	P. L.	1,920	1st November, 1915.	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.
Thayetmyo .	(174) Messrs. The Burma Oil Co., Ltd.	Mineral oil .	P. L. (renewal).	1,440	28th September, 1915.	1 year.
Do. .	(175) Do. .	Do. .	P. L. (renewal).	3,840	24th September, 1915.	Do.
Upper Chindwin.	(176) The Indo-Burma Petroleum Co., Ltd.	Do. .	P. L. (renewal).	3,200	1st October, 1915.	Do.

CENTRAL PROVINCES.

Balaghat .	(177) Indian Mineral Mining Syndicate.	Manganese .	M. L. .	7	5th January, 1915.	5 years.
Do. .	(178) Hon'ble Mr. M. B. Dadabhoy, C.I.E.	Do. .	P. L. .	2	18th January, 1915.	1 year.
Do. .	(179) Hon'ble Sir Kasturchand Daga, B.C.I.E.	Do. .	P. L. (renewal).	743	11th September, 1913.	2 years.
Do. .	(180) Mr. Lakshman Rao Naidu.	Do. .	P. L. .	289	25th June, 1915.	1 year.
Do. .	(181) Netra Manganese Co., Ltd.	Do. .	P. L. .	110	7th April, 1915.	Do.
Do. .	(182) Do. .	Do. .	P. L. .	169	3rd May, 1915.	Do.
Do. .	(183) Babu Kripa Shankar	Do. .	P. L. .	118	25th June, 1915.	Do.
Do. .	(184) Do. .	Do. .	P. L. .	14	7th June, 1915.	Do.
Do. .	(185) Mr. Rewa Shankar	Do. .	P. L. .	3	Do.	Do.
Do. .	(186) Do. .	Do. .	P. L. .	72	Do.	Do.
Do. .	(187) Babu Kripa Shankar	Do. .	P. L. (renewal).	54	17th June, 1915.	6 months.
Do. .	(188) Mr. P. Balkrishna Naidu.	Do. .	P. L. .	21	23rd August, 1915.	1 year.
Do. .	(189) Babu Kripa Shankar	Do. .	M. L. .	532	7th July, 1915.	30 years.
Do. .	(190) Do. .	Do. .	P. L. .	376	8th July, 1915.	1 year.
Do. .	(191) Mr. S. Lakshman Rao Naidu.	Do. .	P. L. .	2	Do.	Do.
Do. .	(192) Do. .	Do. .	P. L. .	29	Do.	Do.
Do. .	(193) Do. .	Do. .	P. L. .	67	27th July, 1915.	Do.
Do. .	(194) Indian Manganese Co., Ltd.	Do. .	P. L. .	40	23rd August, 1915.	Do.
Do. .	(195) Do. .	Do. .	P. L. .	54	Do.	Do.
Lo. .	(196) Diwan Bahadur Sir Kasturchand Daga, K.C.I.E.	Do. .	P. L. .	14	21st September, 1915.	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	(197) Babu Kripa Shankar	Manganese	P. L. (renewal).	54	17th June, 1915.	1 year.
Do.	(198) Diwan Bahadur Sir Kasturchand Daga, K.C.I.E.	Do.	P. L. (renewal).	743	11th September, 1915.	6 months.
Do.	(199) Mr. T. D. Ramchandra Naidu.	Do.	P. L.	346	5th October, 1915.	1 year.
Do.	(200) Do.	Do.	P. L.	374	Do.	Do.
Do.	(201) Messrs. Goredutt, Ganesh Lal and M. D'Costa.	Do.	P. L.	3	Do.	Do.
Do.	(202) Netra Manganese Co., Ltd.	Do.	M. L.	19	30th June, 1915.	30 years.
Do.	(203) Hon'ble Sir Kasturchand Daga, K.C.I.E.	Do.	M. L.	169	9th October, 1915.	Do.
Do.	(204) Do.	Do.	P. L.	3	30th October, 1915.	1 year.
Bhandara	(205) Mr. Lakshman Damodar Lele.	Do.	M. L.	83	9th December, 1914.	3 years.
Do.	(206) Seth Mahadeo	Do.	P. L.	314	10th March, 1915.	1 year.
Do.	(207) Seth Gowardhandas	Do.	P. L.	74	2nd February, 1915.	Do.
Do.	(208) Messrs. Lalbehari Narayandas and Ramcharan Shankarlal.	Do.	M. L.	35	16th January, 1915.	8 years.
Do.	(209) Messrs. Motilal and Ramnarayan.	Do.	P. L.	66	4th January, 1915.	1 year.
Do.	(210) Mr. Mahanandram Sheonarayan.	Do.	P. L.	21	Do.	Do.
Do.	(211) Seth Gowardhandas	Do.	P. L.	159	6th February, 1915.	Do.
Do.	(212) Do.	Do.	P. L.	29	Do.	Do.
Do.	(213) Nagpur Manganese Mining Syndicate.	Do.	P. L.	32	8th April, 1915.	Do.
Do.	(214) Messrs. Ratanchand Kesrichand Chullancy & Sons.	Do.	P. L.	53	27th April, 1915.	Do.
Do.	(215) Hon'ble Sir Kasturchand Daga, K.C.I.E.	Do.	P. L.	16	3rd May, 1915.	Do.
Do.	(216) Seth Gowardhandas	Do.	P. L.	20	14th June, 1915.	Do.
Do.	(217) Do.	Do.	P. L.	17	25th May, 1915.	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 .	(218) Seth Gowardhandas	Manganese	P. L. (renewal).	96	22nd April, 1915.	2 months.
Do. .	(219) Do. .	Do. .	P. L. (renewal).	47	Do.	Do.
Do. .	(220) Seth Mahadeo .	Do. .	M. L. .	257	15th May, 1915.	30 years.
Do. .	(221) Khan Bahadur Byramji Pestonji.	Do. .	P. L. .	13	5th July, 1915.	1 year.
Do. .	(222) Diwan Bahadur Sir Kasturchand Daga, K. C. I. E.	Do. .	P. L. .	87	21st July, 1915.	Do.
Do. .	(223) Seth Gowardhandas	Do. .	P. L. .	47	5th August, 1915.	Do.
Do. .	(224) Do. .	Do. .	P. L. (renewal)	270	2nd July, 1915.	7 months.
Do. .	(225) Do. .	Do. .	P. L. .	19	29th November, 1915.	1 year.
Do. .	(226) Pandit Rewa Shanker.	Do. .	P. L. .	217	23rd December, 1915.	Do.
Chanda .	(227) Chanda Coal Prospecting Syndicate.	Coal . .	M. L. .	776	1 st April, 1915.	Will expire with the original lease, dated the 4th April 1913, to which it is supplementary.
Do. .	(228) Hon'ble Sir Kasturchand Daga, K.C.I.E., and the Hon'ble Mr. M. B. Dadabhoy, C.I.E.	Do. . .	M. L. .	151	14th May, 1915.	Will expire with the original lease, dated the 5th April 1913, to which it is supplementary.
Do. .	(229) Messrs. K. Verma and Kanhaiyalal.	Do. . .	M. L. .	1,064	30th October, 1915.	30 years.
Do. .	(230) Tata Iron & Steel Co., Ltd.	Iron . .	M. L. .	144	22nd October, 1915.	Will expire with the original lease, dated the 17th December 1906, to which it is supplementary.

