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REPORT

OF THE

COAL MINING COMMITTEE

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VOLUME I

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APPENDIX A.

SHORT ACCOUNTS OF ACTUAL COLLAPSES AND FIRES.

Case 1.—At a mine in Jharia where a considerable amount of coal has been lost, and where great difficulty in preventing collapses and controlling fires has been experienced, a section of the strata is as follows:—

- No. 15 seam 28 feet coal, strata 9 feet,
- No. 14 seam 8 feet coal, strata 50 to 100 feet,
- No. 14 seam 28 feet coal, strata 60 feet,
- No. 13 seam.

Workings in 15, 14-A and 14 seams have been made from the outcrops and extended towards the dip for a distance of about one mile. At the dip boundary, the cover to 15 seam is about 600 feet. Depillaring an area of 15 seam near the outcrop was followed by fire and, although very little coal in No. 15 seam was lost, an area in 14-A seam was lost containing 45,000 tons of coal and lying beneath the fire area. Several years after the commencement of this fire, the premature collapse of one or two small pillars in 14 seam permitted the fire to descend into that seam and over 500,000 tons of coal were lost. Shortly afterwards, the same fire made its way from 14 seam up through 80 feet of strata to 14-A and 15 seams in an area adjoining the area which had been previously sealed off, and a further loss of 200,000 tons of very good coal occurred.

Dispillament of two small areas in 15 seam, where the cover was about 200 feet, was followed by spontaneous heating and about 290,000 tons of coal were locked up inside the stoppings isolating these areas.

The extraction of pillars in another part of 15 seam, where the cover was about 600 feet, proceeded normally until a fairly large goaf had been made, and 12 months after the commencement of depillaring spontaneous heating started in the goaf. Within the stoppings built to isolate the area, some 130,000 tons of coal had to be abandoned. Resumption was soon followed by crushing of large pillars and another fire ensued. To seal off this fire and prevent further over-riding of pillars, stoppings were built and a barrier was formed by sand-stowing. Inside the barrier 200,000 tons of coal in 15 seam had to be abandoned. This mine constitutes a striking example of how a fire in one seam can involve workings in lower seams, and how pillar extraction in some seams at certain mines by normal methods (that is without sand-stowing) will almost certainly be followed by fire or over-riding and a considerable loss of valuable coal.

Case 2.—At another mine in Jharia, where 14 seam is 26 feet and 13 seam is 16 feet in thickness, and the seams are separated by only 4 to 6 feet of shale, a considerable amount of coal has been lost or locked up by fires and premature collapses. After the extraction of some 70,000 tons of coal from pillars in 14 seam, over-riding and crushing of adjacent pillars commenced and involved the loss of 44,000 tons of coal in 14 seam and about 40,000 tons in 13 seam. Some months after this premature collapse, spontaneous heating commenced. At the same mine the extraction of some 40,000 tons of coal from pillars in another area of 14 seam was followed by crushing of adjacent pillars and a premature collapse which occasioned the loss of over 50,000 tons of coal in 14 seam and about 40,000 tons in 13 seam. Spontaneous heating in the same area was observed nine months later and, in order to close efficiently that area in both seams, some 300,000 tons of coal in 14 seam and 450,000 tons in 13 seam had to be locked up behind stoppings.

At the same mine, the extraction of pillars in 14 seam in two other areas was followed similarly by premature collapses and fires, and some 260,000

tons of coal in 14 and 13 seams were lost, while over 800,000 tons had to be locked up behind isolation stoppings.

The chief causes of loss of coal in this mine were the excessive height and width of galleries and the inadequate size of pillars in 14 seams, and the inadequate thickness of the parting between 14 and 13 seams.

This case exemplifies the impossibility of extracting pillars in a thick seam in an old mine by ordinary methods without excessive loss by fires and collapses, and it also demonstrates how coal can be lost in workings of a lower seam which are separated from workings in an upper seam by only a few feet of strata.

Case 3.—In a mine adjoining the last case with the same conditions, four separate premature collapses of pillars near the outcrop of 14 seam have occurred and involved the loss of some 115,000 tons of coal, but no spontaneous heating has taken place in the collapsed areas. This absence of fire is believed to be due to the fact that the collapses are close to the outcrop where a good quantity of cool air circulates through the broken areas and removes heat as it is generated.

Case 4.—In old workings of another mine in Jharia where the seam is 86 feet thick and dipping at 1 in 1.8, premature collapses and fire occurred involving the loss of a large section of the mine containing 3 million tons of coal. In addition to the coal entirely lost by fire in this area, a substantial barrier containing some 4 million tons of coal has to be left to protect new workings to the dip of the fire area. The causes of the premature collapses were friability of the coal, inadequate partings between sections, and small pillars.

Case 5.—The premature collapse of pillars in a seam 62 feet thick, dipping at 1 in 1.5, at another mine in Jharia was followed by fire. As galleries had been made from a quarry in several sections of the seam and the partings between the sections were thin, it was impossible to localise the fire and it spread eventually to all parts of the mine. The quantity of coal entirely lost was about 2 million tons. The amount of coal which may have to be locked up in a barrier to protect deeper workings from the fire area will be about the same quantity.

Case 6.—At another mine in Jharia in which a seam 60 feet thick and dipping at 1 in 2 was exploited by shallow shafts, inclines and quarries, a premature collapse was followed by fire and the whole of the connected workings were involved. The fire also involved the workings in a seam 7 feet thick and only 7 feet above the thick seam. The same fire subsequently broke through into an adjoining mine and involved all workings in the same two seams. The loss of coal in the two mines is estimated at 1.7 million tons.

Case 7.—The seams worked at a small mine in Jharia were No. 11-12 combined seam 48 feet in thickness and No. 10 seam 45 feet in thickness. The workings in the top seam were at a depth of 70 feet from the surface and the strata between the two seams measured 140 feet.

In the workings of the lower seam, some galleries were made excessively wide and, as the coal was friable, a premature collapse took place. About nine months later spontaneous heating started in the upper seam in the collapsed area and the whole mine had to be sealed. Although the sealing of the entrances into the mine was done satisfactorily, the fire was not arrested as it was able to obtain air from the surface through the broken ground. A year afterwards numerous subsidences occurred in other parts of the property and the fire became uncontrollable. It passed through attenuated barriers into four other mines and caused extensive damage to property on the surface as well involving the loss of some 1½ million tons of coal in 11-12 seam. About 2 million tons of coal in 11-12 and 10 seams are also locked up by this fire.

Case 8.—A section of the strata at another mine in Jharia was as follows:—

- No. 13 seam 20 feet coal, strata 85 feet,
- No. 12 seam 12 feet coal, strata 8 to 32 feet,
- No. 11 seam 22 feet coal, strata 110 feet, and
- No. 10 seam 45 feet coal with bands of stone.

In this mine and in adjoining mines, 13 seam had been depillared and exhausted, and coal was being recovered from 10, 11 and 12 seams. The fire started at the face of a quarry in 13 seam owing to hot smalls and ashes from the manufacture of soft coke being thrown into the quarry. The fire spread very rapidly through the broken workings of 13 seam within this property and the adjoining properties. Goaves had already been made in 12 and 11 seams below the broken workings in 13 seam, and the fire spread to workings in these seams, through the goaves. In the course of two or three years, the whole of the workings in 11 and 12 seams of five collieries had been embraced by the fire and 2½ million tons of coal were lost. The fire has made the exploitation of 10 seam more difficult, dangerous and costly.

Case 9.—At another mine in Jharia the seam worked was No. 10 seam, 50 feet in thickness. The seam was worked in two sections, the galleries in the top section being up to 20 feet in height and those in the bottom section 15 feet. The centres of pillars were 40 to 50 feet apart and the galleries were 12 to 20 feet wide. Pillar-robbing rendered the pillars unstable and collapses took place involving the loss of some 200,000 tons of coal. The collapses have not been followed by spontaneous heating.

Case 10.—At another mine in Jharia the extraction of pillars near the outcrop in 15 seam of 25 feet thickness was followed by fire and some 600,000 tons of coal were lost behind stoppings isolating the area.

Case 11.—Two of the seams worked at another mine in Jharia were Nos. 14 and 13, 22 feet and 13 feet in thickness, and separated by only 8 feet of shale. Galleries in 14 seam were made 12 feet in width and the full height of the seam, while those in 13 seam were about 10 feet wide and 9 feet high.

The pillars in both seams were 35 to 40 feet square and the pillars in the upper seam were superimposed over those in the lower seam. After a large area of pillars had been extracted near the dip boundary in 14 seam where the depth of cover was about 170 feet, a premature collapse of an adjoining area in both seams took place. The quantity of coal lost was 300,000 tons. The collapse was not followed by fire.