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

CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Chhindwara	(231) Messrs. Shaw Wallace & Co.	Coal . .	P. L. .	2,218	15th January, 1915.	1 year.
Do.	(232) Messrs. H. Verma and Kanhaiyalal.	Do. . .	M. L. .	789	23rd March, 1915.	30 years.
Do.	(233) Do.	Manganese .	M. L. .	150	Do.	10 years.
Do.	(234) Hon'ble Mr. M. B. Dadabhoy, C.I.E.	Do. .	M. L. .	32	7th April, 1915.	5 years.
Do.	(235) Messrs. Byramji Pestonji & Co.	Do. .	P. L. .	203	9th April, 1915.	1 year.
Do.	(236) Indian Manganese Co., Ltd.	Do. .	P. L. .	10	14th August, 1915.	Do.
Do.	(237) Messrs. Shaw Wallace & Co.	Coal . .	P. L. (renewal).	1,193	1st October, 1915.	Do.
Do.	(238) Hon'ble Mr. M. B. Dadabhoy, C.I.E.	Manganese .	M. L. .	25	7th October, 1915.	30 years.
Do.	(239) Hon'ble Sir Kasturchand Daga, K.C.I.E.	Do. .	P. L. .	172	5th November, 1915.	1 year.
Jubbulpore.	(240) Mr. P. C. Dutt .	Bauxite .	M. L. .	214	11th January, 1915.	30 years.
Do.	(241) Mr. George Forrester.	Manganese, Gold, Silver and Copper.	P. L. .	653	20th January, 1915.	1 year.
Do.	(242) Messrs. H. F. Cook & Sons.	Bauxite . .	M. L. .	25	30th January, 1915.	30 years.
Do.	(243) Mr. P. C. Dutt .	Manganese and Iron.	M. L. .	55	4th September, 1915.	Do.
Do.	(244) Do.	Bauxite . .	P. L. .	31	10th September, 1915.	1 year.
Do.	(245) Messrs. Hiralal Ghansiamdas.	Soapstone . .	M. L. .	76	5th September, 1915.	30 years.
Do.	(246) Mr. P. C. Dutt .	Iron and Bauxite.	P. L. (renewal).	281	22nd October, 1915.	1 year.
Nagpur	(247) Mr. Lakshman Damodar Lele.	Manganese .	P. L. .	140	23rd February, 1915.	Do.
Do.	(248) Nagpur Manganese Mining Syndicate.	Do. .	P. L. .	30	6th January, 1915.	Do.
Do.	(249) Do.	Do. .	P. L. .	67	Do.	Do.
Do.	(250) Mr. Ramkrishnapuri Gosai.	Manganese and Coal.	P. L. .	495	27th January, 1915.	Do.
Do.	(251) Do.	Manganese .	P. L. .	75	25th June, 1915.	Do.
Do.	(252) Mr. Lakshman Damodar Lele.	Do. .	P. L. .	157	4th June, 1915.	Do.
Do.	(253) Nagpur Manganese Mining Syndicate.	Do. .	M. L. .	11	18th March, 1915.	3 years.