Case 12.—A section of the strata at another mine in Jharia is as follows:—

- No. 15 seam 27 feet coal, strata 8 feet,
- No. 14-A seam 7 feet coal, strata 67 feet, and
- No. 14 seam 28 feet coal.

Extraction of pillars with collapse in part of 15 seam workings resulted in fire which eventually involved all the workings in 15 and 14-A seams. The fire also descended through goaves into 14 seam workings where it was held in check for many years, but eventually involved the whole of the workings in that seam. The quantity of coal lost in the three seams is, estimated to have been about 4,500,000 tons.

Case 13.—At a mine in Jharia a section of two seams is as follows:—

- No. 14 seam 27 feet, strata 6 to 18 feet, and
- No. 13 seam 18 feet.

The extraction of pillars in a fairly extensive area of the two seams resulted in a goaf fire which eventually involved all the workings in both seams in that section of the colliery. The fire has been a menace to the safety of adjoining mines for many years and has involved those mines

in heavy expenditure on protective works. The quantity of coal lost by fire has been estimated to be about 1.4 million tons.

Case 14.—At another mine in Jharia, where No. 15 seam is 20 feet thick and lies at a depth of 300 to 450 feet from the surface, the extraction of pillars containing 40 to 60 per cent. of the coal in the seam resulted in the premature collapse of pillars over an extensive area. The collapse was not followed by fire because the area was allowed to fill with water. The collapse was due principally to the presence of faults and the inadequate size of pillars. The quantity of coal lost was 350,000 tons.

Case 15.—A section of the strata at a mine in Jharia is as follows:—

Strata 50 feet, No. 15 seam 21 feet coal (burnt and intruded by mica peridotite in many parts),

Strata 175 feet, No. 14 seam 27 feet burnt to jhamma,

Strata 13 feet and No. 13 seam 18 feet clean coal.

In this mine, although the galleries in 13 seam were wide, they were only 12 to 14 feet high and pillars were of a substantial size. Extraction of pillars was followed by heavy over-riding involving an extensive area and, despite the erection of numerous cogs and substantial brick pillars, the movement did not cease until it was arrested by dykes. A similar movement in another part of the mine was initiated by the extraction of about 14 pillars and this also did not cease until it was arrested by dykes and by very large pillars supporting shafts and a railway. The movement involved an area 1,400 feet \times 1,300 feet. The loss of coal amounted to 895,000 tons.

The over-riding in both cases was due to the presence of strong mica peridotite sills and burnt seams in the superincumbent strata. The pillars surrounding the depillared areas were subjected to very abnormal loads and mass ground movements of great intensity because the sills and burnt seams prevented the normal breaking of the superincumbent strata with timely subsidence.

Case 16.—A section of the strata at another mine in Jharia is No. 15 seam top section 10 feet coal, strata 12 feet, No. 15 seam bottom section 8½ feet coal, strata 250 feet, No. 14 seam 28 feet coal, etc.

Pillars in both sections of 15 seam, in an area where the depth of the seams from the surface was small, were extracted by normal methods and no spontaneous heating ensued. Many years later, pillars in 14 seam below the same area were extracted and spontaneous heating started in the old goaves of 15 seam. This case is quoted to show that, although pillar extraction in a seam may not at the time be followed by fire, the extraction of pillars in a lower seam may cause a disturbance and admission of air to the old goaf, and so result in belated spontaneous heating. The quantity of coal locked up behind stoppings isolating this fire was about 200,000 tons.

Case 17.—In a subsidence of old workings close to the outcrop of a seam 18 to 20 feet in thickness in the Raniganj series, spontaneous heating started in December 1919 and the fire soon involved the whole mine. About 2 years later, the fire made its way through a barrier into an adjoining mine, but its advance there was retarded by isolation stoppings until 1925 when it made its way past the stoppings and involved the whole mine. During the course of three years, the original fire also passed through barriers into two other adjoining mines and within seven years it had completely involved five mines. The coal is of grade I quality in the high volatile series, and the seam was characterised by open joints and cleats along which the fire travelled through the barriers. The quantity of coal lost in the five mines was about 1½ million tons.

Case 18.—In a seam 19 feet in thickness in the Raniganj series, workings were made from inclines and shallow shafts over a very extensive area. As the mine was started early in the nineteenth century, the pillars in the old workings were small and numerous premature collapses occurred. Fires

followed the collapses and eventually the whole mine had to be abandoned. The loss of coal has been estimated at over 2 million tons.

Case 19.—At a mine in Raniganj a seam 18 feet in thickness was worked from inclines and shallow shafts over a very extensive area and the extraction of pillars was invariably followed by fire. The open cleats and breaks in the pillars, and the presence of broken workings in a seam 110 feet above, made control of the fires extremely difficult and eventually they got out of hand. The quantity of coal lost in this mine was about 500,000 tons, and 750,000 tons were locked up behind fire seals.

Case 20.—At another mine in Raniganj, a seam 16 feet thick lying at a depth of 400 to 900 feet was worked, extraction of pillars was started in 1921 and, in 1924 after 17 pillars had been extracted, a fire broke out. The fire was sealed off, but owing to crushing of pillars in the vicinity of the stoppings, and the almost unpreventable leakage of air into the area, the fire remained active and was a constant and serious menace to the mine and the workers employed therein. The fire resulted in the loss of 65,000 tons of coal. At the same mine, the extraction of an area of pillars 1,800 × 600 feet was followed by the premature collapse of pillars in an adjoining area and occasioned the loss of some 300,000 tons of coal. The pillars which collapsed contained more than 40 per cent. of the coal in the seam.

Case 21.—In a seam 27 feet in thickness in the Raniganj series with cover of about 100 feet, the extraction of pillars was followed by spontaneous heating. As galleries were of excessive dimensions, localisation of the fire was not possible and a large section had to be abandoned. A few months later, another fire started in the remaining section of the mine at a point where two or three pillars had collapsed some 8 months earlier and the whole mine had to be abandoned. The quantity of coal lost was 775,000 tons.

Case 22.—In a seam 15 feet in thickness in the Raniganj series, mining was commenced from the outcrop about 1870 and workings were made from shafts and inclines over a very extensive area. In the old workings, a high percentage of the seam was extracted in first working and, when pillar extraction was attempted, many premature collapses and fires ensued. The fires eventually got out of hand and the whole area had to be abandoned. The coal in a seam below the abandoned area had also to be locked up. The quantity of coal lost by fires and collapses is estimated to have been 1.1 million tons and the quantity locked up 1.8 million tons.

Case 23.—In a seam 28 feet thick in the Raniganj series, the collapse of a pillar surrounded by galleries made to the full height of the seam was followed two years later by fire. The extreme height of the galleries in the vicinity of the fire rendered the building of isolation stoppings extremely difficult, and a large portion of the workings had eventually to be enclosed in stoppings built in a railway barrier where the few galleries through the barrier were of small dimensions. The coal was grade I in the high volatile series. The fire involved the loss of 500,000 tons of coal.

Case 24.—The seam 17 feet in thickness is in the Raniganj series and 13 feet of the coal is graded in grade I. Fire broke out 8 months after a few pillars had collapsed in old workings lying at a depth of about 100 feet where 60 per cent. of the seam had been removed in the formation of pillars. Attempts to confine the fire to a small area were unsuccessful and the whole mine had to be closed and sealed at the surface. The quantity of coal locked up in the mine is about 2 million tons, but most of it is recoverable.

Case 25.—In a seam 16 feet in thickness in the Raniganj series, the extraction of pillars at a depth of 450 feet below the surface was followed by fires. A fall of roof in one large depillared area sealed off on account of fire caused the collapse of one or more fire dams and the expulsion of noxious and inflammable gases. The mine was abandoned. The quantity

of coal lost was about 1½ million tons of which about one million tons may be recoverable.