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

CENTRAL PROVINCES—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area in acres.	Date of commencement.	Term.
Nagpur	(254) Messrs. Goredutt, Ganeshlal and M. D'Costa.	Manganese	P. L.	163	7th May, 1915.	1 year.
Do.	(255) Ramkrishnapuri Gosai.	Do.	P. L.	47	29th May, 1915.	Do.
Do.	(256) Do.	Galena	P. L.	184	25th June, 1915.	Do.
Do.	(257) Nagpur Manganese Mining Syndicate.	Manganese	M. L.	127	18th March, 1915.	5 years.
Do.	(258) Do.	Do.	M. L.	49	Do.	Do.
Do.	(259) Mr. Asaram Chandrabhan.	Do.	P. L.	94	30th June, 1915.	1 year.
Do.	(260) Mr. Lakshman Damodar Lele.	Do.	P. L. (renewal).	130	1st May, 1915.	Do.
Do.	(261) Mr. S. Lakshman Rao Naidu.	Do.	P. L.	599	6th July, 1915.	Do.
Do.	(262) Hon'ble Mr. M. B. Dadabhoy, C.I.E.	Do.	P. L.	297	16th September, 1915.	Do.
Do.	(263) Rao Sahib D. Lakshminarayan.	Do.	M. L.	63	26th July, 1915.	5 years.
Do.	(264) Mr. Mohanlal Kalar	Do.	P. L.	4	16th September, 1915.	1 year.
Do.	(265) Khan Bahadur Byramji Pestonji.	Do.	P. L.	602	27th September, 1915.	Do.
Do.	(266) Indian Manganese Co., Ltd.	Do.	P. L.	248	16th September, 1915.	Do.
Do.	(267) Babu Madhulal Dugar.	Do.	P. L.	1,613	3rd November, 1915.	Do.
Do.	(268) Gosai Ramkrishnapuri.	Galena	P. L. (renewal).	125	13th October, 1915.	6 months.
Do.	(269) Do.	Do.	P. L.	18	Do.	Do.
Do.	(270) Do.	Do.	P. L.	33	Do.	Do.
Do.	(271) Messrs. Goredutt, Ganeshlal and M. D'Costa.	Manganese	P. L.	726	5th November, 1915.	1 year.
Do.	(272) Messrs. Ramprasad and Lakshminarayan.	Do.	P. L.	163	11th October, 1915.	Do.
Do.	(273) Rai Bahadur Bansilal Abirchand Mining Syndicate.	Do.	P. L.	147	9th October, 1915.	Do.
Do.	(274) Messrs. Balibhadra and Mahanlal.	Do.	M. L.	16	11th November, 1915.	5 years.
Nimar	(275) Rao Bahadur Rajaram Sitaram Dikshit.	Lead, Copper and Silver.	P. L.	358	9th October, 1915.	1 year.

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.
Yeotmal	(276) Hon'ble Sir Kasturchand Daga, K.C.I. E.	Coal . .	P. L. .	8,716	5th May, 1915.	1 year.
Do.	(277) Hon'ble Mr. M. B. Dadabhoy, C.I.E.	Do. . .	P. L. .	5,217	5th March, 1915.	Do.
Do.	(278) Do.	Do. . .	P. L. .	2,812	Do.	Do.
Do.	(279) Mulla Hasan Ali Nathubhoy.	Do. . .	P. L. .	3,839	18th March, 1915.	Do.
Do.	(280) Hon'ble Mr. M. B. Dadabhoy, C.I.E.	Do. . .	P. L. .	372	15th October, 1915.	Do.

MADRAS.

Bellary	(281) A. D. Sanders, Esq., Mining Engineer, Ramandrug.	Manganese and Iron-ores.	P. L. .	46-30	21st September, 1915.	1 year.
Kurnool	(282) A. Ghose, Esq.	Diamond . .	M. L. .	545-42	15th October, 1914.	30 years.
Nellore	(283) M. R. Ry. M. R. M. A. Subrahmaniyam Chettiyar.	Mica . . .	M. L. .	2-23	5th August, 1911.	30 years.
Do.	(284) R. Ramanma, widow of Katem Reddi Panchal Reddi.	Do. . . .	M. L. .	23-70	1st October, 1914.	Do.
Do.	(285) Khan Bahadur Muhammad Safdar Husain, Khan Sahib.	Do. . . .	P. L. .	20-78	1st March, 1915.	1 year.
Do.	(286) Do.	Do. . . .	P. L. .	83-70	Do.	Do.
Do.	(287) M. R. Ry. Kalicheti Panchalu Reddi.	Do. . . .	P. L. .	17-76	Do.	Do.
Do.	(288) Hajee Muhammad Badsha Sahib & Co.	Do. . . .	M. L. .	4-42	1st April, 1915.	30 years.
Do.	(289) Errabaka Venkatarami Reddi.	Do. . . .	M. L. .	8-85	Do.	20 years.
Do.	(290) Gurjala Subramaniam.	Do. . . .	M. L. .	88-79	Do.	30 years.
Do.	(291) Balakavi Pedda Chanchayya.	Do. . . .	M. L. .	31-57	1st March, 1915.	Do.
Do.	(292) A. M. Jeevanjee & Co.	Do. . . .	P. L. .	67-22	15th August, 1915.	1 year.
Do.	(293) Messrs. F. F. Christien & Co.	Do. . . .	P. L. .	88-34	15th June, 1915.	Do.
Do.	(294) P. K. Vengama Nayudu.	Do. . . .	P. L. .	£3-40	10th August, 1915.	Do.