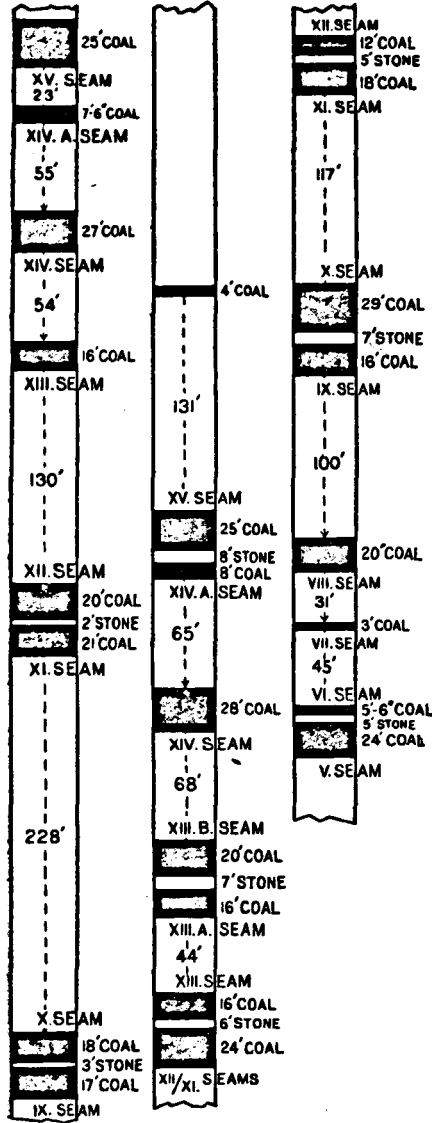
Case 26.—At another mine in Raniganj, where mining was commenced about 1867 from inclines and shallow shafts, two seams were exploited 12 and 18 feet in thickness and separated by 110 feet of strata. In the old workings the percentage of coal extracted in the formation of pillars was extremely high and, when extraction of pillars was commenced, coal was lost and fires ensued. Subsequent pillar extraction caused the collapse of pillars supporting stoppings round a fire area and the mine had to be flooded to overcome the fire which had involved the whole mine. The quantity of coal lost was about 400,000 tons.

It may be added that flooding a fire area is not always practicable because the necessary amount of water may not be available conveniently and also because the barriers between adjacent properties may not be able to hold the water if it is available. In one mine in Raniganj, the attempt to flood a fire led to the next mine being inundated and put out of action for about 6 months.

Case 27.—At another very old mine in which a seam 16 feet thick in the Raniganj series was worked at a shallow depth, pillar extraction resulted in numerous fires and eventually the fires got out of hand. The mine was abandoned and some 500,000 tons of coal were lost.

Case 28.—At another mine in Raniganj, where a seam 18 feet in thickness was exploited from inclines and shallow shafts, pillars were reduced until a collapse took place. Some years later a fire which started in the collapsed areas spread through the whole mine and also through two adjoining mines. The fire resulted in a loss of over 2 million tons of coal in the three properties.

APPENDIX B.

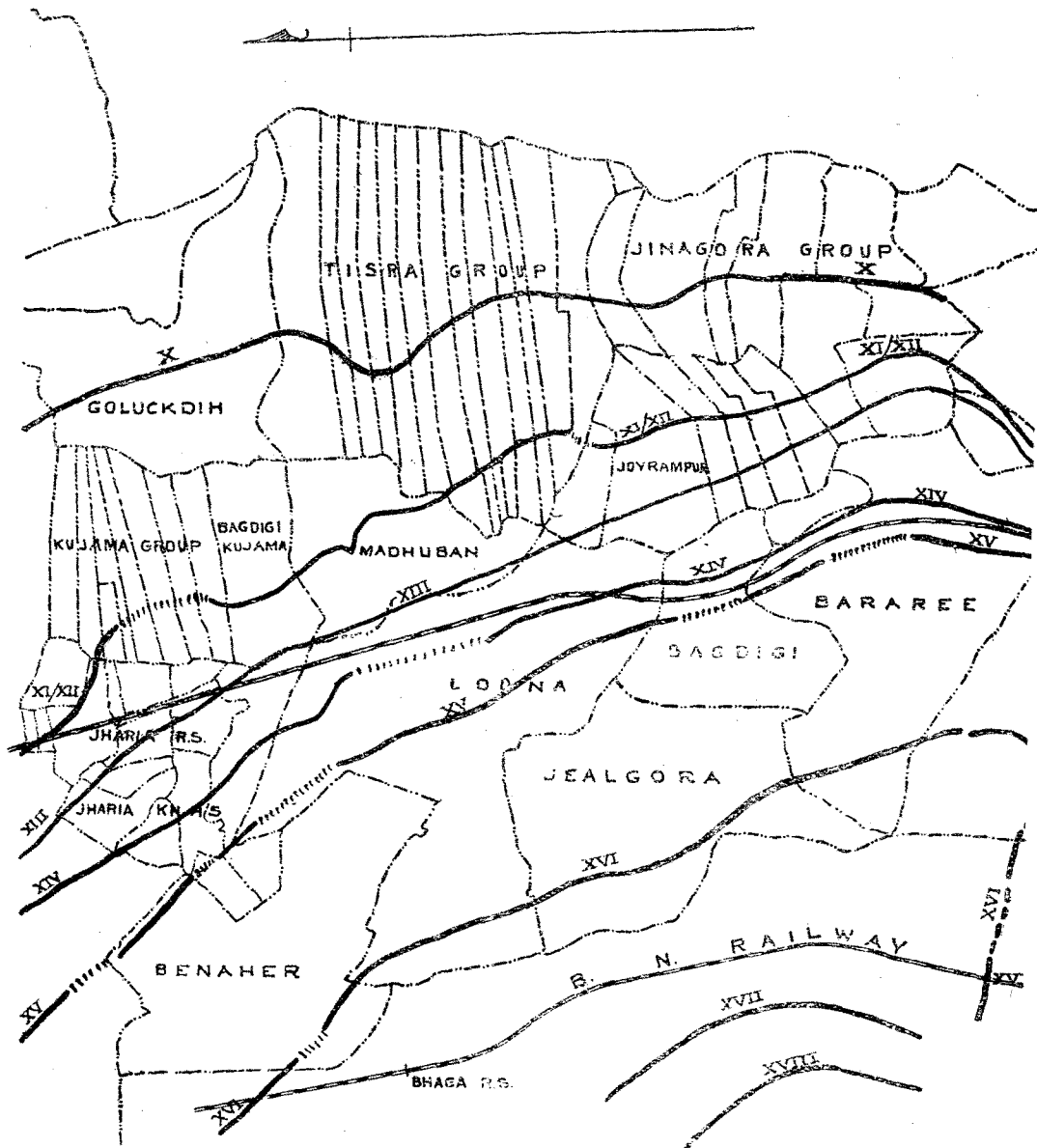


SCALE 100 FEET = 1 INCH.

APPEN

JHARIA

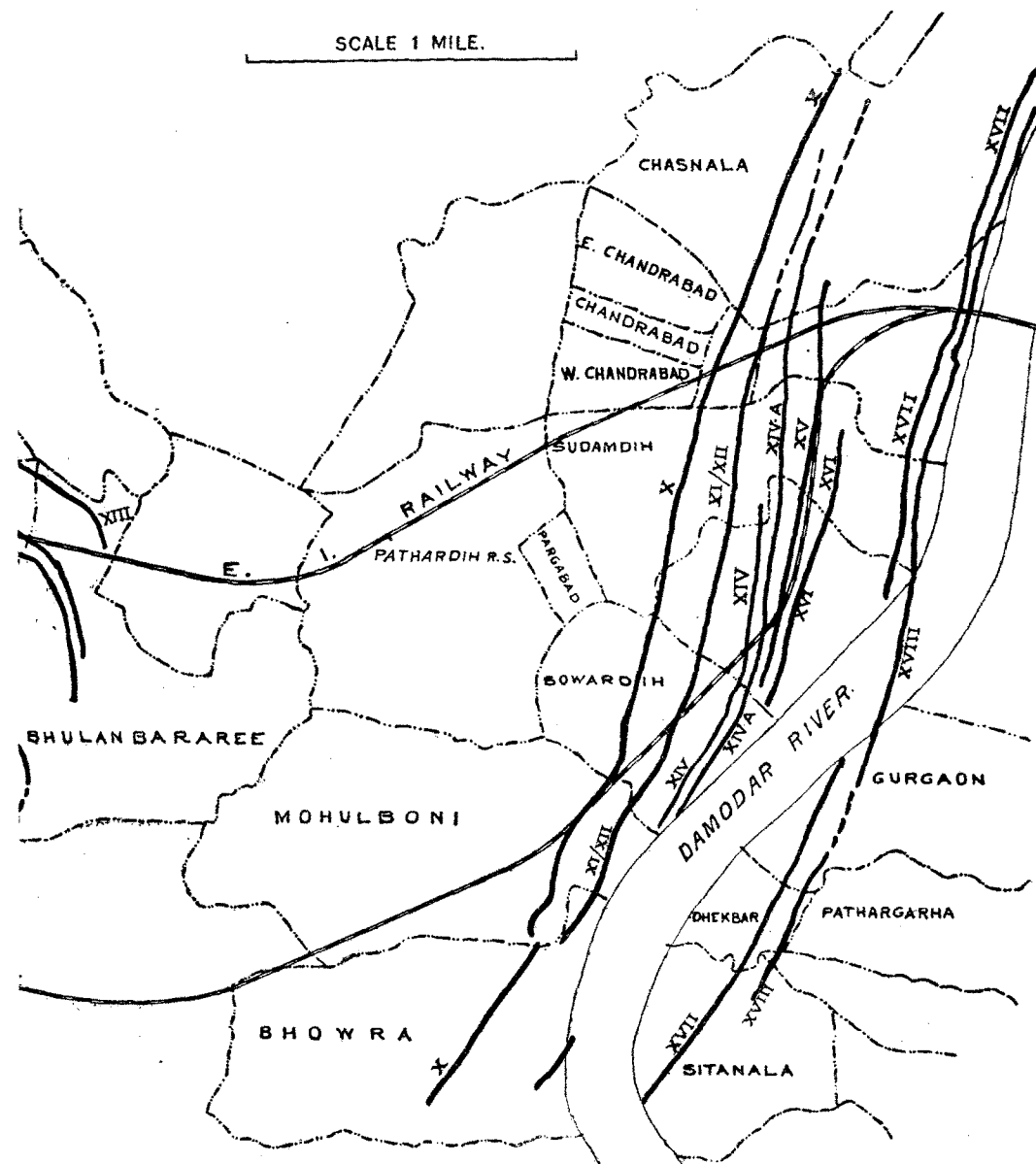
PLAN OF SOUTH-EAST SECTION SHOWING



DIX C.