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

MADRAS—*contd.*

DISTRICT.	Grantee.	Mineral.	Nature of grant.	Area. in acres.	Date of commencement.	Term.
Nellore .	(295) S. Guanamuthu Nadar.	Mica . . .	M. L. .	2-27	4th August, 1915.	20 years.
Do. .	(296) K. Penchalu Reddi	Do. . . .	P. L. .	26-50	20th November, 1915.	1 year.
Do. .	(297) Messrs. F. F. Christien & Co.	Do. . . .	P. L. .	52-00	5th August, 1915.	Do.
Salem .	(298) Messrs. Gaudart & Co.	Iron-ore . .	M. L. .	4,369	8th October, 1914.	30 years.
Do. .	(299) Messrs. Hajee Ismail Sait and Sons.	Magnesite . .	P. L. .	358-44	26th January, 1915.	1 year.
South Canara.	(300) Mr. T. Pinto .	Corundum . .	M. L. .	190-02	1st September, 1915.	30 years.
Tinnevely .	(301) A. Sankarakumaru Chettiyar of Kottar Nagarkoil.	Garnet Sand .	P. L. .	2-10	9th March, 1915.	1 year.

NORTH-WEST FRONTIER PROVINCE.

Hazara .	(302) Messrs. T. H. Chuhar Lal and Sons, Bankers, Abbottabad.	Coal . . .	P. L. .	11-76	25th May, 1915.	1 year.
Do. .	(303) Do. .	Lead . . .	P. L. .	6-14	4th December, 1915.	Do.

PUNJAB.

Attock .	(304) Attock Oil Company	Oil . . .	P. L. .	640	19th June, 1915.	1 year.
Do. .	(305) Do. .	Do. . . .	P. L. .	2,880	17th August, 1915.	Do.
Do. .	(306) Do. .	Do. . . .	P. L. .	15,360	Do.	Do.
Do. .	(307) Do. .	Do. . . .	P. L. .	2,560	Do.	Do.

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

SUMMARY.

Provinces.	Prospecting Licenses.	Mining Leases.	Total of each Province.
Assam	3	..	3
Baluchistan	..	7	7
Bengal	1	..	1
Bihar and Orissa	13	2	15
Burma	147	3	150
Central Provinces	80	24	104
Madras	11	10	21
North-West Frontier Province	2	..	2
Punjab	4	..	4
Totals for each kind and Grand Total, 1915	261	46	307
TOTAL FOR 1914	305	58	363

CLASSIFICATION OF LICENSES AND LEASES.**TABLE 35.—Prospecting Licenses granted in Assam during 1915.**

DISTRICT.	1915.		
	No.	Area in acres.	Mineral.
Khasi and Jaintia Hills . .	1	12,704	Gold and certain other allied minerals. Tin and wolfram. Gold, tin and certain other minerals.
Do.	1	12,704	
Do.	1	8,160	
TOTAL .	3	..	

TABLE 36.—Mining Leases granted in Baluchistan during 1915.

DISTRICT.	1915.		
	No.	Area in acres.	Mineral.
Kalat	1	80	Coal.
Quetta	1	169-76	Do.
Sibi	2	160	Do.
Zhob	3	240	Chromite.
TOTAL .	7	..	

TABLE 37.—Prospecting License granted in Bengal during 1915.

DISTRICT.	1915.		
	No.	Area in acres.	Mineral.
Chittagong .	1	4,000	Mineral oil.

TABLE 38.—*Prospecting Licenses and Mining Leases granted in Bihar and Orissa during 1915.*

DISTRICT.	1915.		
	No.	Area in acres.	Mineral.

Prospecting Licenses.

Hazaribagh	1	80	Mica.
Palamau	1	6,119	Coal.
Sambalpur	1	882.78	Mica.
Singhbhum	1	6.5	Gold.
Do.	1	320	Gold, manganese and bauxite.
Do.	4	496.40	Manganese.
Do.	1	1,267.2	Iron-ore.
Do.	3	5,684.56	Chromite.
TOTAL	13	..	

Mining Leases.

Sambalpur	1	720.2	Coal.
Singhbhum	1	2,035.20	Iron-ore.
TOTAL	2	..	