COALFIELD.

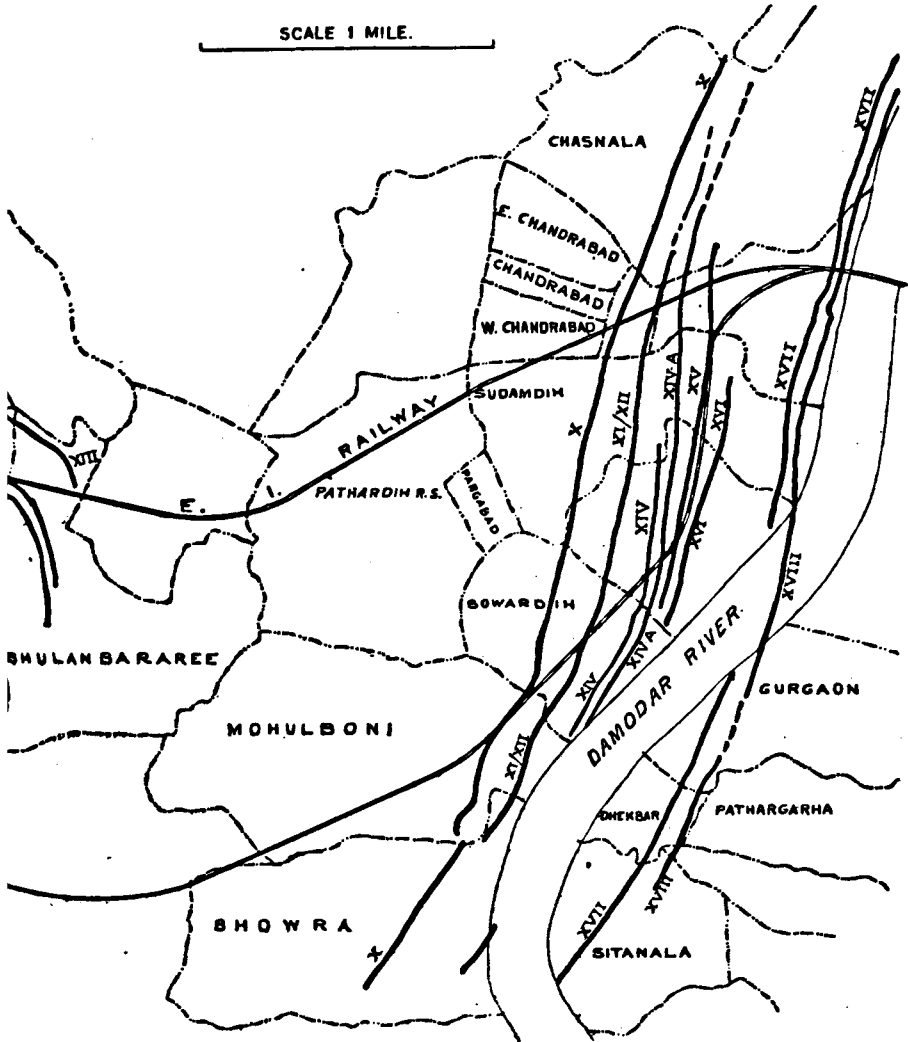
MOUZAS & SOME COLLIERY BOUNDARIES.



DIX C.

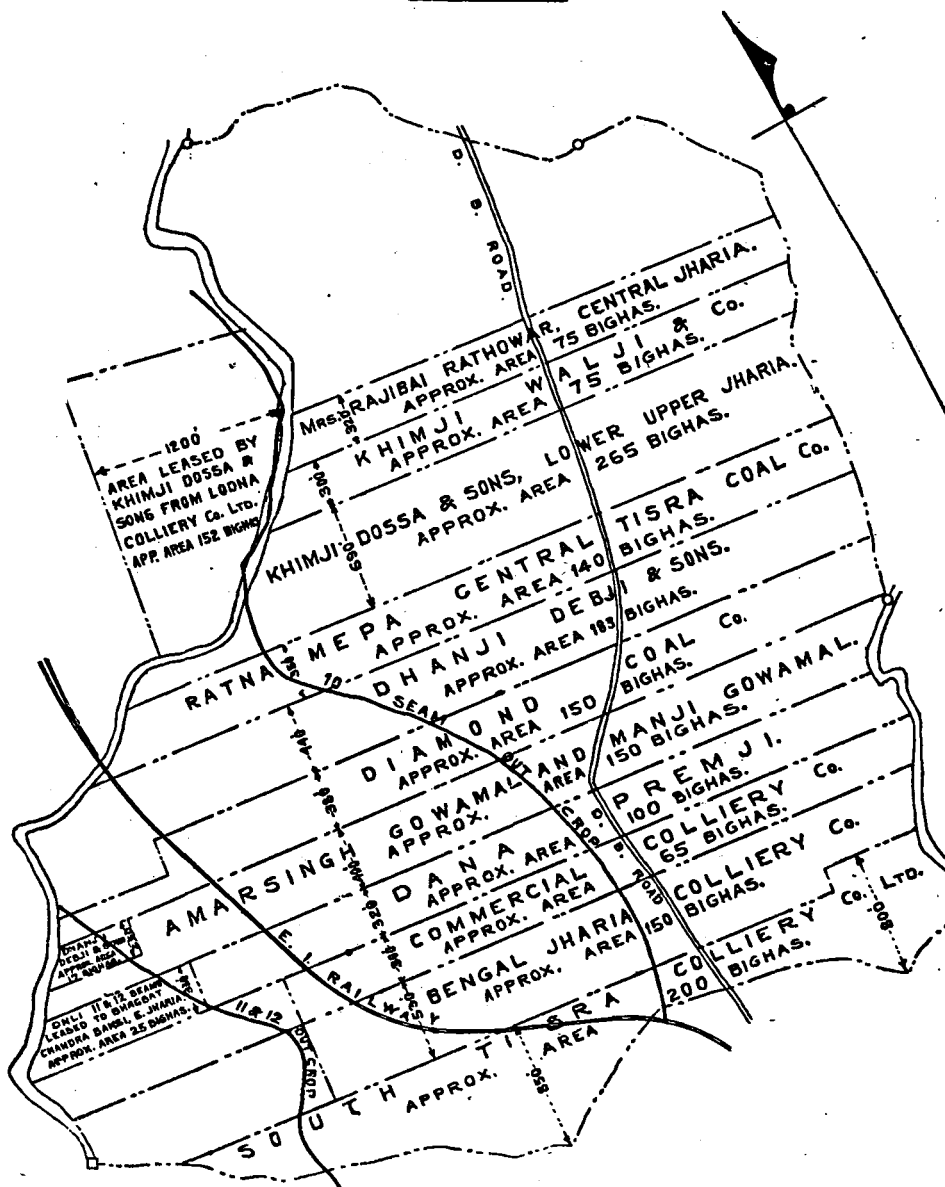
COALFIELD.

MOUZAS & SOME COLLIERY BOUNDARIES.