TABLE 39.—*Prospecting Licenses and Mining Leases granted in Burma during 1915.*

DISTRICT.	1915.		
	No.	Area in acres.	Mineral.
Prospecting Licenses.			
Akyab)	1	3,620	Mineral oil.
Amherst	7	8,477-6	All minerals (except oil).
Do.	1	640	Tin, wolfram, gold, silver, copper and antimony.
Bhamo	1	5,517	All minerals (except oil).
Katha	2	7,596-80	Tin, wolfram, gold, silver and copper.
Do.	1	960	Zinc, lead and silver.
Do.	1	23,568-64	Tin, wolfram, silver, copper, lead, zinc and gold.
Kyaukse	2	14,893	All minerals (except oil).
Lower Chindwin	2	2,940	Copper, tin, lead, zinc, silver and gold.
Do.	1	1,440	Copper.
Magwe	1	2,240	Mineral oil.
Mergui	33	47,854-70	All minerals (except oil).
Minbu	8	6,391-60	Mineral oil.
Myingyan	1	640	Do.
Myitkyina	1	1,440	Gold and platinum.
Do.	3	2,080	Gold, platinum and allied metals.
Do.	1	1,466	Gold and other minerals (except oil).
Do.	2	5,581	Gold.
Northern Shan States	1	3,200	Gold, silver, lead, iron and zinc.
Do.	1	2,560	Copper, Galena and allied minerals.
Pakōkku	3	1,042-83	Mineral oil.
Prome	2	5,062	Do.
Sagaing	1	3,190	Do.
Shwebo	1	3,200	All minerals (except oil)
Southern Shan States	11	19,046	Do.
Do.	1	640	Wolfram.
Tavoy	45	62,812-29	All minerals (except oil).
Thaton	1	1,600	Wolfram.
Do.	3	1,664	All minerals (except oil).
Thayetmyo	7	18,400	Mineral oil.
Upper Chindwin	1	3,200	Do.
TOTAL	147	..	

TABLE 39.—*Prospecting Licenses and Mining Leases granted in Burma during 1915—contd.*

DISTRICT.	1915.		
	No.	Area in acres.	Mineral.
Mining Leases.			
Minbu	2	3,153.40	Mineral oil.
Southern Shan States	1	18.75	Lead and silver.
TOTAL	3	..	.

TABLE 40.—*Prospecting Licenses and Mining Leases granted in the Central Provinces during 1915.*

DISTRICT.	1915.		
	No.	Area in acres.	Mineral.
Prospecting Licenses.			
Balaghat	24	3,700	Manganese.
Bhandara	19	1,597	Do.
Chindwara	2	3,411	Coal.
Do.	3	385	Manganese.
Jubbulpore	1	653	Manganese, gold, silver and copper.
Do.	1	31	Bauxite.
Do.	1	281	Iron and bauxite.
Nagpur	18	5,302	Manganese.
Do.	1	495	Manganese and coal.
Do.	4	360	Galena.
Nimar	1	358	Lead, copper and silver.
Yeotmal	5	20,956	Coal.
TOTAL	80	..	

TABLE 40.—*Prospecting Licenses and Mining Leases granted in the Central Provinces during 1915—contd.*

DISTRICT.	1915.		
	No.	Area in acres.	Mineral.
Mining Leases.			
Balaghat	4	727	Manganese.
Bhandara	3	375	Do.
Chanda	4	2,135	Coal.
Chhindwara	1	789	Do.
Do.	3	207	Manganese.
Jubbulpore	2	239	Bauxite.
Do.	1	55	Manganese and iron.
Do.	1	76	Soapstone.
Nagpur	5	266	Manganese.
TOTAL .	24	..	

✓ TABLE 41.—*Prospecting Licenses and Mining Leases granted in Madras during 1915.*

DISTRICT.	1915.		
	No.	Area in acres.	Mineral.
Prospecting Licenses.			
Bellary	1	46·30	Manganese and iron-ores.
Nellore	8	439·70	Mica.
Salem	1	358·44	Magnesite.
Tinnevely	1	2·10	Garnet sand.
TOTAL .	11	..	

TABLE 41.—*Prospecting Licenses and Mining Leases granted in Madras during 1915—contd.*

DISTRICT.	1915.		
	No.	Area in acres.	Mineral.
Mining Leases.			
Kurnool	1	545.42	Diamond.
Nellore	7	181.83	Mica.
Salem	1	4,369	Iron-ore.
South Canara	1	190.02	Corundum.
TOTAL .	10	..	

TABLE 42.—*Prospecting Licenses granted in the North-West Frontier Province during 1915.*

DISTRICT.	1915.		
	No.	Area in acres.	Mineral.
Hazara	1	11.76	Coal.
Do.	1	6.14	Lead.
TOTAL .	2	..	

TABLE 43.—*Prospecting Licenses granted in the Punjab during 1915.*

DISTRICT.	1915.		
	No.	Area in acres.	Mineral.
Attock	4	21,440	Oil.

FLEMINGOSTREA, AN EASTERN GROUP OF UPPER CRETACEOUS AND EOCENE *OSTREIDÆ*: WITH DESCRIPTIONS OF TWO NEW SPECIES. BY ERNEST W. VREDENBURG, *Superintendent, Geological Survey of India.* (With Plates 17 to 20.)

IN their description of the lamellibranchiata forming the second instalment, shortly to be published, of their monograph on the lower eocene fauna of the Ranikot of Sind, Messrs. Cossman and Pissarro have recorded, under the name of *Ostrea Haydeni*, a species related to the remarkable *Ostrea Flemingi* d'Archiac and Haime, from the middle eocene of the Salt Range. In addition to the form described by our distinguished colleagues, I have noticed, amongst some stray specimens, another species of the same group which had escaped their attention and which is described below as *Ostrea Kalkhora*. A comparison of all these forms with the available material in the hands of the Geological Survey in Calcutta indicates that they are related also to another remarkable species discovered by Dr. Noetling in the upper Cretaceous of the Des valley in Baluchistan (*General Report*, G. S. I., 1898-99, p. 55).

The characters common to all these species are: a small or medium size, a tendency to an equilateral shape, with concentrically foliaceous valves never greatly contrasted and often quite similar; there is no distinct trace of a surface of adherence; the umbo is small, subcentral, exogyroid only in its embryonic portion, the hinge small, the muscular scar transverse inferiorly and posteriorly situated; the pallial punctations and crenulations are feeble or absent.

These thin-shelled forms with their small umbo, and their transverse muscular scar inferiorly and posteriorly situated, can scarcely find place in the sub-genus *Gryphæa* or any of its sections. They do not exhibit any resemblance to *Gryphæa* s. str., the type of which is *Gr. angulata* Lamk., which is very inequivalve with a very prominent spirally coiled umbo in the left valve. They are not in any way related to *Pycnodonta*, the type of which is the ponderous *Gryphæa vesicularis* and which includes extremely inequivalve forms with pronounced pallial pits and crenulations,

and with an orbicular muscular scar situated at a considerable distance from the inferior margin and often subcentral. It seems that they might be conveniently grouped together in a sub-genus *Flemingostrea* of which *Ostrea Flemingi*, may be taken as the type and which might include the following species:—

- Ostrea Morgani* n. sp.
- „ *Haydeni* n. sp., Cossmann and Pissarro.
- „ *Kalthora*, n. sp.
- „ *Flemingi* d'Archiac and Haime.

Ostrea heteroclita DeFrance, from the Thanetian and Sparnacian of the Paris basin, also occurring in the lowest beds of the upper Ranikot in Sind, may also belong to this group, though it seems at times, yet by no means generally, to be fixed by a rather large surface in consequence of its gregarious habit, while the other species above-named are remarkable for the absence of any visible point of attachment.

The oldest species, *O. Morgani*, occurs in the uppermost zone of the Maestrichtian of Baluchistan in the last horizon with abundant ammonites. *Ostrea Kalthora* and *Ostrea Haydeni* occur in the lower eocene (Ranikot) of Sind, while *O. Flemingi* occurs in the Salt Range in beds of Laki age, and has been met with in strata probably of the same age in Tibet.

The proposed sub-genus, or section, *Flemingostrea* does not appear to have survived the eocene. It was already in existence in Upper Cretaceous times. The ancestry of these curious forms should therefore be sought somewhat lower in the Cretaceous. Amongst all the Cretaceous forms described by Coquand, the only one that appears to exhibit some resemblance to the fossils here described is *O. Bourguignati* Coqu. from the Santonian of France and of North Africa (especially the specimens illustrated on Pl. XXI of Coquand's monograph).

Ostrea Morgani and *O. Kalthora* are here described for the first time, and it has been thought useful to have *O. Flemingi* figured afresh.

OSTREA (FLEMINGOSTREA) MORGANI n. sp.

Pl. 17, 18.

1899. *Ostrea* sp., Noetling, Gen. Rep. G. S. I. for 1898-99, p. 55.

Description.—Small to medium, equilateral, broadly triangular, with pointed umbo on either side of which the approximately recti-

linear margins converge towards the apex at an angle of about 76° to 78° while inferiorly they are joined by a rounded curve with the greatly expanded inferior margin. The left valve which is more convex than the right and which shows no trace of a surface of adherence is raised along its median region into a roof-shaped swelling often bordered by a broad groove on one side, more especially the posterior side, or on both. This structure affects the lower margin in such a manner that the junction of the valves exhibits a sinus analogous to that of a brachiopod. The right valve, on approaching, the inferior margin, often shows a broad depression corresponding with the roof-shaped swelling of the left valve. Both valves are similarly ornamented with numerous slightly wavy, concentric, foliaceous lamellæ. The foliaceous structure is especially conspicuous in the case of the specimens collected in the uppermost Maestrichtian of the Des valley. The collections from the same horizon at Mazar Drik have yielded a solitary specimen of a left valve remarkable for the wide spacing of the concentric ripples, a peculiarity which seems partly due to the mode of fossilisation; the outer surface is less exfoliated than usual, so that the layers of growth which increase the wrinkled appearance of weathered specimens have not been exposed. The umbo, in either valve, is small convex only at its apex where it may be slightly exogyroid, often more prominent in the left valve than in the right. The ligament surface of the left valve is tall-triangular, more or less deflected backward at its apex, with a gently concave ligament pit somewhat broader than either of the raised borders. The hinge of the right valve is shorter with an extremely shallow pit. The pallial line is distinct, quite close to the margin of the valves. Pallial pits and crenulations are visible in the neighbourhood of the ligament, but tend to disappear in full-grown specimens. The muscular scar is well marked, very elongate, transverse or only slightly oblique, posteriorly situated a little nearer to the inferior margin than to the hinge.

Dimensions.—The approximate dimensions of some left valves are :—

		Height.	Length.
1		40 mm.	46 mm.
2		34 mm.	37 mm.