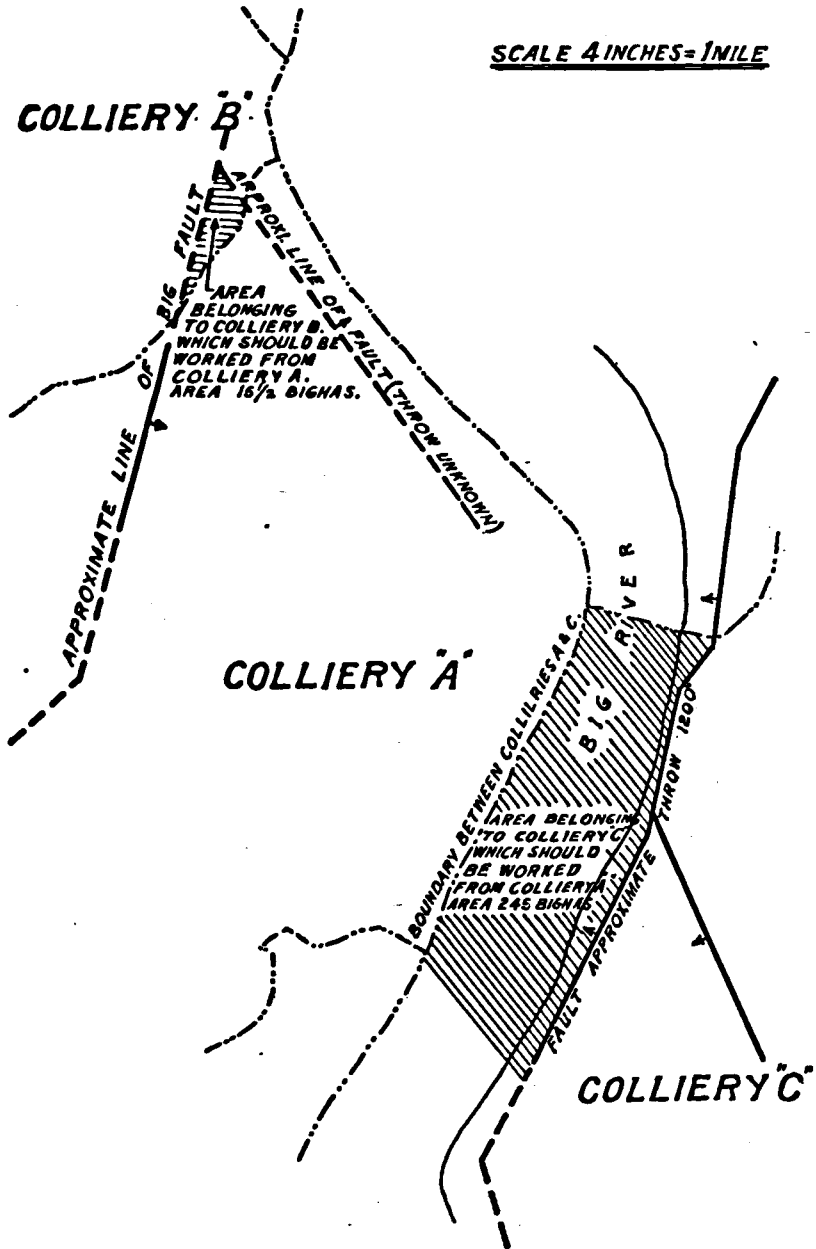
APPENDIX D.
**SKETCH PLAN SHOWING
DISPOSITION OF COLLIERY PROPERTIES
IN TISRA MOUZA**

SCALE 1000 FEET.

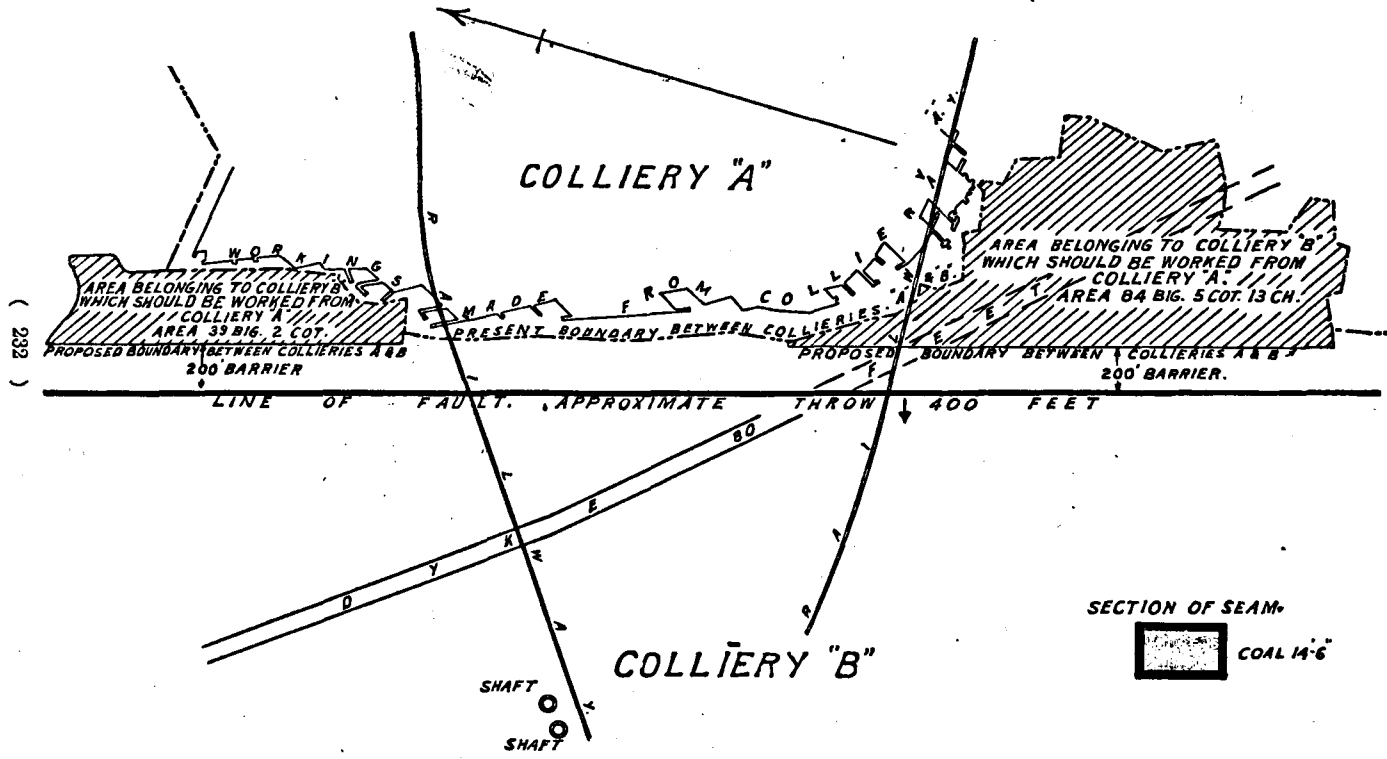


APPENDIX E.

SCALE 4 INCHES = 1 MILE



SCALE 1 INCH = 800 FEET



(292)

APPENDIX F.

TABLE I.—Annual output (in tons) of the Jharia and Raniganj fields during the years 1920 to 1935.

Year.	Jharia Coalfield.	Raniganj Coalfield.	Percentage of figure in Col. 2 to the total annual output in British India.	Percentage of figure in Col. 3 to the total annual output in British India.
1	2	3	4	5
1920 . . .	9,294,040	4,997,679	54.41	29.26
1921 . . .	10,059,649	5,211,845	54.79	28.39
1922 . . .	9,936,299	5,203,214	54.69	28.64
1923 . . .	10,346,015	5,557,424	55.14	29.62
1924 . . .	10,845,642	6,035,347	53.54	29.80
1925 . . .	10,676,883	5,729,686	53.47	28.69
1926 . . .	10,373,736	6,124,884	51.63	30.48
1927 . . .	10,583,487	6,472,036	50.14	30.66
1928 . . .	10,665,479	6,460,490	49.57	30.03
1929 . . .	10,785,745	6,828,053	48.35	30.61
1930 . . .	10,753,858	7,218,691	47.41	31.82
1931 . . .	9,755,037	6,530,713	47.55	31.83
1932 . . .	8,551,283	6,419,007	45.68	34.29
1933 . . .	8,014,949	6,265,703	44.13	34.50
1934 . . .	9,057,546	6,795,838	44.74	33.57
1935 . . .	9,245,292	7,348,323	43.99	34.97

TABLE II.—Annual output (in tons) of superior (selected and grade I) and inferior (grade II and lower) coal from the Jharia coalfield during the years 1920 to 1936.

Year.	Superior coal (in tons).	Inferior coal (in tons).	Percentage of superior coal.	Percentage of inferior coal.	Total output (in tons).
1920 . . .	6,608,633	2,685,407	71.7	28.3	9,294,040
1921 . . .	6,438,175	3,621,474	64.0	36.0	10,059,649
1922 . . .	5,892,503	4,043,796	59.3	40.7	9,936,299
1923 . . .	6,517,989	3,828,026	63.0	37.0	10,346,015
1924 . . .	7,244,889	3,600,753	66.8	33.2	10,845,642
1925 . . .	7,536,419	3,140,464	70.6	29.4	10,676,883
1926 . . .	7,427,595	2,946,141	71.6	28.4	10,373,736
1927 . . .	7,693,285	2,890,202	72.7	27.3	10,583,487
1928 . . .	7,903,120	2,762,359	74.1	25.9	10,665,479
1929 . . .	8,143,237	2,642,508	75.5	24.5	10,785,745
1930 . . .	8,269,717	2,484,141	76.9	23.1	10,753,858
1931 . . .	7,632,715	2,122,322	78.2	21.8	9,755,037
1932 . . .	6,652,898	1,898,385	77.8	22.2	8,551,283
1933 . . .	6,211,585	1,803,364	77.5	22.5	8,014,949
1934 . . .	6,992,426	2,065,120	77.2	22.8	9,057,546
1935 . . .	7,099,234	2,146,058	76.8	23.2	9,245,292
1936 . . .	6,678,768	2,109,084	76.0	24.0	8,787,852*

* There may be some change in the figures for 1936.

TABLE III.—Annual output (in tons) of superior (selected and grade I) and inferior (grade II and lower) coal from the Raniganj coalfield during the years 1920 to 1936.

Year.	Superior coal (in tons).	Inferior coal. (in tons).	Percentage of superior coal.	Percentage of inferior coal.	Total output (in tons).
1920	3,748,259	1,249,420	75.0	25.0	4,997,679
1921	3,882,825	1,329,020	74.5	25.5	5,211,845
1922	3,871,214	1,332,000	74.4	25.6	5,203,214
1923	4,229,200	1,328,224	76.1	23.9	5,557,424
1924	4,695,500	1,339,847	77.8	22.2	6,035,347
1925	4,554,933	1,174,753	79.5	20.5	5,729,686
1926	5,083,654	1,041,230	83.0	17.0	6,124,884
1927	5,598,311	873,725	86.5	13.5	6,472,036
1928	5,816,788	643,702	90.1	9.9	6,460,490
1929	6,199,872	628,181	90.8	9.2	6,828,053
1930	6,605,102	613,589	91.5	8.5	7,218,691
1931	6,021,317	509,396	92.2	7.8	6,530,713
1932	5,956,838	462,169	92.8	7.2	6,419,007
1933	5,852,167	413,536	93.4	6.6	6,265,703
1934	6,394,884	400,954	94.1	5.9	6,795,838
1935	6,966,279	382,044	94.8	5.2	7,348,323
1936	6,828,664	435,872	94.0	6.0	7,264,536*

* There may be some changes in the figures for 1936.

TABLE IV.—Average value (per ton) at pitmouth of coal extracted from the mines in Jharia and Raniganj coalfields.

Year.	Jharia.		Raniganj.		Year.	Jharia.		Raniganj.	
	Rs.	A. P.	Rs.	A. P.		Rs.	A. P.	Rs.	A. P.
1920	4	10 0	6	2 0	1928	3	10 0	4	0 0
1921	5	12 0	7	8 0	1929	3	7 0	3	14 0
1922	6	14 0	9	5 0	1930	3	10 0	4	0 0
1923	6	13 0	8	13 0	1931	3	7 0	3	14 0
1924	6	12 0	7	13 0	1932	3	0 0	3	4 0
1925	5	13 0	6	11 0	1933	2	11 0	2	14 0
1926	4	9 0	5	5 0	1934	2	8 0	2	10 0
1927	3	15 0	4	6 0	1935	2	8 0	2	9 0

TABLE V.—Average prices (per ton) of Indian coal (superior) at chief ports.

Year.	Calcutta,		Calcutta,		Bombay.††		Karachi.††	
	Jharia selected delivered into wagons.		Dishergarh delivered into wagons.		Dishergarh.		Indian (trimmed into bunkers).	
	Rs.	A. P.	Rs.	A. P.	Rs.	A. P.	Rs.	A. P.
1920	6	8 6	8	12 10	32	3 8	33	10 2
1921	12	5 0	18	2 8	33	4 0	38	2 0
1922	11	2 0	14	8 0	33	8 0	35	6 8
1923	9	3 6	12	2 8	30	8 8*	35	0 0
1924	8	2 0	10	9 8	28	15 2*	29	2 8
1925	5	9 0	7	9 4	19	6 6†	23	2 8
1926	4	11 0	6	6 10	18	8 9†	21	4 10
1927	3	9 0	5	14 8	20	3 0†	21	10 11
1928	3	8 0	5	7 3	18	3 0†	19	5 4
1929	3	10 6	5	13 6	18	5 0†	19	4 0
1930	3	11 0	5	14 0	18	4 0†‡	19	0 8
1931	3	2 6	5	6 6	...		18	0 8
1932	3	4 6	4	10 4	15	5 4†§	16	15 4
1933	2	14 0	3	12 2	12	1 4||¶	14	11 0
1934	2	13 6	3	12 4	11	10 4**	13	8 8
1935	2	11 0	3	4 0	11	13 9**	14	7 0

NOTE.—The prices shown are based upon twelve-monthly quotations ruling at the beginning of each month.

* Bengal 1st class mill delivery.

† Ex-scales.

‡ Average for five months only.

§ Average for three months only.

|| C.i.f.

¶ Average for nine months only.

** Selected grade Jharia, net c.i.f. Bombay.

†† Prices include freight also.

TABLE VI.—Exports of Indian coal* (in tons) by sea from 1920 to 1935.

Year.	(Private Merchandise only.)			Total Indian Exports.
	To Ceylon.	To Hongkong.	To Straits Settlements.	
1920	685,559	...	228,355	1,224,758
1921	236,645	...	11,373	275,571
1922	76,742	...	...	77,111
1923	119,620	10	15,388	136,575
1924	170,701	...	17,763	206,483
1925	194,189	...	18,754	216,090
1926	243,263	2,085	117,469	617,573
1927	341,352	8,752	147,405	576,167
1928	352,602	110,701	73,389	626,343
1929	366,926	196,074	75,770	726,610
1930	282,590	61,885	26,367	461,188
1931	282,289	89,127	30,246	441,249
1932	190,834	219,490	13,357	519,483
1933	229,122	140,216	8,655	426,176
1934	228,559	56,737	35,647	330,233
1935	146,232	46,718	16,850	217,584
1936	148,597	5,038	16,660	195,836

* Excluding bunker coal and Government stores, but including coke and patent fuel.

TABLE VII.—Quantity (in tons) of Indian coal* exported on private account as Cargo by sea (coastwise) from Bengal to other Indian ports (British and non-British) during each of the calendar years 1926 to 1935.

Year.	Quantity (in tons).	Year.	Quantity (in tons).
1926 . . .	1,435,110	1931 . . .	1,686,095
1927 . . .	1,682,802	1932 . . .	1,652,853
1928 . . .	1,633,518	1933 . . .	1,425,039
1929 . . .	1,860,602	1934 . . .	1,536,894
1930 . . .	1,556,569	1935 . . .	1,649,090
		1936 . . .	1,441,579

* Excluding coke.

TABLE VIII.—Quantity (in tons) of foreign coal* imported into British India.

(Private Merchandise only.)

Year.	From United Kingdom.	From Australia.†	From Union of South Africa.	Total import into British India.
1920 . . .	5,022	8,134	7,835	39,727
1921 . . .	441,305	111,384	306,968	1,090,749
1922 . . .	742,469	17,849	236,034	1,220,639
1923 . . .	131,739	59,380	281,793	624,918
1924‡ . . .	109,916	21,803	185,141	463,716
1925 . . .	124,111	7,495	204,189	483,160
1926 . . .	35,142	13,323	89,911	193,908
1927 . . .	55,903	11,017	133,827	243,603
1928 . . .	40,233	5,321	129,474	210,186
1929 . . .	33,786	1,043	176,376	218,560
1930 . . .	20,258	1,190	186,029	217,029
1931 . . .	29,974	3,400	48,716	88,035
1932 . . .	19,811	4,070	20,418	47,544
1933 . . .	11,174	4,248	45,258	67,330
1934 . . .	13,340	6,981	45,269	72,161
1935 . . .	13,022	2,624	42,314	77,075

* Figures exclusive of Government stores, but including coke and patent fuel.

† Includes figures for New Zealand up to 1924.

‡ Excludes figures for patent fuel from 1924.

TABLE IX.—Quantity (in tons) of hard coke manufactured in India during the years 1920 to 1935.