There are no full-grown specimens with united valves; the immature specimens are not so broadly triangular as the full-grown ones. An immature specimen with united valves has a height of

27 mm., and a thickness of 15.5 mm. across both valves. Another specimen with united valves has a height of 28 mm., length of 26 mm., thickness of 11 mm.

Comparison with other species.—This species bears the closest resemblance to *O. Kalhora* and *O. Flemingi*, from both of which it is distinguished by its triangular shape and usually its somewhat more crowded foliaceous lamellæ. It also lacks the distinct radial ornamentation and the spines of *O. Kalhora*.

Occurrence.—This interesting fossil was discovered by Dr. Noetling in the last ammonite zone (with *Indoceras baluchistanense*, *Sphenodiscus ubaghsi*, etc.) of the Mari hills (zone 20 of the Des valley section, and in the equivalent zone 13 of the Mazar Drik section), in beds which may be regarded as belonging to the uppermost zone of the Maestrichtian¹.

OSTREA KALHORA² n. sp.

Pl. 19; Pl. 20, fig. 8.

Description.—Of medium size, usually fairly regular for an ostreid shell, orbicular to vertically oval, equilateral, inequivalve; exceptionally it may be elongate and deflected somewhat like an *Exogyra*. Umbo very small, scarcely projecting beyond the margin, with the embryonal portion strongly recurved backwards in exogyroid fashion. Cardinal margin sometimes straight and of moderate length, or else declivous on either side of the umbo. Up to a vertical measurement of about 20 to 24 mm., the shell has a flat, orbicular, fairly symmetrical, somewhat pecten-like shape, and is approximately equivalve. With increasing dimensions it rapidly assumes a shape analogous to that of many brachiopods, the pallial margin of the left valve becoming strongly arched along the umbonal-pallial axis from which the anterior and posterior regions of the valve slope steeply, the disposition being correspondingly inverted in the right valve, whose inferior region is apt to assume a tongue-shaped elongated outline. The outer surface of the left valve is ornamented with concentric lamellæ raised and frilled along their margins; they are distributed at intervals of about 3 or 4 mm., and are somewhat less pronounced in the umbonal region than in the zones of later growth. They are

¹ For a detailed account of the zonal constitution of the Upper Cretaceous of this region, see *Rec. G. S. I.*, vol. XXXVI, pp. 172-178.

² After the dynasty founded by the Baluch chief Yar Muhammad Kalhora. During the waning of the Mogul power, the Kalhora princes ruled Sind from 1701 to 1783.

crossed by radial tube-like ribs at intervals of 2 to 4 mm., generally much narrower than the intervening spaces, becoming especially pronounced at the periphery of each of the lamellæ, and thus contributing to their lacinated appearance. In the neighbourhood of the cardinal margin they have a tendency to increase in bulk and to assume the shape of spinose processes, somewhat like those of the recent *O. hyotis* Linn., which probably helped to anchor the shell which, otherwise, does not show any distinct indications of adherence. The ornamentation of the right valve is analogous, though the radial ribs are apt to be narrower and more delicate, and never show any tendency to develop into spinose processes as in the left valve.

The ligamental surface which is comparatively small and which has the shape of a depressed triangle, consists of the usual rather shallow groove with the shape of an approximately equilateral triangle, between raised flat margins. At its apex, corresponding with the embryonic portion of the shell, the groove is strongly recurved backwards in a hook-like exogyroid fashion, though this feature is not conspicuous owing to its small size. The pallial impression is almost marginal; there are no pits or punctations. The muscular scar is inferiorly situated, rather deep, elongate transverse or very slightly oblique, close to the inferior margin in a thoroughly posterior position, its posterior extremity being almost adjacent to the posterior margin.

Dimensions.—The following dimensions in millimetres were measured on the four figured specimens :—

Antero-postero diameter	.	.	.	.	.	44	44	43	40
Umbonal-pallial diameter	.	.	.	.	.	48	46	40	45
Thickness of united valves	.	.	.	.	.	22	24	23	26

Comparison with other species.—This species is related both to *Ostrea Morgani* and *O. Flemingi*, especially the latter, but is distinguished from both by its radial ornaments and spines. The shape also differs: *O. morgani* is triangular instead of orbicular or oval, while *O. Flemingi* is vertically more elongate and less terebratuloid.

Occurrence.—Upper Ranikot. It is the commonest molluscan in zone 3 at Jhirak (Vredenburg). It also occurs, generally of a smaller size, in zone 4 at Jhirak (Vredenburg K7,123) and north-east of Kotri (Vredenburg K10,608, 612).

OSTREA (FLEMINGOSTREA) FLEMINGI d'Archiac and Haime.

Pl. 20, figs. 1—7.

1854. *Ostrea Flemingi* d'Archiac and Haime, Descr. numm. Inde, P. 275, Pl. XXIII, figs. 14-15.1916. *Liostrea Flemingi* d'A. and H. ; H. Douvillé, *Pal. Ind.*, New Series, Vol. V, Memoir No. 3, p. 41.

Description.—Small, oval, with small pointed umbo, equivalve, convex, the left valve often more convex than the right and sometimes raised in a roof-like fashion along its inferior margin, in which case the junction of the valves exhibits a terebratuloid sinus.