Year.	Production of hard coke.‡‡	Jharia coal.*	Giridih coal.	Raniganj coal.	Other coal.	Total coal used.	Quantity manufactured in coke-making plants.§‡
1920	..	..	..	..	..	..	508,158§
1921	..	..	..	..	..	..	505,266§
1922	..	..	..	..	..	..	501,378||
1923	..	..	..	..	..	..	799,956¶
1924	1,360,551	1,815,670	45,149	..	2,048	1,862,867	1,141,083**
1925	1,170,741	1,540,560	39,747	..	2,405	1,582,712	1,106,528**
1926	1,263,105	1,653,911	51,775	..	2,688	1,708,374	1,225,343**
1927	1,512,784	1,950,783‡	64,651	..	3,030	2,018,464	1,350,654**
1928	1,419,514	1,848,174‡	52,922	..	3,082	1,904,178	1,261,771**
1929	1,688,137	2,154,185	53,553	..	31,546	2,239,284	1,459,675**
1930	1,572,112	1,995,344	51,035	..	46,664	2,093,043	1,399,950**
1931	1,309,993	1,687,681	33,209	12,456	24,558	1,757,904	1,301,418††
1932	1,214,772†	1,585,733	32,724	12,878	7,330	1,638,665	1,216,039††
1933	1,227,746	1,517,483	27,245	110,469	2,898	1,658,095	1,230,319††
1934	1,517,137	1,934,048	26,297	80,924	2,698	2,043,967	1,518,896††
1935	1,766,821	2,232,807	26,740	91,035	2,859	2,353,441	1,759,036††

* Includes Raniganj coal also used by the Bengal Iron Co., accurate figures relating to which are not available.

† Excluding 271 tons produced from the Jarangdih colliery.

‡ Includes Bokaro-Ramgarh coal also used by the Indian Iron and Steel Co., Ltd., separate figures relating to which are not available.

§ Figures from 4 coke plants.

|| Figures from 5 coke plants.

¶ Figures from 6 coke plants.

** Figures from 7 coke plants.

†† Figures from 8 coke plants.

‡‡ Geological Survey of India's figures.

§‡ Chief Inspector of Mines' figures.

TABLE X.—Quantity (in tons) of soft coke manufactured during the years 1920 to 1935.

Year.	Jharia coalfield.	Giridih coalfield.	Raniganj coalfield.	Other coalfields.	Total.
1920	111,956	...	63,137	6,437	181,530
1921	71,730	...	74,737	4,814	151,281
1922	98,859	...	85,962	4,158	188,979
1923	113,464	...	101,443	5,154	220,061
1924	176,797	...	122,966	4,982	304,745
1925	290,807	26	120,644	4,492	415,969
1926	397,589	...	113,160	4,916	515,665
1927	500,812	...	104,229	3,571	608,612
1928	606,520	...	78,922	3,560	689,002
1929	693,186	...	60,134	4,407	757,727
1930	688,250	...	55,980	5,391	749,621
1931	676,976	...	43,639	3,561	724,176
1932	719,980	...	36,858	3,390	760,228
1933	784,429	...	36,572	3,164	824,165
1934	831,086	...	26,305	3,690	861,081
1935	845,453	...	35,749	9,345	890,547

TABLE XI.—*Reserves of Iron Ore.*
(Mainly after C. S. Fox—Trans. Min. Geol. Inst. India, XX, pp. 116-117; 1925.)

Ore.	Location.	Quantity (in million tons).	Composition.			Remarks.
			Fe.	P.	S.	
BIHAR-ORISSA.						
Hæmatite	Mayurbhanj . . .	18	60.68	0.08	up to 0.6	Average ore despatched to smelting works at present contains 64 per cent. Fe, 2 per cent. silica, 1.25 per cent. alumina, 0.7 per cent. lime and magnesia, 0.05 per cent. P. and 0.02 per cent. S. The ore is within 150 miles of Jharia coalfield. Only these ores are now used by Tata Iron and Steel and Bengal Iron Companies.
	Bonai . . .	648				
	Keonjhar . . .	1,482				
	Singhbhum . . .	1,043				
		3,191				
Hæmatite	Singhbhum and Orissa.	Probably 3,000	45.60	..	..	Large quantities of lower grade ores, probably of the same order as that of high quality, available.
CENTRAL PROVINCES.						
Hæmatite	Baster . . .	..	..	..	..	Quantity not known but will apparently run into several tons of million tons.
"	Lohara (Chanda) . . .	>100	61.67	0.005	0.012	Flux nearby, but Wardha valley coal is non-coking.
"	Rajhara (Drug) . . .	10	60	0.058	0.108	Flux at Dalli, but coke must be imported.
Laterite	Kankwara Hills (Jubbulpore).	49	53	0.146	0.02	Suitable for blast furnace, but lack of fuel.
BENGAL.						
Ironstone	Raniganj coalfield . . .	>400	38.46	0.09-0.4	Trace	Used by Bengal Iron Co. until 1913. Now unworked because excellent Singhbhum ore available.
Laterite	Rajmahal . . .	..	43	0.6	..	Quantity not known but large. Former industry of Birbhum based on this ore.
MADRAS.						
Magnetite	Kanjamalai (Salem)	>1,000	38.45	0.02-0.3	0.028	Ore is a mixture of magnetite and quartz. Amenable to magnetic concentration on fine crushing. May be eventually smelted by electricity, now available from the Mettur hydroelectric power station.
MYSORE.						
Hæmatite	Babahudan Hills . . .	50	60.64	0.03 to 0.05	0.03-0.04	Now being used in charcoal blast furnace of 80 tons maximum capacity at Bhadravati in Mysore.

TABLE XII.—*Production (in tons) of Iron Ore in India.*

Year.	Bihar and Orissa.	Mysore.	Burma.	Others.	Total.
1924 . . .	1,032,812	14,958	59,014	59,182	1,445,313
1925 . . .	1,435,558	56,218	51,617	1,185	1,544,578
1926 . . .	1,594,577	15,427	48,089	1,202	1,659,295
1927 . . .	1,736,060	48,465	61,062	1,148	1,846,735
1928 . . .	1,956,621	23,624	74,813	934	2,055,992
1929 . . .	2,337,344	45,937	46,140	715	2,430,136
1930 . . .	1,783,742	31,499	33,458	925	1,849,624
1931 . . .	1,599,386	18,517	1,886	5,092*	1,624,881
1932 . . .	1,744,247	4,394	6,560	5,299*	1,760,500
1933 . . .	1,154,396	35,041	36,293	2,895*	1,228,625
1934 . . .	1,853,116	38,974	23,930	898	1,916,918
1935 . . .	2,316,393	24,019	23,085	800	2,364,297

*Mainly from Madras. The other figures in the same column refer to production mainly from the Central Provinces. Taken from the Records of the Geological Survey of India relating to mineral production in India.

TABLE XIII.—*Production of Pig Iron, Steel and Ferro-Manganese (in tons) in India.*

—	Tata's.	Bengal Iron.	Indian Iron and Steel.	Mysore Iron Works.	Total.	TATA'S	
						Steel.	Ferro-manganese.
1924 . . .	540,140	147,733	168,249	16,425	872,547	218,472	9,951
1925 . . .	563,160	52,674	247,500	16,741	880,075	309,938	6,527
1926 . . .	609,429	20,050	253,431	19,523	920,433	360,980	10,503
1927 . . .	624,028	132,649	363,516	19,858	1,140,051	414,738	5,092
1928 . . .	510,884	128,112	397,784	15,104	1,051,884	289,865	3,233
1929 . . .	722,950	196,080	451,059	21,452	1,391,541	410,923	3,630
1930 . . .	695,923	103,929	354,772	20,668	1,175,292	427,035	4,576
1931 . . .	799,545	Nil.	243,214	15,577	1,058,336	439,134	14,366
1932 . . .	699,931	Nil.	198,700	14,683	913,314	430,333	366
1933 . . .	793,953	Nil.	249,079	14,805	1,057,837	505,429	7,725
1934 . . .	882,054	Nil.	420,271	17,885	1,320,210	596,981	5,536
1935 . . .	897,976	125,850	480,884	19,152	1,451,862	627,867	14,182

TABLE XIV.—Exports of Pig Iron (in tons) from India.

	1924.	1925.	1926.	1927.	1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935.
United Kingdom	8,828	23,708	15,314	21,140	8,920	43,905	114,762	51,800	85,332	82,823	106,867	69,120
Germany		11,595	3,166	9,926	8,542	13,243	10,307	14,332	8,543	5,513	5,982	307
United States of America	97,771	177,180	49,760	67,685	57,897	68,017	108,924	60,121	26,978	71,951	32,187	41,473
Japan	149,697	158,713	230,913	265,226	321,010	385,158	201,997	157,116	101,983	179,506	212,285	334,267
China		not available separately.				12,226	18,329	16,307	10,566	18,066	19,971	11,366
Other countries	14,759	25,598	16,009	19,983	32,256	26,332	46,310	19,518	14,994	14,156	20,762	16,103
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Total export—												
Tons	271,055	401,794	315,162	383,960	428,625	548,881	502,629	318,994	248,396	372,015	398,054	472,636
(Value) Rs.	1,79,78,296	1,98,66,537	1,42,19,549	1,74,28,304	2,10,50,789	2,50,86,155	2,06,99,058	1,12,03,467	86,65,502	91,07,292	88,50,702	1,08,53,877
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Total production in tons.	872,547	880,075	902,433	1,140,051	1,051,884	1,391,551	1,175,292	1,058,336	913,314	1,057,837	1,320,210	1,451,862
Export per cent.	30.4	45.6	34.9	33.7	42.6	39.5	42.8	30.1	27.2	27.9	30.1	32.6

TABLE XV.—Imports of Iron and Steel.

		Cutlery and Hardware.	Machinery and Mill work.	Railway plant and Rolling stock.	Iron bars, Pig iron, etc.	Iron and Steel beams, pillars, sheets, etc.	Steel bars, angles, channels blooms, billets, etc.	Total value Rupees Lakhs.
1924	. . . . .	Rs. 5,72,36,344 Tons ..	15,53,44,993 ..	8,93,15,058 ..	32,46,182 18,001	16,68,06,548 882,369	3,55,87,206 256,549	50,21 ..
1925	. . . . .	Rs. 5,57,79,585 Tons ..	15,95,48,216 ..	7,53,44,065 ..	28,96,335 17,775	15,47,92,396 668,920	1,79,31,685 147,788	46,63 ..
1926	. . . . .	Rs. 5,58,83,246 Tons ..	15,13,37,077 ..	7,14,94,159 ..	23,12,530 13,503	16,63,32,509 738,950	2,41,14,554 228,455	47,15 ..
1927	. . . . .	Rs. 5,67,52,492 Tons ..	16,57,87,417 ..	8,44,57,576 ..	25,16,634 19,455	18,25,16,326 871,813	2,76,83,218 260,389	51,97 ..
1928	. . . . .	Rs. 5,85,55,191 Tons ..	21,04,39,807 ..	2,21,41,648 ..	20,75,394 14,657	18,81,48,943 1,013,458	2,66,84,083 242,954	50,80 ..
1929	. . . . .	Rs. 5,69,79,480 Tons ..	21,58,23,118 ..	} Not avail- able.	15,06,400 11,027	16,12,32,372 824,529	3,16,17,559 270,839	46,72* ..
1930	. . . . .	Rs. 4,47,11,481 Tons ..	18,86,88,956 ..		12,99,908 8,646	11,31,85,835 567,795	1,56,93,801 136,014	36,36* ..
1931	. . . . .	Rs. 3,37,36,689 Tons ..	13,42,30,983 ..		5,95,229 4,680	6,25,97,840 328,290	1,05,08,531 109,803	24,17* ..
1932	. . . . .	Rs. 3,06,41,675 Tons ..	11,02,75,964 ..		6,54,627 4,721	4,65,90,979 329,000	81,19,873 91,330	19,63* ..
1933	. . . . .	Rs. 3,19,63,976 Tons ..	12,87,40,082 ..		7,94,299 6,418	4,52,56,932 238,559	76,73,776 73,573	21,44* ..
1934	. . . . .	Rs. 3,29,87,547 Tons ..	11,74,50,797 ..	7,21,467 6,444	4,99,92,606 256,595	94,83,479 84,712	21,06* ..	
1935	. . . . .	Rs. 3,40,37,964 Tons ..	13,35,71,208 ..	3,59,907 2,768	5,79,43,157 313,781	87,18,398 81,233	23,46* ..	

* Excluding Railway plant and rolling stock.

*Comparative Statistical Information (1919 and 1935).**

Serial No.	Particulars required.	In Raniganj.		In Jharla.		Total of columns 3 and 4.		REMARKS.	
		1919.	1935.	1919.	1935.	1919.	1935.	1919.	1935.
1	Total number of collieries .	305	191	335	206	640	397		
2	Number of collieries under development, but not raising coal.	44	8	9	4	53	12		
3	Number of collieries raising coal.	261	183	326	202	557	385		
4	Total annual output of collieries in serial No. 3.	6,800,844 tons.	7,848,323 tons.	12,036,137 tons.	9,245,292 tons.	18,836,981 tons.	16,593,615 tons.		
5	Number of collieries raising monthly—								
	(a) up to 1,000 tons .	137	70	151	62	a 288	132	a 49.06 p.c.	34.29 p.c.
	(b) over 1,000 and up to 5,000 tons.	92	84	121	97	b 213	181	b 36.28 ,,	47.01 ,,
	(c) over 5,000 tons .	32	29	54	43	c 86	72	c 14.66 ,,	18.70 ,,
								Of total number of 587.	Of total number of 385.
6	Amount of annual output of collieries in—								
	(a) serial No. 5 (a) .	540,721 tons.	218,814 tons.	651,192 tons.	351,906 tons.	d 1,101,913 tons.	570,720 tons.	d 6.83 p.c.	3.44 p.c.
	(b) serial No. 5 (b) .	2,829,495 tons.	2,601,093 tons.	3,704,146 tons.	2,718,181 tons.	e 6,533,641 tons.	[5,314,274 tons.	e 84.69 ,,	32.03 ,,
	(c) serial No. 5 (c) .	3,430,628 tons.	4,528,416 tons.	7,680,799 tons.	6,180,205 tons.	f 11,111,427 tons.	10,708,621 tons.	f 58.98 ,,	64.63 ,,
								Of total output of 18,836,981 tons.	Of total output of 16,593,615 tons.
7	Number of collieries raising coal by—								
	(a) hand labour only or mainly hand labour.	98	38	153	38	g 251	76	g 42.76 p.c.	19.74 p.c.
	(b) steam power only or mainly steam power.	160	135	165	150	h 325	285	h 55.87 ,,	74.03 ,,
	(c) electric power only or mainly electric power.	8	10	9	14	i 11	24	i 1.87 ,,	6.23 ,,
								Of total number of 587.	Of total number of 385.

8	Amount of annual output of collieries in—	(a) serial No. 7 (a)	438,044 tons.	67,754 tons.	1,022,865 tons.	207,310 tons.	1,461,909 tons.	275,073 tons.	7-76 p.c.	} Of total output of 16,836,981 tons.	1-66 p.c.	} Of total output of 16,593,615 tons.
		(b) serial No. 7 (b)	6,044,141 tons.	6,015,787 tons.	9,900,836 tons.	6,919,278 tons.	115,944,977 tons.	12,985,068 tons.	7-84 ..		77-05 ..	
		(c) serial No. 7 (c)	318,659 tons.	1,264,782 tons.	1,111,436 tons.	2,118,695 tons.	1,480,095 tons.	3,363,477 tons.	7-59 ..		30-59 ..	
9	Number of raising collieries worked by—	(a) limited companies	114	83	101	74	215	157				
		(b) private owners	147	100	225	136	372	326				
10	Amount of annual output of collieries in—	(a) serial No. 9 (a)	5,241,860 tons.	5,940,020 tons.	7,659,623 tons.	6,464,148 tons.	12,201,483 tons.	12,404,163 tons.	68-49 p.c.	} Of total output of 16,836,981 tons.	74-75 p.c.	} Of total output of 16,593,615 tons.
		(b) serial No. 9 (b)	1,558,984 tons.	1,408,308 tons.	4,376,514 tons.	2,761,140 tons.	5,935,496 tons.	4,189,452 tons.	31-51 ..		25-25 ..	
11	Average daily number of persons working—	(a) above and below ground.	59,219	55,592	95,276	66,992	154,496	122,584	..	} Of total number of workers.	..	} Of total number of workers.
		(b) above ground	22,940	15,411	37,608	21,493	60,548	36,904	39-19 p.c.		30-11 p.c.	
		(c) below ground	36,279	40,181	57,668	45,499	93,947	85,680	60-81 ..		69-89 ..	
12	Output per person employed—	(a) above and below ground.	114-84 tons.	132-18 tons.	126-33 tons.	138-91 tons.	..	..		
		(b) below ground	137-45 tons.	132-88 tons.	208-71 tons.	203-19 tons.	..	..		
13	Number of collieries making coke in—	(a) open ovens	95	23	204	162	299	135				
		(b) by-product ovens	1	2*	2	4	3	6				
14	Number of collieries in which hydraulic stowing has been introduced for pillar recovery in old workings.	4	2	1	3	5	5					

* 1 is at the Bengal Iron and Steel Works, Kulti, and 1 is at the Indian Iron and Steel Works, Hirapur, Burnpur.
In addition packing is being done in several mines in both the Jharla and Bangan coal-fields to stabilise areas of weak pillars.

* Supplied by the Mines Department.