Both valves are ornamented with wide-spaced foliaceous concentric lamellæ, the broad surfaces of which are quite smooth, or else frilled with scarcely perceptible radial folds best seen near the raised border of the lamellæ, especially of those nearest the umbo, and towards the margins of the shell. Except for those occasional and, in any case, very feeble radial markings, the surface of the broad lamellæ is normally quite smooth; the fine crowded concentric wrinkles intervening between the terminations of the main foliæ as shown in some of d'Archiac and Haime's illustrations are due to weathering and are apt to be developed more particularly in the right valve. The umbo is small, pointed, more or less exogyroid in its initial stages; it is either equally developed in both valves, or else that of the left valve projects furthest. The ligamental plate is small with the usual triangular, more or less exogyroid ligamental pit in the left valve; its entire surface is almost perfectly flat in the right valve. The pallial line is close to the margin and indistinct. The pits and crenulations are not clearly developed even in the neighbourhood of the hinge. The muscular scar is elongate-reniform, posteriorly situated nearer to the inferior margin than to the ligament.

Dimensions.—The following are the dimensions of four complete specimens:—

	Height	Length	Thickness across united valves.
1	30 mm.	23.5 mm.	16 mm.
2	31 „	24 „	14 „
3	31 „	24 „	17 „
4	31 „	25 „	19 „

Comparison with other species.—This species is very closely related to *O. Kalthora* from which it is distinguished by the feeble development or total absence of the radial ornamentation and

the absence of the characteristic spines near the cardinal area of the left valve. The middle eocene species is generally more vertically elongate and seldom exhibits so pronounced a terebratuloid sinus as is almost invariably observed in the Ranikot form. It is evidently a mutation of the Ranikot species, and it is noticeable that the specimens from zone 4 of the Ranikot are somewhat intermediate between *O. Flemingi* and the typical *O. Kalhora* of zone 3, though still possessing the characters of the latter sufficiently distinctly to be united with it specifically.

Occurrence.—D'Archiac and Haime's types were collected by Fleming in the nummulitic beds of the Salt Range in the strata overlying the coal-seam of Dandot, whose age probably corresponds with the Laki (Lybian) of Sind. The collections of the Geological Survey include specimens collected by Fleming, Theobald, Wynne and Noetling, without any precise details of their geological horizons. Those collected by Noetling are labelled as coming from Ara. No locality is mentioned for any of the other specimens. The same species was obtained by Mr. Hayden in the shales and sandstones (no. 16) overlying the Alveolina limestone of Tibet.

EXPLANATION OF PLATES.

PLATE 17.

Ostrea (Flemingostrea) Morgani n. sp.

Maestrichtian of the Des valley, zone 20.

FIG. 1 *a, b.* Left valve of an adult individual to show the broad triangular outline (anterior portion missing).

FIGS. 2 *a, b*, 3 *a, b.* Adult left valves showing terebratuloid sinus.

FIGS. 4 *a, b*, 5 *a, b.* Adult left valves showing the ligament groove.

FIG. 6 *a—c.* Specimen with the internal cast of the right valve on which is seen the impression of the muscular scar.

FIG. 7 *a—d.* Four views of a small specimen with both valves united.

PLATE 18.

Ostrea (Flemingostrea) Morgani n. sp.

FIGS. 1 to 6. Specimens from the Maestrichtian of the Des valley, zone 20.

FIG. 7. Specimen from the Maestrichtian of Mazar Drik, from the corresponding zone 13.

FIGS. 1 *a, b*, 2 *a, b*, 3 *a, b.* Specimens with valves united.

FIGS. 4 *a*, *b*, 5 *a*, *b*, *c*. Right valves showing internal characters.

FIG. 6 *a*—*c*. Specimen with inner cast of right valve showing impression of the muscular scar.

FIG. 7. Left valve with exceptionally wide-spaced concentric ornaments.

PLATE 19.

Ostrea (Flemingostrea) Kalthora n. sp.

FIGS. 1 to 4. Specimens from zone 3 (probably Lower Cuisian) of the Upper Ranikot, Jhirak. (See also Pl. 20, fig. 8.)

FIG. 5. Specimen from zone 4 (horizon of the "sables nummulitiques de Cuisse") of the Upper Ranikot, north-west of Kotri.

FIGS. 1 *a*—*d*, 2 *a*—*c*. Specimens with united valves showing terebratuloid sinus.

FIGS. 3 *a*, *b*, 4 *a*, *b*. Specimens with united valves.

FIG. 5 *a*, *b*. Left valve showing internal characters.

PLATE 20.

Ostrea (Flemingostrea) Flemingi d'A. and H.

FIGS. 1 to 7. Specimens from the Middle Eocene of the Salt Range.

FIGS. 1 *a*—*e*, 2 *a*—*e*. Different aspects of specimens with united valves.

FIGS. 3 *a*—*c*, 4 *a*—*c*, 5 *a*, *b*, 6 *a*, *b*. Specimens with united valves.

FIG. 7 *a*, *b*. Left valve showing internal characters.

Ostrea (Flemingostrea) Kalthora n. sp.

Upper Ranikot. Zone 3, Jhirak.

FIG. 8 *a*—*c*. Specimen of the deflected-elongate race.